TPO LISTENING SCRIPT

~~TPO1~~

Conversation 1

Narrator
Listen to part of a conversation between a student and a librarian.

Student
Hi, um…, I really hope you can help me.

Librarian
That’s why I’m here. What can I do for you?

Student
I’m supposed to do a literature review for my psychology course, but I’m… having a hard time finding articles. I don’t even know where to start looking.

Librarian
You said this is for your psychology course, right? So your focus is on …

Student
Dream Interpretation.

Librarian

Well, you have a focus, so that's already a good start. Hmmm… well, there're a few things… oh wait… have you checked to see if your professor put any material for you to look at on reserve?

Student

Aha, that's one thing I did know to do. I just copied an article, but I still need three more on my topic from three different journals.

Librarian

Let's get you going on looking for those then. We have printed versions of twenty or so psychology journals in the Reference Section. These are ones published within the last year. Now that I think about it… there's a journal named Sleep and Dreams.

Student

Oh, yeah, the article I just copied is from that journal, so I've got to look in other sources.

Librarian

Ok, actually, most of our materials are available electronically now. You can access psychology databases or electronic journals and articles through the library's computers, and if you want to search by title with the word 'dream' for example, just type it in and all the articles with 'dream' in the title will come up on the screen.

Student

Cool, that's great! Too bad I cannot do this from home.

Librarian

But you can. All of the library's databases and electronic sources can be accessed through any computer connected to the university network.

Student

Really?! I can't believe I didn't know that. It still sounds like it's going to take a while though, you know, going through all of that information, all of those sources.

Librarian

Maybe, but you already narrowed your search down to articles on Dream Interpretation, so it shouldn't be too bad. And you probably notice that there's an abstract or summary at the top of the first page of the article you copied. When you go into the databases and electronic sources, you have the option to display the abstracts on the computer screen, skimming those to decide whether or not you want to read the whole article should cut down some time.

Student

Right, abstracts! They'll definitely make the project more doable. I guess I should try out the electronic search while I'm still here then, you know, just in case.

Librarian

Sure, er… that computer's free over there, and I'll be here till five this afternoon.

Student

Thanks, I feel a lot better about this assignment now.

TPO 1 Lecture 1 Contemporary art

Listen to part of a lecture in a contemporary art class.

Professor

Ok, I'm going to begin this lecture by giving you your next assignment. Remember I said that at some point during this semester I wanted you to attend an exhibit at the Fairy Street Gallery and then write about it? Well, the exhibit that I want you to attend is coming up. It's already started in fact, but it'll be at the gallery for the next month, which should give you plenty of time to complete this assignment.

The name of the artist exhibiting there is Rose Frantzen. Frantzen's work may be unfamiliar to you since she's a relatively young artist. But she's got a very unusual style, compared to some of the artists we've looked at this term. But anyway, Frantzen's style is what she herself calls Realistic Impressionism. So you've probably studied both of these movements separately, separate movements, Realism and Impressionism, in some of your art history courses. So who can just sum these up?

Student

Well, Impressionism started in the late 19th century. Um…the basic impressionist style was very different from earlier styles. It didn't depict scenes or models exactly as they looked. Um… Impressionist painters tended to apply paint really thickly, and in big brushstrokes, so the texture of the canvas was rough.

Professor

Good. What else? What were the subjects?

Student

Well, a lot of impressionist artists painted everyday scenes, like people on the streets and in cafes, uh, lots of nature scenes, especially landscapes.

Professor

Good. So when you go to the exhibit, I really want you to take a close look at a certain painting. It's a farm scene. And you will see it right as you enter the gallery. The reason I think this painting is so important is that it stresses the impressionist aspect of Frantzen's style. It's an outdoor scene, an everyday scene. It's kind of bleak, but you can really see those broad brushstrokes and the blurry lines. The colors aren't quite realistic. The sky is kind of, well an unnatural pinkish yellow. And the fence in the foreground is blue, but somehow the overall scene gives an impression of a cold, bleak winter day on a farm. So that's the impressionist side of her work.

Oh, and speaking about farms, that reminds me. One interesting thing I read about Franzten is that when she first moved back to Iowa after living abroad, she often visited this place in her town called the Sales Barn. And the Sales Barn, it was basically this place where the local farmers bought and sold their cattle, their farm animals. And the reason Frantzen went there, and she later on would visit other places like dance halls, was to observe people and the ways that they moved. She really found that this helped her work---that it gave her an understanding of body movements and actions, how humans move, and stand still, what their postures were like, too.

So, what about Realism? What are the elements of Realism we should be looking for in Frantzen's work?

Student

Um… real honest depictions of subject matter, pretty unidealized stuff, and pretty everyday subject matter, too.

Professor

Good. One other painting I really want you to look at is of a young woman surrounded by pumpkins. You will notice that the woman's face is so realistic looking that it's almost like a photograph. The woman's nose is a little less than perfect and her hair is kind of messed up. This is realism. But then, the background of the painting, this woman with the pumpkins is wrapped in a blanket of broad thick brushstrokes, and, it's all kinds of zigzagging brushstrokes and lines, kind of chaotic almost when you look at it close. And there are vibrant colors. There's lots of orange, with little hints of an electric blue peeking out.

I find Frantzen to be a very accessible artist. I mean, some artists, to appreciate them, you have to know their life story. But here's a little bit about Rose Frantzen's life anyway. She attended art school, but was told by one of her instructors that she was not good at illustration, that she should go into advertising instead. So she took advertising classes and fine arts classes too, until she was convinced by the head of an advertising agency that her work was really good, that she could be an artist. But of course, it's not as easy as that, and so Frantzen had to paint other people's portraits at places like art fairs just to make money to buy paint for her more serious art work. No matter what, she never stopped painting. And now, Frantzen is doing extremely well. And her work is being shown all over the country. So I think most of us would be discouraged if we had to face challenges and difficulties like that. But what's important is that you keep at it that you don't give up. That's what is really important to remember.

TPO 1 Lecture2 Geology

Listen to part of a lecture in a geology class.

Professor

Ok, let's get started. Great. Today I want to talk about a way in which we are able to determine how old a piece of land, or some other geologic feature is - dating techniques. I'm going to talk about a particular dating technique. Why? Good dating is key to good analysis. In other words, if you want to know how a land formation was formed, the first thing you probably want to know is how old it is. It's fundamental.

Uh… Take the Grand Canyon for instance. Now, we geologists thought we had a pretty good idea of how the Grand Canyon in the southwestern United States was formed. We knew that it was formed from sandstone that solidified somewhere between 150 and 300 million years ago. Before it solidified, it was just regular sand. Essentially it was part of a vast desert. And until just recently, most of us thought the sand had come from an ancient mountain range fairly close by that flattened out over time. That's been the conventional wisdom among geologists for quite some time.

But now we've learned something different, and quite surprising, using a technique called Uranium-Lead Dating. I should say that Uranium-Lead Dating has been around for quite a while. But there have been some recent refinements. I will get into this in a minute. Anyway, Uranium-Lead Dating has produced some surprises. Two geologists discovered that about half of the sand from the Grand Canyon was actually once part of the Appalachian Mountains. That's really eye-opening news, since the Appalachian Mountain Range is, of course, thousands of kilometers to the east of the Grand Canyon. Sounds pretty unbelievable, right? Of course, the obvious question is how did that sand end up so far west? The theory is that huge rivers and wind carried the sand west where it mixed in with the sand that was already there.

Well, this was a pretty revolutionary finding. Um… and it was basically because of Uranium-Lead Dating. Why? Well, as everyone in this class should know, we usually look at the grain type within sandstone, meaning the actual particles in the sandstone, to determine where it came from. You can do other things too, like look at the wind or water that brought the grains to their location and figure out which way it was flowing. But that's only useful up to a point, and that's not what these two geologists did.

Uranium-Lead Dating allowed them to go about it in an entirely different way. What they did was: they looked at the grains of Zircon in the sandstone. Zircon is a material that contains radioactive Uranium, which makes it very useful for dating purposes. Zircon starts off as molten magma, the hot lava from volcanoes. This magma then crystallizes. And when Zircon crystallizes, the Uranium inside it begins to change into Lead. So if you measure the amount of Lead in the Zircon grain, you can figure out when the grain was formed. After that, you can determine the age of Zircon from different mountain ranges. Once you do that, you can compare the age of the Zircon in the sandstone in your sample to the age of the Zircon in the mountains. If the age of the Zircon matches the age of one of the mountain ranges, then it means the sandstone actually used to be part of that particular mountain range. Is everybody with me on that? Good. So, in this case, Uranium-Lead Dating was used to establish that half of the sandstone in the samples was formed at the same time the granite in the Appalachian Mountains was formed. So because of this, this new way of doing Uranium-Lead Dating, we've been able to determine that one of our major assumptions about the Grand Canyon was wrong.

Like I said before, Uranium-Lead Dating has been with us for a while. But, um… until recently, in order to do it, you really had to study many individual grains. And it took a long time before you got results. It just wasn't very efficient. And it wasn't very accurate. But technical advances have cut down on the number of grains you have to study, so you get your results faster. So I'll predict that Uranium-Lead Dating is going to become an increasingly popular dating method.

There are a few pretty exciting possibilities for Uranium-Lead Dating. Here is one that comes to mind. You know the theory that earth's continents were once joined together and only split apart relatively recently? Well, with Uranium-Lead Dating, we could prove that more conclusively. If they show evidence of once having been joined, that could really tell us a lot about the early history of the planet's geology.

TPO 1 Conversation 2

Narrator

Listen to part of a conversation between a student and his professor.

Professor

Hi Mathew, I'm glad you could come in today. You've been observing Mr. Grable's third-grade class for your approaches to education paper, right?

Student

Um, yes. I go over to Johnson Elementary School, you know, to watch Mr. Grable teach the children in class. It's been amazing, I mean, I'm just learning so much from just watching him. I'm so glad the classroom observations are a requirement for the education program. I mean it's like the best thing ever to prepare you to be a good teacher.

Professor

Well, I'm glad to see you feel that way, Mathew. You know, that's the goal. So, I've been reading over your observation notes and I'm quite interested in what's going on, in particular with the astronomy unit he's been teaching.

Student

The astronomy unit?

Professor

It seems that Mr. Grable has mastered the interdisciplinary approach to teaching that we've been talking about in class.

Student

Oh! OK, yeah, so like when he was teaching them astronomy, he didn't just teach them the names of the planets, he used it as a way to teach mythology.

Professor

Really! So, how did he do that?

Student

Well, some of the students could already name the planets, but they didn’t know that the names had any meaning — the stories behind them.

Professor

So, he…

Student

He introduced Greek and Roman mythology as a way of explaining. Like, you know, how like Jupiter’s the biggest planet, right, and how Jupiter was the name of the king of the gods in Roman mythology, right? So since Jupiter, the planet, is the largest planet in our solar system, it’s like the king of the planets, like Jupiter was the king of all the gods.

Professor

Oh, Mathew, that’s a great example.

Student

Yeah! And each student chose a planet and then did research on it to write a report and make a presentation. They went to the library to do the research, then they made presentations about the planet they chose.

Professor

So, in one science unit, in which the focus was astronomy, the students also learned about the literature of Greek and Roman mythology, used research skills in the library, wrote a report and practiced their oral presentation skills.

Student

Exactly! He used this one topic to teach third-graders all that stuff — how to use the books in the library, to write reports, and even how to speak in public. Plus they had a great time doing it.

Professor

You know, Mathew, this is just what we’ve been talking about in our class. I’m sure everyone can learn something from your experience. You know, Mathew, I’d love for you to talk about this astronomy unit in class on Wednesday.

Student

Really?! Um… ‘cause I don’t really think I’ll have any time to write my paper by then.

Professor

Oh, you won’t need to write anything new just yet. For Wednesday, use your class observation notes and explain the things we’ve discussed today.

Student

Ok, that sounds all right.

TPO 1 Lecture 3 Archeology

Listen to part of a lecture in an archeology class.

Professor

OK, we've been talking about early agriculture in the near east. So let's concentrate on one site and see what we can learn from it. Let's look at Catalhoyuk. Um… I'd better write that down. Catalhoyuk, that's about as close as we get in English. It's Turkish, really. The site's in modern day Turkey, and who knows what the original inhabitants called it. Anyway, uh…Catalhoyuk wasn't the first agricultural settlement in the near east, but it was pretty early, settled about 9,000 years ago in the Neolithic period. And ... um... the settlement...uh...town really, lasted about a thousand years and grew to a size of about eight or ten thousand people. That certainly makes it one of the largest towns in the world at that time.

One of the things that make the settlement of this size impressive is the time period. It's the Neolithic, remember, the late Stone Age. So the people that lived there had only stone tools, no metals. So everything they accomplished, like building this town, they did with just stone, plus wood, bricks, that sort of thing. But you got to remember that it wasn't just any stone they had, they had obsidian. And um... obsidian is a black, volcanic, well, almost like glass. It flakes very nicely into really sharp points. The sharpest tools of the entire Stone Age were made of obsidian. And uh... the people of Catalhoyuk got theirs from further inland, from central Turkey, traded for it, probably.

Anyway, what I wanna focus on is the way the town was built. The houses are all rectangular, one storey, made of sun-dried bricks. But what's really interesting is that there are no spaces between them, no streets in other words, and so generally no doors on the houses either. People walked around on the roofs and entered the house through a hatchway on the roof, down a wooden ladder. You can still see the diagonal marks of the ladders in the plaster on the inside walls. Once you were in the house, there would be one main room and a couple of small rooms for storage. The main room had the hearths, for cooking and for heat. It would've been pretty cold during the winters. And it also looks like they made their tools near the fire. There tends to be a lot of obsidian flakes and chips in the hearth ashes, but no chimney. The smoke just went out the same hatchway that people used for going in and out themselves. So there would have been an open fire inside the house with only one hole in the roof to let the smoke out. You and I would have found it a bit too smoky in there. You can see on the walls, which they plastered and decorated with paintings. They ended up with a layer of black soot on them, and so did people's lungs. The bones found in the graves show a layer of soot on the inside of the ribs.

And that's another unusual feature of Catalhoyuk, the burial sites. The graves have all been found under the houses, right under the floors. And it maybe this burial custom that explains why the houses were packed in so tightly without streets. I mean, you might think it was for protection or something, but there has been no evidence found yet of any violent attack that would indicate that kind of danger. It maybe they wanted to live as near as possible to their ancestors' graves and be buried near them themselves. But it makes a good point. Based on excavations, we can know the layout of the houses and the location of the graves, but we're only guessing when we tried to say why they did it that way. That's the way it is with archeology. You are dealing with the physical remains that people left behind. We have no sure access to what they thought and how they felt about things. I mean it's interesting to speculate. And the physical artifacts can give us clues, but there is a lot we can't really know. So, for instance, their art. They painted on the plastered walls and usually they painted hunting scenes with wild animals in them. Now they did hunt and they also raised cereal crops and kept sheep, but we don't know why so many of the paintings are of hunting scenes. Was it supposed to have religious or magical significance? That's the kind of thing we can only guess at based on clues. And hopefully, further excavation of Catalhoyuk will yield more clues. But we'll probably never know for sure.

TPO 1 Lecture 4 Biology

Narrator

Listen to part of a lecture in a biology class.

Professor

For today's discussion, we'll review the case study on how some animals have behaviorally adapted to their environments. Now you had to read about two animal species, the Eastern marmot and the Olympic marmot. Marmots are rodents. They are large ground squirrels, about the size of an average house cat. And they live in a variety of habitats. And even though they spend the significant portion of the year hibernating, according to this case study, marmots are still considered excellent subjects for animal behavioral studies. Why is that?

Student

Well, when they are not hibernating, you can find them in open areas. And they are pretty active during the day, which makes them easy to observe, right?

Professor

Uh-huh, so first let's discuss the Eastern marmots. They reside throughout the eastern region of North America where there is a temperate climate, where the growing season lasts for at least five months of the year, which is when they do all their mating, playing and eating.

Student

Oh, I see. At first I wasn't sure what growing season meant, just from the reading. But now I get it. It's the amount of time it takes for them to grow, right? So it would be five months?

Professor

Umm? Oh, uh… I'm sorry but no. It has nothing to do with that. It's not about the time it takes for Eastern marmots to grow. It's when the food is available. That is when it's not covered in snow and there is no frost covering the grass and, umm, vegetative parts of a plant's herbs and the flowers the marmots like to eat. So growing season refers to the availability of the food they eat, OK? So now how would you describe the Eastern marmots' social habits?

Student

Well, they are really territorial, and loners, and just so aggressive even with other Eastern marmots. And their mating ritual is just so impersonal.

Professor

Uh-huh? Now when they emerge in the spring from hibernation, the mating process begins. For them, well, they come together to mate and then they go their separate ways. Then about six to eight weeks after birth, the offspring leave their mothers.

Student

Really? Just six weeks? Is that possible for the offspring to make it on their own so young?

Professor

Well, it's not as if they aren't ready for the real world because they are. Remember, they mature quickly and the weather's nice. Also they live in open fields where there is lots of edible vegetation. So roughly six weeks after birth, Eastern marmots are just old enough to take their chances of surviving in the temperate environment. So how does this relate to their behavior?

Student

Oh, I get it. Since the climate's not too bad, the Eastern marmots don't have to rely on each other too much and they really don't need to stay together as a family to survive either.

Professor

Uh-ha. Any contrast, the Olympic marmots? What about them?

Student

Well, they live together as a family and take care of their young until they are at least two years old. They're really friendly with each other. And what I really like is that they even have greeting ceremonies. And they are not at all aggressive and territorial like the Eastern marmots. So their social behavior is so different from Eastern marmots because of the climate where they live? That seems so bizarre.

Professor

Well, the Olympic marmots inhabit meadows high in the Olympic Mountains where the weather conditions are much harsher. So there is a lot more wind and snow. The growing season only lasts about two to three months. So in that much shorter period of time, all the Olympic marmots, male and female, eat, play, work and nurture the young together. Because the climate is so harsh, cooperation increases the survival rate of the Olympic marmots. They keep their young at home until they are physically able to survive on their own. This could explain why the social behavior of the Olympic marmots is so unlike that of the Eastern marmots.

TPO2

备注：TPO2 听力来自托福 OG，上面附有正确的听力文本。

Conversation 1

Narrator

Listen to a conversation between a student and a professor.

Student

Uh, excuse me, Professor Thompson. I know your office hours are tomorrow, but I was wondering if you had a few minutes free now to discuss something.

Professor

Sure, John. What did you want to talk about?

Student

Well, I have some quick questions about how to write up the research project I did this semester—about climate variations.

Professor

Oh, yes. You were looking at variations in climate in the Grant City area, right? How far along have you gotten?

Student

I've got all my data, so I'm starting to summarize it now, preparing graphs and stuff. But I'm just. . . I'm looking at it and I'm afraid that it's not enough, but I'm not sure what else to put in the report.

Professor

I hear the same thing from every student. You know, you have to remember now that you're the expert on what you've done. So, think about what you'd need to include if you were going to explain your research project to someone with general or casual knowledge about the subject, like . . . like your parents. That's usually my rule of thumb: would my parents understand this?

Student

OK. I get it.

Professor

I hope you can recognize by my saying that how much you do know about the subject.

Student

Right. I understand. I was wondering if I should also include the notes from the research journal you suggested I keep.

Professor

Yes, definitely. You should use them to indicate what your evolution in thought was through time. So, just set up, you know, what was the purpose of what you were doing—to try to understand the climate variability of this area—and what you did, and what your approach was.

Student

OK. So, for example, I studied meteorological records; I looked at climate charts; I used different methods for analyzing the data, like certain statistical tests; and then I discuss the results. Is that what you mean?

Professor

Yes, that's right. You should include all of that. The statistical tests are especially important. And also be sure you include a good reference section where all your published and unpublished data came from, 'cause you have a lot of unpublished climate data.

Student

Hmm . . . something just came into my mind and went out the other side.

Professor

That happens to me a lot, so I've come up with a pretty good memory management tool. I carry a little pad with me all the time and jot down questions or ideas that I don't want to forget. For example, I went to the doctor with my daughter and her baby son last week and we knew we wouldn't remember everything we wanted to ask the doctor, so we actually made a list of five things we wanted answers to.

Student

A notepad is a good idea. Since I'm so busy now at the end of the semester, I'm getting pretty forgetful these days. OK. I just remembered what I was trying to say before.

Professor

Good. I was hoping you'd come up with it.

Student

Yes. It ends up that I have data on more than just the immediate Grant City area, so I also included some regional data in the report. With everything else it should be a pretty good indicator of the climate in this part of the state.

Professor
Sounds good. I'd be happy to look over a draft version before you hand in the final copy, if you wish.

Student
Great. I'll plan to get you a draft of the paper by next Friday. Thanks very much. Well, see ya.

Professor
OK.

TPO2 Lecture 1 Psychology

Narrator
Listen to part of a psychology lecture. The professor is discussing behaviorism.

Professor
Now, many people consider John Watson to be the founder of behaviorism. And like other behaviorists, he believed that psychologists should study only the behaviors they can observe and measure. They're not interested in mental processes. While a person could describe his thoughts, no one else can see or hear them to verify the accuracy of his report. But one thing you can observe is muscular habits. What Watson did was to observe muscular habits because he viewed them as a manifestation of thinking. One kind of habits that he studied are laryngeal habits.

Watson thought laryngeal habits . . . you know, from larynx, in other words, related to the voice box . . . he thought those habits were an expression of thinking. He argued that for very young children, thinking is really talking out loud to oneself because they talk out loud even if they're not trying to communicate with someone in particular. As the individual matures, that overt talking to oneself becomes covert talking to oneself, but thinking still shows up as a laryngeal habit. One of the bits of evidence that supports this is that when people are trying to solve a problem, they, um, typically have increased muscular activity in the throat region. That is, if you put electrodes on the throat and measure muscle potential—muscle activity—you discover that when people are thinking, like if they're diligently trying to solve a problem, that there is muscular activity in the throat region.

So, Watson made the argument that problem solving, or thinking, can be defined as a set of behaviors—a set of responses—and in this case the response he observed was the throat activity. That's what he means when he calls it a laryngeal habit. Now, as I am thinking about what I am going to be saying, my muscles in my throat are responding. So, thinking can be measured as muscle activity. Now, the motor theory . . . yes?

Student
Professor Blake, um, did he happen to look at people who sign? I mean deaf people?

Professor
Uh, he did indeed, um, and to jump ahead, what one finds in deaf individuals who use sign language when they're given problems of various kinds, they have muscular changes in their hands when they are trying to solve a problem . . . muscle changes in the hand, just like the muscular changes going on in the throat region for speaking individuals.

So, for Watson, thinking is identical with the activity of muscles. A related concept of thinking was developed by William James. It's called ideomotor action.

Ideomotor action is an activity that occurs without our noticing it, without our being aware of it. I'll give you one simple example. If you think of locations, there tends to be eye movement that occurs with your thinking about that location. In particular, from where we're sitting, imagine that you're asked to think of our university library. Well, if you close your eyes and think of the library, and if you're sitting directly facing me, then according to this notion, your eyeballs will move slightly to the left, to your left, 'cause the library's in that general direction.

James and others said that this is an idea leading to a motor action, and that's why it's called "ideomotor action"—an idea leads to motor activity. If you wish to impress your friends and relatives, you can change this simple process into a magic trick. Ask people to do something such as I've just described: think of something on their left; think of something on their right. You get them to think about two things on either side with their eyes closed, and you watch their eyes very carefully. And if you do that, you'll discover that you can see rather clearly the eye movement—that is, you can see the movement of the eyeballs. Now, then you say, think of either one and I'll tell which you're thinking of.

OK. Well, Watson makes the assumption that muscular activity is equivalent to thinking. But given everything we've been talking about here, one has to ask: are there alternatives to this motor theory—this claim that muscular activities are equivalent to thinking? Is there anything else that might account for this change in muscular activity, other than saying that it is thinking? And the answer is clearly yes. Is there any way to answer the question definitively? I think the answer is no.

TPO2 Lecture 2 Botany

Narrator

Listen to part of a lecture from a Botany class.

Professor

Hi, everyone. Good to see you all today. Actually, I expected the population to be a lot lower today. It typically runs between 50 and 60 percent on the day the research paper is due. Um, I was hoping to have your exams back today, but, uh, the situation was that I went away for the weekend, and I was supposed to get in yesterday at five, and I expected to fully complete all the exams by midnight or so, which is the time that I usually go to bed, but my flight was delayed, and I ended up not getting in until one o'clock in the morning. Anyway, I'll do my best to have them finished by the next time we meet.

OK. In the last class, we started talking about useful plant fibers. In particular, we talked about cotton fibers, which we said were very useful, not only in the textile industry, but also in the chemical industry, and in the production of many products, such as plastics, paper, explosives, and so on. Today we'll continue talking about useful fibers, and we'll begin with a fiber that's commonly known as "Manila hemp."

Now, for some strange reason, many people believe that Manila hemp is a hemp plant. But Manila hemp is not really hemp. It's actually a member of the banana family— it even bears little banana-shaped fruits. The "Manila" part of the name makes sense, because Manila hemp is produced chiefly in the Philippine Islands and, of course, the capital city of the Philippines is Manila.

Now, as fibers go, Manila hemp fibers are very long. They can easily be several feet in length and they're also very strong, very flexible. They have one more characteristic that's very important, and that is that they are exceptionally resistant to salt water. And this combination of characteristics—long, strong, flexible, resistant to salt water—makes Manila hemp a great material for ropes, especially for ropes that are gonna be used on ocean-going ships. In fact, by the early 1940's, even though steel cables were available, most ships in the United States Navy were not moored with steel cables; they were moored with Manila hemp ropes.

Now, why was that? Well, the main reason was that steel cables degrade very, very quickly in contact with salt water. If you've ever been to San Francisco, you know that the Golden Gate Bridge is red. And it's red because of the zinc paint that goes on those stainless steel cables. That, if they start at one end of the bridge and they work to the other end, by the time they finish, it's already time to go back and start painting the beginning of the bridge again, because the bridge was built with steel cables, and steel cables can't take the salt air unless they're treated repeatedly with a zinc-based paint.

On the other hand, plant products like Manila hemp, you can drag through the ocean for weeks on end. If you wanna tie your anchor to it and drop it right into the ocean, that's no problem, because plant fibers can stand up for months, even years, in direct contact with salt water. OK. So how do you take plant fibers that individually you could break with your hands and turn them into a rope that's strong enough to moor a ship that weighs thousands of tons? Well, what you do is you extract these long fibers from the Manila hemp plant, and then you take several of these fibers, and you group them into a bundle, because by grouping the fibers you greatly increase their breaking strength—that bundle of fibers is much stronger than any of the individual fibers that compose it. And then you take that bundle of fibers and you twist it a little bit, because by twisting it, you increase its breaking strength even more. And then you take several of these little bundles, and you group and twist them into bigger bundles, which you then group and twist into even bigger bundles, and so on, until eventually, you end up with a very, very strong rope.

TPO 2 Conversation 2

Narrator

Listen to a conversation between two students. They are both studying to be English teachers.

Girl

Did you register already for your classes next semester?

Boy

Yes, I did.

Girl

What are you taking?

Boy

Um…contemporary literature, English style, um… the teaching seminar, and I still have to do my student teaching. I'm gonna help teach a writing class of the junior high.

Girl

That's a heavy schedule.

Boy

Yeah, it will be really busy and I'm also taking a theory class. But I have to quit my job a couple of weeks 'cause it will be just too much.

Girl

Where do you work at?

Boy

Buster's coffee shop, but just till the end of the month. What are you doing next semester?

Girl

Actually a teaching seminar too. And I will have to start writing my thesis. You know, I'm also going for my master's degree.

Boy

So you are not writing any poetry, I imagine.

Girl

No, I was actually thinking about revising some of my poems and sending them into places for publication.

Boy

Cool, you should. Um, did you hear about that new poetry club, The Poetry Kitchen?

Girl

Yeah, no time.

Boy

It's fun. It's Sunday night. You don't do anything at Sunday nights?

Girl

I do homework Sunday nights.

Boy

Well, it's only from 7 to 9.

Girl

Is it every Sunday?

Boy

Last Sunday of every month. I don't know about this month, 'cause it's probably a little too close to Thanksgiving, so they might move it up. I don't know what they are gonna to do, but it's a good time, it's fun, some really impressive readings.

Girl

Who? From our class?

Boy

Some people from our class are reading. A lot of them go, sometimes even the professor.

Girl

Really? I don't know if I would want reading in front of her.

Boy

You wouldn't have to read, you can just watch. I just watched the first time, but it's a good environment to read them, I think anyway.

Girl

I probably have to write something new, so maybe during the summer, I just can't now.

Boy
Yeah, it wouldn't be the same just reading old stuff. Are you going to do summer school?

Girl
Definitely. Otherwise, I will be short 6 credits. I have no choice.

Boy
Yeah, me too. This is the second summer I'll have to take classes. I gotta go now, my Shakespeare class starts at twenty minutes.

TPO2 Lecture 3 Philosophy

Narrator
Listen to part of a lecture in a philosophy class.

Professor
OK. Another ancient Greek philosopher we need to discuss is Aristotle—Aristotle's ethical theory. What Aristotle's ethical theory is all about is this: he's trying to show you how to be happy—what true happiness is.

Now, why is he interested in human happiness? It's not just because it's something that all people want to aim for. It's more than that. But to get there we need to first make a very important distinction. Let me introduce a couple of technical terms: extrinsic value and intrinsic value.

To understand Aristotle's interest in happiness, you need to understand this distinction.

Some things we aim for and value, not for themselves but for what they bring about in addition to themselves. If I value something as a means to something else, then it has what we will call "extrinsic value." Other things we desire and hold to be valuable for themselves alone. If we value something not as a means to something else, but for its own sake, let us say that it has "intrinsic value."

Exercise. There may be some people who value exercise for itself, but I don't. I value exercise because if I exercise, I tend to stay healthier than I would if I didn't. So I desire to engage in exercise and I value exercise extrinsically . . . not for its own sake, but as a means to something beyond it. It brings me good health.

Health. Why do I value good health? Well, here it gets a little more complicated for me. Um, health is important for me because I can't . . .do other things I want to do— play music, teach philosophy—if I'm ill. So health is important to me—has value to me—as a means to a productive life. But health is also important to me because I just kind of like to be healthy—it feels good. It's pleasant to be healthy, unpleasant not to be. So to some degree I value health both for itself and as a means to something else: productivity. It's got extrinsic and intrinsic value for me.

Then there's some things that are just valued for themselves. I'm a musician, not a professional musician; I just play a musical instrument for fun. Why do I value playing music? Well, like most amateur musicians, I only play because, well, I just enjoy it. It's something that's an end in itself.

Now, something else I value is teaching. Why? Well, it brings in a modest income, but I could make more money doing other things. I'd do it even if they didn't pay me. I just enjoy teaching. In that sense it's an end to itself.

But teaching's not something that has intrinsic value for all people—and that's true generally. Most things that are enjoyed in and of themselves vary from person to person. Some people value teaching intrinsically, but others don't.

So how does all this relate to human happiness? Well, Aristotle asks: is there something that all human beings value . . . and value only intrinsically, for its own sake and only for its own sake? If you could find such a thing, that would be the universal final good, or truly the ultimate purpose or goal for all human beings. Aristotle thought the answer was yes. What is it? Happiness. Everyone will agree, he argues, that happiness is the ultimate end to be valued for itself and really only for itself. For what other purpose is there in being happy? What does it yield? The attainment of happiness becomes the ultimate or highest good for Aristotle.

The next question that Aristotle raises is: what is happiness? We all want it; we all desire it; we all seek it. It's the goal we have in life. But what is it? How do we find it? Here he notes, with some frustration, people disagree.

But he does give us a couple of criteria, or features, to keep in mind as we look for what true human happiness is. True human happiness should be, as he puts it, complete. Complete in that it's all we require. Well, true human happiness . . . if you had that, what else do you need? Nothing.

And, second, true happiness should be something that I can obtain on my own. I shouldn't have to rely on other people for it. Many people value fame and seek fame. Fame for them becomes the goal. But, according to Aristotle, this won't work either, because fame depends altogether too much on other people. I can't get it on my own, without help from other people.

In the end, Aristotle says that true happiness is the exercise of reason—a life of intellectual contemplation . . . of thinking. So let's see how he comes to that.

TPO 2 Lecture 4 Astronomy

Narrator
Listen to part of a lecture in an astronomy class. You will not need to remember the numbers the professor mentions.

Professor
OK. Let's get going. Today I'm going to talk about how the asteroid belt was discovered. And . . . I'm going to start by writing some numbers on the board. Here they are: We'll start with zero, then 3, . . . 6, . . . 12. Uh, tell me what I'm doing.

Female student
Multiplying by 2?

Professor
Right. I'm doubling the numbers, so 2 times 12 is 24, and the next one I'm going to write after 24 would be . . .

Female student
48.

Professor
48. Then 96. We'll stop there for now. Uh, now I'll write another row of numbers under that. Tell me what I'm doing. 4, 7, 10 . . . How am I getting this second row?

Male Student

Adding 4 to the numbers in the first row.

Professor

I'm adding 4 to each number in the first row to give you a second row. So the last two will be 52, 100, and now tell me what I'm doing.

Female Student

Putting in a decimal?

Professor

Yes, I divided all those numbers by 10 by putting in a decimal point. Now I'm going to write the names of the planets under the numbers. Mercury . . . Venus. . . Earth. . . Mars. So, what do the numbers mean? Do you remember from the reading?

Male Student

Is it the distance of the planets from the Sun?

Professor

Right. In astronomical units—not perfect, but tantalizingly close. The value for Mars is off by . . . 6 or 7 percent or so. It's . . . but it's within 10 percent of the average distance to Mars from the Sun. But I kind of have to skip the one after Mars for now. Then Jupiter's right there at 5-point something, and then Saturn is about 10 astronomical units from the Sun. Um, well, this pattern is known as Bode's Law.

Um, it isn't really a scientific law, not in the sense of predicting gravitation mathematically or something, but it's attempting a pattern in the spacing of the planets, and it was noticed by Bode hundreds of years ago. Well, you can imagine that there was some interest in why the 2.8 spot in the pattern was skipped, and um . . . but there wasn't anything obvious there, in the early telescopes. Then what happened in the late 1700s? The discovery of . . . ?

Female Student

Another planet?

Professor

The next planet out, Uranus—after Saturn.

And look, Uranus fits in the next spot in the pattern pretty nicely, um, not perfectly, but close. And so then people got really excited about the validity of this thing and finding the missing object between Mars and Jupiter. And telescopes, remember, were getting better. So people went to work on finding objects that would be at that missing distance from the Sun, and then in 1801, the object Ceres was discovered.

And Ceres was in the right place—the missing spot. Uh, but it was way too faint to be a planet. It looked like a little star. Uh, and because of its starlike appearance, um, it was called an "asteroid." OK? "Aster" is Greek for "star," as in "astronomy." Um, and so, Ceres was the first and is the largest of what became many objects discovered at that same distance. Not just one thing, but all the objects found at that distance from the asteroid belt. So the asteroid belt is the most famous success of this Bode's Law. That's how the asteroid belt was discovered.

Conversation 1

Narrator

Listen to a conversation between a student and a receptionist at the Registrar's Office on the first day of the semester.

Student

Excuse me, I'm supposed to be having my physics class in the science building, but no one's in the classroom. Could you tell me where the class is? Physics 403 — has it been moved?

Receptionist

Well, there's a room assignment sheet on the bulletin board outside this office.

Student

Yeah, I know, but my class isn't listed there. There must be some kind of mistake or something. Could you look it up, please?

Receptionist

Hmmm... ok, let me check on the computer. It's physics, right? Wait, did you say physics 403?

Student

Yeah.

Receptionist

Er…I'm sorry, but it says here that it was cancelled. You should have gotten a letter from the registrar's office about this.

Student

What? I've never got it.

Receptionist

Are you sure? 'Cause it says on the computer that the letter was sent out to students a week ago.

Student

Really? I should have gotten it by now. I wonder if I threw it away with all the junk mail by mistake.

Receptionist

Well, it does happen. Er… let me check something. What's your name?

Student

Woodhouse, Laura Woodhouse.

Receptionist

Ok, hmmm…Woodhouse, let me see… ah, it says here we sent it to your apartment on er… Center Street.

Student

Oh, that's my old apartment. I moved out of there a little while ago.

Receptionist

Well, and I suppose you haven't changed your mailing address at the administration office. Well, that would explain it.

Student

Yeah, I guess that's it. But how can they cancel the class after offering it. If I'd known this was going to happen, I would have taken it last semester.

Receptionist

I know, it's really inconvenient for you, I understand that, but er… if we don't have enough students signed up for the course, the college can't offer it. You know, it's a practical issue, like we can't have an instructor when there're only a few students in the class. You see what I mean?

Student

I guess, but now I don't know what course I should take instead.

Receptionist

Ok, let's see. Do you have any courses you're going to take next semester? If you do, you might want to take them now and sign up for physics 403 next semester.

Student

Yeah, I guess I could do that. I just hope it won't be cancelled again. Do you know how many people have to be enrolled in order to keep a class from being cancelled?

Receptionist

Well, it depends on the class, but for that class, you have to have er… let's see, usually it'd be at least ten people, but since it was cancelled this semester, they might even do it with less. But do you know what you should do? Give the physics department a call a couple of weeks before the semester starts. They'll be able to tell you if they're planning to go through with it. It's their decision, actually.

Student

Oh, ok, I will do that. Thanks for the info.

Receptionist

No problem. Sorry about the class. Oh, why don't you go change your mailing address now. It'll only takes a minute.

Student

Oh, oh, sure, I will do that right way.

TPO 3 Lecture 1 Environmental science

Narrator

Listen to part of a lecture in an environmental science class.

Professor

Now, we've been talking about the loss of animal habitat from housing developments, um…, growing cities – small habitat losses. But today I wanna begin talking about what happens when habitat is reduced across a large area. There are, of course, animal species that require large areas of habitat, and some migrate over very long distances. So what's the impact of habitat loss on those animals – animals that need large areas of habitat?

Well, I'll use the humming birds as an example.

Now you know a humming bird is amazingly small, but even though it's really tiny, it migrates over very long distances, travels up and down the western hemisphere – the Americas, back and forth between where it breeds in the summer and the warmer climates where it spends the winter. So we would say that this whole area over which it migrates is its habitat because on this long-distance journey, it needs to come down to feed and sleep every so often, right?

Well, the humming bird beats its wings – get this – about 3 thousand times per minute. So you think, wow, it must need a lot of energy, a lot of food, right? Well, it does. It drinks a lot of nectar from flowers and feeds on some insects, but it's energy-efficient too. You can't say it isn't. I mean, as it flies all the way across the Gulf of Mexico, it uses up almost none of its body fat. But that doesn't mean it doesn't need to eat. So humming birds have to rely on plants in their natural habitat.

And it goes without saying, but, well, the opposite is true as well, plants depend on humming birds too. There are some flowers that can only be pollinated by the humming birds. Without it stopping to feed and spreading pollen from flower to flower, these plants would cease to exist.

But the problem, well, as natural habitat along these migration routes is developed by humans for housing or agriculture or cleared for raising cattle, for instance, there is less food available for migrating humming birds. Their nesting sites are affected too, the same, by the same sorts of human activities. And all of these activities pose a real threat to the humming bird population.

So to help them survive, we need to preserve their habitats. And one of the concrete ways people have been doing this is by cleaning up polluted habitat areas and then replanting flowers, um, replanting native flowers that humming birds feed on.

Promoting ecological tourism is another way to help save their habitat. As the number of visitors, eco-tourists who come to humming bird habitats to watch the birds, the more the number of visitors grows, the more local businesses profit, so ecological tourism can bring financial rewards, all the more reason to value these beautiful little creatures in their habitat, right?

But to understand more about how to protect and support humming birds the best we can, we've got to learn more about their breeding, nesting sites and migration routes, and also about the natural habitats we find there. That should help us determine how to prevent further decline in the population.

A good research method, a good way to learn more, is by running a banding study. Banding the birds allows us to track them over their lifetime. It's been a practice that's been used by researchers for years. In fact, most of what we know about humming birds comes from banding studies, where we capture a humming bird and make sure all the information about it, like its weight and age and length, are all recorded, put into international, an international information database. And then we place an extremely lightweight band on one of its legs, well, what looks like a leg, although technically it's considered part of the bird's foot.

Anyway, these bands are perfectly safe, and some humming birds have worn them for years with no evidence of any problems. The band is labeled with a tracking number, oh, and there is a phone number on the band for people to call for free, to report a banded bird they've found or recaptured. So when a banded bird is recaptured and reported, we learn about its migration route, its growth, and how long it has been alive, its lifespan. One recaptured bird had been banded almost 12 years earlier – she is one of the oldest humming birds on record.

Another interesting thing we've learned is that some humming birds, um, they no longer use a certain route. They travel by a different route to reach their destination. And findings like these have been of interest to biologists and environmental scientists in a number of countries who are trying to understand the complexities of how changes in a habitat affect the species in it.

TPO 3 Lecture 2 Film history

Narrator

Listen to part of a lecture in a film history class.

Professor

Okay, we've been discussing films in the 1920s and 30s, and how back then film categories, as we know them today, had not yet been established. We said that by today's standards, many of the films of the 20s and 30s would be considered hybrids, that is, a mixture of styles that wouldn't exactly fit into any of today's categories. And in that context, today we are going to talk about a film-maker who began making very unique films in the late 1920s. He was French, and his name was Jean Painlevé.

Jean Painlevé was born in 1902. He made his first film in 1928. Now in a way, Painlevé's films conform to norms of the 20s and 30s, that is, they don't fit very neatly into the categories we use to classify films today. That said, even by the standards of the 20s and 30s, Painlevé's films were a unique hybrid of styles. He had a special way of fusing, or some people might say, confusing, science and fiction. His films begin with facts, but then they become more and more fictional. They gradually add more and more fictional elements. In fact, Painlevé was known for saying that science is fiction.

Painlevé was a pioneer in underwater film-making, and a lot of his short films focused on the aquatic animal world. He liked to show small underwater creatures, displaying what seemed like familiar human characteristics – what we think of as unique to humans. He might take a clip of a mollusk going up and down in the water and set it to music. You know, to make it look as if the mollusk were dancing to the music like a human being – that sort of thing. But then he suddenly changed the image or narration to remind us how different the animals are, how unlike humans.

He confused his audience in the way he portrayed the animals he filmed, mixing up our notions of the categories human and animal. The films make us a little uncomfortable at times because we are uncertain about what we are seeing. It gives him films an uncanny feature: the familiar made unfamiliar, the normal made suspicious. He liked twists, he liked the unusual. In fact, one of his favorite sea animals was the seahorse because with seahorses, it's the male that carries the eggs, and he thought that was great. His first and most celebrated underwater film is about the seahorse.

Susan, you have a question?

Student 1

But underwater film-making wasn't that unusual, was it? I mean, weren't there other people making movies underwater?

Professor

Well, actually, it was pretty rare at that time. I mean, we are talking the early 1930s here.

Student 1

But what about Jacques Cousteau? Was he like an innovator, you know, with underwater photography too?

Professor

Ah, Jacques Cousteau. Well, Painlevé and Cousteau did both film underwater, and they were both innovators, so you are right in that sense. But that's pretty much where the similarities end.

First of all, Painlevé was about 20 years ahead of Cousteau. And Cousteau's adventures were high-tech, with lots of fancy equipment, whereas Painlevé kind of patchedequipment together as he needed it. Cousteau usually filmed large animals, usually in the open sea, whereas Painlevé generally filmed smaller animals, and he liked to film in shallow water.

Uh, what else? Oh well, the main difference was that Cousteau simply investigated and presented the facts – he didn't mix in fiction. He was a strict documentarist. He set the standard really for the nature documentary. Painlevé, on the other hand, as we said before, mixed in elements of fiction. And his films are much more artistic, incorporating music as an important element.

John, you have a question?

Student 2

Well, maybe I shouldn't be asking this, but if Painlevé's films are so special, so good, why haven't we ever heard of them? I mean, everyone's heard of Jacques Cousteau.

Professor

Well, that's a fair question. Uh, the short answer is that Painlevé's style just never caught on with the general public. I mean, it probably goes back at least in part to what we mentioned earlier, that people didn't know what to make of his films – they were confused by them, whereas Cousteau's documentaries were very straightforward, met people's expectations more than Painlevé's films did. But you true film history buffs know about him. And Painlevé is still highly respected in many circles.

TPO 3 Conversation 2

Narrator

Listen to a conversation between a student and a professor.

Student

Hi, Professor Archer, you know how in class last week you said that you were looking for students who are interested in volunteering for your archeology project?

Professor

Of course, are you volunteering?

Student

Yes, I am. It sounds really interesting, but um… do I need to have any experience for these kinds of projects?

Professor

No, not really. I assume that most students taking the introductory level class would have little or no experience with archeological research, but that's ok.

Student

Oh, good, that’s a relief. Actually, that’s why I’m volunteering for the project — to get experience. What kind of work is it?

Professor

Well, as you know, we're studying the history of the campus this semester. This used to be an agricultural area and we already know that where the main lecture hall now stands, there once were farm house and barn that were erected in the late 1700s. We are excavating near the lecture hall to see what types of artifacts we find, you know, things people used in the past that got buried when the campus was constructed. We’ve already begun to find some very interesting items, like old bottles, buttons, pieces of clay pottery.

Student

Buttons and clay pottery? Did the old owners leave in such a hurry that they left their clothes and dishes behind?

Professor

Hmmm… that’s just one of the questions we hope to answer with this project.

Student

Wow, and it’s all right here on campus.

Professor

That’s right, no traveling involved. I wouldn’t expect volunteers to travel to a site, especially in the middle of the semester. We expect to find many more things, but we do need more people to help.

Student

So… how many student volunteers are you looking for?

Professor

I’m hoping to get five or six. I’ve asked for volunteers in all of the classes I teach, but no one has responded. You are the first person to express interest.

Student

Sounds like it could be a lot of work. Is there um… is there any way I can use the experience to get some extra credit in class? I mean, can I write a paper about it?

Professor

I think it’ll depend on what type of work you do in the excavation, but I imagine we can arrange something. Actually I’ve been considering offering extra credit for class because I’ve been having a tough time getting volunteers. Extra credit is always a good incentive for students.

Student

And how often would you want the volunteers to work?

Professor

We’re asking for three or four hours per week, depending on your schedule. A senior researcher, I think you know John Franklin, my assistant, is on site every day.

Student

Sure, I know John. By the way, will there be some sort of training?

Professor

Yes, er… I want to wait till Friday to see how many students volunteer, and then I'll schedule a training class next week at a time that's convenient for everyone.

Student

Ok. I'll wait to hear from you. Thanks a lot for accepting me.

TPO 3 Lecture 3 Art History

Narrator

Listen to part of a lecture in an Art History class. The professor has been discussing the origins of art.

Professor

Some of the world's oldest preserved art is the cave art of Europe, most of it in Spain and France. And the earliest cave paintings found to date are those of the Chauvet Cave in France discovered in 1994.

And you know, I remember when I heard about the results of the dating of the Chauvet paintings, I said to my wife, "Can you believe these paintings are over 30,000 years old?" And my 3-year-old daughter piped up and said, "Is that older than my great-grandmother?" That was the oldest age she knew. And you know, come to think of it. It's pretty hard for me to really understand how long 30,000 years is too. I mean, we tend to think that people who lived at that time must have been pretty primitive. But I'm gonna show you some slides in a few minutes and I think you will agree with me that this art is anything but primitive. They are masterpieces. And they look so real, so alive that it's very hard to imagine that they are so very old.

Now, not everyone agrees on exactly how old. A number of the Chauvet paintings have been dated by a lab to 30,000 or more years ago. That would make them not just older than any other cave art, but about twice as old as the art in the caves at Altamira or Lascaux, which you may have heard of. Some people find it hard to believe Chauvet is so much older than Altamira and Lascaux, and they noted that only one lab did the dating for Chauvet, without independent confirmation from any other lab. But be that as it may, whatever the exact date, whether it's 15,000, 20,000 or 30,000 years ago, the Chauvet paintings are from the dawn of art. So they are a good place to start our discussion of cave painting.

Now, one thing you've got to remember is the context of these paintings. Paleolithic humans - that's the period we are talking about here, the Paleolithic, the early stone age, not too long after humans first arrived in Europe - the climate was significantly colder then, and so rock shelters, shallow caves were valued as homes protected from the wind and rain. And in some cases at least, artists drew on the walls of their homes.

But many of the truly great cave art sites like Chauvet were never inhabited. These paintings were made deep inside a dark cave, where no natural light can penetrate. There's no evidence of people ever living here. Cave bears, yes, but not humans. You would have had to make a special trip into the cave to make the paintings, and a special trip to go see it. And each time you'd have to bring along torches to light your way. And people did go see the art. There's charcoal marks from their torches on the cave walls clearly dating from thousands of years after the paintings were made. So we can tell people went there. They came but they didn't stay. Deep inside a cave like that is not really a place you'd want to stay, so, why? What inspired the Paleolithic artists to make such beautiful art in such inaccessible places? We'll never really know of course, though it's interesting to speculate.

But, um, getting to the paintings themselves, virtually all Paleolithic cave art represents animals, and Chauvet is no exception. The artists were highly skilled at using, or even enhancing, the natural shape of the cave walls to give depth and perspectives to their drawings, the sense of motion and vitality in these animals. Well, wait till I show you the slides. Anyway, most Paleolithic cave art depicts large herbivores. Horses are most common overall with deer and bison pretty common too, probably animals they hunted.

But earlier at Chauvet, there is a significant interest in large dangerous animals, lots of rhinoceros, lions, mammoth, bears. Remember that the ranges of many animal species were different back then, so all these animals actually lived in the region at that time.

But the Chauvet artists didn't paint people. There is a half-man-half-bison creature and there is outlines of human hands but no depiction of a full human.

So, why these precise animals? Why not birds, fish, snakes? Was it for their religion, magic or sheer beauty? We don't know. But whatever it was, it was worth it to them to spend hours deep inside a cave with just a torch between them and utter darkness. So, on that note, let's dim the lights, so we can see these slides and actually look at the techniques they used.

TPO 3 Lecture 4 Astronomy

Narrator

Listen to part of a lecture in an astronomy class.

Professor

Now astronomy didn't really bloom into the science it is today until the development of spectroscopy.

Spectroscopy is basically the study of spectra and spectral lines of light, and specifically for us, the light from stars. It makes it possible to analyze the light emitted from stars. When you analyze this light, you can figure out their distance from the Earth, and identify what they are made of, determine their chemical composition.

Before we get into that though, it's probably a good thing to back up a bit. You all know how when you take a crystal prism and pass a beam of sunlight through it, you get a spectrum, which looks like a continuous band of rainbow colors. The light that we see with our human eyes as a band of rainbow color falls in the range of what's called visible light. And visible light spectroscopy is probably the most important kind of spectroscopy.

Anyone want to take a stab at the scientific term for visible light? And I'm sure all of you know this because you all did the reading for today.

Student

Optical radiation. But I thought being exposed to radiation is dangerous.

Professor

Yes, and no. If you are talking about radiation, like in the element Uranium, yeah, that's dangerous. But radiation as a general term actually refers to anything that spreads away from its source. So optical radiation is just visible light energy spreading out.

OK, so we've got a spectrum of a beam of sunlight and it looks like the colors bleed into each other. There are no interruptions, just a band flowing from violet to green, to yellow, to… you get the idea.

Well, what happens if the sunlight's spectrum is magnified? Maybe you all didn't do the reading. Well, here's what you'd see. I want you to notice that this spectrum is interrupted by dark lines called spectral lines. If you really magnify the spectrum of the sunlight, you could identify more than 100,000 of them. They may look like kind of randomly placed, but they actually form many distinct patterns. And if you were looking at the spectrum of some other star, the colors would be the same. But the spectral lines would break it up at different places, making different patterns. Each pattern stands for a distinct chemical element, and so different sets or patterns of spectral lines mean that the star has a different chemical composition.

Student

So how do we know which spectral patterns match up with which elements?

Professor

Well, a kind of spectroscopic library of elements was compiled using flame tests. A known element, say a piece of iron for example, is heated in a pure gas flame. The iron eventually heats to the point that it radiates light. This light is passed through a prism, which breaks it up into a spectrum. And a unique pattern, kind of like a chemical fingerprint of spectral lines for that element appears. This process was repeated over and over again for many different elements, so we can figure out the chemical makeup of another star by comparing the spectral pattern it has to the pattern of the elements in the library.

Oh, an interesting story about how one of the elements was discovered through spectroscopy. There was a pretty extensive library of spectral line patterns of elements even by the 1860s. A British astronomer was analyzing a spectrograph of sunlight, and he noticed a particular pattern of spectral lines that didn't match anything in the library. So he put two and two together, and decided there was an element in the sun that hadn't been discovered here on the earth yet.

Any guesses about what that element is? It actually turned out to be pretty common and I'm sure all of you know it.

OK. Let's try something else. Any of you happened to be familiar with the Greek word for "sun" by chance?

Student

Something like "Helius" or something like that. Oh, it must be "Helium". So you are saying that Helium was discovered on the sun first.

Professor

Yes, and this is a good example of how important spectroscopy is in astronomy.

TPO 4

Conversation 1

Narrator

Listen to a conversation between a student and a librarian.

Librarian

Can I help you?

Student

Yeah, I need to find a review. It's for my English class. We have to find reviews of the play we are reading. But they have to be from when the play was first performed, so I need to know when that was and I suppose I should start with newspaper reviews and…

Librarian

Contemporary reviews.

Student

Sorry?

Librarian

You want contemporary reviews. What's the name of the play?

Student

It's Happy Strangers. It was written in 1962 and we are supposed to write about its influence on American theatre and show why it's been so important.

Librarian

Well, that certainly explains why your professor wants you to read some of those old reviews. The critiques really tore the play to pieces when it opened. It's so controversial. Nobody had ever seen anything like it on the stage.

Student

Really? Is that a big deal?

Librarian

Oh, sure. Of course the critics' reaction made some people kind of curious about it. They wanted to see what was causing all the fuss. In fact, we were on vacation in New York. Oh, I had to be, oh, around 16 or so, and my parents took me to see it. That would've been about 1965.

Student

So that was the year it premiered? Great! But uh, newspapers from back then aren't online, so, how do I…

Librarian

Well, we have copies of old newspapers in the basement, and all the major papers publish reference guides to their articles, reviews, etc. You will find them in the reference stacks in the back. But I start with 1964, I think the play had been running for a little while when I saw it.

Student

How do you like it? I mean just two characters on the stage hanging around basically doing nothing.

Librarian

Well, I was impressed. The actors were famous, and besides it was my first time in a real theatre. But you are right. It was definitely different from many plays that we read in high school. Of course, in a small town the assignments are pretty traditional.

Student

Yeah, I've only read it but it doesn't seem like it would be much fun to watch. The story doesn't progress in any sort of logical matter, doesn't have real ending either, just stops. Honestly, you know, I thought it was kind of slow and boring.

Librarian

Oh, well I guess you might think that. But when I saw it back then it was anything but boring. Some parts were really funny, but I remember crying too. But I'm not sure just reading it. You know, they've done this play at least once on campus. I'm sure there is a tape of the play in our video library. You might want to borrow it.

Student

That's a good idea. I'll have a better idea of what I really think of it before I read those reviews.

Librarian

I'm sure you will be surprised that anyone ever found it radical. But you will see why it is still powerful, dramatically speaking.

Student

Well, there must be something about it, or the professor wouldn't have assigned it. I'm sure I'll figure it out.

TPO 4 Lecture 1 Biology

Narrator

Listen to part of a lecture in a biology class. The class is discussing animal behavior.

Professor

Ok, the next kind of animal behavior I want to talk about might be familiar to you. You may have seen, for example, a bird that's in the middle of a mating ritual, and suddenly it stops and preens, you know, it takes a few moments to straighten its feathers, and then returns to the mating ritual. This kind of behavior, this doing something that seems completely out of place, is what we call a 'Displacement Activity'.

Displacement activities are activities that animals engage in when they have conflicting drives. If we take our example from a minute ago, if the bird is afraid of its mate, it's conflicted. It wants to mate but it's also afraid and wants to run away. So, instead, it starts grooming itself. So, the displacement activity, the grooming, the straightening of its feathers, seems to be an irrelevant behavior.

So, what do you think another example of a displacement activity might be?

Karl

How about an animal that, um, instead of fighting its enemy or running away, it attacks a plant or a bush?

Professor

That's really good suggestion, Karl. But that's called 'redirecting'. The animal is redirecting its behavior to another object, in this case, the plant or the bush. But that's not an irrelevant or inappropriate behavior. The behavior makes sense. It's appropriate under the circumstances. But what doesn't make sense is the object the behavior's directed towards.

Ok, who else? Carol?

Carol

I think I read in another class about an experiment where an object that the animal was afraid of was put next to its food – next to the animal's food. And the animal, it was conflicted between confronting the object and eating the food, so instead, it just fell asleep. Like that?

Professor

That's exactly what I mean. Displacement occurs because the animal's got two conflicting drives – two competing urges, in this case, fear and hunger. And what happens is, they inhibit each other, they cancel each other out in a way, and a third seemingly irrelevant behavior surfaces through a process that we call 'Disinhibition'.

Now, in disinhibition, the basic idea is that two drives that seem to inhibit, to hold back, a third drive. Well, well, they're getting in a way of each other in a… in a conflict situation and somehow lose control, lose their inhibiting effect on that third behavior, which means that the third drive surfaces, it's expressed in the animal's behavior.

Now, these displacement activities can include feeding, drinking, grooming, even sleeping. These are what we call 'Comfort Behavior'. So why do you think displacement activities are so often comfort behaviors, such as grooming?

Karl

Maybe because it's easy for them to do? I mean, grooming is like one of the most accessible things an animal can do. It's something they do all the time, and they have the stimulus right there on the outside of their bodies in order to do the grooming, or if food is right in front of them. Basically, they don't have to think very much about those behaviors.

Carol

Professor, isn't it possible that animals groom because they've got messed up a little from fighting or mating? I mean if a bird's feathers get ruffled or an animal's fur, maybe it's not so strange for them to stop and tidy themselves up at that point.

Professor

That's another possible reason although it doesn't necessarily explain other behaviors such as eating, drinking or sleeping.

What's interesting is that studies have been done that suggest that the animal's environment may play a part in determining what kind of behavior it displays. For example, there's a bird, the 'wood thrush', anyway, when the 'wood thrush' is in an attack-escape conflict, that is, it's caught between the two urges to escape from or to attack an enemy, if it's sitting on a horizontal branch, it'll wipe its beak on its perch. If it's sitting on a vertical branch, it'll groom its breast feathers. The immediate environment of the bird, its immediate, um, its relationship to its immediate environment seems to play a part in which behavior will display.

TPO 4 Lecture 2 Literature

Narrator

Listen to part of a lecture in a literature class.

Professor

All right, so let me close today's class with some thoughts to keep in mind while you are doing tonight's assignment. You will be reading one of Ralph Waldo Emerson's best-known essays 'Self-Reliance' and comparing it with his poems and other works.

I think this essay has the potential to be quite meaningful for all of you as young people who probably wonder about things like truth and where your lives are going - all sorts of profound questions.

Knowing something about Emerson's philosophies will help you when you read 'Self-Reliance'. And basically, one of the main beliefs that he had was about truth. Not that it's something that we can be taught, Emerson says it's found within ourselves. So this truth, the idea that it's in each one of us, is one of the first points that you'll see Emerson making in this essay. It's a bit abstract but he's very into…uh… into each person believing his or her own thought, believing in yourself, the thought or conviction that's true for you.

But actually, he ties that in with a sort of 'universal truth' – something that everyone knows but doesn't realize they know. Most of us are in touch with ourselves in a way, so we just aren't capable of recognizing profound truth. It takes geniuses, people like, say, Shakespeare, who're unique because when they have a glimpse of this truth, this universal truth, they pay attention to it and express it and don't just dismiss it like most people do.

So Emerson is really into each individual believing in and trusting him or herself. You'll see that he writes about, well, first, conformity. He criticizes that people of his time for abandoning their own minds and their own wills for the sake of conformity and consistency. They try to fit in with the rest of the world even though it's at odds with their beliefs and their identities. Therefore, it's best to be a non-conformist – to do your own thing, not worrying about what other people think. That's an important point. He really drives this argument home throughout the essay.

When you are reading, I want you to think about that and why that kind of thought would be relevant to the readers of his time. Remember this is 1838,'Self-Reliance' was a novel idea at the time and the United States citizens were less secure about themselves as individuals and as Americans. The country as a whole was trying to define itself. Emerson wanted to give people something to really think about, help them find their own way and what it meant to be who they were. So that's something that I think is definitely as relevant today as it was then, probably, um, especially among young adults like yourselves, you know, uh, college being a time to sort of really think about who you are and where you're going.

Now, we already said that Emerson really emphasizes non-conformity, right? As a way to sort of not lose your own self and identity in the world, to have your own truth and not be afraid to listen to it.

Well, he takes this a step further. Not conforming also means, uh, not conforming with yourself or your past. What does that mean? Well, if you've always been a certain way or done a certain thing, but it's not working for you any more, or you're not content, Emerson says that it'd be foolish to be consistent even with our own past."Focus on the future," he says, "That's what matters more. Inconsistency is good."

He talks about a ship's voyage and this is one of the most famous bits of the essay - how the best voyage is made up of zigzag lines. Up close, it seems a little all over the place, but from farther away, the true path shows and in the end it justifies all the turns along the way. So, don't worry if you are not sure where you're headed or what your long-term goals are. Stay true to yourself and it'll make sense in the end. I mean, I can attest to that. Before I was a literature professor, I was an accountant. Before that, I was a newspaper reporter. My life is taking some pretty interesting turns and here I am, very happy with my experiences and where they've brought me. If you rely on yourself and trust your own talents, your own interest, don't worry, your path will make sense in the end.

TPO 4 Conversation 2

Narrator
Listen to a conversation between a student and a professor.

Professor
Hey, Jane, you look like you are in a hurry.

Student
Yeah, things are a little crazy.

Professor
Oh yeah? What's going on?

Student

Oh, it's nothing. Well, since it's your class, I guess it's OK. It's, it's just that I am having trouble with my group project.

Professor

Ah, yes, due next week. What's your group doing again?

Student

It's about United States Supreme Court Decisions. We are looking at the impact of recent cases on property rights, municipal land use cases, owning disputes.

Professor

Right, OK. And it's not going well?

Student

Not really. I'm worried about the other two people in my group. They are just sitting back, not really doing their fair share of the work and waiting for an A. It's kind of stressing me out, because we are getting close to the deadline and I feel like I'm doing everything for this project.

Professor

Ah, the good old free rider problem.

Student

Free rider?

Professor

Ah, it's just a term that describes this situation, when people in the group seek to get the benefits of being in a group without contributing to the work. Anyway, what exactly do you mean when you say they just sit back? I mean, they've been filing the weekly progress reports with me.

Student

Yes, but I feel like I'm doing 90% of the work. I hate to sound so negative here, but honestly, they are taking credit for things they shouldn't take credit for. Like last week in the library, we decided to split up the research into 3 parts and then each of us was supposed to find sources in the library for our parts. I went off to the stack and found some really good material for my part, but when I got back to our table, they were just goofing off and talking. So I went and got materials for their sections as well.

Professor

Um…you know you shouldn't do that.

Student

I know, but I didn't want to risk the project going down the drain.

Professor

I know Teresa and Kevin. I had both of them in other courses. So, I'm familiar with the work and work habits.

Student

I know, me too. And that's why this has really surprised me.

Professor

Do you…does your group like your topic?

Student

Well, I think we'd all rather focus on cases that deal with personal liberties, questions about freedom of speech, things like that. But I chose property rights.

Professor

You chose the topic?

Student

Yeah, I thought it would be good for us, all of us to try something new.

Professor

Um…maybe that's part of the problem. Maybe Teresa and Kevin aren't that excited about the topic? And since you picked it, have you thought…talk to them at all about picking a different topic?

Student

But we've got all the sources and it's due next week. We don't have time to start from scratch.

Professor

OK, I will let you go 'cause I know you are so busy. But you might consider talking to your group about your topic choice.

Student

I will think about it. Got to run, see you in class.

TPO 4 Lecture 3 Geology

Narrator

Listen to part of a lecture in a geology class.

Professor

Now we've got a few minutes before we leave for today. So I'll just touch on an interesting subject that I think makes an important point.

We've been covering rocks and different types of rocks for the last several weeks. But next week we are going to do something a bit different. And to get started I thought I'd mention something that shows how uh…as a geologist, you need to know about more than just rocks and the structure of solid matter.

Moving rocks, you may have heard about them. It's quite a mystery. Death valley is this desert plain, a dry lake bed in California surrounded by mountains and on the desert floor these huge rocks, some of them hundreds of pounds. And they move. They leave long trails behind them, tracks you might say as they move from one point to another. But nobody has been able to figure out how they are moving because no one has ever seen it happen.

Now there are a lot of theories, but all we know for sure is that people aren't' moving the rocks. There are no footprints, no type tracks and no heavy machinery like a bulldozer…uh, nothing was ever brought in to move these heavy rocks.

So what's going on? Theory NO.1 ---Wind. Some researchers think powerful uh…windstorms might move the rocks. Most of the rocks move in the same direction as the dominant wind pattern from southwest to northeast. But some, and this is interesting, move straight west while some zigzag or even move in large circles. Hmm…How can that be?

How about wind combined with rain? The ground of this desert is made of clay. It's a desert, so it's dry. But when there is the occasional rain, the clay ground becomes extremely slippery. It's hard for anyone to stand on, walk on. Some scientists theorized that perhaps when the ground is slippery the high winds can then move the rocks. There's a problem with this theory. One team of scientists flooded an area of the desert with water, then try to establish how much wind force would be necessary to move the rocks. And get this: you need winds of at least five hundred miles an hour to move just the smallest rocks! And winds that strong have never been recorded. Ever! Not on this planet. So I think it's safe to say that that issues has been settled.

Here is another possibility – ice. It's possible that rain on the desert floor could turn to thin sheets of ice when temperatures drop at night. So if rocks…uh become embedded in ice, uh … OK, could a piece of ice with rocks in it be pushed around by the wind? But there's a problem with this theory, too. Rocks trapped in ice together would have moved together when the ice moved. But that doesn't always happen. The rocks seem to take separate routes.

There are a few other theories. Maybe the ground vibrates, or maybe the ground itself is shifting, tilting. Maybe the rocks are moved by a magnetic force. But sadly all these ideas have been eliminated as possibilities. There's just no evidence. I bet you are saying to yourself well, why don't scientists just set up video cameras to record what actually happens? Thing is, this is a protected wilderness area. So by law that type of research isn't allowed. Besides, in powerful windstorms, sensitive camera equipment would be destroyed. So why can't researchers just live there for a while until they observe the rocks moving? Same reason.

So where are we now? Well, right now we still don't have any answers. So all this leads back to my main point – you need to know about more than just rocks as geologists. The researchers studying moving rocks, well, they combine their knowledge of rocks with knowledge of wind, ice and such…uh not successfully, not yet. But you know, they wouldn't even have been able to get started without um… earth science understanding – knowledge about wind, storms, you know, meteorology. You need to understand physics. So for several weeks like I said we'll be addressing geology from a wider perspective. I guess that's all for today. See you next time.

TPO 4 Lecture 4 United States government

Narrator
Listen to part of a lecture in a United States government class.

Professor
OK, last time we were talking about government support for the arts. Who can sum up some of the main points? Frank?

Frank
Well, I guess there wasn't really any, you know, official government support for the arts until the twentieth century. But the first attempt the United States government made to, you know, to support the arts was the Federal Art Project.

Professor

Right, so what can you say about the project?

Frank

Um…it was started during the Depression, um…in the 1930s to employ out of-work artists.

Professor

So was it successful? Janet? What do you say?

Janet

Yeah, sure, it was successful. I mean, for one thing, the project established a lot of…uh like community art centers and galleries in places like rural areas where people hadn't really had access to the arts.

Professor

Right.

Frank

Yeah. But didn't the government end up wasting a lot of money for art that wasn't even very good?

Professor

Uh…some people might say that. But wasn't the primary objective of the Federal Art Project to provide jobs?

Frank

That's true. I mean…it did provide jobs for thousands of unemployed artists.

Professor

Right. But then when the United States became involved in the Second World War, unemployment was down and it seems that these programs weren't really necessary any longer.

So, moving on, we don't actually see any govern…well any real government involvement in the arts again until the early 1960s, when President Kennedy and other politicians started to push for major funding to support and promote the arts. It was felt by a number of politicians that …well that the government had a responsibility to support the arts as sort of… oh, what can we say?...the the soul…or spirit of the country. The idea was that there be a federal subsidy…um…uh…financial assistance to artists and artistic or cultural institutions. And for just those reasons, in 1965, the National Endowment for the Arts was created. So it was through the NEA, the National Endowment for the Arts, um…that the arts would develop, would be promoted throughout the nation.

And then individual states throughout the country started to establish their own state arts councils to help support the arts. There was kind of uh…cultural explosion. And by the mid 1970s, by 1974 I think, all fifty states had their own arts agencies, their own state arts councils that work with the federal government with corporations, artists, performers, you name it.

Frank

Did you just say corporations? How are they involved?

Professor

Well, you see, corporations aren't always altruistic. They might not support the arts unless…well, unless the government made it attractive for them to do so, by offering corporations tax incentives to support the arts, that is, by letting corporations pay less in taxes if they were patrons of the arts. Um, the Kennedy Centre in Washington D.C. , you may uh…maybe you've been there, or Lincoln Centre in New York. Both of these were built with substantial financial support from corporations. And the Kennedy and Lincoln center's aren't the only examples. Many of your cultural establishments in the United States will have a plaque somewhere acknowledging the support – the money they received from whatever corporation. Oh, yes, Janet?

Janet
But aren't there a lot of people who don't think it's the government's role to support the arts?

Professor
Well, as a matter of fact, a lot of politicians who did not believe in government support for the arts, they wanted to do away with the agency entirely, for that very reason, to get rid of governmental support. But they only succeeded in taking away about half the annual budget. And as far as the public goes, well…there are about as many individuals who disagree with the government support as there are those who agree.

In fact, with artists in particular, you have lots of artists who support and who have benefited from this agency, although it seems that just as many artists oppose the government agency being involved in the arts, for many different reasons, reasons like they don't want the government to control what they create. In other words, the arguments both for and against government funding of the arts are as many and, and as varied as the individual styles of the artists who hold them.

TPO-5

Conversation 1

Narrator
Listen to a conversation between a student and a counselor at the University Counseling Center.

Student
Hi, thanks for seeing me on such short notice.

Counselor
No problem. How can I help?

Student
Well, I think I might have made a mistake coming to the school.

Counselor
What makes you say that?

Student
I'm a little overwhelmed by the size of this place. I come from a small town. There were only 75 of us in my high school graduating class. Everyone knew everyone. We all grew up together.

Counselor
So it's a bit of a culture shock for you? Being one of 15,000 students on a big campus in an unfamiliar city?

Student

That's an understatement. I just can't get comfortable in class or in the dorms. You know, socially.

Counselor

Hmmm…well, let's start with your academics. Tell me about your classes.

Student

I'm taking mostly introductory courses and some are taught in these huge lecture halls.

Counselor

And you are having trouble in keeping pace with the material?

Student

No, in fact I got an A on my first economics paper. It's just that, it's so impersonal, I'm not used to it.

Counselor

Are all your classes impersonal?

Student

No, it's just that…for example, in sociology yesterday, the professor asked a question, so I raised my hand, several of us raised our hands. And I kept my hand up because I did the reading and knew the answer. But the professor just answered his own question and continued with the lecture.

Counselor

Well, in a big room it's possible he didn't notice you. Maybe he was trying to save time. In either case I wouldn't take it personally.

Student

I suppose. But I just don't know how to, you know, distinguish myself.

Counselor

Why not stop by his office during office hours?

Student

That wouldn't seem right. You know, taking time from other students who need help?

Counselor

Don't say that. That's what office hours are for. There is no reason you couldn't pop in to say hi and to make yourself known. If you are learning a lot in class, let the professor know. Wouldn't you appreciate positive feedback if you were a professor?

Student

You are right. That's a good idea.

Counselor

OK, er…let's turn to your social life. How's it going in the dorms?

Student

I don't have much in common with my roommate or anyone else I've met so far. Everyone's into sports and I'm more artsy, you know, into music. I play the cello.

Counselor

Hah, have you been playing long?

Student

Since age ten. It’s a big part of my life. At home I was the youngest member of our community orchestra.

Counselor

You are not going to believe this. There is a string quartet on campus, all students. And it so happened that the cellist graduated last year. They’ve been searching high and low for a replacement, someone with experience. Would you be interested in auditioning?

Student

Absolutely. I wanted to get my academic work settled before pursuing my music here. But I think this would be a good thing for me. I guess if I really want to fit in here I should find people who love music as much as I do. Thank you.

Counselor

My pleasure.

TPO 5 Lecture 1 Sociology

Narrator

Listen to part of a lecture in a sociology class.

Professor:

Have you ever heard the one about alligators living in New York sewers? The story goes like this: a family went on vacation in Florida and bought a couple of baby alligators as presents for their children, then returned from vacation to New York, bringing the alligators home with them as pets. But the alligators would escape and find their way into the New York sewer system where they started reproducing, grew to huge sizes and now strike fear into sewer workers. Have you heard this story? Well, it isn’t true and it never happened. But despite that, the story has been around since the 1930s.

Or how about the song ‘twinkle, twinkle little star’, you know, ‘twinkle, twinkle, little star, how I wonder what you are’. Well we’ve all heard this song. Where am I going with this? Well, both the song and the story are examples of memes. And that’s what we would talk about, the theory of memes.

A meme is defined as a piece of information copied from person to person. By this definition, most of what you know, ideas, skills, stories, songs are memes. All the words you know, all the scientific theories you’ve learned, the rules your parents taught you to observe, all are memes that have been passed on from person to person.

So what? You may say. Passing on ideas from one person to another is nothing new. Well, the whole point of defining this familiar process as transmission of memes is so that we can explore its analogy with the transmission of genes. As you know, all living organisms pass on biological information through the genes. What’s a gene? A gene is a piece of biological information that gets copied or replicated, and the copy or replica is passed on to the new generation. So genes are defined as replicators. Genes are replicators that pass on information about properties and characteristics of organisms. By analogy, memes also get replicated and in the process pass on cultural information from person to person, generation to generation. So memes are also replicators.

To be a successful replicator, there are three key characteristics: longevity, fecundity and fidelity. Let's take a closer look.

First, longevity. A replicator must exist long enough to be able to get copied, and transfer its information. Clearly, the longer a replicator survives, the better its chances of getting its message copied and passed on. So longevity is a key characteristic of a replicator. If you take the alligator story, it can exist for a long time in individual memory, let's say, my memory. I can tell you the story now or ten years from now, the same with the twinkle, twinkle song. So these memes have longevity because they are memorable for one reason or another.

Next, fecundity. Fecundity is the ability to reproduce in large numbers. For example, the common housefly reproduces by laying several thousand eggs, so each fly gene gets copied thousands of times. Memes, well, they can be reproduced in large numbers as well. How many times have you sung the'twinkle, twinkle song' to someone? Each time you replicated that song, and maybe passed it along to someone who did not know it yet, a small child maybe.

And finally, fidelity. Fidelity means accuracy of the copying process. We know fidelity is an essential principle of genetic transmission. If a copy of a gene is a bit different from the original, that's called a genetic mutation. And mutations are usually bad news. An organism often cannot survive with a mutated gene. And so a gene usually cannot be passed on, unless it's an exact copy. For memes however, fidelity is not always so important. For example, if you tell someone the alligator story I told you today, it probably won't be word for word exactly as I said it. Still, it will be basically the same story, and the person who hears the story will be able to pass it along.

Other memes are replicated with higher fidelity though, like the twinkle, twinkle song. It had the exact same words 20 years ago as it does now. Well, that's because we see songs as something that has to be performed accurately each time. If you change a word, the others will usually bring you in line. They'll say, 'that's not how you sing it', right?

So, you can see how looking at pieces of cultural information as replicators, as memes, and analyzing them in terms of longevity, fecundity and fidelity, we can gain some insight about how they spread, persist or change

TPO 5 Lecture 2 Astronomy

Narrator
Listen to part of a lecture in an Astronomy Class

Professor:
Last week, we covered some arguments against going back to the Moon. But there are compelling reasons in favor of another Moon landing too, um… not the least of which is trying to pinpoint the moon's age.

We could do this in theory by studying an enormous impact crater, known as the South Pole-Aitken Basin. Um…it's located in the moon's South Polar Region. But, since it's on the far side of the moon, it can only be seen from space.

Here is an image of…we'll call it the SPA Basin. This color-coated image of the SPA Basin, those aren't its actual colors obviously, this image is from the mid 90s, from the American spacecraft called Clementine. Um… unlike earlier lunar missions, Clementine didn't orbit only around the moon's equator. Its orbits enabled it to send back data to create this topographical map of … well, the grey and white area towards the bottom is the South Pole, the purples and blues in the middle correspond to low elevations - the SPA Basin itself, the oranges and reds around it are higher elevations.

The basin measures an amazing 2,500 km in diameter, and its average depth is 12 km. That makes it the biggest known crater in our solar system and it may well be the oldest. You know planetary researchers love studying deep craters to learn about the impacts that created them, how they redistributed pieces of the planet's crust. And in this case, we especially want to know if any of the mantle, the layer beneath the crust, was exposed by the impact. Not everyone agrees, but some experts are convinced that whatever created the SPA Basin did penetrate the Moon's mantle. And we need to find out, because much more than the crust, the mantle contains information about a planet's or Moon's total composition. And that's key to understanding planet formation. Um…Dian?

Dian:

So, the only way to know the basin's age is to study its rocks directly?

Professor:

Well, from radio survey data, we know that the basin contains lots of smaller craters. So it must be really old, about 4 billion years, give or take a few hundred million years. But that's not very precise. If we had rock samples to study, we'd know whether these small craters were formed by impacts during the final stages of planetary formation, or if they resulted from later meteor showers.

Dian:

But if we know around how old the Basin is, I'm not sure that's reason enough to go to the Moon again.

Professor:

No…, but such crude estimates…um…we can do better than that.

Besides, there's other things worth investigating, like is there water ice on the moon? Clementine's data indicated that the wall of the south-polar crater was more reflective than expected. So some experts think there's probably ice there. Also, data from a later mission indicates significant concentrations of hydrogen and by inference water less than a meter underground at both poles.

Student:

Well, if there's water, how did it get there? Underground rivers?

Professor:

We think meteors that crashed into the moon or tails of passing comets may have introduced water molecules. Any water molecules that found their way to the floors of craters near the moon's poles, that water would be perpetually frozen, because the floors of those craters are always in shadow. Um…furthermore, if the water ice was mixed in with rock and dust, it would be protected from evaporation.

Dian:

So are you saying there might be primitive life on the moon?

Professor:

That's not my point at all. Um… o.k., say there is water ice on the moon. That would be of very practical value for a future moon base for astronauts. Water ice could be melted and purified for drinking. It could also be broken down into its component parts - oxygen and hydrogen. Oxygen could be used to breathe, and hydrogen could be turned into fuel, rocket fuel. So water ice could enable the creation of a self-sustaining moon base someday, a mining camp perhaps or a departure point for further space exploration.

Student:

But hauling tons of equipment to the moon to make fuel and build a life support system for a moon base, wouldn't that be too expensive?

Professor:

Permanent base, maybe a ways off, but we shouldn't have to wait for that. The dust at the bottom of the SPA Basin really does have a fascinating story to tell. I wouldn't give for a few samples of it.

TPO 5 Conversation 2

Narrator

Listen to a conversation between a student and a professor.

Student

Hi, I was wondering if I could talk with you about the assignment in the film theory class.

Professor

Of course, Jill.

Student

It seems that pretty much everyone else in the class gets what they are supposed to be doing but I'm not so sure.

Professor

Well, the class is for students who are really serious about film. You must have taken film courses before.

Student

Yeah, in high school, film appreciation.

Professor

Hmmm…I wouldn't think that would be enough. Did you concentrate mainly on form or content?

Student

Oh, definitely content. We'd watch, say Lord of the Flies, and then discuss it.

Professor

Oh, that approach, treating film as literature, ignoring what makes it unique.

Student

I liked it, though.

Professor

Sure, but that kind of class. Well, I'm not surprised that you are feeling a little lost. You know, we have two introductory courses that are supposed to be taken before you get to my course, one in film art, techniques, technical stuff and another in film history. So students in the class you are in should be pretty far along in film studies. In fact, usually the system blocks anyone trying to sign up for a class they shouldn't be taking, who hasn't taken the courses you are required to do first as prerequisites.

Student

Well, I did have a problem with that but I discussed it with one of your office staff, and she gave me permission.

Professor

Of course. No matter how many times I tell them, they just keep on…

Well, for your own good, I'd really suggest dropping back and starting at the usual place.

Student

Yes. But I've already been in this class for 4 weeks. I'd hate to just drop it now especially since I find it so different, so interesting.

Professor

I guess so. Frankly I can't believe you've lasted this long. These are pretty in-depth theories we've been discussing and you've been doing OK so far, I guess. But still, the program's been designed to progress through certain stages. Like any other professional training we build on pervious knowledge.

Student

Then maybe you could recommend some extra reading I can do to… catch up?

Professor

Well, are you intending to study film as your main concentration?

Student

No, no. I am just interested. I'm actually in marketing, but there seems to be a connection.

Professor

Oh…well, in…in that case, if you're taking the course just out of interest, I mean I still highly recommend signing up for the introductory courses at some point, but in the meantime, there is no harm I guess in trying to keep up with this class. The interest is clearly there. Eh, instead of any extra reading just now though, you could view some of the old introductory lectures. We have them on video. That would give you a better handle on the subject. It's still a pretty tall order, and we will be moving right along, so you will really need to stay on top of it.

Student

OK, I've been warned. Now, could I tell you about my idea for the assignment?

TPO 5 Lecture 3 Chemistry

Narrator

Listen to part of a lecture in a chemistry class.

Professor

Okay. I know you all have a lot of questions about this lab assignment that's coming out so ... I'm gonna take a little time this morning to discuss it. So, you know the assignment has to do with Spectroscopy, right? And your reading should help you get a good idea of what that's all about. But, let's talk about Spectroscopy a little now just to cover the basics.

What is Spectroscopy? Well, the simplest definition I can give you is that Spectroscopy is the study of the interaction between matter and light. Now, visible light consists of different colors or wavelengths, which together make up what's called spectrum, a band of colors, like you see in a rainbow. And all substances, all forms of matter, can be distinguished according to what wavelength of light they absorb and which ones they reflect. It's like, um, well, every element has, what we call, its own spectral signature. If we can read that signature, we can identify the element. And that's exactly what spectroscopy does.

Now, Laser Spectroscopy, which is the focus of your assignment, works by measuring very precisely what parts of the spectrum are absorbed by different substances. And it has applications in a lot of different disciplines. And your assignment will be to choose a discipline that interests you, and devise an experiment.

For example, I'm gonna talk about art. I'm interested in the art and to me it's interesting how spectroscopy is used to analyze art. Let’s say a museum curator comes to you with a problem. She’s come across this painting that appears to be an original - let's say, a Rembrandt. And she wants to acquire it for her museum. But she's got a problem: she's not absolutely certain it's an original. So, what do you do? How do you determine whether the painting's authentic?

Okay. Think about the scientific process. You've got the question: Is the painting a Rembrandt? So first, you'll need to make a list of characteristics the painting would have to have to be a Rembrandt. Then you have to discover whether the painting in question has those characteristics.

So first of all, you'll need to know the techniques Rembrandt used when he applied paint to canvas - his brushstrokes, how thickly he applied his paint. So you’d need to work with an art historian who has expert knowledge of Rembrandt’s style. You'd have to know when he created his paintings, um... what pigments he used, in other words, what ingredients he used to make different colors of paint, ‘cause the ingredients used in paints and binding agents plus burnishes, finishes, what have you, have changed over time.

Since you’re trying to verify if it’s a Rembrandt, the ingredients in the pigment would need to have been used during Rembrandt's lifetime - in the 17th century. And that's where chemistry comes in. You've got to find out what's in those pigments, learn their composition, and that requires lab work - detective work really - in a word, Spectroscopy. So, how do we use Spectroscopy?

Well, we put an infrared microscope - a spectroscope - on tiny tiny bits of paint. And using ultraviolet light we can see the spectral signature of each component part of the pigment. Then we compare these signatures with those of particular elements like zinc or lead, to determine what the pigment was made of. So, you can see why this type of analysis requires a knowledge of the history of pigments, right? How and when they were made? Say we determined a pigment was made with zinc, for example. We know the spectral signature of zinc. And it matches that of the paint sample. We also know that zinc wasn't discovered until the 18th century. And since Rembrandt lived during the 17th century, we know he couldn't have painted it.

Now, Spectroscopy has a very distinct advantage over previous methods of analyzing our works, because it's not invasive. You don't have to remove big chips of paint to do your analysis, which is what other methods require. All you do is train the microscope on tiny flecks of paint and analyze them.

Now a word or two about restoration. Sometimes original art works appear questionable or inauthentic because they’ve had so many restorers add touch-up layers to cover up damage, damage from the paint having deteriorated over time. Well, spectroscopy can reveal the composition of those touch-up layers too. So we can find out when they were applied. Then if we want to undo some bad restoration attempts, we can determine what kind of process we can use to remove them to dissolve the paint and uncover the original.

TPO 5 Lecture 4 Literature

Narrator

Listen to part of a lecture in a literature class.

Professor

Now we can't really talk about fairy tales without first talking about folktales because there's a strong connection between these two genres, these two types of stories. In fact, many fairy tales started out as folktales.

So, what's a folktale? How would you characterize them? Jeff?

Jeff:

Well, they are old stories, traditional stories. They were passed down orally within cultures from generation to generation, so they changed a lot over time. I mean, every storyteller, or, maybe every town, might have had a slightly different version of the same folktale.

Professor:

That's right. There's local difference. And that's why we say folktales are communal. By communal, we mean they reflect the traits and the concerns of a particular community at a particular time. So essentially the same tale could be told in different communities, with certain aspects of the tale adapted to fit the specific community. Um, not the plot, the details of what happens in the story would remain constant. That was the thread that held the tale together. But all the other elements, like the location or characters, might be modified for each audience.

Okay. So what about fairy tales? Th…they also are found in most cultures, but how are they different from folktales?

I guess the first question is: what is a fairy tale? And don’t anyone say “a story with a fairy in it” because we all know that very few fairy tales actually have those tiny magical creatures in them. But, what else can we say about them? Mary.

Mary:

Well, they seem to be less realistic than folktales…like they have something improbable happening - a frog turning into a prince, say. Oh, that's another common element, royalty - a prince or princess. And fairy tales all seem to take place in a location that's nowhere and everywhere at the same time.

Professor:

What's the line-up? How do all those stories start? Once upon a time, in a faraway land... oh, in the case of folktales, each storyteller would specify a particular location and time, though the time and location would differ for different storytellers.

With fairy tales, however, the location is generally unspecified, no matter who the storyteller is. That land far away... We'll come back to this point in a few minutes.

Student:

Um... I, I thought that a fairy tale was just a written version of an oral folktale.

Professor:

Well, not exactly, though that is how many fairy tales developed. For example, in the late 18th century, the Grimm Brothers traveled throughout what's now Germany, recording local folktales. These were eventually published as fairy tales, but not before undergoing a process of evolution.

Now, a number of things happen when an oral tale gets written down.

First, the language changes. It becomes more formal, more standard - some might say, "Less colorful". It's like the difference in your language depending on whether you are talking to someone, or writing them a letter.

Second, when an orally transmitted story is written down, an authoritative version with a recognized author is created. The communal aspect gets lost. The tale no longer belongs to the community. It belongs to the world, so to speak. Because of this, elements like place and time can no longer be tailored to suit a particular audience. So they become less identifiable, more generalizable to any audience.

On the other hand, descriptions of characters and settings can be developed more completely. In folktales, characters might be identified by a name, but you wouldn't know anything more about them. But in fairy tales, people no longer have to remember plots. They're written down, right? So more energy can be put into other elements of the story like character and setting. So you get more details about the characters, about where the action takes place, what people's houses were like, ur, whether they're small cabins or grand palaces. And it's worth investing that energy because the story, now in book form, isn't in danger of being lost. Those details won't be forgotten. If a folktale isn't repeated by each generation, it may be lost for all time. But with a fairy tale, it's always there in a book, waiting to be discovered, again and again.

Another interesting difference involves the change in audience. Who the stories are meant for? Contrary to what many people believe today, folktales were originally intended for adults, not for children. So why is it that fairy tales seem targeted toward children nowadays?

TPO 6

Conversation1

Narrator
Listen to a conversation between a student and an employee in the university’s career services office.

Student
Hi, do you have a minute?

Employee
Sure, how can I help you?

Student
I have a couple of questions about the career fair next week.

Employee
OK, shoot.

Student
Um ...well, are seniors the only ones who can go? I mean, you know, they are finishing school this year and getting their degrees and everything. And, well, it seems like businesses would wanna talk to them and not first year students like me.

Employee
No, no, the career fair is opened to all our students and we encourage anyone who’s interested to go check it out.

Student

Well, that's good to know.

Employee

You've seen the flyers and posters around campus, I assume.

Student

Sure, can't miss them. I mean, they all say where and when the fair is, just not who should attend.

Employee

Actually they do, but it's in the small print. Uh, we should probably make that part easier to reach, shouldn't we? I'll make a note of that right now. So, do you have any other questions?

Student

Yes, actually I do now. Um ...since I'd only be going to familiarize myself with the process, you know, check it out, I was wondering if there is anything youwould recommend that I do to prepare.

Employee

That's actually a very good question. Well, as you know, the career fair is generally an opportunity for local businesses to recruit new employees, and for soon-to-be graduates to have interviews with several companies they might be interested in working for. Now, in your case, even though you wouldn't be looking for employment right now, it still wouldn't hurt for you to prepare much like you would if you were looking for a job.

Student

You mean, like get my resume together and wear a suit?

Employee

That's a given. I was thinking more along the lines of doing some research. The flyers and posters list all the businesses that are sending representatives to the career fair. Um ...what's your major or do you to have one yet?

Student

Well, I haven't declared a major yet, but I'm strongly considering accounting. See, that's part of the reason I wanna go to the fair, to help me decide if that's what I really want to study.

Employee

That's very wise. Well, I suggest that you get on the computer and learn more about the accounting companies in particular that would be attending. You can learn a lot about companies from their internet websites. Then prepare a list of questions.

Student

Questions, hmm… so, in a way, I'll be interviewing them?

Employee

That's one way of looking at it. Think about it for a second. What do you want to know about working for an accounting firm?

Student

Well, there is the job itself, and salary of course, and working conditions, I mean, would I have an office, or would I work in a big room with a zillion other employees, and…and maybe about opportunities for advancement.

Employee

See? Those're all important things to know. After you do some research, you'll be able to tailor your questions to the particular company you are talking to.

Student

Wow, I'm glad I came by here. So, it looks like I've got some work to do.

Employee

And if you plan on attending future career fairs, I recommend you sign up for one of our interview workshops.

Student

I'll do that.

TPO 6 Lecture 1 Economics

Narrator

Listen to part of a lecture in an economics class.

Professor

Now when I mention the terms "boom and bust", what does that bring to mind?

Student

The dot-com crash of the '90s.

Professor

Ok. The boom in the late 1990s when all those new Internet companies sprang up and were then sold for huge amounts of money. Then the bust around 2000…2001 when many of those same Internet companies went out of business. Of course, booms aren't always followed by busts. We've certainly seen times when local economies expanded rapidly for a while and then went back to a normal pace of growth.

But, there's a type of rapid expansion, what might be called a hysterical or irrational boom that pretty much always leads to a bust. See, people often create and intensify a boom when they get carried away by some new industry that seems like it will make them lots of money fast. You'd think that by the 90s, people would have learned from the past. If they did, well, look at tulips.

Student

Tulips? You mean like the flower?

Professor

Exactly. For instance, do you have any idea where tulips are from? Originally I mean.

Student

Well, the Netherlands, right?

Professor

That's what most people think, but no. They are not native to the Netherlands, or even Europe. Tulips actually hail from an area that Chinese call the Celestial Mountains in Central Asia. A very remote mountainous region. It was Turkish nomads who first discovered tulips and spread them slowly westward.

Now, around the 16th century, Europeans were traveling to Istanbul and Turkey as merchants and diplomats. And the Turks often gave the Europeans tulip bulbs as gifts which they would carry home with them. For the Europeans, tulips were totally unheard of. Er…a great novelty. The first bulb to show up in the Netherlands, the merchant who received them roasted and ate them! He thought they were kind of onion.

It turns out that the Netherlands was an ideal country for growing tulips. It had the right kind of sandy soil for one thing, but also, it was a wealthy nation with a growing economy, willing to spend lots of money on new exotic things. Plus, the Dutch had a history of gardening. Wealthy people would compete, spending enormous amounts of money to buy the rarest flowers for their gardens. Soon tulips were beginning to show up in different colors as growers tried to breed them specifically for colors which would make them even more valuable. But they were never completely sure what they would get. Some of the most prized tulips were white with purple streaks, or red with yellow streaks on the petals, even a dark purple tulip that was very much prized.

What happened then was a craze for these specialized tulips. We called that craze "tulip mania". So, here we've got all the conditions for an irrational boom: a prospering economy, so more people had more disposable income-money to spend on luxuries, but they weren't experienced at investing their new wealth. Then along comes a thrilling new commodity. Sure the first specimens were just plain old red tulips, but they could be bred into some extraordinary variations, like the dark purple tulip. And finally, you have an unregulated market place, no government constraints, where prices could explode. And explode they did, starting in the 1630s.

There was always much more demand for tulips than supply. Tulips didn't bloom frequently like roses. Tulips bloomed once in the early spring. And that was it for the year. Eventually, specially-bred multicolored tulips became so valuable, well, according to records, one tulip bulb was worth 24 tons of wheat, or a thousand pounds of cheese. One particular tulip bulb was sold and exchanged for a small ship. In other words, tulips were literally worth their weight in gold.

As demand grew, people began selling promissory notes guaranteeing the future delivery of prized tulip bulbs. The buyers of these pieces of paper would resell the notes at marked up prices. These promissory notes kept changing hands from buyer to buyer until the tulip was ready for delivery. But it was all pure speculation because as I said, there was no way to know if the bulb was really going to produce the variety, the color that was promised. But that didn't matter to the owner of the note. The owner only cared about having that piece of paper so it could be traded later at a profit. And people were borrowing, mortgaging their homes in many cases to obtain those bits of paper because they were sure they found an easy way to make money.

So now, you've got all the ingredients for a huge bust. And bust it did, when one cold February morning in 1637, a group of bulb traders got together and discovered that suddenly there were no bidders. Nobody wanted to buy. Panic spread like wild fire and the tulip market collapsed totally.

TPO 6 Lecture 2 Biology

Narrator
Listen to part of a lecture in a biology class.

Professor
Ok, I have an interesting plant species to discuss with you today. Uh…it's a species of a very rare tree that grows in Australia, Eidothea hardeniana, but it's better known as the Nightcap Oak.

Now, it was discovered only very recently, just a few years ago. Um… it remained hidden for so long because it's so rare. There are only about 200 of them in existence. They grow in a rain forest, in a mountain rage…range in the north part of New South Wales which is uh… a state in Australia. So just 200 individual trees in all.

Now another interesting thing about the Nightcap Oak is that it is…it represents…uh…a very old type…uh…kind of tree that grew a hundred million years ago. Um, we found fossils that old that bear remarkable resemblance to the tree. So, it's a primitive tree. A…a living fossil you might say. It's relic from earlier times and it has survived all these years without much change. And it…it's probably a kind of tree from which other trees that grow in Australia today evolved.

Just to give you an idea of what we are talking about. Here's a picture of the leaves of the tree and its flowers. I don't know how well you can see the flowers. They're those little clusters sitting at the base of the leaves.

Okay, what have we tried to find out about the tree since we've discovered it? Hmm…or how…why is…is it so rare? It's one of the first questions. Um… how is it…um…how does it reproduce? It's another question. Um, maybe those two questions are actually related. Jim?

Student

Hmm …I don't know. But I can imagine that…for instance, seed dispersal might be a factor. I mean if the…er…you know, if the seeds cannot really disperse in the wild area, then, you know, the tree may not colonize new areas. It can't spread from the area where it's growing.

Professor

Right. That's…that's actually a very good answer. Uh, of course, you might think there might not be many areas where the tree could spread into, er…because…um…well, it's very specialized in terms of the habitat. But, that's not really the case here. Um…the suitable habitat, that is, the actual rainforest is much larger than the few hectares where the Nightcap Oak grows.

Now this tree is a flowering tree as I showed you. Um…um…it produces a fruit, much like a plum. On the inci…inside there's a seed with a hard shell. It…it appears that the shell has to crack open or break down somewhat to allow the seed to soak up water. You know, if the Nightcap Oak remains…if their seeds remain locked inside their shell, they will not germinate. Actually, the seeds…er…they don't retain the power to germinate for very long, maybe two years. So there's actually quite a short window of opportunity for the seed to germinate. So the shell somehow has to be broken down before this…um…germination ability expires. And…and then there's a kind of rat that likes to feed on the seeds as well. So, given all these limitations, not many seeds that the tree produces will actually germinate. So this is a possible explanation for why the tree does not spread. It doesn't necessarily explain how it became so rare, but it explains why it doesn't increase.

OK, so it seems to be the case that the species, this Nightcap Oak is not very good at spreading. However, it seems, though we can't be sure, that it's very good at persisting as a population. Um…we…there's some indications to suggest that the population of the Nightcap Oak has not declined over the last. er…you know, many hundreds of years. So it's stayed quite stable. It's not a remnant of some huge population that is dwindled in the last few hundred years for some reason. It's not necessarily a species in retreat. Ok, so it cannot spread very well, but it's good at maintaining itself. It's rare, but it's not disappearing.

Ok, the next thing we might want to ask about a plant like that is what chances does it have to survive into the future. Let's look at that.

TPO 6 Conversation 2

Narrator

Listen to a conversation between a student and a professor.

Student
Professor Martin?

Professor
Uh, hi, Lisa, what can I do for you?

Student
Well, I've been thinking about, you know, what you were saying in class last week, about how we shouldn't wait until the last minute to find an idea and get started working on our term paper

.

Professor
Good, good, and have you come up with anything?

Student
Well, yeah, sort of. See, I've never had a linguistics class before, so I was sort of, I mean, I was looking over the course description and a lot of the stuff you described there, I just don't know what it is talking about, you know, or what it means. But there was one thing that really did jump out at me.

Professor
Yes?

Student
The section on dialects, 'cause…like, that's the kind of thing that's always sort of intrigued me, you know?

Professor
Well, that's certainly an interesting topic. But you may not realize, I mean, the scope...

Student
Well, especially now, 'cause I've got like one roommate who is from the south and another one from New York. And we all talk like totally different, you know

Professor
Yes, I understand. But…

Student
But then I was noticing, like, we don't really get into this till the end of the semester, you know. So I…

Professor
So, you want some pointers where to go for information on the subject? Well, you could always start by reading the chapter in the book on sociolinguistics. That will give you a basic understanding of the key issues involved here.

Student
Yeah, that's what I thought. So I started reading the chapter, you know, about how everyone speaks some dialect of a language. And I'm wondering like, well, how do we even manage to understand each other at all?

Professor
Ah, yes, an interesting question. You see…

Student

So then I read the part about dialect accommodation. You know, the idea that people tend to adapt their speaking to make it closer to the speech of whomever they're talking to, and I'm thinking, yeah, I do that when I talk with my roommates, and without even thinking about it or anything, you know.

Professor

OK, all right. Dialect accommodation is a more manageable sort of topic.

Student

So I was thinking like, I wonder just how much other people do the same thing. I mean, there are students here from all over the place. Does everyone change the way they talk to some degree depending on whom they are talking to?

Professor

You'd be surprised.

Student

So, anyway, my question is, do you think it'd be OK if I did a project like that for my term paper? You know, find students from different parts of the country, record them talking to each other in different combinations, report on how they accommodate their speech or not, that kind of thing?

Professor

Tell you what, Lisa, write me up a short proposal for this project, how you're going to carry out the experiment and everything, a design plan. And I think this'll work out just fine.

TPO 6 Lecture 3 Creative Writing

Narrator

Listen to part of a lecture in a creative writing class.

Professor

Alright everybody, the topic for today is, well, we're gonna take a look at how to start creating the characters for the stories you're writing. One way of doing that is to come up with what's called "a character sketch", I don't mean a sketch like a drawing, I guess that's obvious. It's um…it's a…a sketch is a way of getting started on defining your characters' personalities.

To begin, how do we create fictional characters? We don't just pull them from thin air, do we? I mean we don't create them out of nothing. We base them, consciously or unconsciously, we base them on real people, or we blend several people's traits, their attributes into one character. But when people think fiction, they may assume the characters come from the author's imagination. But the writer's imagination is influenced by… by real people, could be anyone, so, pay attention to the people you meet, someone in class, at the gym, that guy who is always sitting in the corner at the coffee house, um… your cousin, who's always getting into dangerous situations. We're pulling from reality, gathering bits and pieces of real people. You use these people, and the bits of behavior or characteristics as a starting point as you begin to sketch out your characters.

Here is what you should think about doing first. When you begin to formulate a story, make a list of interesting people you know or have observed. Consider why they're unique or annoying. Then make notes about their unusual or dominant attributes. As you create fictional characters, you'll almost always combine characteristics from several different people on your list to form the identity and personality of just one character. Keeping this kind of character sketch can help you solidify your character's personality, so that it remains consistent throughout your story.

You need to define your characters, know their personalities so that you can have them acting in ways that are predictable, consistent with their personalities. Get to know them like a friend, you know your friends well enough to know how they'll act in certain situations, right? Say you have three friends, their car runs out of gas on the highway. John gets upset. Mary remains calm. Teresa takes charge of handling the situation. And let's say, both John and Mary defer to her leadership. They call you to explain what happen. And when John tells you he got mad, you're not surprised, because he always gets frustrated when things go wrong. Then he tells you how Teresa took charge, calmed him down, assigned tasks for each person and got them on their way. Again, you're not surprised. It's exactly what you'd expect. Well, you need to know your characters, like you know your friends. If you know a lot about a person's character, it's easy to predict how they'll behave. So if your characters' personalities are well defined, it will be easy for you as the writer to portray them realistically…er… believably, in any given situation.

While writing character sketches, do think about details. Ask yourself questions, even if you don't use the details in your story, um…what does each character like to eat, what setting does each prefer, the mountains, the city, what about educational background, their reactions to success or defeat, write it all down.

But, here I need to warn you about a possible pitfall. Don't make your character into a stereotype. Remember the reader needs to know how your character is different from other people who might fall in the same category. Maybe your character loves the mountains and has lived in a remote area for years. To make sure he is not a stereotype, ask yourself how he sees life differently from other people who live in that kind of setting. Be careful not to make him into the cliché of the "ragged mountain dweller".

Okay, now, I'll throw out a little terminology. It's easy stuff. Major characters are sometimes called "round characters". Minor characters are sometimes called, well, just the opposite, "flat". A round character is fully developed; a flat character isn't, character development is fairly limited. The flat character tends to serve mainly as a motivating factor. For instance, you introduce a flat character who has experienced some sort of defeat. And then your round, your main character who loves success and loves to show off, comes and boasts about succeeding and jokes about the flat character's defeat in front of others, humiliates the other guy. The flat character is introduced solely for the purpose of allowing the round character to show off.

TPO 6 Lecture 4 Earth Science

Narrator
Listen to part of a lecture in an earth science class.

Professor
We're really just now beginning to understand how quickly drastic climate change can take place. We can see past occurrences of climate change that took place over just a few hundred years.

Take uh… the Sahara Desert in Northern Africa. The Sahara was really different 6,000 years ago. I mean, you wouldn't call it a tropical paradise or anything, uh…or maybe you would if you think about how today in some parts of the Sahara it…it only rains about once a century. Um… but basically, you had greenery and you had water.

And what I find particularly interesting... amazing really, what really indicates how undesert-like the Sahara was thousands of years ago, was something painted on the rock, prehistoric art, hippopotamuses, as you know hippos need a lot of water and hence? Hence what?

Student

They need to live near a large source of water year around.

Professor

That's right.

Student

But how is that proof that the Sahara used to be a lot wetter? I mean the people who painted those hippos, well, couldn't they have seen them on their travels?

Professor

Okay, in principle they could, Karl. But the rock paintings aren't the only evidence. Beneath the Sahara are huge aquifers, basically a sea of fresh water, that's perhaps a million years old filtered through rock layers. And…er…and then there is fossilized pollen, from low shrubs and grasses that once grew in the Sahara. In fact these plants still grow, er…but hundreds of miles away, in more vegetated areas. Anyway, it's this fossilized pollen along with the aquifers and the rock paintings, these three things are all evidence that the Sahara was once much greener than it is today, that there were hippos and probably elephants and giraffes and so on.

Student

So what happened?

Professor

How did it happen? Well, Now, we're so used to hearing about how human activities are affecting the climate, right? But that takes the focus away from the natural variations in the earth climate, like the Ice Age, right? The planet was practically covered in ice just a few thousand years ago. Now as far as the Sahara goes, there is some recent literature that points to the migration of the monsoon in that area

Students

Huh?????

Professor

What do I mean? Okay, a monsoon is a seasonal wind that can bring in a large amount of rainfall. Now if the monsoon migrates, well, that means that the rains move to another area, right?

So what caused the monsoon to migrate? Well, the answer is: the dynamics of earth's motions, the same thing that caused the Ice Age by the way. The earth's not always the same distance from the sun, and it's not always tilting toward the sun at the same angle. There are slight variations in these two parameters. They're gradual variations but their effects can be pretty abrupt. And can cause the climate to change in just a few hundred years.

Student

That's abrupt?

Professor

Well, yeah, considering that other climate shifts take thousands of years, this one is pretty abrupt. So these changes in the planet's motions, they caused the climate to change.

But it was also compounded. What the Sahara experienced was uh…a sort of "runaway drying effect". As I said the monsoon migrated itself, so there was less rain in the Sahara. The land started to get drier, which in turn caused a huge decrease in the amount of vegetation, because vegetation doesn't grow as well in dry soil, right? And then, less vegetation means the soil can't hold water as well, the soil loses its ability to retain water when it does rain. So then you have less moisture to help clouds form, nothing to evaporate for cloud formation. And then the cycle continues, less rain, drier soil, less vegetation, fewer clouds, less rain etc. etc..

Student

But, what about the people who made the rock paintings?

Professor

Good question. No one really knows. But there might be some connections to ancient Egypt. At about the same time that the Sahara was becoming a desert…hmm ...5,000 years ago, Egypt really began to flourish out in the Nile River valley. And that's not that far away. So it's only logical to hypothesize that a lot of these people migrated to the Nile valley when they realized that this was more than a temporary drought. And some people take this a step further. And that's okay, that's science and they hypothesize that this migration actually provided an important impetus in the development of ancient Egypt. Well, we'll stay tuned on that.

TPO 7

Conversation 1

Narrator

Listen to a conversation between a student and a professor.

Eric: Hi, Professor Mason, do you have a minute?

Pro: Yeah, of course, Eric. I think there was something I wanted to talk to you about too.

Eric: Probably my late essay.

Pro: Ah, that must be it. I thought maybe I've lost it.

Eric: No, I'm sorry. Actually it was my computer that lost it, the first draft of it. And, well, anyway, I finally put it in your mailbox yesterday.

Pro: Oh,and I haven't checked the mailbox yet today. Well, I'm glad it's there. I will read it this weekend.

Eric: Well, sorry again. Say, I can send it to you by email too if you like.

Pro: Great. I'll be interested to see how it all came out.

Eric: Right. Now, um, I just have overheard some graduate students' talking, something about a party for Dean Adams?

Pro: Retirement party, yes, all students are invited. Wasn't there notice on the Anthropology Department's bulletin board?

Eric: Uh, I don't know. But I want to offer help out with it. You know whatever you need. Dean Adams, well, I took a few anthropology classes with her and they were great, inspiring. That's why I want to pitch in.

Pro: Oh, that's very thoughtful of you, Eric, but it will be pretty low-key, nothing flashy. That's not her style.

Eric: So there's nothing?

Pro: No, we'll have coffee and cookies, maybe a cake. But actually a couple of the administrative assistants are working on that. You could ask them but I think they've got covered.

Eric: Ok.

Pro: Actually, oh, no, never mind.

Eric: What's it?

Pro: Well, it's nothing to do with the party and I'm sure there are more exciting ways that you could spend your time. But we do need some help with something. We're compiling a database of articles the anthropology faculty has published. There is not much glory in it, but we are looking for someone with some knowledge of anthropology who can enter the articles. I hesitate to mention it. But I don't suppose this is something you would...

Eric: No, that sounds kind of cool. I would like to see what they are writing about.

Pro: Wonderful. And there are also some unpublished studies. Did you know Dean Adams did a lot of field research in Indonesia? Most of it hasn't been published yet.

Eric: No, like what?

Pro: Well, she is really versatile. She just spent several months studying social interactions in Indonesia and she's been influential in ethnology. Oh, and she's also done work in south of America, this is closer to biology, especially with speciation.

Eric: uh, not to seem uninformed...

Pro: Well, how species form. You know, how two distinct species form from one. Like when populations of the same species are isolated from each other and then develop into two different directions and end up as two distinct species.

Eric: Interesting.

Pro: Yes, and while she was there in South America, she collected a lot of linguistic information and songs, really fascinating.

Eric: Well. I hate to see her leave.

Pro: Don't worry. She'll still be around. She's got lots of projects that she's still in the middle of.

TPO 7 Lecture 1 Theater History

Narrator

Listen to part of a lecture in a class on theater history. The professor is discussing the theater of 19th-century France.

Pro: The 19th century was the time that saw what we called Realism developed in the European theater. Um… to understand this though, we first need to look at an earlier form of drama known as the well-made play, which basically was a pattern for constructing plays, plays that... uh.. beginning with some early 19th century comedies in France proved very successful commercially.

The dramatic devices used here weren't actually anything new. They had been around for centuries. But the formula for a well-made play required that the certain of these elements be included in a particular order. And most importantly, that everything in the plays be logically connected. In fact, some of these playwrights would start by writing the end of a play and work backward toward the beginning, just to make sure each event led logically from what had gone before.

Ok, so what are the necessary elements of a well-made play?

Well, the first is logical exposition. Exposition is whatever background information you have to reveal to the audience. So, they'll understand what is going on. Before this time, exposition might have come from actors simply giving speeches. Someone might walk out on a stage and say: "In fair Verona where we lay our scene!" and then tell all about the feuding families of Romeo and Juliet. But for the well-made play, even the exposition had to be logical, believable. So, for example, you might have two servants gossiping as they are cleaning the house. And one says, Oh, what a shame the master's son is still not married. And the other might mention a rumor about a mysterious gentleman who's just moved into town with his beautiful daughter. These comments are part of the play's logical exposition.

The next key element of the a well-made play is referred to as the inciting incident. After we have the background information, we need a key moment that gets things moving, that really makes the audience interested in what happens to the characters we just heard about. So, for example, after the two servants reveal all this background information, we meet the young man. Just as he first lays eyes on the beautiful young woman, and immediately falls in love. This is the inciting incident. It sets off, the plot of the play.

Now, the plot of a well-made play is usually driven by secrets. Things that the audience knows, but the characters often don't know. So, for example, the audience learns through a letter or through someone else's conversation who this mysterious gentleman is and why he left the town many years before. But the young man doesn't know about this. And the woman doesn't understand the ancient connection between her family and his.

And before the secrets are revealed to the main characters, the plot of the play proceeds as a series of sort of up and down moments. For example, the woman first appears not to even notice the young man, and it seems to him like the end of the world. But then, he learns that she actually wants to meet him too. So, life is wonderful. Then, if he tries to talk with her, maybe her father get furious, for no apparent reason. So, they can't see each other. But, just as the young man has almost lost all hope, he finds out, well you get the idea, the reversals of fortune continue, increasing the audience's tension and excitement, making them wonder if everything is going to come out okay or not.

Next comesan element known as the: obligatory scene. It's a scene, a moment in which all the secrets are revealed. And generally, things turn out well for the hero and others we care about, a happy ending of some sort. This became so popular that a playwright almost had to include it in every play, which is why it's called: the obligatory scene.

And that's followed by the final dramatic element---the denouement or the resolution, when all the loose ends have to be tied up in a logical way. Remember, the obligatory scene gives the audience emotional pleasure. But the denouement offers the audience a logical conclusion. That's the subtle distinction we need to try very hard to keep in mind.

So, as I said, the well-made play, this form of playwriting, became the basis for realism in drama, and for a lot of very popular 19th-century plays. And also, a pattern we find in the plots of many later plays and even movies that we see today.

TPO 7 Lecture 2 Biology

Narrator
Listen to part of a lecture in a Biology class.

Pro: So, that is how elephants use infrasound. Now, let's talk about the other end of the acoustical spectrum, sound that is too high for humans to hear---ultrasound.

Ultrasound is used by many animals that detect and some of them send out very high frequency sounds. So, what is a good example? Yes? Carol.

Carol: Well, bats, since they are all blind, bats have to use sound for, you know, to keep from flying into things.

Pro: That is echolocation. Echolocation is pretty self-explanatory; using echoes reflected sound waves to locate things. As Carol said, bats use it for navigation and orientation. And what else? Mike.

Mike: Well, finding food is always important, and I guess not becoming food for other animals.

Pro: Right, on both counts. Avoiding other predators, and locating prey, typically insects that fly around at night. Now before I go on, let me just respond to something Carol was saying--- this idea that bats are blind. Actually, there are some species of bats, the ones that don't use echolocation that do rely on their vision for navigation, but it is true that for many bats, their vision is too weak to count on.

Ok, so quick summary of how echolocation works. The bat emits these ultrasonic pulses, very high pitch sound waves that we cannot hear. And then, they analyze the echoes, how the waves bounce back. Here, let me finish this diagram I started before class. So the bat sends out these pulses, very focused bursts of sound, and echoes bounce back. You know, I don't think I need to draw on the echoes, your reading assignment for the next class; it has a diagram that shows this very clearly.

So, anyway, as I were saying, by analyzing these echoes, the bat can determine, say, if there is wall in a cave that it needs to avoid, and how far away it is. Another thing it uses ultrasound to detect is the size and shape of objects. For example, one echo they quickly identify is the one they associate with a moth, which is common prey for a bat, particularly a moth beating its wings. However, moth happened to have a major advantage over most other insects. They can detect ultrasound; this means that when a bat approaches, the moth can detect the bat's presence. So, it has time to escape to safety, or else they can just remain motionless. Since, when they stop beating their wings, they'd be much harder for the bat to distinguish from, oh… a leaf or some other object.

Now, we have tended to underestimate just how sophisticated the abilities of animals that use ultrasound are. In fact, we kind of assumed that they were filtering a lot out, the way a sophisticated radar system can ignore echoes from stationary objects on the ground. Radar does this to remove ground clutter, information about hills or buildings that it doesn't need. But bats, we thought they were filtering out this kind of information, because they simply couldn't analyze it. But, it looks as if we were wrong. Recently there was this experiment with trees and a specific species of bats. A bat called: the lesser spearnosed bat.

Now, a tree should be a huge acoustical challenge for a bat, right? I mean it's got all kinds of surfaces with different shapes and angles. So, well, the echoes from a tree are going to a mass of chaotic acoustic reflections, right, not like the echo from a moth. So, we thought for a long time that bats stop their evaluation at simply that is a tree. Yet, it turns out that bats or at least this particular species, cannot only tell that is a tree, but can also distinguish between, say, a pine tree, and a deciduous tree, like a maple or oak tree, just by their leaves. And when I say, leaves, I mean pine needles too. Any ideas on how it would know that?

Stu: Well, like with the moth, could it be their shape?

Pro: You are on the right track---it is actually the echo of all the leaves as whole that matters. Now, think, a pine tree with all those little densely packed needles. Those produce a large number of faint reflections in what's... what's called a ... a smooth echo. The wave form is very even, but an oak which has fewer but bigger leaves with stronger reflections, produces a jagged wave form, or what we called: a rough echo. And these bats can distinguish between the two, and not just with trees, but with any echo that comes in a smooth or rough shape.

TPO 7 Conversation

Narrator
Listen to a conversation between a student and a librarian.

Stu: Hi, I am new here and I couldn't come to the student orientation and I'm wondering if you can give me a few quick pointers about the library? I'd really appreciate it.

Pro: Sure. I'd be glad to. What's your major area of study?

Stu: Latin American Literature.

Pro: OK. Well, over here's the section where we have language, literature and the arts. And if you go downstairs you will find the history section. Generally, the students who concentrate in Latin American literature find themselves researching in the history section a lot.

Stu: Um-hmm, you are right. I am a transfer student and I've already done a year at another university so I know how the research can go. I spent a lot of time in the history section. So how long can I borrow books for?

Pro: Our loan period is a month. Oh I should also mention that we have an inter-library loan service. If you need to get hold a book that's not in our library, there is a truck that runs between our library and a few other public and university libraries in this area. It comes around three times a week.

Stu: Hey, that's great! At my last school, it could take a really long time to get the materials I needed. So when I had a project, I had to make a plan way in advance. This sounds much faster. Another thing I was wondering is: is there a place where I can bring my computer and hook it up?

Pro: Sure. There is a whole area here on the main floor where you can bring a laptop and plug it in for power but on top of that we also have a connection for the internet at every seat.

Stu: Nice, so I can do the all research I need to do right here in the library. I'll have all the resources, all the books and the information I need right here in one place.

Pro: Yeah. That's the idea. I am sure you'll need photocopiers too. There are down the hall to your left. We have a system where you have to use a copy card so you'll need to buy a card from the front desk. You insert it into the machine and you are ready to make copies.

Stu: How much do you guys get charge?

Pro: Seven cents a copy.

Stu: Oh, that is not too bad. Thanks. Um, where is the collection of rare books?

Pro: Rare books are up on the second floor. They are in a separate room where the temperature is controlled, to preserve the old paper in them. You need to get special permission to access them, and then you have to wear gloves to handle them ‘cause the oils in our hands, you know, can destroy the paper. And gloves prevent that so we have a basket of gloves in the room.

Stu: Ok. Thanks. I suppose that’s all I need to know. You've been very helpful. Thanks.

Pro: Anytime. Bye

Stu: Bye.

TPO 7 Lecture 3 Anthropology

Pro: So we've been discussing 16th century Native American life, and today we're going to focus on the Iroquois and Huron peoples. They lived in the northeastern great lakes region of North America. Now, back then, their lifes depended on the natural resources of the forests, especially the birch tree. The birch tree can grow in many different types of soils and is prevalent in that area. Now can anyone here describe a birch tree?

Stu: They are tall and white, the bark, I mean.

Pro: Yes. The birch tree has white bark, and this tough protective outer layer of the tree, this white bark, is waterproof. And this waterproof quality of the bark, it made it useful for making things like cooking containers, a variety of utensils. And if you peel birch bark in the winter, we call it “the winter bark”, another layer, a tougher inner layer of the tree adheres to the bark, producing a stronger material. So the winter bark was used for larger utensils and containers.

Stu: I know people make utensils out of wood, but utensils out of tree bark?

Pro: Well, birch bark is pliable and very easy to bend. The Native Americans would cut the bark and fold it into any shape they needed, then secure it with cords until it dried. They could fold the bark into many shapes.

Stu: So if they cooked in bowls made of birch bark, wouldn't that make the food taste funny?

Pro: Oh, that's one of the great things about birch bark. The taste of the birch tree doesn't get transferred to the food. So it was perfect for cooking containers.

But the most important use of the bark, by far, was the canoe. Since the northeast region of North American is interconnected by many streams and waterways, water transportation by vessels like a canoe was most essential. The paths through the woods were often overgrown, so water travel was much faster. And here's what the Native Americans did. They would peel large sheets of bark from the tree to form lightweight yet sturdy canoes. The bark was stretched over frames made from tree branches, stitched together and sealed with resin. You know that sticky liquid that comes out of the tree? And when it dries, it's watertight.

One great thing about these birch bark canoes was, uh, they could carry a large amount of cargo. For example, a canoe weighing about 50 pounds could carry up to nine people and 250 pounds of cargo.

Stu: Wow! But how far could they travel that way?

Pro: Well like I said, the northeastern region is interconnected by rivers and streams and the ocean at the coast. The canoes allow them to travel over a vast area that today would take a few hours to fly over. You see, the Native Americans made canoes of all types, for travel on small streams or on large open ocean waters. For small streams, they made narrow, maneuverable boats, while, while larger canoes were needed for the ocean. They could travel throughout the area only occasionally having to portage, to carry the canoe over a land short distance to another nearby stream. And since the canoes were so light, this wasn't a difficult task.

Now how do you think this affected their lives?

Stu: Well if they could travel so easily over such a large area, they could trade with people from other areas which I guess would lead them to form alliances?

Pro: Exactly. Having an efficient means of transportation, well, that helps the Iroquois to form a federation linked by natural waterways. And this federation expanded from what is now Southern Canada all the way south to the Dalever River. And this efficiency of the birch bark canoe also made an impression on newcomers to the area. French traders in the 17th century modeled their...well they adopted the design of the Iroquois birch bark canoes, and they found they could travel great distances more than 15 kilometers a month.

Now besides the bark, Native Americans also used the wood of the birch tree. The young trees were used as supports for lodgings, with the waterproof bark used as roofing. Branches were folded into snowshoes. And the Native American people were all adept at running very fast over the snow in these birch branch snowshoes, which if you ever tried walking in snowshoes you know it wasn't easy.

TPO 7 Lecture 4 Geology

Last time, we started to talk about glaciers and how these masses of ice form from crystallized snow, and some of you were amazed at how huge some of these glaciers are. Now, even though it may be difficult to understand how a huge mass of ice can move or flow, it’s another word for it, it’s really known that no secret that the glaciers flow because of gravity. But how they flow, the way they flow, needs some explaining.

Now, the first type of glacier flow is called: basal slip. Basal slip or sliding as it’s often called, basically refers to the slipping or sliding of a glacier across bedrock, actually across a thin layer of water on top of the bedrock. So, this process shouldn’t be too hard to imagine. What happens is that the ice at the base of the glacier is under a great deal of pressure-- the pressure coming from the weight of the overlying ice. And you probably know that under pressure, the melting temperature of water, of the ice I mean, is reduced. So, ice at the base of the glacier melts, even though it’s below zero degree Celsius. And this results in a thin layer of water between the glacier and the ground. This layer of water reduces friction is... is like a lubricant. And it allows the glacier to slide or slip over the bedrock. OK?

Now the next type of movement we will talk about is called: deformation. You'v already known that ice is brittle, if you hit it with a hammer, it will shatter like glass. But ice is also plastic, it can change shape without breaking. If you leave, for example, a bar of ice supported only at one end, the end, the unsupported end will deform under its own weight, it'll kind of flatten out at one end, get distorted, deformed. Think of deformation as a very slow oozing. Depending on the stresses on the glacier, the ice crystal within it reorganize. And during this re-organization the ice crystals realign in a way that allows them to slide pass each other. And so the glacier oozes downhill without any ice actually melting.

Now, there are a couple of factors that affect the amount of deformation that takes place or the speed of the glacier's movement for example. Deformation is more likely to occur the thicker the ice is, because of the gravity of the weight of the ice. And temperature also plays a part here, in that cold ice does not move as easily as ice that is close to the melting point, in fact, it is not too different from… the way oil is, thicker at lower temperatures. So, if you have a glacier in a slightly warmer region, it will flow faster than a glacier in a cooler region.

Ok, um… Now, I'd like to touch briefly on extension and compression. Your textbook includes these as types, as a particular type of glacier movement, but you will see that there are …as many textbooks that omit it as a type of movement as include it. And I might not include it right now, if it weren't in your textbook. But, basically, the upper parts of glaciers have less pressure on them. So, they don't deform easily, they tend to be more brittle. And crevasses can form in this upper layers of the glacier. When the glacier comes into contact with bedrock walls or is otherwise under some kind of stress, but can't deform quickly enough. So, the ice would expand or constrict, and that can cause big fissures big cracks to form in the surface layers of the ice, and that brittle surface ice moving is sometimes considered a type of glacier movement depending on which source you are consulting.

Now, as you probably know, glaciers generally move really slowly. But sometimes, they experience surges, and during these surges, in some places, they can move at speeds as high as 7000 meters per year. Now, speeds like that are pretty unusual, hundreds of times faster than the regular movement of glaciers, but you can actually see glacier move during these surges, though it is rare.

TPO 8

Conversation 1

Narrator
Listen to a conversation between a student and a registrar.

Stu: Hi, I'd like to drop off my graduation form; I understand you need this in order to process my diploma.

Pro: Ok, I will take that. Before you leave, let's me check our computer. Looks like you are OK for graduation, and actually, I am getting a warning flag on your academic record here.

Stu: Really?

Pro: Yeah. Let's see what's what. Are you familiar with our graduation requirements?

Stu: Uh, I think so

Pro: Well, then you know you need 48 credits in your major field to graduate and at least 24 credits at the intermediate level or higher. Also, after your second year, you have to meet with your department chair to outline a plan for the rest of your time here. In the past, we also issue letters before students' final year began to let them know what they needed to take in the final year to be OK, but we don't do that anymore.

Stu: I definitely met with my chair person 2 years ago. He told me that I needed 8 more courses at the intermediate level or higher in the last 2 years to be OK. So I am not sure what the problem is, I make sure I got those credits.

Pro: Unfortunately, the computer is usually pretty reliable. So I am not sure what's going on here.

Stu: It could be that I have taken 2 basic courses but coupled both of them with, uh, field experiences.

Pro: What do you mean?

Stu: Well, I could only take intro courses because there were no intermediate level courses available for those particular topics. My chair person told me that if I did independent field research in addition to the assigned work in each course; they would count as intermediate level courses. My classmates, um, some of my classmates, did this for an easy way to meet their intermediate course requirement, but I did it to get the kind of depth in those topics I was going for. As it turned out I really enjoyed the field work, it was a nice supplement to just sitting and listening to lectures

Pro: I am sure that's true, but the computer is still showing them as basic level courses despite the field work.

Stu: I am not sure what to do then, I mean, should I cancel my graduation party?

Pro: No, no reason to get worried like that, just contact your chair person immediately, ok, tell him to call me as soon as possible so that we can verify your field work arrangement and certify those credits right away. It's not like there is an actual deadline to date or anything. But if more than a few weeks go by, we might have a real problem that would very difficult to fix in time for you to graduate. In fact, there probably would be nothing we could do.

Stu: I will get on that.

TPO 8 Lecture 1 Animal Behavior

Pro: OK. Well, last time we talked about passive habitat selection, like plants for example, they don't make active choices about where to grow. They are dispersed by some other agent, like the wind. And if the seeds land in a suitable habitat, they do well and reproduce.

With active habitat selection, an organism is able to physically select where to live and breed. And because an animal's breeding habitat is so important, we'd expect animal species to have developed preferences for particular types of habitats, places where their offspring have the best chance of survival. So let's look at the effect this preference can have by looking at some examples.

But first let's recap. What do we mean by habitat? Frank?

Stu: Well, it's basically the place or environment where an organism normally lives and grows.

Pro: Right, and as we'v discussed, there are some key elements that a habitat must contain, food obviously, water, it's got to have the right climate and spaces for physical protection. And we saw how important habitat selection is when we look at habitats where some of these factors are removed, perhaps through habitat destruction. I just read about a shorebird, the plover.

The plover lives by the ocean and feeds on small shellfish, insects and plants. It blends in with the sand, so it's well-camouflaged from predator birds above. But it lays its eggs in shallow depressions in the sand with very little protection around them. So if there are people or dogs on the beach, the eggs and fledglings in the nests are really vulnerable. Out in California where there has been a lot of human development by the ocean. The plovers are now a threatened species. So conservationists tried to recreate a new habitat for them. They made artificial beaches and sand bars in areas inaccessible to people and dogs. And the plover population is up quite a bit in those places.

Ok. That is an instance where a habitat is made less suitable. But now, what about cases where an animal exhibits a clear choice between two suitable habitats? In cases like that, does the preference matter? Well, Let's look at the blue warbler.

The Blue warbler is a songbird that lives in North America. They clearly prefer hard wood forests with dense shrubs, bushes underneath the trees. They actually nest in the shrubs, not the trees. So they're pretty close to the ground, but these warblers also nest in forests that have low shrub density. It is usually the younger warblers that nest in these areas because the preferred spots where there are a lot of shrubs are taken by the older, more dominant birds.

And the choice of habitat seems to affect reproductive success. Because the older, more experienced birds who nest in the high density shrub areas have significantly more offspring than those in low density areas, which suggests that the choice of where to nest does have an impact on the number of chicks they have.

But a preferred environment doesn't always seem to correlate with greater reproductive success. For example, In Europe, studies have been done of blackcap warblers. We just call them blackcaps.

The Blackcap can be found in two different environments. Their preferred habitat is forests near the edge of streams. However, blackcaps also live in pine woods away from water. Studies have been done on the reproductive success rates for the birds in both areas, and the result showed surprisingly that the reproductive success was essentially the same in both areas--- the preferred and the second choice habitat. Well. Why?

It turned out that there were actually four times as many bird pairs or couples living in the stream edge habitat compared to the area away from the stream. So this stream edge area had a much denser population, which meant more members of the same species competing for resources, wanting to feed on the same things or build their nests in the same places, which lower the suitability of the prime habitat even though it's their preferred habitat. So the results of the study suggest that when the number of the competitors in the prime habitat reaches a certain point, the second rank habitat becomes just as successful as the prime habitat, just because there are fewer members of the same species living there. So it looks like competition for resources is another important factor in determining if a particular habitat is suitable.

TPO 8 Lecture 2 Art History

Pro: We've been talking about the art world of the late 19th century in Paris. And today I'd like to look at the women who went to Paris at that time to become artists. Now from your reading what do you know about Paris, about the art world of Paris during the late 19th century?

Stu: People came there from all over the world to study.

Stu: It had a lot of art schools and artists who taught painting. There were, our book mentions classes for women artists. And it was a good place to go to study art.

Pro: If you wanted to become an artist, Paris was not a good place to go; Paris was THE place to go. And women could find skilled instructors there. Before the late 19th century. If they women who wanted to become artists had to take private lessons or learn from family members. They had more limited options than men did. But around 1870s, some artists in Paris began to offer classes for female students. These classes were for women only. And by the end of the 19th century, it became much more common for women and men to study together in the same classes. So within a few decades, things had changed significantly.

OK. Let's back up again and talk about the time period from the 1860s to the 1880s and talk more about what happened in women's art classes. In 1868, a private art academy opened in Paris, and for decades it was probably the most famous private art school in the world. Its founder Rodolphe Julian was a canny businessman. And quickly established his school as a premier destination for women artists. What he did was: After an initial trail period of mixed classes, he changed the school policy. He completely separated the men and women students.

Stu: Any reason why he did that?

Pro: Well. Like I said Julian was a brilliant businessman, with progressive ideas. He saw that another small private art school where all the students were women was very popular at that time. And that's probably why he adopted the women only classes. His classes were typically offered by... by established artists and were held in the studio, the place where they painted. This was a big deal because finally women could study art in a formal setting. And there was another benefit to the group setting of these classes. The classes included weekly criticism. And the teacher would rank the art of all the students in the class from best to worst. How would you like it if I did that in this class?

Stu1: Hah…No way.

Stu2: But our textbook said that the competitive…the competition was good for women. It helped them see where they needed to improve.

Pro: Isn't that interesting? One woman artist, her name was Marie Bashkirtseff. Bashkirtseff once wrote how she felt about a classmate's work. She thought her classmate's art was much better than her own and it gave her an incentive to do better. Overall the competition in the women's art classes gave women more confidence. Confidence that they could also compete in the art world after their schooling. And even though Bashkirtseff could not study in the same classes as men, she was having an impact as an artist. Just look like the salon, what do you know about the salon?

Stu: It was a big exhibition, a big art show that they had in Pairs every year. They art had to be accepted by judges.

Stu: It was a big deal you can make a name for yourself.

Pro: You can have a painting or sculpture in the salon and go back to your home country saying you 've been a success in Paris. It was sort of uh, a seal of approval. It was a great encouragement for an artist's career. And by the last two decades of the 19th century, one fifth of the paintings in the salon were by women, much higher than in the past.

In fact, Marie Bashkirtseff herself had a painting in the salon in 1881. Interestingly this masterpiece called In the Studio is a painting of the interior of Julian's art school. It is not in your textbook. I will show you the painting next week. The painting depicts an active crowded studio with women drawing and painting a live model. It was actually Bashkirtseff, actually followed Julian's savvy suggestion and painted her fellow students in a class at the school with the artist herself at the far right. A great advertisement for the school when the painting eventually hung up at the salon, for a women's studio had never been painted before.

TPO 8 Conversation 2

Pro: So, Richard... what's up?

Stu:Well, I know we have a test coming up on chapters.

Pro: Chapters 3 and 4 from your textbook.

Stu: Right, 3 and 4, well, I didn't get something you said in class Monday.

Pro: Alright. Do you remember what it was about?

Stu: Yeah, you were talking about a gym... a health club where people can go to exercise, that kind of thing.

Pro: Ok, but the health-club model is actually from chapter 5.so…

Stu: Oh, chapter 5? Oh so it not... OK but I guess I still want to try to understand…

Pro: Of course, well, I was talking about an issue in strategic marketing, the healthy club model; I mean with a health club you might think they would have trouble attracting customers right?

Stu: Well, I know when I pass by a healthy club and I see all those people working out, they're exercising, I just as soon walk on by.

Pro: Yes, there is that. Plus, lots of people have exercise equipment at home, or they can play sports with their friends. Right?

Stu: Sure.

Pro: But nowadays in spite of all that, and expensive membership fees, health clubs are hugely popular, so how come?

Stu: I guess that is what I didn't understand.

Pro: Ok, basically they have to offer things that most people can't find anywhere else, you know quality, that means better exercise equipment, high-end stuff, and classes... exercise classes, maybe aerobics.

Stu: I am not sure if I…ok I get it. And you know another thing is I think people probably feel good about themselves when they are at the gym. And they can meet new people, socialize.

Pro: Right, so health clubs offer high quality facilities. And also they sell an image about people having more fun, relating better to others and improving their own lives if they become members.

Stu: Sure that makes sense.

Pro: Well, then, can you think of another business or organization that could benefit from doing this? Think about an important building on campus here, something everyone uses, a major source of information?

Stu: You mean like an administrative building?

Pro: Well, that is not what I had in my mind.

Stu: You mean the library.

Pro: Exactly. Libraries, imagine publish libraries; They're an information resource for the whole community right?

Stu: Well they can be, but now with the internet and big book stores, you can probably get what you need without going to a library.

Pro: That's true. So if you were the director of a public library, what would you do about that?

Stu: To get more people to stop in, well, like you said, better equipment, maybe a super fast internet connection, and not just a good variety of books but also like nice and comfortable areas where people can read and do research. Things that make them want to come to the library and stay.

Pro: Great!

Stu: Oh, and maybe have authors come and do some readings or ... I don't know, special presentations. Something people couldn't get at home.

Pro: Now, you are getting it.

Stu: Thanks, Professor Wilkins, I think too.

TPO 8 Lecture 3 History

Pro: So we've been talking about the printing press, how it changed people's lives, making books more accessible to everyone. More books meant more reading, right? But, as you know, not everyone has perfect vision. This increase in literacy, um, in reading, led to an increase in demand for eyeglasses. And here's something you probably haven't thought of. This increased demand impacted societal attitudes towards eyeglasses.

But, first let me back up a bit and talk about vision correction before the printing press. And, um, what did people with poor vision do, I mean, especially those few people who were actually literate? What did they do before glasses were invented? Well, they had different ways of dealing with not seeing well. If you think about it, poor vision wasn't their only problem. I mean, um, think about the conditions they lived in: houses were dark, sometimes there weren't any windows; candles were the only source of light. So in some places, um, like ancient Greece for example, the wealthiest people with poor vision could have someone else read to them- easy solution if you could afford it.

Another solution was something called a "reading stone". Around 1000 C.E. European monks would take a piece of clear rock, often quartz, and place it on top of the reading material. The clear rock magnified the letters, making them appear larger, um, well, it's like what happens when a drop of water falls on something, whatever's below the drop of water appears larger, right? Well, the "reading stone" works in a similar way.

But rocks like quartz, well, quartz of optical quality weren't cheap. Late in the 13th century, glass makers in Italy came up with a less expensive alternative. They made reading stones out of clear glass. And these clear glass reading stones evolved into the eyeglasses we know today. So we're pretty sure that glasses were invented about the late 1200's, well, over a hundred years before the printing press. But it's not clear who exactly invented them first or exactly what year. But record shows that they were invented in both Europe and China at about the same time. By the way, we call this "independent discovery". Independent discovery means when something is invented in different parts of the world at the same time and it's not as unusual as it sounds. You can look at the timeline charts in the back of your textbook to see when things were invented in different cultures at about the same time to see what I'm talking about.

So now let's tie this to what I've said before about societal attitudes towards glasses. Initially in parts of Europe and in China, glasses were a symbol of wisdom and intelligence. This is evident in the artwork from the period. European paintings often portrayed doctors or judges wearing glasses. In China, glasses were very expensive. So in addition to intelligence, they also symbolize affluence, um, wealth. In 14th-century Chinese portraits, the bigger the glasses, the smarter and wealthier the subject was. So glasses were a status symbol in some parts of the world.

Now let's get back to the invention of the painting press in 1440. What happened? Suddenly, books became readily available and more people wanted to read. So the need, oh well, actually not only the need but the demand for more affordable glasses rose drastically. Eventually, inexpensive glasses were produced, and then glasses were available to everyone. People could purchase them easily from a traveling peddler.

TPO8 Lecture 4 Chemistry

Pro: So, are there any questions?

Stu: Yes, um, Professor Harrison, you were saying that the periodic table is predictive. What exactly does that mean? I mean I understand how it organizes the elements but where's the prediction?

Pro: Ok, let's look at our periodic table again. Ok, it groups elements into categories that share certain properties, right?

Stu: Uh-huh.

Pro: And it is arranged according to increasing atomic number, which is…

Stu: The number of protons in each atom of an element.

Pro: Right, well, early versions of the periodic table had gaps, missing elements. Every time you had one more proton, you had another element. And then, oops, there'd be an atomic number, for which there was no known element. And the prediction was that an element with that atomic number existed somewhere, but it just hadn't been found yet. And its location in the table would tell you what properties it should have. It was really pretty exciting for scientists at that time to find these missing elements and confirm their predictive properties.

Um, actually, that reminds of a ... of a very good example of all these, element 43. See on the table, the symbols for elements 42 and 44. Well, in early versions of the table, there was no symbol for an element 43 protons because no element with 43 protons had been discovered yet. So the periodic table had a gap between elements 42 and 44.

And then in 1925, a team of chemists led by a scientist named Ida Tacke claimed that they had found element 43. They had been using a relatively new technology called X-ray spectroscopy, and they were using this to examine an ore sample. And they claimed that they'd found an element with 43 protons. And they named it Masurium.

Stu: Um, Professor Harrison, then, how come in my periodic table here, element 43 is Tc, that's Technetium, right?

Pro: Ok, let me add that. Actually, um, that's the point I'm coming to. Hardly anyone believed that Tacke'd discovered a new element. X-ray spectroscopy was a new method at that time. And they were never able to isolate enough Masurium to have a weighable sample to convince everyone of the discovery. So they were discredited.

But then, 12 years later in 1937, a different team became the first to synthesize an element using a cyclotron. And that element had…

Stu: 43 protons?

Pro: That's right, but they named it Technetium to emphasize that it was artificially created with technology. And people thought that synthesizing this element, making it artificially was the only way to get it. We still hadn't found it occuring in nature.

Now element 43, whether you call it Masurium or Technetium, is radioactive. Why does that matter? What is true of a radioactive element?

Stu: It decays, it turns into other elements. Oh, so does that explain why it was missing in the periodic table?

Pro: Exactly, because of its radioactive decay, element 43 doesn't last very long. And therefore, if that ever had been present on Earth, it would have decayed ages ago. So the Masurium people were obviously wrong, and the Technetium people were right. Right? Well, that was then, now we know that element 43 does occur naturally. It can be naturally generated from Uranium atoms that have spontaneously split. And guess what, the ore sample the Masurium group was working with had plenty of Uranium in it enough to split into measurable amounts of Masurium. So Tacke's team might very well have found small amounts of Masurium in the ore sample. It's just that once was generated from split Uranium, it decayed very quickly.

And you know here's an incredible irony, Ida Tacke, the chemist led the Masurium team, well, she was the first to suggest that Uranium could break up into smaller pieces, but she didn't know that that was the defense of her own discovery of element 43.

Stu: So is my version of the periodic table wrong? Should element 43 really be called Masurium?

Pro: Maybe, but you know it's hard to tell for sure after all this time, if Ida Tacke's group did discover element 43. They didn't, um, publish enough detail on their methods or instruments for us to know for sure. But I'd like to think element 43 was discovered twice. As Masurium, it was the first element discovered that occurs in nature only from spontaneous fission, and as Technetium, it was the first element discovered in a laboratory. And of course, it was an element the periodic table let us to expect existed before anyone had found it or made it.

TPO 9

Conversation 1

Listen to a conversation between a student and her professor.

P: Before we get started, I...I just wanted to say I'm glad you chose food science for your major course of study.

S: Yeah, it seems like a great industry to get involved with. I mean with a four-year degree in food science, I'll always be able to find a job.

P: You're absolutely right. Before entering academia, I worked as a scientist for several food manufacturers and for the US Food and Drug Administration. I even worked on a commercial fishing boat in Alaska a couple of summers while I was an undergraduate. We'd bring in the day's catch to a floating processor boat where the fish got cleaned, packaged and frozen right at sea.

S: That's amazing! As a matter of fact, I'm sort of interested in food packaging.

P: Well, for that, you'll need a strong background in physics, math and chemistry.

S: Those are my best subjects. For a long time, I was leaning towards getting my degree in engineering.

P: Well, then you shouldn't have a problem. Uh, and fortunately, at this university, the department of food science offers a program in food packaging. Elsewhere, you might have to hammer courses together on your own.

S: I guess I luck out then. I am… so since my appointment today is to discuss my term paper topic, I wanted to ask, could I write about food packaging? I realize we're supposed to research food-born bacteria, but food packaging must play a role in all of that, right?

P: Absolutely! Maybe you should do some preliminary research on that.

S: I have! That's the problem. I'm overwhelmed.

P: Well, in your reading, did anything interest you in particular? I mean something you'd like to investigate.

S: well, I was surprised about the different types of packaging used for milk. You know, clear plastic bottles, opaque bottles, carton board containers...

P: True! In fact, the type of packaging has something to do with the way milk's treated against bacteria.

S: Yeah, and I read a study that showed how light can give milk a funny flavor and decrease its nutritional value. And yet most milk bottles are clear. What's up about that?

P: Well consumers like being able to visually examine the color of the milk. That might be one reason that opaque bottles haven't really caught on. But that study... I'm sure there is more studies on the subject. You shouldn't base your paper on only one study.

S: Maybe I should write about those opaque plastic bottles. Find out if there is any scientific reasons they aren't used more widely? Maybe opaque bottles aren't as good at keeping bacteria from growing in milk after the bottle has been opened for something… but where to begin researching this? I don't have a...

P: You know, there is a dairy not far from here in Chelsea. It was one of the first diaries to bottle milk in opaque plastic, but now they're using clear plastic again. And they're always very supportive of the university and our students, so if you wanted...

S: Yeah, I like that idea.

TPO 9 Lecture 1 Theater

Listen to part of a lecture in a theater class.

Pro: As we have seen, the second half of the 18th century was an exciting time in Europe: it was not only an age of great invention, but social changes also led to a rise in all sorts of entertainment, from reading to museums, to travel. And finding himself in the middle of this excitement was an accomplished French painter named Philippe Jacques de Loutherbourg.

Loutherbourg arrived in England in 1771, and immediately went to work as a set designer at the famous Drury Lane Theater in London. From his first shows, Loutherbourg showed a knack for imagination and stage design, all in the interest of creating illusions that allowed the audience to suspend disbelief completely. He accomplished this by giving the stage a greater feeling of depth, which he did by cutting up some of the rigid background scenery, and placing it at various angles and distances from the audience. Another realistic touch was using three-dimensional objects on the set, like rocks and bushes as opposed to two-dimensional painted scenery. He also paid much more attention to lighting and sound than had been done before.

Now, these sets were so elaborate that many people attended the theater more for them than for the actors or the story. At the time, people were wild for travel and for experiencing new places; but not everyone could afford it. Loutherbourg outdid himself, however, with a show that he set up in his own home. He called it the "Eidophusikon".

"Eidophusikon" means something like representation of nature, and that's exactly what he intended to do: create realistic moving scenes that change before the audiences' eyes. In this, he synthesized all his tricks from Drury Lane: mechanical motions, sound, light, other special effects to create, if you will, an early multimedia production.

The "Eidophusikon" was Loutherbourg's attempt to release painting from the constraints of the picture frame. After all, even the most action-filled exciting painting can represent only one moment in time; and any illusion of movement is gone after the first glance. But Loutherbourg, like other contemporary painters, wanted to add the dimension of time to his paintings. You know, the popular thinking is that Loutherbourg was influenced by landscape painting. But why can't we say that the "Eidophusikon" actually influenced the painters? At the very least we have to consider that it was more ... it was more of a mutual thing. We know, for example, that the important English landscape painter Thomas Gainsborough attended almost all of the early performances, and his later paintings are notable for their increased color and dynamic use of light.

Loutherbourg's influence on the theater though, he was incredibly influential: the way he brought together design and lighting and sound as a unified feature of the stage, can easily be seen in English theater's subsequent emphasis on lighting and motion.

Now, the "Eidophusikon" stage was actually a box: a few meters wide, a couple meters tall and a couple meters deep. That is, the action took place within this box. This was much smaller of course than the usual stage. But, it also allowed Loutherbourg to concentrate the lighting to better effect. Also, the audience was in the dark, which wouldn't be a common feature of the theater until a hundred years later. The show consisted of a series of scenes, for example, a view of London from sunrise that changes as the day moves on; mechanical figures, such as cattle, moved across the scene, and ships sailed along the river.

But what really got people was the attention to detail, much like his work at Drury Lane. So, for example, he painted very realistic ships, and varied their size depending on their distance from the audience. Small boats moved more quickly across the foreground than larger ones did that were closer to the horizon. Other effects, like waves, were also very convincing. They reflected sunlight or moonlight depending on the time of day or night. Even the colors changed as they would in nature. Sound and light were important in making his productions realistic. He used a great number of lamps, and he was able to change colors of light by using variously colored pieces of glass, to create effects like passing clouds that suddenly change in color. Furthermore, he used effects to make patterns of shadow and light, rather than using the uniform lighting that was common at the time. And many of the sound effects he pioneered are still in use today, like creating thunder by pulling on one of the corners of a thin copper sheet.

One of his most popular scenes was of a storm. And there is a story that on one occasion, an actual storm passed over head during the show. And some people went outside, and they claimed Loutherbourg's thunder was actually better than the real thunder.

TPO 9 Lecture 2 Environmental Science

Listen to a part of lecture in an environmental science class.

Lecturer: So since we're on the topic of global climate change and its effects, in Alaska, in the northern Arctic part of Alaska, over the last ... oh... thirty years or so, temperatures have increased about half a degree Celsius per decade, and scientists have noticed that there’s been a change in surface vegetation during this time. Shrubs are increasing in the "tundra".

Tundra is flat land with very little vegetation. Just a few species of plants grow there because the temperature is very cold, and there's not much precipitation. And because of the cold temperatures, the tundra has two layers: top layer, which is called the active layer, is frozen in the winter and spring, but thaws in the summer. Beneath this active layer is a second layer called "permafrost", which is frozen all year around, and is impermeable to water.

Female Student: So because of the permafrost, none of the plants that grow there can have deep roots, can they?

Lecturer: No, and that's one of the reasons that shrubs survive in the Arctic. Shrubs are little bushes. They're not tall and being low to the ground protects them from the cold and wind. And their roots don't grow very deep, so the permafrost doesn't interfere with their growth. OK?

Now since the temperatures have been increasing in Arctic Alaska, the growth of shrubs has increased. And this has presented climate scientists with a puzzle...

Male Student: I'm sorry, when you say the growth of shrubs has increased, do you mean that the shrubs are bigger, or that there are more shrubs?

Lecturer: Good question! And the answer is both. The size of the shrubs has increased and shrub cover has spread to what was previously shrub-free tundra. Ok, so what's the puzzle? Warmer temperatures should lead to increased vegetation growth, right? Well, the connection is not so simple. The temperature increase has occurred during the winter and spring, not during the summer. But the increase in shrubs has occurred in the summer. So how can increase temperatures in the winter and spring result in increased shrub growth in the summer?

Well, it may be biological processes that occur in the soil in the winter, that cause increased shrub growth in the summer, and here's how: there are "microbes", microscopic organisms that live in the soil. These microbes enable the soil to have more nitrogen, which plants need to live and they remain quite active during the winter. There're two reasons for this: first, they live in the active layer, which, remember, contains water that doesn't penetrate the permafrost. Second, most of the precipitation in the Arctic is in the form of snow. And the snow, which blankets the ground in the winter, actually has an insulating effect on the soil beneath it. And it allows the temperature of the soil to remain warm enough for microbes to remain active. So there's been increased nutrient production in the winter. And that's what's responsible for the growth of shrubs in the summer and their spread to new areas of the tundra. Areas with more new nutrients are the areas with the largest increase in shrubs.

Female student: But, what about run-off in the spring, when the snow finally melts? Won't the nutrients get washed away? Spring thaw always washes away soil, doesn't it?

Lecturer: Well, much of the soil is usually still frozen during peak run-off. And the nutrients are deep down in the active layer anyway, not high up near the surface, which is the part of the active layer most affected by run-off.

But as I was about to say, there's more to the story. The tundra is windy, and the snow is blown across the tundra, it's caught by shrubs. And deep snow drifts often form around shrubs. And we've already mentioned the insulating effect of snow. So that extra warmth means even more microbial activity, which means even more food for the shrubs, which means even more shrubs and more snow around etc.. It's a circle, a loop. And because of this loop, which is promoted by warmer temperatures in winter and spring, well, it looks like the tundra may be turning into shrub land.

Female student: But will it be long-term? I mean maybe the shrubs will be abundant for a few years, and then it'll change back to tundra.

Lecturer: Well, shrub expansion has occurred in other environments, like semiarid grassland, and tall grass prairies. And shrub expansion in these environments does seem to persist, almost to the point of causing a shift. Once is established, shrub land thrives, particularly in the Arctic, because Arctic shrubs are good at taking advantage of increased nutrients in the soil, better than other Arctic plants.

TPO 9 Conversation 2

Listen to a conversation between a student and a librarian employee.

S: Excuse me. Can you help me with something?

L: I'll do my best. What do you need?

S: Well, I received a letter in my mailbox saying that I'm supposed to return a book that I checked out back in January, it's call "Modern Social Problems". But because I'm writing my senior thesis, I'm supposed to be able to keep the book all semester.

L: So you signed up for extended borrowing privileges?

S: Yeah.

L: But we are still asking you to bring the book back?

S: Uh-huh.

L: Well, let me take a look and see what the computer says. The title was
"Modern Social Problems"?

S: Yeah.

L: OK. Um... Oh, I see, it's been recalled. You can keep it all semester as long as no one else requests it. But, someone else has. It looks like one of the professors in the sociology department has requested it. So you have to bring it back, even though you've got extended borrowing privileges. You can check out the book again when it's returned in a couple of weeks.

S: But I really need this book right now.

L: Do you need all of it or is there a certain section or chapter you're working with?

S: I guess there is one particular chapter I've been using lately for a section of my thesis. Why?

L: Well, you can photocopy up to one chapter of the book. Why don't you do that for the chapter you're working on right now? And by the time you need the rest of the book, maybe it will have been returned. We can even do the photocopying for you because of the circumstances.

S: Oh, well, that would be great.

L: I see you've got some books there. Is that the one you were asked to return?

S: No, I left it in my dorm room. These are books I need to check out today. Is it Ok if I bring that one by in a couple of days?

L: Actually, you need to return it today. That is if you want to check out those books today. That's our policy.

S: Oh, I didn't know that.

L: Yeah, not a lot of people realize that. In fact, every semester we get a few students who have their borrowing privileges suspended completely because they haven't returned books. They're allowed to use books only in the library. They're not allowed to check anything out because of unreturned books.

S: That's not good. I guess I should head back down to the dorm right now then.

L: But, before you go, what you should do is fill out a form requesting the book back in two weeks. You don't want to waste any time getting it back.

S: Thanks a lot. Now I don't feel quite so bad about having to return the book.

TPO 9 Lecture 3 Geology

Lecturer: So, continuing our discussion of desert lakes, now I want to focus on what's known as the "Empty Quarter". The "Empty Quarter" is a huge area of sand that covers about a quarter of the Arabian Peninsula. Today it's pretty desolate, barren and extremely hot. But there've been times in the past when monsoon rains soaked the Empty Quarter and turned it from a desert into grassland that was dotted with lakes and home to various animals. There were actually two periods of rain and lake formation: the first one began about 37,000 years ago; and the second one dates from about 10,000 years ago.

Female Student: Excuse me, Professor. But I'm confused. Why would lakes form in the desert? It's just sand, after all.

Lecturer: Good question! We know from modern day desert lakes, like Lake Eyre in South Australia, that under the right conditions, lakes do form in the desert. But the Empty Quarter lakes disappeared thousands of years ago. They left behind their beds or basins as limestone formations that we can still see today. They look like low-lying, white or grey buttes, long, narrow hills with flat tops, barely a meter high.

A recent study of some of the formations presents some new theories about the area's past. Keep in mind though that this study only looked at 19 formations. And about a thousand have been documented. So there's a lot more work to be done.

According to the study, two factors were important for lake formation in the Empty Quarter: first the rains that fell there were torrential. So it would've been impossible for all the water to soak into the ground. Second, as you know, sand dunes contain other types of particles, besides sand, including clay and silt. Now, when the rain fell, water ran down the sides of the dunes, carrying clay and silt particles with it. And wherever these particles settled, they formed a pan, a layer that water couldn't penetrate. Once this pan formed, further run-off collected, and formed a lake.

Now, the older lakes, about half the formations, the ones that started forming 37000 years ago, the limestone formations we see, they're up to a kilometer long, but only a few meters wide, and they're scattered along the desert floor, in valleys between the dunes. So, the theory is, the lakes formed there on the desert floor, in these long narrow valleys. And we know, because of what we know about similar ancient desert lakes, we know that the lakes didn't last very long, from a few months to a few years on average. As for the more recent lakes, the ones from 10000 years ago, well, they seemed to have been smaller, and so may have dried up more quickly.

Another difference, very important today for distinguishing between older lake beds and newer ones, is the location of the limestone formations. The more recent beds are high up in the dunes.

Why these differences? Well, there are some ideas about that, and they have to do with the shapes of the sand dunes, when the lakes were formed. 37000 years ago, the dunes were probably nicely rounded at the top, so the water just ran right down their sides to the desert floor. But there were thousands of years of wind between the two rainy periods, reshaping the dunes. So, during the second rainy period, the dunes were kind of chopped up at the top, full of hollows and ridges, and these hollows would've captured the rain right there on the top.

Now, in a grassland of Lake Ecosystem, we'd expect to find fossils from a variety of animals, and numerous fossils have been found at least at these particular sites. But, where did these animals come from? Well, the theory that has been suggested is that they migrated in from nearby habitats where they were already living. Then as the lakes dried up, they died out.

The study makes a couple of interesting points about the fossils, which I hope will be looked at in future studies. At older lake sites, there’s fossil remains from hippopotamuses, water buffalo, animals that spend much of their lives standing in water, and also, fossils of cattle. However, at the sites of the more recent lakes, there’ s only cattle fossils, additional evidence for geologists that these lakes were probably smaller, shallower, because cattle only use water for drinking. So they survive on much less. Interestingly, there are clams and snail shells; but, no fossils of fish. We're not sure why. Maybe there was a problem with the water. Maybe it was too salty. That's certainly true of other desert lakes.

TPO 9 Lecture 4 Linguistic

Listen to part of a lecture in a linguistics class. The professor has been discussing Animal communication systems.

L: OK, so last time, we covered the dances honey bees do to indicate where food can be found and the calls and songs of different types of birds. Today, I'd like to look at some communication systems found in mammals, particularly in primates, such as orangutans, chimpanzees, gorillas... Yes, Thomas?

T: Excuse me, Professor. But when you talk about gorilla language, do you mean like, those experiments where humans taught them sign language or a language like...

L: OK, wait just a minute. Now, who in this class heard me use the word "language"? No one I hope. What we're talking about here, are systems of communication, all right?

T: Oh, sorry, communication, right. But could you maybe, like, clarify what the difference is?

L: Of course, that's a fair question. OK, well, to start with, let's make it clear that language is a type of communication, not the other way around. OK, so all communication systems, language included, have certain features in common.

For example, the signals used to communicate from the bee's dance movements, to the word and sentences found in human languages. All these signals convey meaning. And all communication systems serve a purpose, a pragmatic function of some sort. Warning of danger perhaps or offering other needed information.

But there're several features peculiar to human language that have, for the most part, never been found in the communication system of any other species.

For one thing, learn ability. Animals have instinctive communication systems. When a dog, a puppy gets to certain age, it's able to bark. It barks without having to learn how from other dogs, it just barks. But much of human language has to be learned from other humans.

What else makes human language unique? What makes it different from animal communication? Deborah?

D: How about grammar? Like having verbs, nouns, adjectives?

L: OK, that's another feature. And it's a good example...

D: I mean I mention this ‘cause like in my biology class last year, I kind of remember talking about a study on prairie dogs, where, I think the researchers claimed that the warning cries of prairie dogs constitute language, because they have these different parts of speech. You know, like nouns, to name the type of predator they spotted, adjectives to describe its size and shape, verbs..., but now it seems like...

L: All right, hold on a moment. I'm familiar with the study you're talking about. And for those of you who don't know, prairie dogs are not actually dogs. They're a type of rodent who, who burrow in the ground in the grasslands of the western United States and Mexico.

In this study, the researchers looked at the high-pitched barks a prairie dog makes when it spots predator. And from this they made some pretty.., well, they made some claims about these calls qualifying as an actual language, with its own primitive grammar. But actually, these warning calls are no different from those found among certain types of monkeys. And, well, let's not even get into the question of whether concepts like noun and verb can be meaningfully applied to animal communication.

Another thing that distinguishes a real language is a property we call "discreteness". In other words, messages are built up out of smaller parts, sentences out of words, words out of individual sounds, etc. Now maybe you could say that the prairie dog's message is built from smaller parts, like say for example, our prairie dog spots a predator, a big coyote approaching rapidly. So the prairie dog makes a call that means "coyote", then one that means "large", and then another one to indicate its speed. But do you really suppose it makes any difference what order these calls come in? No.

But the discrete units that make up language can be put together in different ways. Those smaller parts can be used to form an infinite number of messages, including messages that are completely novel, that have never been expressed before.

For example, we can differentiate between: "A large coyote moves fast." and say "Move the large coyote fast." or "Move fast, large coyote.", and I truly doubt whether anyone has ever uttered either of these sentences before.

Human language is productive, an open-ended communication system, whereas no other communication system has this property.

And another feature of language that's not displayed by any form of animal communication is what we call "displacement". That is, language is abstract enough that we can talk about things that aren't present here and now. Things like "My friend Joe is not in the room." or "It will probably rain next Thursday." Prairie dogs may be able to tell you about a hawk that’s circling overhead right now, but they never show any inclination to describe the one they saw last week.

TPO 10

Conversation 1

Narrator

Listen to a conversation between a student and her Photography Professor.

Student

Professor Johnson, there is something that’s been on my mind.

Professor

OK?

Student

Remember last week, you told us that it's really important to get our photography into a show, basically as soon as we can?

Professor

Yup, it's a big step, no question.

Student

Thing is, I am sitting here and I am just not sure how I’d get there. I mean I’ve got some work I like, but is it really what a gallery is looking for? How would I know, how do I make the right contacts to get it into a show, I just really don't...

Professor

OK, hold on, slow down. Um…these are questions that, well, just about every young artist has to struggle with. OK, the first thing you should do is you absolutely have to stay true to your artistic vision; take the pictures you want to take.

Don't start trying to catch the flavor the month and be trendy because you think you’ll get into a show--- that never works, because you wind up creating something you don’t really believe in. It’s uninspired, and won’t make any shows. I’ve seen it happen so many times. This doesn't mean that you should go into a cave. Keep up with trends, even think about how your work might fit in with them, but don't mindlessly follow them.

Student

Well, yeah, I can see that. I think though I have always been able to stay pretty true to what I want to create, not what others want me to create. I think that comes through in my work.

Professor

OK, just remember that is one thing to create work that you really want to create when it’s in the classroom. The only thing at stake is your grade. But work created outside the classroom? That can be in different story. I'm not talking about technique or things like that. It's just that there is so much more at stake when you are out there making art for a living. There's a lot of pressure to become something you are not, and people often surrender to that pressure.

Student

But to get stuff exhibited…

Professor

Well, you need to be a bit of an opportunist. You know, common sense things like always having a sample of your work on hand to give to people. You won't believe the kind of contacts and opportunities you can get in this way. And try to get your work seen in the places like restaurants, bookstores, you'd be surprised how word gets around about photography in places like that.

Student

OK it's just so hard to think about all of those practical things and make good work, you know.

TPO 10 Lecture 1 Marine Biology

Narrator

Listen to part of a lecture in a Marine Biology Class

Professor

We know whales are mammals and that they evolved from land creatures. So the mystery is figuring out how they became ocean dwellers. Because until recently there was no fossil record of what we call "the missing link"- that is evidence of species that show the transition between land-dwelling mammals and today's whales. Fortunately, some recent fossil discoveries have made the picture a little bit clearer.

For example, a few years back in Pakistan, they found the skull of a wolf-like creature. It was about 50 million years old. Scientists had seen this wolf-like creature before, but this skull was different. The ear area of the skull had characteristics seen only in aquatic mammals, specifically whales.

Uh, well, then also in Pakistan they found a fossil of another creature, which we call Ambulocetus Natans. That's a mouthful, eh? The name Ambulocetus natans comes from Latin of course, and means "walking whale that swims". It clearly had four limbs that could have been used for walking. It also had a long thin tail, typical of mammals, something we don't see in today's whales. But, it also had a long skeletal structure. And that long skeletal structure suggests that it was aquatic.

And very recently in Egypt, they found a skeleton of Basilosaurus. Basilosaurus was a creature that we've already known about for over a hundred years. And it has been linked to modern whales because of its long whale-like body. But this new fossil find showed a full set of leg bones, something we didn't have before. The legs were too small to be useful. They weren't even connected to its pelvis and couldn't have supported its weight. But it clearly shows Basilosaurus's evolution from land creatures. So that's a giant step in the right direction. Even better, it establishes Ambulocetus natans as a clear link between the wolf-like creature and Basilosaurus.

Now these discoveries don't completely solve the mystery. I mean, Ambulocetus is a mammal that shows a sort of bridge between walking on land and swimming. But it also is very different from the whales who know today. So really we are working just a few pieces of a big puzzle.

Um…a related debate involved some recent DNA studies. Remember, DNA is the genetic code for any organism. And when the DNA from two different species is similar, it suggests that those two species are related. And when we compared some whale DNA with DNA from some other species, we got quite a surprise. The DNA suggests that whales are descendants of the hippopotamus. Yes, the hippopotamus! Well, it came as a bit of a shock. I mean, that a four-legged land and river dweller could be the evolutionary source of a completely aquatic creature up to 25 times its size? Unfortunately this revelation about the hippopotamus apparently contradicts the fossil record, which suggests that the hippopotamus is only a very distant relative of the whale, not an ancestor. And of course as I mentioned, that whales are descended not from hippos but from that distant wolf-like creatures.

So we have contradictory evidence. And more research might just raise more questions and create more controversies. At any rate, we have a choice. We can believe the molecular data, the DNA, or we can believe the skeleton trail, but unfortunately, not both.

Um… and there have been some other interesting findings from DNA research. For a long time, we assumed that all whales that had teeth including sperm whales and killer whales were closely related to one another. And the same for the toothless whales, like the blue whale and other baleen whales, we assumed that they be closely related. But recent DNA studies suggest that that's not the case at all. The sperm whale is actually closely related to the baleen whale, and it's only distantly related to the toothed-whales. So that was a real surprise to all of us.

TPO10 Lecture 2 European History

Narrator:
Listen to part of a lecture in a European History Class.

Professor
So would it surprise you to learn that many of the foods that we today consider traditional European dishes that their key ingredients were not even known in Europe until quite recently, until the European started trading with the native peoples of North and South America? I mean, you are probably aware that the Americas provide Europe and Asia with foods like squash, beans, turkey, peanuts. But what about all those Italian tomato sauces, hungarian goulash or my favorite, French fries? Those yummy fried potatoes.

Student
Wait. I mean I knew potatoes were from where, South America?

Professor
South America. Right, the Andes Mountains.

Student
But you are saying tomatoes too? I just assume since they're used in so many Italian dishes.

Professor
No, like potatoes, Tomatoes grew wild in the Andes. Although unlike potatoes, they weren't originally cultivated there. That seems to have occurred first in Central America. And even then the tomato doesn't appear to have been very important as a food plant until the Europeans came on the scene. They took it back to Europe with them around 1550. And Italy was indeed the first place where it was widely grown as a food crop. So in a sense, it really is more Italian than American.

And another thing and this is true of both potato and tomato. Both of these plants are members of the Nightshade family. The Nightshade family is a category of plants which also includes many that you wouldn't want to eat, like mandrake, belladonna, and even tobacco. So it's no wonder that people once considered potatoes and tomatoes to be inedible too, even poisonous. And in fact, the leaves of the potato plant are quite toxic. So it took both plants quite a while to catch on in Europe. And even longer before they made the return trip to North America and became popular food items here.

Student

Yeah, you know, I remember, I remember my grandmother telling me that when her mother was a little girl, a lot of people still thought that tomatoes are poisonous.

Professor

Oh, sure. People didn't really start eating them here until the mid-eighteen hundreds.

Student

But seems like I heard... didn't Thomas Jefferson grow them or something?

Professor

Well, that's true. But then Jefferson is known not only as the third president of the United States but also as a scholar who was way ahead of his time in many ways. He didn't let the conventional thinking of his day restrain his ideas.

Now, potatoes went through a similar sort of ...uh... of a rejection process, especially when they were first introduced in Europe. You know how potatoes can turn green if they are left in the light too long? And that greenish skin can make the potatoes tastes bitter; even make you ill. So that was enough to put people off for over 200 years. Yes, Bill?

Student

I'm sorry professor Jones. But I mean yeah ok. American crops have probably contributed a lot to European cooking over the years. But…

Professor

But have they really played any kind of important role in European history? Well, as a matter of fact, yes. I was just coming to that.

Let's start with North American corn or maize, as it's often called. Now before the Europeans made contact with the Americas,

they subsisted mainly on grains, grains that often suffered from crop failures. And largely for this reason that political power in Europe was centered for centuries in the South, around the Mediterranean Sea, which was where they could grow these grains with more reliability.

But

when corn came to Europe from Mexico, well, now they had a much hardier crop that could be grown easily in more northerly climates and the centers of power began to shift accordingly. And then, well, as I said potatoes weren't really popular at first. But when they finally did catch on which they did first in Ireland around 1780. Well, why do you suppose it happen? Because potatoes have the ability to provide an abundant and extremely nutritious food crop, no other crop grew in North Europe at the time had anything like the number of vitamins contained in potatoes. Plus, potatoes grown on the single acre of land could feed many more people than say, wheat grown on the same land. Potatoes soon spread to France and other Northern European countries. And as a result, the nutrition of the general population improved tremendously and population soared in the early 1800s and so the shift of power from southern to northern Europe continued.

TPO10 Conversation 2

Narrator
Listen to a conversation between a student and an employee in the University bookstore.

Student
Hi, I bought this book at the beginning of the semester, but, some thing’s come up and… I’d like to return it.

Employee
Well, for a full refund: store policy is that you have to return merchandise 2 weeks from the time it was purchased. Uh... but for assigned textbooks or anything having to do with specific courses. Wait... was it for a specific course?

Student
Yeah, but actually…

Employee
Well... for course books, the deadline is 4 weeks after the beginning of the semester. So this for this fall semester, the deadline was October. 1st.

Student
Ouch, then I missed it. But, why October.1st?

Employee
Well, I guess the reasoning is the by October. 1st, the semester is in full gear. And everyone kind of knows what courses they’ll be taking that semester

Student
I get it, so it’s mainly for people who decide to withdraw from… to change to new courses early on.

Employee
Exactly!!! The book has to been in perfect condition of course. They can’t be marked up or looked use in any way for the full refund, I mean.

Student
Well, but, see, my situation is a little different. I hope you might be able to make an
exception.

Employee
Well, the policies are generally pretty rigid and the semester is almost over.

Student
Okay. Here’s what happened. Um~ I think my professor really miscalculated. Anyway the syllabus was way too ambitious in my opinion. There’re only 2 weeks of classes left in the semester and there are like 6 books on the syllabus that we haven’t even touched.

Employee
I see. So you were hoping to return this one.

Student

Yeah, the professor already announced that we won't be reading this one by Jane Bowles and all the others I bought used

Employee

Jane Bowles? Which book of hers?

Student

It called "Two serious ladies"

Employee

Oh, but you should keep that one. Are you interested in literature?

Student

Well. I am an English major.

Employee

You are lucky to have a professor who includes a lesser-known writer like her on the syllabus, you know, not the usual authors we've all read.

Student

So you really think..

Employee

I do. And especially if you're into literature

Student

Hmm... well, this I wasn't expecting. I mean…uh.. Wow!

Employee

I hope you don't think I am being pushy. If you prefer, you can return the book and arrange for a store credit, you don't qualify for a refund. Policy is policy after all, but you can make an exchange and you can use the credit for your books for next semester. The credit carries over for one semester to the next.

Student

Hmm…that's good to know, but now I am really intrigued. I guess that just because we ran out of time to read this book in class, doesn't mean that I can' t read it on my own time. You know, I think I'll give it a try.

TPO10 Lecture 3 Ecology

Narrator

Listen to part of a lecture in an Ecology Class.

Professor

So we've been talking about nutrients, the elements in the environment that are essential for living organisms to develop, live a healthy life and reproduce. Some nutrients are quite scarce; there just isn't much of them in the environment.

But fortunately they get recycled. When nutrients are used over and over in the environment, we call that a nutrient cycle. Because of the importance of nutrients and their scarcity, nutrient recycling is one of the most significant eco-system processes that we'll cover in this course. The three most important nutrient recycles are the nitrogen cycle, the carbon cycle and the one we are going to talk about today, the Phosphorus cycle.

So the Phosphorus cycle has been studied a lot by ecologists because like I said, Phosphorus is an important nutrient and it's not so abundant. The largest quantities are found in rocks and at the bottom of the ocean.

How does Phosphorus get there? Well, let's start with the Phosphorus in rocks. The rocks get broken down into smaller and smaller particles as they are weathered. They are weathered slowly by rain and wind over long periods of time. Phosphorus is slowly released as the rocks are broken down and it gets spread around into the soil. Once it's in the soil, plants absorb it through their roots.

Student

So that's the reason people mine rocks that contain a lot of Phosphorus to help with agriculture?

Professor

Uh-huh, they mined the rock, artificially break it down and put the Phosphorus into agricultural fertilizers. So humans can play a role in the first part of the Phosphorus cycle -- the breaking down of rocks and the spreading of Phosphorus into the soil by speeding up the rate at which this natural process occurs. You see.

Now after the Phosphorus is in the soil, plants grow. They use Phosphorus from the soil to grow. And when they die, they decompose. And the Phosphorus is recycled back into the soil; same thing with the animals that eat those plants, or eat other animals that have eaten those plants. We call all of this – the land phase of the Phosphorus cycle. But a lot of the Phosphorus in soil gets washed away into rivers by rain and melting snow. And so begins another phase of the cycle. Can anyone guess what it is called? Nancy?

Nancy

Well, if the one is called the land phase, then this has to be called the water phase, right?

Professor

Yes, that's such a difficult point isn't it? In a normal water phase, rivers eventually empty into oceans, and once in the oceans, the Phosphorus gets absorbed by water plants like algae. Then fish eats the algae or eat other fish that have eaten those plants.

But the water phase is sometime affected by excessive fertilizers. If not all of Phosphorus gets used by the crops and large amounts of Phosphorus gets into the rivers. This could cause rapid growth of water plants in the river, which can lead to the water ways getting clogged with organisms, which can change the flow of the water. Several current studies are looking at these effects and I really do hope we can find a way to deal with this issue before these ecosystems are adversely affected. Ok?

Of course, another way that humans can interrupt the normal process is fishing. The fishing industry helps bring Phosphorus back to land. In the normal water phase the remaining Phosphorus makes its way, settles to the bottom of the ocean and gets mixed into ocean sediments. But remember, this is a cycle. The Phosphorus at the bottom of the ocean has to somehow make its way back to the surface, to complete the cycle, to begin the cycle all over again.

After millions of years, powerful geological forces, like underwater volcanoes lift up the ocean sediments to form new land. When an underwater volcano pushes submerged rock to the surface, a new island is created. Then over many more years the Phosphorus-rich rocks of the new land begin to erode and the cycle continues.

Guy

What about, well, you said that the nitrogen cycle is also an important nutrient cycle. And there is a lot of nitrogen in the atmosphere, so I was wondering, is there a lot of Phosphorus in the atmosphere too?

Professor

Good question, George. You're right to guess that Phosphorus can end up in Earth's atmosphere. It can move from the land or from the oceans to the atmosphere, and vice versa. However, there's just not a substantial amount of it there, like there is with nitrogen, it's a very minimal quantity.

TPO10 Lecture 4 Psychology

Narrator

Listen to part of a lecture in a Psychology Class.

Professor

OK. If I ask about the earliest thing you can remember, I'll bet for most of you, your earliest memory would be from about age 3, right? Well, that's true for most adults. We can't remember anything that happened before the age of 3. And this phenomenon is so widespread and well-documented it has a name. It is called childhood amnesia and was first documented in 1893.

As I said, this phenomenon refers to adults not being able to remember childhood incidents. It's not children trying to remember events from last month or last year. Of course it follows that if you can't remember an incident as a child, you probably won't remember it as an adult. OK?

So …so... so why is this? What are the reasons for childhood amnesia?

Well, once a popular explanation was that childhood memories are repressed ... uh, the memories are disturbing so that as adults we keep them buried, and so we can't recall them. And this is based on…well, well, it's not based on, on, on… the kind of solid research and lab testing we want to talk about today. So let's put that explanation aside and concentrate on just two. OK?

It...it could be that as children we do form memories of things prior to age 3, but forget them as we get grow older, that's one explanation. Another possibility is that children younger than three lack...uh...lack some cognitive capacity for memory. And that idea, that children are unable to form memories, that's been the dominant belief in psychology for the past hundred years.

And this idea is very much tied to two things, the theories of Jean Piaget and also to language development in children.

So Piaget's theory of cognitive development. Piaget suggested that because they don't have language, children younger than 18 to 24 months live in the here and now, that is they lack the mean to symbolically represent objects and events, that are not physically present. Everybody get that? Piaget proposed that young children don't have a way to represent things that aren't right in front of them. That's what language does, right? Words represent things, ideas.

Once language starts to develop from about age 2, they do have a system for symbolic representation and can talk about things which aren't in their immediate environment including the past. Of course he didn't claim that infants don't have any sort of memory, it's acknowledged that they can recognize some stimuli, like faces. And for many years this model was very much in favor in psychology, even though memory tests were never performed on young children.

Well, finally in the 1980s, a study was done. And this study showed that very young children under the age of 2 do have the capacity for recall. Now, if the children can' t talk, how was recall tested? Well, that is a good question, since the capacity for recall has always been linked with the ability to talk.

So the researchers set up an experiment using imitation-based tasks. Adults used props, uh, toys or other objects to demonstrate an action that had 2 steps. The children were asked to imitate the steps immediately and then again after delays of one or more month. And even after a delay, the children could…could recall or replicate the action, the objects used, the steps involved and the order of the steps. Even children as young as 9 months!

Now, tests showed that there was a faster rate of forgetting among the youngest children, but most importantly it showed that the development of recall did not depend on language development. And that was an importance finding!

I guess I should add that the findings don't say that there was no connection...no connection between the development of language and memory. There's some of evidence that being able to talk about an event does lead to having a stronger memory of that event. But that does not seem to be the real issue here.

So, back to our question about the cause of childhood amnesia, well, there is something called the rate of forgetting. And childhood amnesia may reflect a high rate of forgetting, in other words, children under the age of 3 do form memories and do so without language. But they forget the memories at a fast rate, probably faster than adults do. Researchers have set a standard….sort of an expected rate of forgetting, but that expected rate was set based on the tests done on adults. So what is the rate of forgetting for children under the age of 3? We expect it to be high, but the tests to prove this really haven't been done yet.

TPO 11

Conversation 1

Narrator
Listen to a conversation between a student and a university employee.

Student
Hi, I need to pick up a gym pass.

Employee
OK. I'll need your name, year, and university ID.

Student
Here's my ID card. And my name is Gina Kent, and I'm first year.

Employee
OK. Gina. I'll type up a pass for you right away.

Student
Great! This is exciting. I can't wait to get started.

Employee

Oh, this is a wonderful gym.

Student
That’s what everybody has been saying. Everyone is talking about the new pool and the new indoor courts. But what I love is all the classes.

Employee
The classes…?

Student
Yes, like the swimming and tennis classes and everything.

Employee
Oh yeah, but this pass doesn’t entitle you to those.

Student
It doesn’t?

Employee
No, the classes fall into a separate category.

Student
But, that’s my whole reason for getting a pass. I mean, I was planning to take a swimming class.

Employee
But that’s not how it works. This pass gives you access to the gym and to all the equipment, and to the pool and so forth. But not when the teams are practicing, so you’ll have to check the schedule.

Student
But what do I have to do if I want to take a class?

Employee
You have to: one, register; and two, pay the fee for the class.

Student
But that’s not fair.

Employee
Well, I think if you think about it. You’ll see that it’s fair.

Student
But people who play sports in the gym… they don’t have to pay anything.

Employee
Yes, but they just come in, and play or swim on their own. But, taking a class---that is a different story, I mean, someone has to pay the instructors.

Student

So, if I want to enroll in a class....

Employee

Then you have to pay extra. The fee isn't very high, but there's a fee. So, what class did you say you want to take?

Student

Swimming…

Employee

OK. Swimming classes are thirty dollars a semester.

Student

I guess I could swing that. But I'm still not convinced it's fair. So, do I pay you?

Employee

Well, first, you need to talk to the instructor. They have to assess your level and steer you to the right class, you know, beginner, intermediate…

Student

You mean, I have to swim for them? Show them what I can do?

Employee

No, no, you just tell them a little bit about your experience and skill, so they know what level you should be in.

Student

Oh, OK. So, I guess I'll need an appointment.

Employee

And I can make that for you right now. And then I'll type up your gym ID card. You'll need it to get into the building. Now about that appointment… how does Wednesday at three sound?

Student

Fine…

Employee

OK. And you'll be meeting with Mark Gettys. He's the swimming instructor. He also coaches the swim team. And here, I've jotted it all down for you.

Student

Great! Thanks.

TPO11 Lecture 1 Biology

Narrator

Listen to part of a lecture in a Biology Class. The class has been learning about birds.

Professor

Ok, today we are going to continue our discussion of the parenting behaviors of birds. And we are going to start by talking about what are known as distraction displays.

Now if you are a bird and there is a predator around.

What are you going to do? Well, for one thing you are going to try to attract as little attention as possible, right? Because if the predator doesn't know you are there, it is not going to try to eat you. But sometimes certain species of birds do the exact opposite. When a predator approaches, they do their best to attract the attention of that predator.

Now why would they do that? Well, they

do that to draw the predator away from their nest, away from their eggs or their young birds. And the behaviors that the birds engage in to distract predators are called distraction displays. And there are a number of different kinds of distraction displays.

Most of the time, when birds are engaging in distraction displays, they are going to be pretending either that they have an injury or that they're ill or that they're exhausted. You know something that'll make the predator think: Ah… here is an easy meal.

One pretty common

distraction display is what's called the broken-wing display. And in a broken-wing display, the bird spreads and drags a wings or its tail, and while it does that, it slowly moves away from the nests. So it really looks like a bird with a broken wing. And these broken-wing displays can be pretty convincing.

Another version of this kind of distraction display is where the bird creates the impression of a mouse or some other small animals that's running along the ground. A good example of that kind of display is created by a bird called the purple sandpiper.

Now what's the purple sandpiper does is when a predator approaches, it drags its wings but not to give the impression that its wing is broken but to create the illusion that it has a second pair of legs. And then it raises its feathers, so it looks like it's got a coat of fur. And then it runs along the ground swerving left and right, you know like it's running around little rocks and sticks. And as it goes along, it makes this little squealing noise. So from a distance it really looks and sounds like a little animal running along the ground trying to get away. Again to the predator, it looks like an easy meal.

Now what's interesting is that birds have different levels of performance of these distraction displays. They don't give their top performance, their prime time performance every time. What they do is they save their best performances, their most conspicuous and most risky displays for the time just before the baby birds become able to take care of themselves. And they time it that way because that's when they'll have made the greatest investment in parenting their young. So they are not going to put on their best performance just after they laid their eggs, because they haven't invested that much time or energy in parenting yet. The top performances are going to come later.

Now you have some birds that are quiet mature, are quite capable almost as soon as they hatch. In that case, the parent will put on the most conspicuous distraction displays just before the babies hatch, because once the babies are hatched, they can pretty much take care of themselves. And then you have others birds that are helpless when they hatch. In that case, the parent will save its best performances until just before the babies get their feathers.

TPO11 Lecture 2 Architecture

Narrator

Listen to part of a lecture in an Architecture Class.

Professor

Today, we are taking a little detour from the grand styles of public architecture we've been studying to look at residential architectures in the United States. Since this is something we can all identify with, I think it will help us see the relationship between the function of a structure and its style or form. This has been an ongoing theme in our discussions, and we will be getting back to it in just a moment. But before we get started, I want you to take a moment to think: does anyone know what the single most popular style for a house in the United States is today? Bob?

Student 1

"I bet it is the ranch-style house."

Professor

"Well, in this area, probably. But are we typical? Yes, Sue."

Student 2

"How about the kind of house my grandparents live in? They call it a Cape Cod.

Professor

That's the one. Here is a drawing of what we consider of a classic Cape Cod house. These days, you see this style all over the United States. But it first showed up in U.S. northeast, in the New England region, around the late 1600s. For those of you who don't know the northeast coastal region, Cape Cod is a peninsula, a narrow strip of land that jets out into the Atlantic, and so ... so, many houses in this particular style were built on Cape Cod, that the name of the place became the name of the style.

Now why did the Cape Cod style house become so popular in the northeast? Well, one reason is that it's a great example of form following function. We've talked about this design principle a lot about form following function. And what did we say it meant? Someone give me an application of this principle. What is this concept that form should follow function? How would it be applied to housing design?

Student 2

Well, if it means that the design of a building should be based on the needs of the people who use it. Then, well, the architect has to be very practical to think about the people who'll actually be living in the house or working in the office building, whatever, so for the architect, it's all about the users not about showing off how creative you can be.

Professor

Good, of course, for a Cape Cod house, it might be even more accurate to say that form also follows climate. Who knows what the climate's like on Cape Cod?

Student 1

Cold in the winter…

Student 2

And whenever I visit my grandparents, it's really wet. It's usually either raining or snowing or foggy and windy, too. I guess because it's so exposed to the ocean?

Professor

That's right. So take another look at this drawing, and you can imagine how this design might be particularly helpful in that kind of climate. Notice how the house sits fairly low to the ground. This relatively low compact structure helps the house withstand the strong winds blowing off the ocean.

And look at the

slope of the roof, the steep angle helps keep off all that rain and snow that accumulates in the winter.

Another thing, Cape Cod houses usually face south to take advantage of the sun's warm through the windows. That's helpful in winter.

Now what can you tell me about the chimney, about its location?

Student 2

Well, it's in the middle. Because, does that have something to do with heating the houses? I mean since the heat never has to travel very far.

Student 1

That'd mean you can heat the house more efficiently, right?

Professor

Exactly, now see how the house has very little exterior decoration, that's also typical of early Cape Cod houses. The wind was one reason, nothing sticking out that might blow away in the harsh weather, but there was probably another reason, not related to the climate, more a reflection of rural New England society back then, you see Cape Cod houses were not built in the big cities, where all the rich people lived back then. These were modest dwellings, the people who built them simply couldn't afford lots of expensive decorative details. But it was more than just a matter of money. In these rural areas, people depended on each other for survival. Neighbors had to help and support each other in a difficult environment, so you didn't want to appear to be showing off. You'd want to avoid anything that might set you apart from your neighbors, the same people you might need to help you someday. So all these help to create an attitude of conformity in the community, and you can see why a modest, a very plain style would have become so widely imitated throughout rural New England.

Student 2

It is plain, but you know its nice looking.

Professor

Good point, and in fact it's precisely that aesthetic appeal, the…the purity, the nearly perfect proportions of the house…that's another reason for the Cape Cod's enduring popularity, even in places where the climate is so mild that its functional design doesn't matter.

TPO 11 Conversation2

Narrator

Listen to a conversation between a student and a Professor.

Student
Hi professor Atkins, you wanted to see me?

Professor
Hi Bill thanks for coming. I wanted to talk to you about …..

Student
Is there ... is there something wrong with my research paper?

Professor
No, not at all, in fact it's very good. That's why I wanted to talk to you.

Student
Oh, thanks

Professor
I think you know the department is looking to hire a new professor, are you familiar with our hiring process?

Student
No, but what is that got to do with me?

Professor
Well, Bill, we have several qualified applicants we are serious about. And as part of the interview process, we have them meet with a committee of professors and students in our department. They also have to give a talk.

Student
You mean like a lecture?

Professor
Yes, like a sample lecture on one of their academic interests

Student
Oh, so you can see their teaching style.

Professor
Exactly

Student
Uh-huh.…Make sense.

Professor
So I'd like to know if you'd be willing to join us as a student representatives on the interview committee. It'd be a good experience for you. You could put it on your resume.

Student
Oh… that'd look good for my grad school application, I guess, so, what do I have to do?

Professor

The department secretary will give you a schedule of the applicants' visits. If you are free, we'd like you to attend their talks and then later you can give us your opinion. Oh, and we usually serve lunch or snacks depending on what time the talk is.

Student

Cool, that's another good reason to do this. Um… when is the next talk?

Professor

We actually haven't had any yet, the first one is next Friday, at 10 AM, then lunch, and then formal discussion with the applicant right after.

Student

Oh well, I'm free on Fridays. If all the talks are on Fridays, I will be able to make it to all of them.

Professor

That's great, now you should know that this job candidate is interested in the life cycles in the forest.

Student

That's what my research about.

Professor

Yes, I know that's why I feel it necessary to point out that even though this applicant's research interests are similar to yours; we want you to tell us what you think about the teaching of all these applicants. Your perspective as a student, how the applicant teaches in the classroom, that what's important to us.

Student

I understand. So how many applicants are there?

Professor

Let's see, we have 4, all very good candidates, that we will be looking at over the next few weeks. It's going to be a tough decision. But it'll be a good experience for you, especially if you're going to grad school.

Student

Thank you. It'll be cool to do this. I'll get a copy of the schedule from the secretary on my way out.

Professor

You're welcome, see you in class this afternoon

TPO11 Lecture 3 Environmental science

Narrator

Listen to part of a lecture in an environmental science class.

Professor

When land gets developed for human use, the landscape changes. We don't see as many types of vegetation, trees, grasses and so forth. This in turn leads to other losses: the loss of animals that once lived there. Err…but these are the obvious changes, but there are also less obvious changes like the climate. One interesting case of this…uh…of changes in the local land use causing changes in climate, specifically the temperature is in Florida. Now what comes to mind when you think of the state of Florida?

Student A

Sunshine, beaches.

Student B

Warm weather, oranges…

Professor

Yes, exactly. Florida has long had a great citrus industry; large growth of oranges, lemons and the like. Florida's winter is very mild; the temperature doesn't often get below freezing. But there are some areas of Florida that do freeze. So in the early 1900s, farmers moved even further south in Florida, to areas that were even less likely to freeze. Obviously, freezing temperatures are a danger to the crops. A bad bout of cold weather, a long spell of frosts could ruin a farmer's entire crop, anyway, before the citrus growers moved south, much of the land in south Florida, was what we called wetlands. Wetlands are areas of marshy, swampy land, areas where water covers the soil, or is present either at or near the surface of the soil for a large part of the year. Wetlands have their own unique ecosystems, with plants and animals with special and interesting adaptations. Very exciting, but it's not what we are talking about today. Emm…where was I?

Student A

Farmers moved south?

Professor

Oh, yes. Farmers moved south. But the land was not suitable for farming. You can't grow oranges in wetlands, so farmers had to transform the wetlands into land suitable for farming. To do that, you have to drain the water from the land, move the water elsewhere, and divert the water sources such as rivers. Hundreds of miles of drainage canals were built in the wetlands.

Now these areas, the new areas the farmers moved to, used to be warm and unlikely to freeze, however, recently the area has become susceptible to freezes. And we are trying to understand why.

Student B

Is it some global temperature change or weather pattern like El Niño or something?

Professor

Well, there are two theories. One idea is as you suggest that major weather patterns, something like El Niño, are responsible. But the other idea and this is the one that I personally subscribe to, is that the changes in the temperature pattern have been brought about by the loss of the wetlands.

Student A

Well, how would loss of wetlands make a difference?

Professor

Well, think about what we've been studying so far. We've discussed the impact of landscapes on temperature, right? What effects does a body of water have on an area?

Student A

Oh, yeah. Bodies of water tend to absorb the heat during the day, and then they release the heat at night.

Professor

Yes, exactly. What you just said is what I want you all to understand. Bodies of water release heat and moisture back into the environment. So places near large bodies of water are generally milder, err...slightly warmer than those without water. And what I and others think is that the loss of the wetlands has created a situation where the local temperatures in the area are now slightly different, slightly colder than they were 100 years ago, before the wetlands were drained.

Student B

Hmm…do we know what the temperature was like back then?

Professor

Well, we were able to estimate this. We have data about South Florida's current landscape, uh…the plant cover. And we were able to reconstruct data about its landscape prior to 1900. Then we enter those data, information about what the landscape look like before and after the wetlands were drained. We enter the data into a computer weather model. This model can predict temperatures. And when all of the data were entered, an overall cooling trend was predicted by the model.

Student B

How much colder does it get now?

Professor

Well, actually the model shows a drop of only a few degrees Celsius. But this is enough to cause dramatic damage to crops. If temperatures overnight are already very close to the freezing point, then this drop of just a few degrees can take the temperature below freezing. And freezing causes frosts, which kill crops. These damaging frosts wouldn't happen if the wetlands were still in existence, just a tiny temperature difference can have major consequences.

TPO11 Lecture 4 Business

Narrator

Listen to part of a lecture in a Business Class.

Professor

Let's get started. Um, last time we were talking about the need for advertising. Now, let's look at how you can successfully call attention to the service or product you want to sell. To succeed, you've got to develop a systematic approach. If you don't come up with a system, um, a plan, you risk making decisions that waste money, or even drive away potential customers.

But what

does a systematic advertising plan look like? Well, it covers what we call -- the 'Four Ms'. The 'Four Ms': Market, Media, Money, Message. All are important areas to focus on when creating your advertising plan. We will look at them one by one.

The First step is to look at your Market, that's the people who might become customers, buyers of your service or product. You need to know all about your possible customers： Who are they？ What age group are they? What do they like, or dislike? How do they shop? So, you got that? A market is a group of potential customers.

Next, Media… Obviously the major media are television, radio, newspapers, magazines, um, billboards, and so forth. There are all avenues of communication. And you need to figure out: Which media you should advertise through? Which media will reach your intended audience -- your market? So, you do research, trying to determine which media will reach the most potential customers for the lowest cost. For instance, if you have a product, that ... oh... say teachers would like, then teachers are your market. So you ask yourself: What magazines do the majority of teachers read? What TV programs do teachers watch? Do teachers listen to much radio? At what times of the day? Say, now your research turns up two magazines that teachers read. And it also shows that the majority of teachers - say ages twenty to thirty - read the magazine about classroom activities. While most teachers older than that read the other magazine, the one about, oh, let's say—'Educational Psychology'. You think your product will appeal most to teachers ages twenty to thirty, so you decide to put your advertisement in their favorite magazine, the one about classroom activities. You don't waste money advertising in the 'Educational Psychology' magazine, you know the one that the younger teachers generally don't read. And since you're reaching the majority of the teachers in your target age group, you're probably spending your money well, which bring us to the third M -- Money.

You have an advertising budget to spend, but how do you to spend it wisely. Again, research is the key. Good research gives you facts, facts that can help you decide, well, as we already mentioned, decide the right market to target, and the best media to use. But also: When to advertise? or…or how to get the best rates? Like, maybe you're advertising Sports equipment, and you have been spending most of your budget during the holiday season when people buy gifts for each other. Now, in theory, that would seem a great time to advertise, but maybe research shows that you're wrong, that the customers who buy sports equipment tend not to give it as a holiday gift, but want to use it themselves. In that case, advertising during a different season of the year might give you better results. And, um, maybe at even lower, non-holiday rates, so you actually save money. But you need to get the facts; facts that come from good research to be certain and know for sure that you're getting your money's worth.

OK, finally, there is your message: What you want to say about your product? Why buying it will make the customer's life easier, or safer or better somehow. Whatever the message is, make sure you get it right.

Let me give you an example of not getting it right, Ha...ha...ha... you are going to love this one: There was this Soup Shop, the soup was really tasty, but there weren't a lot of customers. The owner thought that maybe if they gave something away for free with each purchase, then more people would come buy soup. So they got some cheap socks, and they advertised to give a pair away with each bowl of soup. But, then even fewer people came to the restaurant. Well, you can imagine why. People started to associate the soup with feet; they began to imagine the soup smelled like feet. The advertising message, soup means free socks, was a bad choice; it was a waste of money. And worse, it caused the loss of customers.

Now, I want everyone to get into small groups and come up with some examples, not of good advertising messages, but of truly disastrous ones. Think of real examples or make some up, and talk about the reasons those messages are unsuccessful. And then we'll get back together and share.

TPO 12

Conversation 1

Narrator

Listen to a conversation between a student and a professor.

Student

So Professor Tibbits, your notes said that you wanted to see me about my Hemingway paper. I have to say that grade wasn't what I was expecting. I thought I'd done a pretty good job.

Professor

Oh, you did. But do you really want to settle for pretty good when you can do something very good?

Student

You think it can be very good?

Professor

Absolutely!

Student

Would that mean you'd…I could get a better grade?

Professor

Oh, sorry! It's not for your grade. It's…I think you could learn a lot by revising it.

Student

You mean, rewrite the whole thing? I'm really swamped. There's deadlines wherever I turn and… and I don't really know how much time I could give it.

Professor

Well, it is a busy time, with spring break coming up next week. It's your call. But I think that with a little extra effort, you can really turn this into a fine essay.

Student

No… yeah…I mean, after I read your comments, I...I can see how it tries to do too much.

Professor

Yeah. It's just too ambitious for the scope of the assignment.

Student

So I should cut out the historical part?

Professor

Yes. I would just stick to the topic. Anything unrelated to the use of nature imagery has no place in the paper. All that tangential material just distracts from the main argument.

Student

Yeah, I never know how much to include. You know…where to draw the line?

Professor

Tell me about it! All writers struggle with that one. But it's something you can learn. That will become more clear with practice. But I think if you just cut out the…um…

Student

The stuff about the history, but if I cut out those sections, won't it be too short?

Professor
Well, better a short well-structured paper than a long paper that's poorly structured and wanders off topic.

Student
So all I have to do is delete those sections?

Professor
Well, not so fast. After you cut out those sections, you'll have to go back and revise the rest, to see how it all fits together. And of course, you'll have to revise the introduction too, to accurately describe what you do in the body of the paper. But that shouldn't be too difficult. Just remember to keep the discussion focused. Do you think you can get it to me by noon tomorrow?

Student
Wow…um…I have so much…er…but I'll try.

Professor
OK, good! Do try! But if you can't, well, shoot for after spring break, OK?

TPO12 Lecture 1 Biology

Narrator
Listen to part of a lecture in a Biology Class.

Professor
As we learn more about the DNA in human cells and how it controls the growth and development of cells, then maybe we can explain a very important observation, that when we try to grow most human cells in a laboratory, they seem programmed to divide only a certain number of times before they die.

Now this differs with the type of cell. Some cells, like nerve cells, only divide seven to nine times in their total life. Others, like skin cells, will divide many, many more times. But finally the cells stop renewing themselves and they die. And in the cells of the human body itself, in the cells of every organ, of almost every type of tissue in the body, the same thing will happen eventually.

OK, you know that all of a person's genetic information is contained on very long pieces of DNA called Chromosomes. 46 of them are in the human cells, that's 23 pairs of these Chromosomes of various lengths and sizes.

Now if you'll look at this rough drawing of one of them, one Chromosome about to divide into two. You see that it sort of looks like, well actually it's much more complex than this, but it reminds us a couple of springs linked together, two coiled up pieces of DNA. And if you stretch them out you will find they contain certain genes, certain sequences of DNA that help determine how the cells of the body will develop. When researchers look really carefully at the DNA in Chromosomes though, they were amazed, we all were, to find that only a fraction of it, maybe 20-30%, converts into meaningful genetic information. It's incredible; at least it was to me. But if you took away all the DNA that codes for genes, you still have maybe 70% of the DNA left over. That's the so-called JUNK DNA. Though the word junk is used sort of tongue-in-cheek.

The assumption is that even if this DNA doesn't make up any of the genes, it must serve some other purpose. Anyway, if we examine these ends of these coils of DNA, we will find a sequence of DNA at each end of every human Chromosome, called a telomere.

Now a telomere is a highly repetitious and genetically meaningless sequence of DNA, what we were calling JUNK DNA. But it does have an important purpose; it is sort of like the plastic tip on each end of a shoelace. It may not help you tie your shoe but that little plastic tip keeps the rest of the shoelace, the shoe string from unraveling into weak and useless threads. Well, the telomeres at the ends of Chromosomes seem to do about the same thing--- protect the genes, the genetically functional parts of the Chromosome, from being damaged. Every time the Chromosome divides, every time one cell divides into two. Pieces of the ends of the Chromosome, the telomeres, get broken off. So after each division, the telomeres get shorter and one of the things that may happen after a while is that pieces of the genes themselves get broken off the Chromosomes. So the Chromosome is now losing important genetic information and is no longer functional. But as long as the telomeres are a certain length, they keep this from happening. So it seems that, when the, by looking at the length of the telomeres on specific Chromosomes, we can actually predict pretty much how long certain cells can successfully go on dividing.

Now, there are some cells that just seem to keep on dividing regardless, which may not always be a good thing if it gets out of control.

But when we analyze these cells chemically, we find something very interesting, a chemical in them, an enzyme called telomerase. As bits of the telomere break off from the end of the Chromosome, this chemical, this telomerase can rebuild it, can help reassemble the protective DNA, the telomere that the Chromosome has lost. Someday we may be able to take any cell and keep it alive functioning and reproducing itself essentially forever through the use of telomerase. And in the future we may have virtually immortal nerve cells and immortal skin cells or whatever, because this chemical, telomerase, can keep the telomeres on the ends of Chromosomes from getting any shorter.

TPO12 Lecture 2 Business

Narrator
Listen to part of a lecture in a Business Class

Professor
Ok, as we’ve talked about a key aspect of running a successful business is knowing, um, getting a good sense of what the customer actually wants, and how they perceive your product. So with that in mind, I want to describe a very simple method of researching customer preference, and it is becoming increasingly common, it's called----MBWA----which stands for managing by wandering around. Now, MBWA, that's not the most technical sounding name you've ever heard, but it describes the process pretty accurately. Here is how it works.

Basically, Um, the idea is that business owners or business managers just go out and actually talk to their customers, and learn more about how well the business is serving their needs, and try to see what the customer experiences, because that's a great way to discover for yourself, how your product is perceived, what its strengths and weaknesses are, you know, how you can improve it... that sort of thing. You know Dortans, they make soup and canned vegetables and such. Well, the head of the company had Dortans’ top executives walk around supermarkets, um, asking shoppers what they thought of Dortans’ soups, and he used that data to make changes to the company's product, I mean, when Dortans of all the companies, embraces something as radical as MBWA, it really shows you how popular the theory has become, yes, Lisa?

Student A
But isn’t it dangerous to base decisions on information from a small sample of people? Isn’t large scale market research safer getting data on a lot of people?

Professor

That's a good question, and well I don't want to pretend that W… MBWA is some sort of, um, replacement for other methods of customer research. Now, market research data definitely can give you a good idea of, um, of the big picture, but MBWA is really useful, it kind of filling in the blanks, you know, getting a good underground sense of how your products are used, and how people need to respond to them, and Yes, the numbers of opinion you get is small so you do need to be careful, but, good business managers will tell you that the big fear they have and.. .and one of the most frequent problems they come across is well becoming out of touch with what their customers really want and need, you know, surveys and market research stuff like that, they can only tell you so much about what the customers actually want in their day-to-day lives. Managing by wandering around, on the other hand, well, that gets you in there and gives you a good sense of what customers need. So ... so when using combination then, MBWA and market research, well, they are powerful tools.

Oh, here is another example for you, uh, senior executives for a clothing manufacturer. It was, um, Lken, Lken jeans you know, they went and worked in a store for a few days, selling Lken's cloths. Now that gave them a very different idea about their product, they saw how people responded to it; they could go up to customers in the store and ask them questions about it, uh, yes Mike?

Student B

Well, I would think that a lot of customers would be bothered by, you know, if I'm shopping, I don't know if I'd want some business representative coming up to me and asking me questions, it's.. It's like when I get phone calls at home from market researchers, I just hang up on them Professor Oh, well, it's certainly true that well no one likes getting calls at home from market researchers or people like that, but I will tell you something. Most customers have the exact opposite reaction when it comes to MBWA. Now, don't ask me why, because I really have no idea, but the fact is that customers tend to respond really well to MBWA, which is the key reason for its success.

In fact, the techniques of MBWA work so well, they have actually been extended to all kinds of different contexts, like politics for instance, Um, a few years back, the mayor of Baltimore, Um.. I think his name was Sheaffer or something like that. Anyway, he decided that the best way to serve the people of the city, of his city, was to actually get out there in it and experience the things that they experienced, so he'd ride around the city in, well, you know, in all parts of it, and he'd see all the potholes; he'd see how the trash was sometimes, um, not picked up off the side of the street and then he'd go back to his office and he'd write these memos, now they were memos to his staff about the problems he had seen, and how they needed to be fixed, you know that sort of thing, but the thing is he got all this information just by going around and seeing the different Baltimore neighborhoods and talking to the people in them. Now he called it--- smart politics, we'd call it MBWA, or just, playing good customer service.

TPO 12 Conversation 2

Narrator

Listen to a conversation between a student and a Department Secretary.

Student

Hi. Miss Hendrix.

Secretary

Hi Brad, how are you?

Student

I'm fine; except I have a question about my paycheck.

Secretary

Sure. What' up?

Student

Well it's already been several weeks into the semester and my paycheck was supposed to go directly into my bank account, but there haven't been any deposits.

Secretary

That's odd.

Student

Yea, I thought graduate teaching assistants will automatically put on the payroll at the beginning of the semester.

Secretary

They are. Let's see did you complete all the forms for payroll?

Student

I filled in whatever they sent me, and I returned like at the end of
August.

Secretary

Hmm, well, you definitely should have been paid by now. At least two pay periods have passed since then.

Student

I asked the bank and they didn't know anything. Who should I talk to about this, payroll?

Secretary

I'm going to contact them for you. There was a problem in processing some of the graduate student payroll paperwork. 'Cause their computer program crashed after all the information was processed. And some people's information couldn't be retrieved.

Student

Oh. But why didn't anyone let me know?

Secretary

I don't know how they work over there, 'cause they couldn't even figure out whose information was missing. And this isn't the first time, seems like something like this happens every semester.

Student

So how do I find out if my information was lost?

Secretary

I will contact them tomorrow morning to see if you're in the system.
But you're probably not.

Student

Well, then, what will I need to do?

Secretary

Sorry but you will need to fill out those forms again and then I will fax them over to the payroll office.

Student

And then what… Well, what I really need to know is how long till I get some money, I'm already a month behind in my bills and my tuition's due soon.

Secretary

They'll get you into the system the same day they receive your paperwork. So if you do that tomorrow, you'll get paid next Friday.

Student

That's a long time from now. Will that paycheck include all the money I am owed?

Secretary

It should. I will double check with the payroll department.

Student

And another thing, Is there any way I could get paid sooner, I have been teaching all these weeks…

Secretary

I know it's not fair but I don't think they can do anything; all the checks are computed automatically in the system. They can't just write checks.

Student

But they are the ones that made a mistake. And they never told me!

Woman

I understand how you feel. If I were you, I'd be upset too. I'll tell you what: when I call them, I will explain the situation and ask if there is any way you could be paid sooner. But I have to tell you that based on past experiences you shouldn't count on it.

Student

(Sigh) I understand thanks. I know it's' not your fault and that you're doing everything you can.

Secretary

Well, what I CAN do is make sure that your first check for the total amount that the university owes you.

Student

That'll be great! Thank you. I will be on campus about 10 tomorrow morning and I will come by to see you then.

TPO 12 Lecture 3 Music history

Narrator

Listen to part of a lecture in a music history class. The professor has been discussing Opera.

Professor

The word opera means work, actually it means works. It's the plural of the word opus from the Latin. And in Italian it refers in general to works of art. Opera Lyrica or lyric opera refers to what we think of as opera, the musical drama.

Opera was commonplace in Italy for almost a thousand years before it became commercial as a venture. And during those years, several things happened, primarily linguistic or thematic and both involving secularization.

Musical drama started in the churches. It was an educational tool. It was used primarily as a vehicle for teaching religion and was generally presented in Latin, the language of the Christian Church which had considerable influence in Italy at that time. But the language of everyday life was evolving in Europe and at a certain point in the middle ages it was really only merchants, aristocrats and clergy who could deal with Latin. The vast majority of the population used their own regional vernacular in all aspects of their lives. And so in what is now Italy, operas quit being presented in Latin and started being presented in Italian.

And once that happened, the themes of the opera presentations also started to change. And musical drama moved from the church to the plaza right outside the church. And the themes again, the themes changed. And opera was no longer about teaching religion as it was about satire and about expressing the ideas of society or government without committing yourself to writing and risking imprisonment or persecution, or what have you.

Opera, as we think of it, is of course a resurrected form. It is the melodious drama of ancient Greek theater, the term 'melodious drama' being shortened eventually to 'melodrama' because operas frequently are melodramatic, not to say unrealistic. And the group that put the first operas together that we have today then, were, well…it was a group of men that included Galileo's father Vincenzo, and they met in Florence he and a group of friends of the count of Bardi and they formed what is called the Camerata dei Bardi. And they took classical theater and reproduced it in the Renaissance time. This…uh…this produced some of the operas that we have today.

Now what happened in the following century is very simple. Opera originated in Italy but was not confined to Italy any more than Italians were. And so as Italians migrated across Europe, they carried theater with them and opera specifically because it was an Italian form.

What happened is that the major divide in opera that endures today took place. The French said opera ought to reflect the rhythm and cadence of dramatic literature, bearing in mind that we are talking about the golden age in French literature. And so the music was secondary, if you will, to the dramatic cadence of language, to the way the rhythm of language was used to express feeling and used to add drama and of course as a result instead of arias or solos, which would come to dominate Italian opera. The French relied on what the Italians called recitativo or recitative in English. The lyrics were spoken, frequently to the accompaniment of a harpsichord.

The French said you really can't talk about real people who lived in opera and they relied on mythology to give them their characters and their plots, mythology, the pastoral traditions, the novels of chivalry or the epics of chivalry out of the middle Ages. The Italians said, no this is a great historical tool and what better way to educate the public about Nero or Attila or any number of people than to put them into a play they can see and listen to.

The English appropriated opera after the French. Opera came late to England because all theaters, public theaters were closed, of course, during their civil war. And it wasn't until the restoration in 1660 that public theaters again opened and opera took off. The English made a major adjustment to opera and exported what they had done to opera back to Italy.

So that you have this circle of musical influences, the Italians invented opera, the French adapted it, the English adopted it, the Italians took it back.

It came to America late and was considered to elitist for the general public. But Broadway musicals fulfilled a similar function for a great long while.

John Jay Chapman wrote about opera, quote, “If an extraterrestrial being were to appear before us and say, what is your society like, what is this Earth thing all about, you could do worse than take that creature to an opera.” End quote. Because opera does, after all, begin with a man and a woman and an emotion.

TPO12 Lecture 4 Environmental science

Narrator
Listen to part of a lecture in an environmental science class.

Professor
All right folks, let’s continue our discussion of alternative energy sources and move on to what’s probably the most well-known alternative energy source--- solar energy. The sun basically provides Earth with virtually unlimited source of energy everyday, but the problem has always been how do we tap this source of energy. Can anyone think of why it’s so difficult to make use of solar energy?

Student A
Because it is hard to gather it?

Professor
That’s exactly it. Solar energy is everywhere, but it’s also quite diffused. And the thing is the dream of solar energy is not a new one. Humanity has been trying to use the sun’s light as a reliable source of energy for centuries. And around the beginning of the 20th century there were actually some primitive solar water heaters on the consumer market. But they didn’t sell very well. Any of you wanna guess why?

Student A
Well, there were other energy choices like oil and natural gas, right?

Professor
Yeah. And for better or for worse, we chose to go down that path as a society. When you consider economic factors, it’s easy to see why. But then in the 1970s, there was an interest in solar energy again. Why do you think that happened?

Student B
Because oil and natural gas were...err...became scarce?

Professor
Well, not exactly. The amount of oil and natural gas in the Earth was still plentiful, but there were other reasons. It’s a political thing really and I’m gonna get into that now. So what happened in the 1970s was oil and natural gas became very expensive very quickly, and that spurred people to start looking into alternative forms of energy, solar energy probably being the most popular. But then in the 80s, this trend reversed itself when the price of oil and natural gas went down.

Alright, let’s shift our focus now to some of the technologies that have been invented to overcome the problem of gathering diffused solar energy. The most basic solution is simply to carefully place windows in a building, so that the sun shines into the building and then it's absorbed and converted into heat. Can anyone think of where this is most commonly used?

Student A
Greenhouses.

Professor
Yep, greenhouses where plants are kept warm and provided with sunlight, because the walls of the building are made entirely of glass. But we do also have more complex systems that are used for space heating and they fall into two categories, passive and active heating systems.

Passive systems take advantage of the location or design of a house. For example, solar energy is gathered through large glass panels facing the sun. The heat is then stored in water-filled tanks or concrete. No mechanical devices are used in passive heating systems. They operate with little or no mechanical assistance.

With active systems, on the other hand, you collect the solar energy at one location, and then you use pumps and fans to move heat from the collectors through a plumbing system to a tank, where it can be used to heat a home or to just provide hot water.

Student B
Excuse me, professor, but I've got to ask, how can solar energy work at night or on cloudy days?

Professor
That's...Well...that is a really good question. As a matter of facts, science is still working on it, trying to find ways of enhancing energy storage techniques so that the coming of night or cloudy days really wouldn't matter. That is the biggest drawback to solar energy. The problem of what do you do in cases where the sun's light is weak or virtually non-present. So the storage of solar energy, lots of solar energy, is a really important aspect.

Student A
Does that mean that solar energy can only be used on a small scale, like heating a home?

Professor
Well actually, there have been some attempts to build solar energy power plants. The world's largest solar power plant is located in Kremer Junction California. It can generate 194 megawatts of electric power, but that's just a drop in the bucket. Right now the utility companies are interested in increasing the capacity of the Kremer Junction Plant, but only time will tell if it will ever develop into a major source of power for that region, considering the economic and political factors involved.

TPO 13

Conversation 1

Narrator
Listen to a conversation between a student and his psychology professor.

Professor:
Good afternoon, Alex, can I help you with something?

Student:

Well, I wanted to talk with you about the research project you assigned today. I um…I hope you could clarify a few things for me.

Professor:

I'll certainly try.

Student:

Ok, all we have to do is do two observations and take notes on them, right?

Professor:

Ur, that's a start, but you'll need to do some research, too. Then you will write a paper that is not so much about the observations, but a synthesis of what you have observed and read.

Student:

Ok….And what about the children I am supposed to observe?

Professor:

Not children, a single child observed twice.

Student:

Oh…Ok, so I should choose a child with the permission of the child's parent of course and then observe that child a couple of times and take good notes, then?

Professor:

Actually after your first observation, you'll go back and look through your textbook or go to a library and find a few sources concerning the stage of development this particular child is in. And then, with that knowledge, you will make a second observation of the same child to see if the expected developmental behaviors are exhibited.

Student:

Can you give me an example?

Professor:

Well, um, if you observed a four-year-old child, for example, my daughter is 4 years old; you might read up on Piaget's stages of cognitive development we covered those in class.

Student:

Uh-huh.

Professor:

Uh, most likely, what stage would a child of that age be in?

Student:

Um… the pre-operational stage?

Professor:

Exactly, if that's the case, her language use would be maturing and her memory and imagination would be developed.

Student:

So she might play pretend like she can pretend when driving her toy car across a couch that the couch is actually a bridge or something.

Professor:

That is right. In addition, her thinking would be primarily egocentric.

Student:

So she would be thinking mostly about herself and her own needs, and might not be able to see things from anyone else's perspective?

Professor:

Hmm..huh.

Student:

But what if she doesn't? I mean, what if she doesn't demonstrate those behaviors?

Professor:

That's fine; you'll note that in your paper. See, your paper should compare what is expected of children at certain stages of development with what you actually observed.

Student:

Ok, I have one more question now.

Professor:

And what's that?

Student:

Where can I find a child to observe?

Professor:

Um, I suggest you contact the education department secretary. She has a list of contacts at various schools and with certain families who are somehow connected to the university. Sometimes they are willing to help out students with projects like yours.

Student:

Ok, I'll stop by the education department office this afternoon.

Professor:

And if you have any trouble or any more questions, feel free to come by during my office hours.

TPO 13 Lecture 1 City planning

Narrator:

Listen to part of a lecture in a city planning class.

Professor:

In the last 50 years or so, many American cities have had difficulties in maintaining a successful retail environment. Business owners in the city centers or the downtown areas have experienced some financial losses, because of a steady movement of people out of the cities and into the suburbs. In general, downtown areas, just don't have that many residential areas, not that many people live there. So what have city planners decided to do about it? Well, one way they've come up with some ways to attract more people, to shop downtown was by creating pedestrian malls.

Now, what is a pedestrian mall? It's a pretty simple concept really, it is essentially an outdoor shopping area designed just for people on foot. And… well, unlike many other shopping malls that are built in the suburbs nowadays, these pedestrian malls are typically located in the downtown area of the city. And...oh... there are features like white sidewalks, comfortable outdoor seating and maybe even fountains, and... you know, art. There are variations on this model of course, but the common denominator is always the idea of creating a shopping space that will get people to shop in the city without needing their cars. So I am sure you can see how having an area that's off-limits to automobile traffic would be ideal for a heavily populated city where, well, the streets would otherwise be bustling with noisy, unpleasant traffic congestion.

Now the

concept which originated in Europe was adopted by American city planners in the late 1950s. And since then, a number of Unites States' cities have created pedestrian malls. And many of them have been highly successful. So what have city planners learned about making these malls succeed?

Well, there are two critical factors to consider when creating a pedestrian mall--- location and design. Both of which are equally important. Now let's start with the location. In choosing a specific location for a pedestrian mall, there are in fact two considerations. Proximity to potential customers, um…that's we'd call a customer base and accessibility to public transportation which we will get to in just a moment.

Now, for a customer base, the most obvious example would be a large office building since the employees could theoretically go shopping after work or during their lunch hour, right? Another really good example is convention center which typically has a hotel and large meeting spaces to draw visitors to the city for major business conferences and events. But ideally, the pedestrian mall would be used by local residents, not just people working in the city or visiting the area. So that's where access to public transportation comes in, either ...um...either the designers plan to locate the mall near a central transportation hub, like a bus terminal, a major train or subway station or they work with city officials to create sufficient parking areas, not too far from the mall, which makes sense because if people can't drive into the mall area, well, then they need to have easy access to it. OK, so that's location, but ... but what about design? Well, design doesn't necessarily include things like sculptures or decorative walkways or… or even eye-catching window displays, you know, art. Although I would be the first to admit those things are aesthetically appealing, however, visually pleasing sights, well, they are not a part of the pedestrian mall design that matter than most. The key consideration is a compact and convenient layout. One which allows pedestrians to walk from one end of the mall to the other in just a few minutes, so they can get to the major stores, resaurants and other central places without having to take more than one or two turns. Now, this takes careful and creative planning.

But now what if one ingredient to this planning recipe is missing? There could quite possibly be long-lasting effects. And I think a good example is the pedestrian mall in the Louisville Kentucky for instance. Now when the Louisville mall was built, oh, it had lots of visual appeal, it was attractively designed, right in the small part of downtown and it pretty much possessed all of the other design elements for success. But ... uh, now, here is where my point about location comes into play. There wasn't a convention center around to ... to help draw in visitors, and well, the only nearby hotel eventually closed down for that same reason. Well, you can imagine how this must have affected local and pedestrian mall business owners. Sort of what was we call a chain reaction. It wasn't until a convention center and a parking garage were built about a decade later that the mall started to be successful.

TPO 13 Lecture 2 Ecology

Narrator:
Listen to part of a lecture in an ecology class.

Professor:
So, continuing our discussion of ecological systems--- whole systems. The main thing to keep in mind here is the interrelationships. The species in a system uh…. and even the landscape itself, they are interdependent. Let's take what you read for this week and see if we can apply this interdependence idea. Mike?

Student:
Well, um…, how about beavers--- ecosystems with beavers and waterways.

Professor:
Good, good, go on.

Student:
Like, well, you can see how it's so important, 'cause if you go back before European settled in north America, like before the 1600s, back when native Americans were the only people living here, well, back then there were a lot of beavers, but later on, after Europeans…

Professor:
OK, wait, I see where you are heading with this, but before we go into how European settlement affected the ecosystem, tell me this--- what kind of environment do beavers live in? Think about what it was like before the Europeans settlers came, we'll come back to where you were headed.

Student:
OK, well, beavers live near streams and rivers and they block up the streams and rivers with like logs and sticks and mud. You know, they build dams that really slow down the flow of the stream. So then the water backs up, and creates like a pond that floods the nearby land.

Professor:
And that creates wetlands. OK, tell me more.

Student:
Well with wetlands, it's like there is more standing water, more still water around, and that water is a lot cleaner than swiftly flowing water, because the dirt and sediment and stuff has a chance to sink to the bottom.

Professor:
More important for our discussion, wetland areas support a lot more varieties of life than swiftly flowing water. For example, there are more varieties of fish, or insects, lots of frog spices, and then species that rely on those species start to live near the wetlands too.

Student:
Yes, like birds and mammals that eat the fish and insects, and you get trees and plants that begin to grow near the standing water that can't grow near the running water. Oh, and there's something about wetlands and groundwater too.

Professor: OK, good. Wetlands have a big effect on groundwater, the amount of water below the surface of the land.

Think of wetlands as, Umm, like a giant sponge, the earth soaks up a lot of this water that's continually flooding the surface, which increases the amount of water below. So where there're wetlands, you get a lot of groundwater, and groundwater happens to be a big source of our own drinking water today.

Alright… So, back to the beavers, what if the beavers weren't there?

Student:
You just have a regular running stream, because there is no dam, so the ecosystem would be completely different, there would be fewer wetlands.

Professor:
Exactly, so, now let's go back to where you were headed before, Mike. You mentioned a change that occurred after Europeans came to North America.

Student:
Yeah, well, there used to be beavers all over the place, something like 200 million beavers, just in the continental United States. But when Europeans came, they started hunting the beavers for their fur, because beaver fur is really warm, and it was really popular for making hats in Europe. So the beavers were hunted a lot, overhunted, they are almost extinct by the 1800s, so… that meant fewer wetlands, less standing water.

Professor:
And what does that mean for the ecosystem? Kate?

Student:
Well if there is less standing water, then the ecosystem can't support as many species, because a lot of insects and fish and frogs can't live in running water, and then the birds and animals that eat them, lose their food supply.

Professor:
Precisely, so the beaver in this ecosystem is what we call a keystone species. The term keystone kind of explains itself. In architecture, a keystone in an archway or doorway is the stone that holds the whole thing together, and keeps it from collapsing. Well, that's what a keystone species does in an ecosystem. It's the crucial species that keeps the system going. Now, beaver populations are on the rise again, but there is something to think about. Consider humans as part of these ecosystems, you've probably heard about water shortages or restrictions on how much water you can use, especially in the summer time, in recent years. And remember what I said about groundwater; imagine if we still have all those beavers around, all those wetlands. What would our water supply be like then?

TPO 13 Conversation 2

Narrator:
Listen to a conversation between a student and the language lab manager.

Student:
Hi, I'm not sure, but um... is this the Carter language lab?

Manager:
Yes, it is. How can I help you?

Student:

I'm taking first year Spanish this semester. Our professor says we need to come here to view a series of videos. I think it is called Spanish-- Working on Your Accent?

Manager:

Yes, we have that. Um....They are on the wall behind you.

Student:

OK. So, I can just take....err.....Can I take the whole series home? I think there are three of them.

Manager:

I guess you haven't been here before.

Student:

No, no I haven't.

Manager:

Ok, well, you have to watch the videos here. You need to sign in to reserve an open room and sign out the video you need, just start with the first one in the series, each video is half an hour long.

Student:

So, it is a video library, basically?

Manager:

Yes, but unlike the library, you can't take any videos out of the lab.

Student:

OK, so how long can I use a video room for?

Manager:

You can sign up for two hours at a time.

Student:

Oh, good, so I can watch more than one video when I come up here. Is the lab pretty busy all the time?

Manager:

Well, rooms are usually full right after dinner time, but you can sign up the day before to reserve a room if you want.

Student:

Err...the day before....But, I can just stop in too, to see if there’s any rooms open, right?

Manager:

Sure, stop in any time.

Student:

What about copies of the videos? Is there just one copy of each in the series?
I don't want to miss out if everyone comes in at once.

Manager:

Oh, no, we have several copies of each tape in the Spanish Accent series. We usually have multiple copies of everything for each video collection.

Student:
Super. So...how many rooms are there total in the lab?

Manager:
20. They are pretty small. So, we normally get one person or no more than a small group of people in there watching a video together. Actually, someone else from your class just came in and took the first Spanish video in to watch. You could probably run in there and watch it with him. Of course, you are welcome to have own room. But, sometimes students like to watch with a classmate, so they can review the material with each other afterwards. For example, if there was some content they didn't really understand.

Student:
I guess I prefer my own room. I concentrate better by myself and I don't want to miss anything, you know, and he’s probably already started watching it...

Manager:
No problem, we've got a lot of rooms open right now. When you come in, you sign your name on the list and you’re assign a room number, or if you call in advance, then the attendant will tell you your room number, if you forget, just come in and take a look at the list. The videos are over there.

Student:
Great, thanks.

TPO 13 Lecture 3 Poetry

Narrator:
Listen to part of a lecture in a poetry class, the professor is discussing medieval poetry.

Professor:
OK, so the two poems we are looking at today fall into the category of ... uh ... medieval times, which was how long ago?

Student:
Almost a thousand years ago, right?

Professor:
Yes, that’s right.

Student:
But, professor, are you sure these are poems? I mean I thought poems were shorter; these are more like long stories. I mean one of them was all about love, but the other one, the Chan…Chan…whatever it’s called, the other one; well, it was all about fighting and battles. I mean can both of them be considered poems?

Professor:

Well, think back to the very beginning of this course.

Student:
Uh-huh.

Professor:
Remember how we, we define poetry? In the very broadest sense, we said it's written to evoke, to make you, the audience, have some kind of the emotional experience through the use of imagery, um, some kind of predictable rhythm. And usually, but not always, there's more than one meaning implied with the words that are used.

Let's start with the Chanson poetry first. That's Chanson. Chanson poems became popular in Europe, particularly in France, and the term is actually short for a longer French phrase that translates to um ... uh… songs of deeds.

Now, they were called songs of deeds because strangely enough, they were written to describe the heroic deeds or actions of warriors, the knights during conflicts. We don't know a lot about the authors, it's still contested somewhat. But we are pretty sure about who the Chanson poems were written for. That is---they were written for knights and the lords---the nobility that they served. The poems were sung, performed by a minstrel, a singer who travelled from castle to castle, singing to the local lord and his knights. Uh… well, would someone summarize the main features of the Chanson poem you read?

Student:
Well, there's a hero, a knight, who goes to battle, and he is admired for his courage, bravery and loyalty, loyalty to the lord he serves, his country and his fellow warriors in the field. He's ....um... he has a, he's a skilled fighter, willing to face the most extreme dangers, sacrificial, willing to sacrifice anything and everything to protect his king and country.

Professor:
Ok, now, given that the intended audience for these poems were knights and lords. What can we say about the purpose of Chanson poetry? What kinds of feelings was it meant to provoke?

Student:
I guess they must've been really appealing to those knights and lords who were listening to them. Hearing the songs probably made them feel more patriotic, made them feel like it was a good and noble thing to serve their countries in whatever way they could.

Professor:
Good, we've got a pretty good picture of what the Chanson hero was like. Now let's compare that to the hero in the other poem. The other poem is an example of what's called Romance Poetry. And the hero in the Romance poem was also a knight. But what made the knight in Romance Poetry different from the knight in Chanson poetry?

Well, first the purpose of the hero's actions was different. The hero in Romance Poetry is independent, purely solitary in a way, not like the Chanson poet who was always surrounded by his fighting companions. He doesn't engage in conflict to protect his lord or country. He does it for the sake of adventure, to improve himself, to show he's worthy of respect and love from his lady. He's very conscious of the particular rules of social behavior he has to live up to somehow. And all of his actions are for the purpose of proving that he is an upright, moral, well-mannered, well-behaved individual. You may have noticed that in Chanson poetry, there isn't much about the hero's feelings. The focus is on the actions, the deeds. But the Romance Poetry describes a lot of the inner feelings, the motivations, psychology you could say, of a knight trying to improve himself, to better himself, so that he's worthy of the love of a woman.

What explains this difference? Well, uh, digging into the historical context tells us a lot. Romance Poetry emerged a few generations after Chanson, and its roots were in geographic regions of France that were calmer, where conflict wasn't central to people's lives. More peaceful times meant there was more time for education, travel, more time for reflection. Another name for Romance Poetry that's often synonymous with it is troubadour poetry.

Troubadours were the authors of these new Romance poems. And we know a lot more about the troubadours than we do about the Chanson authors, because they often had small biographical sketches added to their poems that gave pretty specific information about their social status, geographical location and a small outline of their career. These information wasn't particularly reliable because they were sometimes based on fictitious stories of great adventure or scraped together from parts of different poems. But there is enough there to squeeze or infer some facts about their social class. The political climate had settled down enough so that troubadours had the luxury of being able to spend most if not all of their time, creating, crafting or composing their love songs for their audiences. And yes these poems were also sung; many troubadours were able to make a living being full-time poets which should tell you something about the value of that profession during medieval times.

TPO 13 Lecture 4 Astronomy

Narrator:
Listen to part of a lecture in an astronomy class.

Professor:
OK, I wanna go over the different types of meteorites, and what we've learned from them about the formation of Earth, and the solar system. Uh… the thing is what's especially interesting about meteorites is that they come from interplanetary space, but they consist of the same chemical elements that are in matter originating on Earth, just in different proportions. But that makes it easier to identify something as a meteorite, as opposed to…to just a terrestrial rock.

So to talk about where meteorites come from, we need to talk about comets and asteroids, which basically...they're basically made up of debris left over from the origin of the solar system 4.6 billion years ago.

Now I'm going a bit out of a order here…um…I'm not going to go into any depth on comets and asteroids now, but we'll come back later and do that. For now, I'll just cover some basic info about them.

OK, comets and asteroids. It might help if you think of...remember we talked about the two classes of planets in our solar system? And how they differ in composition? The terrestrial planets--like Mars and Earth--composed largely of rocks and metals, and the large gas giants, like Jupiter. Well, the solar system also has two analogous classes of objects, smaller than planets--namely, asteroids and comets.

Relatively near the sun, in the inner solar system, between Jupiter and Mars to be precise, we've got the asteroid belt, which contains about 90 percents of all asteroids orbiting the sun. These asteroids are…uh…like the terrestrial planets, in that they're composed mostly of rocky material and metals.

Far from the sun, in the outer solar system, beyond Jupiter's orbit, temperatures are low enough to permit ices to form out of water and…and out of gases like methane and carbon dioxide. Loose collections of these ices and small rocky particles form into comets. So comets are similar in composition to the gas giants.

Both comets and asteroids are...typically are smaller than planets. An even smaller type of interplanetary debris is the meteoroid. And it's from meteoroids that we get meteors and meteorites. "Roids" are, for the most part anyway, they are just smaller bits of asteroids and comets. When these bits enter Earth's atmosphere, well, that makes them so special that they get a special name. They're called meteors. Most of them are very small, and they burn up soon after entering Earth's atmosphere. The larger ones that make it through the atmosphere and hit the ground are called meteorites. So meteorites are the ones that actually make it through.

Now we've been finding meteorites on Earth for thousands of years, and we've analyzed enough of them to learn a lot about their composition, most come from asteroids, though a few may have come from comets. So essentially they are rocks, and like rocks, they're mixtures of minerals. They are generally classified into three broad categories--stones, stony irons and irons.

Stone meteorites, which we refer to simply as, uh, stones, are almost entirely rock material. They actually account for almost all of the meteorite material that falls to earth. But even so, it's rare to ever find one. I mean, it's easier to find an iron meteorite or a stony iron. Anyone guess why? Look at their names. What do you think iron meteorites consist of?

Student:
Mostly iron?

Professor:
Yeah… iron and some nickel, both of which are metals. And, if you're trying to find metal?

Student:
Oh! Metal detectors!

Professor:
Right, thank you. At least that's part of it. Stone meteorites, if they lie around exposed to the weather for a few years, well, they're made of rock, so they end up looking almost indistinguishable from common terrestrial rocks--ones that originated on earth. So it's hard to spot them by eye. But we can use metal detectors to help us find the others, and they're easier to spot by eye. So most of the meteorites in collections, uh, in museums, they'll be...they're iron meteorites, or the stony iron kind, even though they only make up about 5 percent of the meteorite material on the ground.

TPO 14

Conversation 1

Narrator:
Listen to a conversation between a student and the librarian employee.

Student:
Hi, I am looking for this book---the American judicial system. And I can't seem to find it anywhere. I need to read a chapter for my political science class.

Librarian:
Let me check in the computer. Um… doesn't seem to be checked out and it's not on reserve. You've checked the shelves I assume.

Student:
Yeah, I even checked other shelves and tables next to where the book should be.

Librarian:

Well, it’s still here in the library. So people must be using it. You know this seems to be a very popular book tonight. We show six copies. None are checked out. And, yet you didn’t even find one copy on the shelves. Is it a big class?

Student:
Maybe about Seventy Five?

Librarian:
Well, you should ask your professor to put some of the copies on reserve. You know about the ‘Reserve system’, right?

Student:
I know that you have to read reserve books in the library and that you have time limits. But I didn’t know that I could ask a professor to put a book on reserve. I mean I thought the professors make that kind of decisions at the beginning of the semester.

Librarian:
Oh… they can put books on reserve at anytime during the semester.

Student:
You know reserving book seems a bit unfair. What if someone who is not in the class wants to use the book?

Librarian:
That’s why I said some copies.

Student:
Ah, well, I’ll certainly talk to my professor about it tomorrow. But what I am gonna do tonight?

Librarian:
I guess you could walk around the Poli-Sci (Political Science) section and look at the books waiting to be re-shelved.

Student:
There do seem to be more than normal.

Librarian:
We are a little short-staffed right now. Someone quit recently, so things aren’t getting re-shelved as quickly as usual. I don’t think they’ve hired a replacement yet, so, yeah, the un-shelved books can get a bit out of hand.

Student:
This may sound a bit weird. But I’ve been thinking about getting a job. Um… I’ve never worked in a library before, But…..

Librarian:
That’s not a requirement. The job might still be open. At the beginning of the semester we were swamped with applications, but I guess everyone who wants a job has one by now.

Student:
What can you tell me about the job?

Librarian:

Well, we work between six and ten hours a week, so it's a reasonable amount. Usually we can pick the hours we want to work. But since you'd be starting so late in the semester, I'm not sure how that would work for you. And… Oh… we get paid the normal university rates for student employees.

Student:

So who do I talk to?

Librarian:

I guess you talk to Dr. Jenkins, the head librarian. She does the hiring.

TPO 14 Lecture 1 Psychology

Narrator:

Listen to part of a lecture in a psychology class

Professor:

We've said that the term "Cognition" refers to mental states like: knowing and believing, and to mental processes that we use to arrive at those states. So for example, reasoning is a cognitive process, so is perception. We use information that we perceive through our senses to help us make decisions, to arrive at beliefs and so on. And then there are memory and imagination which relate to the knowledge of things that happen in the past or may happen in the future. So perceiving, remembering, imagining are all internal mental processes that lead to knowing or believing.

Yet, each of these processes has limitations and can lead us to hold mistaken beliefs or make false predictions.

Take memory for example, maybe you have heard of studies in which people hear a list of related words. Um…, let's say a list of different kinds of fruit. After hearing this list, they are presented with several additional words. In this case, we'll say the additional words were "blanket" and "cherry". Neither of these words was on the original list, and while people will claim correctly that "blanket" was not on the original list, they'll also claim incorrectly that the word "cherry" was on the list. Most people are convinced they heard the word "cherry" on the original list. Why did they make such a simple mistake? Well, we think because the words on the list were so closely related, the brain stored only the gist of what it heard. For example, that all the items on the list were types of fruit. When we tap our memory, our brains often fill in details and quite often these details are actually false.

We also see this "fill-in" phenomenon with perception. Perception is the faculty that allows us to process information in the present as we take it in via our senses. Again, studies have shown that people will fill in information that they thought they perceived even when they didn`t. For example, experiments have been done where a person hears a sentence, but it is missing the word that logically completes it. They'll claim to hear that word even though it was never said. So if I were to say…er…the Sun rises in the…and then fail to complete the sentence, people will often claim to have heard the word "east".

In cognitive psychology, we have a phrase for this kind of inaccurate "filling in of details"--- it's called: A Blind Spot. The term originally refers to the place in our eyes where the optic nerve connects the back of the eye to the brain. There are no photoreceptors in the area where the nerve connects to the eye. So that particular area of the eye is incapable of detecting images. It produces "A Blind Spot" in our field of vision. We aren't aware of it, because the brain fills in what it thinks belongs in the image, so the picture always appears complete to us. But the term "blind spot" has also taken on a more general meaning--- it refers to people being unaware of a bias that may affect their judgment about a subject.

And the same “blind-spot phenomenon” that affects memory and perception also affects imagination. Imagination is a faculty that some people use to anticipate future events in their lives. But the ease with which we imagine details can lead to unrealistic expectations and can bias our decisions.

So…um…Peter, suppose I ask you to imagine a lunch salad, no problem, right? But I bet you imagine specific ingredients. Did yours have tomatoes, Onion, Lettuce? mine did. Our brains fill in all sorts of details that might not be part of other people’s image of a salad, which could lead to disappointment for us. If the next time we order a salad in a restaurant, we have our imagined salad in mind, that’s not necessarily what we’ll get on our plate. The problem is not that we imagine things, but that we assume what we’ve imagined is accurate. We should be aware that our imagination has this built-in feature, the blind spot, which makes our predictions fall short of reality.

TPO 14 Lecture 2 Biology

Narrator:

Listen to part of a lecture in a biology class.

Professor:

Almost all animals have some way of regulating their body temperature; otherwise they wouldn’t survive extreme hot or cold conditions---sweating, panting, swimming to cooler or warmer water; ducking into somewhere cool like a burrow or a hole under a rock; these are just a few. And that spot is colder or warmer than the surrounding environment, because it’s a microclimate.

A microclimate is a group of climate conditions that affect a localized area, weather features like temperature, wind, moisture and so on. And when I say localized, I mean really localized, because microclimates can be, as the name suggests, pretty small, even less than a square meter. And microclimates are affected by huge number of other variables. Obviously weather conditions in the surrounding area are a factor. But other aspects of the location like, um… the elevation of the land, the plant life nearby, and so on, have a substantial effect on microclimates. And of course the human development in the area, um, a road will affect a nearby microclimate. It’s also interesting to note that microclimates that are near each other can have very different conditions. In the forest for example, there can be a number of very different microclimates close to each other, because of all the variables I just mentioned.

Student:

So how does a hole in the ground, a burrow, stay cool in a hot climate?

Professor:

Well, since cold air sinks, and these spots are shaded, they are usually much cooler than the surrounding area. And these spots are so important because many animals rely on microclimates to regulate their body temperature. Um, for instance, there is a species of squirrel, in the Western part of the United States that can get really hot when they are out foraging for food. So they need a way to cool down. So what do they do? They go back to their own burrow. Once they get there, their body temperatures decrease very, very quickly. The trip to the burrow prevents the squirrel from getting too hot.

Student:

But squirrels are mammals, right? I thought mammals regulated their temperature internally.

Professor:

Mammals do have the ability to regulate their body temperature, but not all can do it to the same degree, or even the same way. Like when you walk outside on a hot day, you perspire, and your body cools itself down, a classic example of how a mammal regulates its own body temperature. But one challenge that squirrels face, well many small mammals do, is that because of their size, sweating would make them lose too much moisture. They dehydrate. But on the other hand, their small size allows them to fit into very tiny spaces. So for small mammals, microclimates can make a big difference. They rely on microclimates for survival.

Student:

So cold-blooded animals, like reptiles, they can't control their own body temperature, so I can imagine the effect a microclimate would have on them.

Professor:

Yes, many reptiles and insects rely on microclimates to control their body temperature. A lot of reptiles use burrows or stay under rocks to cool down. Of course with reptiles, it's a balancing act. Staying in the heat for too long can lead to problems, but staying in the cold can do the same. So reptiles have to be really precise about where they spend their time, even how they position their bodies. And when I say they're precise, I mean it--- some snakes will search out a place under rocks of a specific thickness, because too thin a rock doesn't keep them cool enough, and too thick a rock will cause them to get too cold. That level of precision is critical to the snake for maintaining its body temperature.

And even microscopic organisms rely on microclimates for survival. Think about this, decomposing leaves create heat that warms the soil; the warm soil in turn affects the growth, the conditions of organisms there. And those organisms then affect the rate of decomposition of the leaves. So a microclimate can be something so small and so easily disturbed that even a tiny change can have a big impact. If someone on a hike knocks a couple of rocks over, they could be unwittingly destroying a microclimate that an animal or organism relies on.

TPO 14 Conversation 2

Narrator:

Listen to a conversation between a student and his faculty adviser

Advisor:

Hi, Steve. I scheduled this appointment 'cause it has been a while since we touched base.

Student:

I know I have been really busy--- a friend of mine works on the school paper. He asks me if I would like to try reporting so I did and I really love it.

Advisor:

Hey…that's sounds great!

Student:

Yeah… the first article I wrote, it was a profile of the chemistry professor---the one who was named Teacher of the Year. My article ran on the front page. When I saw my name, I mean my byline in print, I was hooked. Now I know this is what I want to do--- be a reporter.

Advisor:

Isn't it great to discover something that you really enjoy? And I read that the article too? It was very good.

Student:

To be honest, the article got lots of editing. In fact I barely recognized a couple of paragraphs. But the editor explained why the changes were made. I learned a lot and my second article didn't need nearly as many changes.

Advisor:

Sounds like you've got a real knack for this.

Student:

Yeah… anyway, I am glad you scheduled this meeting 'cause I want to change my major to journalism now.

Advisor:

Um... the university doesn't offer a major in journalism.

Student:

Oh no…

Advisor:

But….

Student:

I… I mean… should I transfer to another school, or major in English?

Advisor:

Well… wait a minute. Let me explain why the major isn't offered. Editors at newspaper… editors… I mean when you apply for a reporting job, editors look at two things--- they want to see clips, you know, some of your published articles, they'll also want you to try out, they'll give you an assignment like… covering a press conference or some other event, then see if you can craft a story about it, accurately, on deadline.

Student:

So they don't even look at my major?

Advisor:

It is not that they don't look at it… it is… well, having a degree in something other than journalism should actually work to your advantage.

Student:
How?

Advisor:

Most journalists specialize these days. They only write about science or business or technology for example. Is there a type of reporting you think you may like to specialize in?

Student:

Well… I think it'd be really cool to cover the Supreme Court. I mean… their decisions
affect so many people.

Advisor:

That is really a goal worth striving for. So, why not continue major in political science? And as electives, you could take some Pre-Law classes like Constitutional Law, and as for your work on the student newspaper, maybe they'd let you cover some local court cases--- ones that students and professors here would want to read about.

Student:
Do you know of any？

Advisor:
I do. Actually, there is case involving this computer software program that one of our professors wrote. The district court is deciding if the university is entitled to any of the professor's profits?

Student:
Wow…. I will definitely follow up on that!

TPO 14 Lecture 3 Astronomy

Narrator:

Listen to part of a lecture in an astronomy class.

Professor:

OK, last time we talked about ancient agricultural civilizations that observed the stars and then used those observations to keep track of the seasons. But today I want to talk about the importance of stars for early seafarers, about how the fixed patterns of stars were used as navigational aids.

OK, you've all heard about the Vikings and their impressive navigation skills, but the seafaring peoples of the Pacific islands, the Polynesians and the Micronesians, were quite possibly the world's greatest navigators. Long before the development of, uh, advanced navigational tools in Europe, Pacific islanders were travelling from New Zealand to Hawaii and back again, using nothing but the stars as their navigational instruments.

Um, the key to the Pacific islanders' success was probably their location near the equator. What that meant was that the sky could be partitioned, divided up, much more symmetrically than it could farther away from the equator. Unlike the Vikings, early observers of the stars in Polynesia or really anywhere along the equator would feel that they were at the very center of things, with the skies to the north and the skies to the south behaving identically, they could see stars going straight up in the east and straight down in the west. So it was easier to discern the order in the sky than farther north or farther south, where everything would seem more chaotic.

Take the case of the Gilbert Islands, they are part of Polynesia, and lie very close to the equator. And the people there were able to divide the sky into symmetrical boxes, according to the main directions, north, east, south and west. And they could precisely describe the location of a star by indicating its position in one of those imaginary boxes. And they realized that you had to know the stars in order to navigate. In fact there was only one word for both in the Gilbert Islands, when you wanted the star expert, you ask for a navigator.

Um, islanders from all over the Pacific learned to use the stars for navigation, and they passed this knowledge down from generation to generation. Some of them utilized stone structures called stone canoes, uh, and these canoes were on land, of course, and you can still see them on some islands today. They were positioned as if they were heading in the direction of the points on the sea horizon where certain stars would appear and disappear during the night, and, um, young, would-be navigators sat by the stones at night and turned in different directions to memorize the constellations they saw, so they could recognize them and navigate… by them later on when they went out to sea.

One important way the Polynesians had for orienting themselves was by using zenith stars. A zenith star was a really bright star that would pass directly overhead at a particular latitude…at a particular distance from the equator, often at a latitude associated with some particular Pacific island. So the Polynesians could estimate their latitude just by looking straight up, by observing whether a certain zenith star passed directly overhead at night, they'd know if they have reached the same latitude as a particular island they were trying to get to.

Um, another technique used by the Polynesians was to look for a star pair, that's two stars that rise at the same time, or set at the same time, and navigators could use these pairs of stars as reference points, because they rise or set together only at specific latitudes. So navigators might see one star pair setting together. And, uh…would know how far north or south of the equator they were. And if they kept on going, and the next night they saw the pair of stars setting separately, then they would know that they were at a different degree of latitude. So looking at rising and setting star pairs is a good technique. Um… actually it makes more sense with setting stars; they can be watched instead of trying to guess when they'll rise.

Uh, OK, I think all this shows that navigating doesn't really require fancy navigational instruments; the peoples of Pacific islands had such expert knowledge of astronomy as well as navigation that they were able to navigate over vast stretches of open ocean. Uh, it's even possible that Polynesian navigators had already sailed to the Americas, centuries before Columbus.

TPO 14 Lecture 4 Archeology

Narrator:

Listen to part of a lecture in an archaeology class

Professor:

When we think of large monumental structures built by early societies, an Egyptian pyramid probably comes to mind. But there are some even earlier structures in the British Isles also worth discussing, and besides the well-known circle of massive stones of Stonehenge, which don't get me wrong is remarkable enough, well, other impressive Neolithic structures are found there too. Oh, yes, we are talking about the Neolithic period here, also called new Stone Age, which was the time before stone tools began to be replaced by tools made of bronze and other metals. It was about 5000 years ago, even before the first Egyptian pyramid that some amazing Neolithic monuments---tombs, were erected at various sites around Ireland, Great Britain and coastal islands nearby.

I am referring particular to structures that in some cases, look like ordinary natural hills but were definitely built by humans, well-organized communities of humans to enclose a chamber or room within stone walls and sometimes with a high, cleverly designed ceiling of overlapping stones. These structures are called Passage Graves, because the inner chamber, sometimes several chambers in fact, could only be entered from the outside through a narrow passageway.

Michael:

Excuse me, professor, but you said Passage Graves. Were these just monuments to honor the dead buried there or were they designed to be used somehow by the living?

Professor:

Ah, yes! Good question, Michael. Besides being built as tombs, some of these Passage Graves were definitely what we might call Astronomical Calendars, with chambers that were flooded with sunlight on certain special days of the year, which must've have seemed miraculous and inspired a good deal of religious wonder. But research indicates that not just light but also the physics of sound helped enhance

this religious experiences.

Michael:

How so?

Professor:

Well, first the echoes. When a religious leader started chanting with echoes bouncing off the stonewalls over and over again, it must've seemed like a whole chorus of other voices, spirits of Gods maybe, joining in.

But even more intriguing is what physicists called

Standing Waves. Basically, the phenomenon of Standing Waves occurs when sound waves of the same frequency reflect off the walls and meet from opposite directions. So, the volume seems to alternate between very loud and very soft. You can stand quite near a man singing in loud voice and hardly hear him. Yet step a little further away and his voice is almost deafening. As you move around the chamber, the volume of the sound goes way up and way down, depending on where you are in these standing waves. And often the acoustics make it hard to identify where sounds are coming from. It's as if powerful voices are speaking to you or chanting from inside your own head. This had to engender a powerful sense of awe in Neolithic worshipers.

And another bit of physics at play here is something called Resonance. I am no physicist, but well I imagine you have all blown air over the top of an empty bottle and heard the sound it makes. And you've probably noticed that depending on its size--- each empty bottle plays one particular musical note. Or as a physicist might put it, each bottle resonates at a particular frequency. Well, that's true of these chambers too. If you make a constant noise inside the chamber, maybe by steadily beating drum at a certain rate, a particular frequency of sound will resonate, will ring out intensely, depending on the size of the chamber. In some of the larger chambers though, these intensified sound may be too deep for us to hear, we can feel it. We are mysteriously agitated by it….but it is not a sound our ears can hear.

The psychological effects of all these extraordinary sounds can be profound, especially when they seem so disconnected from the human doing the drumming or chanting. And there can be observable physical effects on people too. In fact, the sounds can cause headaches, feelings of dizziness, increased heart rate, that sort of thing, you see. Anyway, what was experienced inside one of these Passage Graves clearly could be far more intense than the everyday reality outside, which made them very special places.

But back to your question, Michael, as to whether these Graves were designed to be used by the living. Well, certainly, with regard to astronomical or calendar function. That seems pretty obvious, and I wanna go into more detail on that now.

TPO 15

Conversation 1

Narrator:
Listen to a conversation between a student and the faculty advisor of the campus newspaper .

Student
Hi! I talked to someone on the phone a couple of weeks ago, Anna , I think it was?
Advisor
I'm Anna, the faculty advisor
Student
Oh, great! I'm Peter Murphy. You probably don't remember me, but …
Advisor
No! No! I remember you . You were interested in working for the paper.
Student
Yeah, as a reporter .
Advisor
That's right. You're taking a journalism class and you've done some reporting before in high school, right?
Student
Wow, you have a good memory.
Advisor
Well we haven ' t had many students applying lately so … so anyway, you still want to do some reporting for us?
Student
Yeah, if you have room for me on the staff .
Advisor
Well we always need more reporters, but you know, we don't pay anything, right?
Student

Yeah, I know, but I ...uh.. . I'd like the experience. It would look good on my resume .

Advisor

Absolutely! Let's see . I think I told you that we ask prospective reporters to turn in some outlines for possible articles .

Student

Yeah, I sent them in about a week ago, but I haven't heard anything back yet, so, so I thought I'd stop by and see, but I guess you haven't looked at them yet .

Advisor

Oh, Max, the news editor. He looks at all the submissions

Student

Oh , so he hasn't made any decision about me yet?

Advisor

Well I just got here a few minutes ago... haven't been in for a couple of days. Just give me a second to check my e-mail. Uh … here is a message from Max. Let ' s see. Well it seems you've really impressed him. He says it would be wonderful if you could join our staff.

Student

Oh, great! When can I start?

Advisor

WeII, you turned in an outline on something to do with the physics department?

Student

Yeah, they're trying to come up with ways to get more students to take their introductory courses.

Advisor

Right, well , apparently, nobody else is covering that story , so he wants you to follow up on it.

Student

OK. Uh … what about the other outline I sent in, about the proposed increase in tuition fees?

Advisor

Oh, it looks like we've got that covered

Student

So I am starting with an article about the physics department. I guess I'd better get to work. Do you have any advice on how I should cover the story?

Advisor

Well, Max will want to talk to you but I am sure he will tell you to find out things like why the physics department's worried about enrollment. Has the number of students been getting smaller in recent years? By how much? What kinds of plans are they considering to address this problem?

Student

Right, some of those issues are already in what I proposed .

Advisor

And you'll want to do some interviews, you know, what do the professors think of the plans , what do the students think... you get the idea but …

Student

But wait till I talk to Max before proceeding .

Advisor

Right, he'll cover everything you need to know to be a reporter for us .

Can you come back this afternoon? He will be here until 5 o'clock .

TPO 15 Lecture 1 Psychology

Narrator:

Listen to part of a lecture in a psychology class

Professor

For decades, psychologists have been looking at our ability to perform tasks while other things are going on, how we are able to keep from being distracted and what the conditions for good concentration are.

As long ago as 1982, researchers came up with something called the CFQ - the Cognitive Failures Questionnaire. This questionnaire asks people to rate themselves according to how often they get distracted in different situations, like um … .. forgetting to save a computer file because they had something else on their mind or missing a speed limit sign on the road. John?

John

I've lost my share of computer files, but not because I'm easily distracted. I just forget to save them.

Professor

And that's part of the problem with th e CFQ. It doesn ' t take other factors into account enough, like forgetfulness. Plus you really can ' t say you are getting objective scientific results from a subjective questionnaire where people report on themselves.

So it ' s no surprise that someone attempted to design an objective way to measure distraction. I t ' s a simple computer game designed by a psychologist named, Nilli Lavie. In Lavie ' s game, people watch as the letters N and X appear and disappear in a certain area on the computer screen. Every time they see an N, they press one key, and every time they see an X they press another, except other letters also start appearing in the surrounding area of the screen with increasing frequency which creates a distraction and makes the task more difficult. Lavie observed that people ' s reaction time slowed as these distractions increased.

Student 2

Well that's not too surprising, is it?

Professor

No, it's not. It's the next part of the experiment that was surprising. When the difficulty really increased, when the screen filled up with letters, people got better at spotting the Xs and Ns . Why do you think that happened?

John

Well, maybe when we are really concentrating, we just don't perceive irrelevant information . Maybe we just don't take it in, you know?

Professor

Yes, and that's one of the hypotheses that was proposed, that the brain simply doesn't admit the unimportant information. The second hypothesis is that, yes, we do perceive everything, but the brain categorizes the information, and whatever is not relevant to what we are concentrating on gets treated as low priority.

So Lavie did another experiment, designed to look at this ability to concentrate better in the face of increased difficulty. This time she used brain scanning equipment to monitor activity in a certain part of the brain, the area called V5, which is part of the visual cortex, the part of our brains that processes visual stimuli. V5 is the area of the visual cortex that's responsible for the sensation of movement. Once again, Lavie gave people a computer-based task to do.

They have to distinguish between words in upper and lower-case letters or even harder, they had to count the number of syllables in different words. This time the distraction was a moving star field in the background, you know, where it looks like you are moving through space, passing stars. Normally area of V5 would be stimulated as those moving stars are perceived and sure enough, Lavie found that during the task area of V5 was active, so people were aware of the moving star field. That means people were not blocking out the distraction.

Student

So doesn't that mean that the first hypothesis you mentioned was wrong, the one that says we don't even perceive irrelevant information when we are concentrating?

Professor

Yes that's right, up to a point, but that's not all. Lavie also discovered that as she made the task more difficult , V5 became less active, so that means that now people weren ' t really noticing the star field at all. That was quite a surprise and it proved that the second hypothesis – that we do perceive everything all the time but the brain categorizes distractions differently, well, that wasn't true either.

Lavie thinks the solution lies in the brai 's ability to accept or ignore visual information. She thinks its capacity is limited. It's like a highway. When there are too many cars, traffic is stopped. No one can get on. So when the brain is loaded to capacity, no new distractions can be perceived .

Now that may be the correct conclusion for visual distractions, but more research is needed to tell us how the brain deals with, say, the distractions of solving a math problem when we are hungry or when someone is singing in the next room.

TPO 15 Lecture 2 Geology

Narrator:

Listen to part of a lecture in a geology class .

Professor

As geologists, we examine layers of sediment on the Earth' s surface to approximate the dates of past geologic time periods. Uh... sediment as you know, is material like sand , gravel, fossil fragments that is transported by natural processes like wind , water flow or the movement of glaciers. So sediment is transported and then deposited and it forms layers on the Earth's surface over time. We examine these layers to learn about different geologic time periods including when they began and ended.

For example, from about 1.8 million years ago to around 11 thousand years ago was the Pleistocene Epoch. The Pleistocene Epoch was an ice age. During this Epoch, sediment was made by the kind of erosion and weathering that happens when the climate is colder, and part of those sediments are fossils of plants and animals that lived at that time.

The Holocene Epoch followed the Pleistocene Epoch when the Earth ' s climate warmed up around 11 thousand years ago. The Holocene Epoch is characterized by different sediments, ones that form when the climate is warmer. Because the climate changed, the types of plants and animals changed also. Holocene sediments contain remnants of more recent plants and animals, so it's pretty easy to differentiate geologically between these two Epochs.

Now there is growing evidence that the presence of humans has altered the Earth so much that a new Epochc of geologic history has begun – the Anthropocene Epoch, a new human-influenced Epoch. This idea that we've entered a new Anthropocene Epoch was first proposed in 2002. The idea is that around the year 1800 CE the human population became large enough, around a billion people, that its activities started altering the environment.

This was also the time of the industrial revolution, which brought a tremendous increase in the use of fossil fuels such as coal. The exploitation of fossil fuels has brought planetwide developments: industrialization, construction, uh, mass transport. And these developments have caused major changes like additional erosion of the Earth’s surface and deforestation. Also, things like the damming of rivers , has caused increased sediment production, not to mention the addition of more carbon dioxide and methane in the atmosphere. Naturally all these changes show up in recent sediments. And these sediments are quite different from pre year 1800 sediment layers.

Interestingly there's some speculation that humans started having a major impact on Earth much earlier, about 8000 years ago. That's when agriculture was becoming widespread. Early farmers started clearing forests and livestock produced a lot of extra methane. But I want to stress this is just a hypothesis. The idea that early humans could have had such a major effect, well I'm just not sure we can compare it with the industrial age.

Geologists in the far future will be able to examine the sediment being laid down today, whereas right now we can say that yes, human impact on the Earth is clear: It'll be future researchers who have a better perspective and will be able to really draw a line between the Holocene and the Anthropocene Epochs

TPO 15 Conversation 2

Narrator

Listen to part of a conversation between a student and her biology professor .

Professor

Hi Samantha, how did your track meet go?

Samantha

Great! I placed first in one race and third in another.

Professor

Congratulations ! You must practice a lot.

Samantha

Three times a week pre-season, but now that we’re competing every weekend, we practice 6 days a week from 3:30 till 5:00.

Professor

Athletics place a heavy demand on your time, don ’ t they?

Samantha

Yeah, but I really love competing, so …

Professor

You know I played soccer in college and my biggest challenge, and I didn ’ t always succeed, was getting my studying in during soccer season. Are you having a similar …

Samantha

No, I … I really do make time to study. And I actually study more for this class than I do for all my other classes. But I didn ’ t see the grade I expected on my mid-term exam, which is why I came by.

Professor

Well, you didn't do badly on the exam, but I agree it did not reflect your potential. I say this because your work on the lab project was exemplary. I was so impressed with the way you handle the microscope and the samples of onion cells, and with how carefully you observed and diagramed and interpreted each stage of cell division. And I don't think you could have done that if you hadn't read and understood the chapter. I mean it seemed like you really had a good understanding of it.

Samantha

I thought so too, but I missed some questions about cell division on the exam.

Professor

So what happened?

Samantha

I just sort of blanked out, I guess. I had a hard time remembering details. It was so frustrating.

Professor

Alright, let's back up. You say you studied, where, at home?

Samantha

At my kitchen table actually.

Professor

And that's supposed to be a quiet environment?

Samantha

Not exactly. My brother and parents try to keep it down when I am studying, but the phone pretty much rings off the hook, so …

Professor

So you might try a place with fewer distractions, like the library …

Samantha

But the library closes at mid-night, and I like to study all night before a test, you know, so everything is fresh in my mind. I studied six straight hours the night before the mid-term exam . That ' s why I expected to do so much better.

Professor

Oh ok. You know that studying six consecutive hours is not equivalent to studying one hour a day for six days.

Samantha

It isn't?

Professor

No. There is research that shows that after about an hour of intense focus, your brain needs a break. It needs to, you know, shift gears a little. Your brain's ability to absorb information starts to decline after about the first hour. So if you are dealing with a lot of new concepts and vocabulary, anyway, if you just review your notes, even 20 minutes a day, it'd be much better than waiting until the night before an exam to try and absorb all those details.

Samantha

Oh, I didn't realize.

Professor

Think of your brain as a muscle. If you didn't practice regularly with your track team, and then tried to squeeze in three weeks worth of running practice the day before a track meet, how well do you think you'd perform in your races?

TPO 15 Lecture 3 Art History

Narrator:

Listen to part of a lecture in an art history class.

Professor:

Now in Europe in the Middle Ages before the invention of printing and the printing press, all books, all manuscripts were hand-made. And the material typically used for the pages was parchment, which is animal skin that's stretched and dried under tension, so it become s really flat and can be written on . During the 1400s, when printing was being developed, paper became the predominant material for books in Europe, but prior to that, it was parchment. Parchment is durable, much more so than paper, and it could be reused which came in handy since it was a costly material and in short supply, so it wasn ’ t uncommon for the scribes or monks who produced the manuscripts .

Ah, remember before printing books were made mainly in monasteries . Well, the scribes often recycled the parchment that’d been used for earlier manuscripts. They simply
erased the ink off the parchment and wrote something new in its place
A manuscript page that was written on, erased and then used again is
called a palimpsest.

Palimpsests were created, well, we know about two methods that were used for removing ink from parchment. In the late Middle Ages, it was customary to scrape away the surface of the parchment with an abrasive, which completely wiped out any writing that was there. But earlier in the Middle Ages, the original ink was usually removed by washing the used parchment with milk. That removed the ink. But with the passing of time, the original writing might reappear. In fact , it might reappear to the extent that scholars could make out and even decipher the original text.

Perhaps, the most famous example is the Archimedes' palimpsest.

Archimedes lived in Greece around 200 BCE, and as you probably know, he's considered one of the greatest Mathematicians who ever lived, even though many of his writings had been lost , including what many now think to be his most important work called The Method .

But in 1998, a book of prayers from the Middle Ages sold in an art auction for a lot of money, more money than anyone would pay for a damaged book from the 12th century. Beautiful or not, why? It had been discovered that the book was a palimpsest, and beneath the surface writing of the manuscript laid, guess what? Mathematical theorems and diagrams from Archimedes.

Archimedes' writings were originally done on papyrus scrolls. Then in the 10 th century, a scribe made a copy on parchment of some of his texts and diagrams including, as it turns out, The Method . This was extremely fortunate, since later on, the original papyrus scrolls disappeared. About 200 years later in the 12 th century, this parchment manuscript became a palimpsest when a scribe used the parchment to make a prayer book. So the pages, the pieces of parchment themselves, had been preserved. But the Archimedes' text was erased and written over, and no one knew it existed.

It wasn't until 1906 that a scholar came across the prayer book in a library and realized it was a palimpsest, and that the underlying layer of texts could only have come from Archimedes. That was when his work The Method was discovered for the first time.

Um... the palimpsest then went through some more tough times, but eventually it ended up in an art auction where was bought and then donated to an art museum in Baltimore, for conservation and study. To avoid further damage to the manuscript, the research team at the art museum has had to be extremely selective in the techniques they used to see the original writing. They've used ultraviolet light and some other techniques, and if you're interested in that sort of thing, you can learn more about it in an art conservation class.

But actually, it was a physicist who came up with a method that was a breakthrough. He realized that the iron in the ancient ink would display if exposed to a certain X-ray imaging method, and except for small portions of the text that couldn't be deciphered, this technique's been very helpful in seeing Archimedes' texts and drawings through the medieval overwriting.

TPO 15 Lecture 4 Biology

Narrator:
Listen to part of a lecture in a biology class.

Professor:
OK. We've been talking till now about the two basic needs of a biological community – an energy source to produce organic materials, you know uh, food for the organisms, and the waste recycling or breakdown of materials back into inorganic molecules, and about how all this requires photosynthesis when green plants or microbes convert sunlight into energy, and also requires microorganisms, bacteria, to secrete chemicals that break down or recycle the organic material to complete the cycle.

So, now we are done with this chapter of the textbook, we can just review for the weekly quiz and move on to the next chapter, right? Well, not so fast. First, I ‘d like to talk about some discoveries that have challenged one of these fundamental assumptions about what you need in order to have a biological community.

And, well, there actually were quite a few surprises. It all began in 1977 with the exploration of hydrothermal vents on the ocean floor. Hydrothermal vents are cracks in the Earth’s surface that occur, well, the ones we are taiking about here are found deep at the bottom of the ocean. And these vents on the ocean floor, they release this incredibly hot water, 3 to 4 times the temperature that you boil water at, because this water has been heated deep within the Earth.

Well about 30 years ago, researchers sent a deep-sea vessel to explore the ocean’s depth, about 3 kilometers down, way deep to the ocean floor, No one had ever explored that far down before. Nobody expected there to be any life down there because of the conditions.

First of all, sunlight doesn't reach that far down so it ’ s totally dark. There couldn’t be any plant or animal life since there's no sunlight, no source of energy to make food. If there was any life at all, it’d just be some bacteria breaking down any dead materials that might have fallen to the bottom of the ocean . And?

Student 1
And what about the water pressure? Didn ’ t we talk before about how the deeper down into the ocean you go, the greater the pressure?

Professor
Excellent point! And not only the extreme pressure, but also the extreme temperature of the water around these vents. If the lack of sunlight didn't rule out the existence of a biological community down there then these factors certainly would, or so they thought.

Student 2
So you are telling us they did find organisms that could live under those conditions?

Professor:
They did indeed, something like 300 different species.

Student 1
But... but how could that be? I mean without sunlight, no energy, no no …

Protessor:
What they discovered was that microorganisms, bacteria, had taken over both functions of the biological community - the recycling of waste materials and the production of energy. They were the energy source. You see, it turns out that certain microorganisms are chemosynthetic - they don't need sunlight because they take their energy from chemical reactions.

So, as I said, unlike green plants which are photosynthetic and get their energy from sunlight, these bacteria that they found at the ocean floor, these are chemosynthetic, which means that they get their energy from chemical reactions. How does this work?

As we said, these hydrothermal vents are releasing into the ocean depth this intensely hot water and here is the thing, this hot water contains a chemical called hydrogen sulfide, and also a gas , carbon dioxide. Now these bacteria actually combine the hydrogen sulfide with the carbon dioxide and this chemical reaction is what produces organic material which is the food for larger organisms. The researchers had never seen anything like it before.

Student 2 :
Wow! So just add a chemical to a gas, and bingo, you ’ ve got a food supply?

Professor
Not just that! W hat was even more surprising were all the large organisms that lived down there. The most distinctive of these was something called the tube worm. Here, let me show you a picture . The tube of the tube worm is really, really long. They can be up to one and a half meters long , and these tubes are attached to the ocean floor, pretty weird looking, huh?

And another thing, the tube worm has no mouth or digestive organs. So you are asking how does it eat? Well, they have these special organs that collect the hydrogen sulfide and carbon dioxide and then transfer it to another organ, where billions of bacteria live. These bacteria that live inside the tube worms, the tube worms provide them with hydrogen sulfide and carbon dioxide. And the bacteria, well the bacteria kind of feed the tube worms through chemosynthesis, remember, that chemical reaction I described earlier.

TPO 16

Conversation1

Narrator:
Listen to a conversation between a Student and a facilities Manager at the university.

Student:
Hi. I’m Melanie, the one who’s been calling.

Manager:
From the singing group, right?

Student:
From the choir.

Manager:
Right, the choir. It's nice to finally meet you in person. So, you are having problems with...

Student:
Noise. Like I explained on the phone we've always had our rehearsals in the Lincoln Auditorium every day at 3 o'clock and it's always worked just great. But the past few weeks with the noise, it's been a total nightmare since construction started next door on the science hall.

Manager:
Oh, that's right. They're building that addition for new laboratories.

Student:
Exactly. Anyway, ever since they started working on it, it's been so noisy we can barely hear ourselves think.

Manager:
Let alone sing.

Student:
Forget about singing. I mean, we keep the windows down and everything, but once those bulldozers get going, I mean those machines are loud. We've already had to cut short two rehearsals and we've got a concert in 6 weeks.

Manager:
Well, that's not good. I'm assuming you've tried to reschedule your rehearsals. They don't do construction work at night.

Student:
I ran that by the group, but there were just too many... I mean evenings are really hard. It seems like everyone in the choir already has plans and some even have classes at night.

Manager:
And what about the music building?

Student:
You know, originally we were booked in one of the rehearsal rooms in the music building, but then we switched with the jazz ensemble. They're a much smaller group and they said the acoustics, the sound in that room, was better for them. So having us move to a bigger space like the Lincoln Auditorium seemed like a reasonable idea.

Manager:
But now...

Student:
All that noise. I don't know. I just wonder if the jazz ensemble knew what was going to happen.

Manager:
Well, that wouldn't be very nice.

Student:
No. But it really was quite a coincidence. Anyway, now the music building's fully booked, mornings, afternoons, everything, we just need a quiet space. And it has to have a piano.

Manager:
A piano. Of course some of the other auditoriums have pianos, but that's not going to be easy.

Student:
You think they're pretty booked up?

Manager:
Probably. But it can't hurt to check. What about Bradford Hall? I remember a piano in the old Student center there.

Student:
At this point, we'd be grateful for any quiet place.

Manager:
Can you... How flexible can you be on times? You said no evenings, but what if can't find something open at 3 o'clock? Can you move earlier or later?

Student:
I wish I could say another time would be okay, but you know how it is, everybody's already got commitments for the whole semester. 2:30 or 3:30 would probably be okay, but I don't think we could go much outside that

Manager:
Well, check with me tomorrow morning. I should've found something by then. It might not be ideal...

Student:
As long as it's got a piano and nobody's putting up a building next door, we'll be happy.

TPO 16 Lecture 1 geology

Narrator:
Listen to a part of lecture in a geology class.

Professor:
Now there are some pretty interesting caves in parts of the western United States, especially in national parks. There is one part that has over a hundred caves, including some of the largest ones in the world. One of the more interesting ones is

called Lechuguilla Cave. Lechuguilla has been explored a lot in recent decades. It's a pretty exciting place I think. It was mentioned only briefly in your books. So can anyone remember what it said? Ellen?

Male Student:
It's the deepest limestone cave in the U.S.?

Professor:
That's right. It's one of the longest and deepest limestone caves not just in the country but in the world. Now, what else?

Male Student:
Well, it was formed because of sulfuric acid, right?

Professor:
That's it. Yeah, what happens is you have deep underground oil deposits and there are
bacteria. Here let me draw a diagram.
Part of the limestone rock layer is permeated by water from below. Those curly lines are supposed to be cracks in the rock. Below the water table and rock is oil. Bacteria feed on this oil and release hydrogen sulfide gas. This gas is hydrogen sulfide, rises up and mixes with oxygen in the underground water that sits in the cracks and fissures in the limestone. And when hydrogen sulfide reacts with the oxygen in the water, the result of that is sulfuric acid, Ok? Sulfuric acid eats away at limestone very aggressively. So you get bigger cracks and then passageways being formed along the openings in the rock and it's all underground. Ah yes, Paul?

Male Student:
So that water... It's not flowing, right? It's still?

Professor:
Yes, so there's two kinds of limestone caves. In about 90 percent of them, you have water from the surface, streams, waterfall or whatever - moving water that flows through cracks found in the limestone. It's the moving water itself that wears away at the rock and makes passageways.

Also, in surface water, there is a weak acid, carbonic acid, not sulfuric acid, but carbonic acid that helps dissolve the rock. With a little help from this carbonic acid, moving water forms most of the world's limestone caves. When I was researching this for a study a few years ago, I visited a couple of these typical limestone caves, and they were all very wet, you know, from streams and rivers. This flowing water
carved out the caves and the structures inside them.

Male Student:
But not Lechuguilla?

Professor:
Dry as a bone. Well, that might be a bit of an exaggeration. But it's safe to say that it's sulfuric acid and not moving water that formed Lechuguilla cave and those few other ones like it. In fact, there is no evidence that flowing water has even gone in or out of the cave. So, it's like a maze. You have passageways all around. There are wide passages, narrow ones at all different depths, like underground tunnels in the limestone. And, since they were created underground and not from flowing surface water, not all these passageways have an opening to the outside world.

And.. .and there is other evidence that
flowing water wasn't involved in Lechuguilla. We've said that sulfuric acid dissolves limestone, right, and forms the

passageways? What else does sulfuric acid do? Paul?

Male Student:
Ah, leaves a chemical residue ... um...

FeMale Student:
Gypsum, right?

Professor:
Yep, you'll find lots of gypsum deposited at Lechuguilla. And, as we know, gypsum is soluble in water. So if there were flowing water in the cave, it would dissolve the gypsum. This is part of what led us to the realization that Lechuguilla is in that small group of waterless caves.

And Lechuguilla is pretty much dormant now. It's not really forming any more. But, there is other ones like it, for example, in Mexico, that are forming. And when cave researchers go to explore them, they see and smell, the sulfuric acid and gases of...er...phew...now, something else, think of rotten eggs. And, it's not just the smell. Explorers even need to wear special masks to protect themselves from the gases in these caves. OK? Paul.

Male Student:
Yeah, how about what these caves look like on the inside?

Professor:
Well, the formations.. .there is really something. There's such variety there, like nothing anywhere else in the world, some of them are elaborate looking, like decorations. And a lot of them are made of gypsum and could be up to 20 feet long. It's pretty impressive.

TPO 16 Lecture 2 music history

Narrator:
Listen to part of a lecture in a music history class.

Professor:
Up until now in our discussions and readings about the Baroque and early classical periods,
we've been talking about the development of musical styles and genres within the
relatively narrow social context of its patronage by the upper classes. Composers, after all, had to earn a living and those who were employed in the services of a specific patron, well, I don't have to spell it out for you, the likes and dislikes of that patron, this would've had an effect on what was being composed and performed. Now, of course, there were many other influences on composers, um, such as the technical advances we've seen and the development of some of the instruments, uh, you remember the transverse flute, the clarinet and so on.

But I think if I were asked to identify a single crucial development in European music of this time, it would be the invention of the piano, which, interestingly enough also had a significant effect on European society of that time. And I'll get to that in a minute.

Now, as we know, keyboard instruments existed long before the piano - the organ, which dates back to the Middle Ages, as do other keyboard instruments, such as the harpsichord which is still popular today with some musicians. But none of these has had as profound an impact as the piano.

Uh, the piano was invented in Italy in 1709. The word piano is short for pianoforte, a combination of the Italian words for soft and loud. Now, unlike the harpsichord which came before it, the piano is a percussion instrument. You see, the harpsichord is actually classified as a string instrument, since pressing a key of a harpsichord causes a tiny quill that's connected to the key to pluck the strings that are inside the instrument, much the same as a guitar pick plucks the strings of a guitar But pressing the keys of a piano causes tiny felt-covered hammers to strike the strings inside the instrument, like drumsticks striking the head of a drum. This striking action is why the piano is a percussion instrument instead of a string instrument.

Okay, so why is this so important? Well, the percussive effect of those little hammers means that the pianist, unlike the harpsichordist, can control the dynamics of the sound - how softly or loudly each note is struck, hence the name, pianoforte, soft and loud.

Now, artistically for both composers and performers this was a major turning point. This brand new instrument, capable of producing loud and soft tones, greatly expanded the possibilities for conveying emotion. This capacity for increased expressiveness, in fact, was essential to the Romantic style that dominated 19th century music. But I'm getting ahead of myself.

Um, before we get back to the musical impact of this development, I wanna take a look at the social impact that I mentioned earlier.

Now, in the late 1700s and the earlier 1 800s, the development of the piano coincided with the growth of the middle class in Western Europe. Of course folk music, traditional songs and dances had always been part of everyday life. But as mass production techniques were refined in the 19th century, the price of pianos dropped to the point that a larger proportion of the population could afford to own them. As pianos became more available, they brought classical music, the music which previously had been composed only for the upper classes, into the lives of the middle class people as well.

One way in particular that we can see the social impact of this instrument is its role in the lives of women of the time. Previously, it was quite rare for a woman to perform on anything, but maybe a harp or maybe she sang. But suddenly in the 19th century it became quite acceptable, even, to some extent, almost expected for a middle-class European woman to be able to play the piano, partly because among upper-middle class women it was a sign of refinement. But it was also an excellent way for some women to earn money by giving piano lessons.

And some women, those few who had exceptional talent and the opportunity to develop it, their lives were dramatically affected. Later we'll be listening to works by a composer named Robert Schumann. But let's now talk about his wife Clara Schumann. Clara Schumann was born in Germany in 1819. She grew up surrounded by pianos. Her father sold pianos and both her parents were respected piano teachers. She learned to play the instrument when she was a small child and gave her first public recital at age 9. Clara grew up to become a well-known and respected piano virtuoso, a performer of extraordinary skill who not only gave concerts across Europe, but also was one of the first important female composers for the instrument.

Section 2

TPO 16 Script Conversation 2

Narrator:
Listen to a conversation between a Professor and a Student .

Professor
Jeff, I'm glad you drop by. I've been meaning to congratulate you on the class leadership award.

Student
Thanks Professor Brownson, I was really happy to get it and a little surprised. I mean, there were so many other people nominated.

Professor
Well, I know the award was well deserved. Now, what can I do for you today?

Student
I needed to talk to you about the medieval history test you know, the one scheduled for Friday afternoon.

Professor
Yes?

Student
Well, there is this trip that my French class is taking. We are going to Montreal for the weekend.

Professor
Montreal? That's my favorite city. What'll you be seeing there?

Student
I'm not sure yet. Well, the reason, the main reason I wanted to go is that we'll be rooming with French speaking Students there, you know, so we can get a chance to use our French, to actually talk with real French speakers.

Professor
It sounds like a good opportunity. But then, there is that test...

Student
Yeah... but.. well, the thing is the bus leaves right in the middle of when our history class meets this Friday. So, well, I was thinking maybe I could take the test on a different day like Monday morning during your office hours?

Professor
Eh...Monday morning...um...that would not be...oh wait, let me just see one thing. Aha, okay. That's what I thought. So, for your class, I was planning a take-home exam so you could just take the test along with you. Let's see, I guess you could come to class Friday just to pick up the test. That way you'd still make your bus, and then find some quiet time during your trip to complete it and you can bring it to class Wednesday when I'll be collecting everyone else's.

Student

Hmm.. . um...during the trip, well, I guess I could. So I should plan to take my books and stuff with me.

Professor

You'll definitely need your class notes. I'm giving you several short essay questions to make you think critically about the points we've discussed in class, to state.. .uh state and defend your opinion, analyze the issues, speculate about how things might have turned out differently. So, you see, I don't care if you look updates and that kind of thing. What I want is for you to synthesize information to reflect back on what we've read and discussed and to form your own ideas, not just repeat points from the textbook. Does that make sense?

Student

Yeah, I think so. You are looking for my point of view.

Professor

That's right. The mid-term exam showed me that you know all the details of who, where and when. For this test, I want to see how you can put it all together to show some original thinking.

Student

That's sounds pretty challenging, especially trying to work it into this trip. But, yeah, I think I can do it.

Professor

I'm sure you can.

Student

Thank you, Professor Brownson.

Professor

Have a great time in Montreal.

TPO 16 Lecture 3 biology

Narrator:

Listen to a part of a lecture in a biology class.

Professor

OK. Let's continue our discussion about animal behavior by talking about decisions that animals face, complex ones. Animals, even insects, carry out what look like very complex decision making processes.

The question is how. I mean no one really thinks that, say a bee goes through weighing the pros and cons of pollinating this flower or that flower. But then how do animals solve complex questions, questions that seem to require decision making. The answer we'll propose of course is that their behavior is largely a matter of natural selection. As an example, let's look at foraging behavior among beavers.

Beavers eat plants, mostly trees. And they also use trees and tree branches to construct their homes in streams and lakes.

So when they do forage for food and for shelter materials, they have to leave their homes and go up on land where their main predators are. So there are a number of choices that have to be made about foraging.

So for example, um... they need to decide what kind of tree they should cut down. Some trees have higher nutritional value than others, and some are better for building material, and some are good for both... um...aspen trees. Beavers peel off the bark to eat and they also use the branches for building their shelters. So aspens do double duty. But ash trees, beavers use ash trees only for construction.

Another decision is when to forage for food. Should they go out during the daytime when it's hotter outside and they have to expend more energy, or at night when the weather is cooler but predators are more active? Ok, but there are two more important issues, really the most central, the most important, OK?

First, let's say a beaver could get the same amount of wood from a single large tree, one that has lots of branches, as it could get from three small trees. Which should it choose? If it chooses one large tree, it'll have to carry that large piece of wood back home, and lugging a big piece of wood 40 or 50 yards is hard work, takes a lot of energy. Of course it'll have to make only one trip to get the wood back to the water. On the other hand, if it goes for three small trees instead, it will take less energy per tree to get the wood back home, but it'll have to make three trips back and forth for the three trees. And presumably, the more often it wanders from home, the more it's likely to be exposed to predators. So which is better, a single large tree or three small trees?

Another critical issue and it's related to the first, to the size issue, is how far from the water should it go to get trees. Should it be willing to travel a greater distance for a large tree, since it'll get so much wood from it? Beavers certainly go farther from the water to get an aspen tree than for an ash tree. That reflects their relative values. But what about size? Will it travel farther for a larger tree than It will for a smaller tree?

Now I would have thought the bigger the
tree, the farther the beaver would be willing to travel for it. That would make sense, right?
If you're going to travel far, make the trip worth it buy bringing back most wood possible.

But actually, the opposite is true. Beavers will cut down only large trees that are close to the water. They will travel far only to cut down certain small trees that they can cut down quickly and drag back home quickly. Generally, the farther they go from the water, the smaller the tree they will cut down. They're willing to make more trips to haul back less wood, which carries a greater risk of being exposed to predators. So it looks as though beavers are less interested in minimizing their exposure to predators and more interested in saving energy when foraging for wood, which may also explain why beavers forage primarily during the evenings.

OK, so why does their behavior indicate more of a concern with how much energy they expend than with being exposed to predators? No one believes a beaver consciously weighs the pros and cons of each of these elements. The answer that some give is that their behavior has evolved over time. It's been shaped by constraints over vast stretches of time, all of which comes down to the fact that the best foraging strategy for beavers isn't the one that yields the most food or wood. It's the one that results in the most descendants, the most offspring. So let's discuss how this idea works.

TPO 16 Lecture 4 art history

Narrator:
Listen to part of a lecture in an art history class.

Professor
OK, now um, a sort of paradigmatic art form of the Middle Ages was stained glass art. Stained glass of course is simply glass that has been colored and cut into pieces and re-assembled to form a picture or a decorative design. To truly experience the beauty of this decorative glass you should see it with light passing through it, especially sunlight, which is why stained glass is usually used for windows. But of course it has other uses, especially nowadays.

Um, anyway the art of making stained glass windows developed in Europe, urn, during the Middle Ages and was closely related to church building. In the early 1100s a church building method was developed that reduced the stress on the walls so more space could be used for window openings allowing for large and quite elaborate window designs.

Back then, the artists made their own glass, but first they came up with the design. Paper was scarce and expensive, so typically they drew the design onto a white tabletop. They'd draw the principal outline but also outline the shape of each piece of glass to be used and indicate its color.

Now in the window itself the pieces of glass would be held together by strips of lead. So in the drawing the artists would also indicate the location of the lead strips. Then you could put a big piece of glass on the tabletop and see the design right through it and use it to guide the cutting of the glass into smaller pieces.

Student
And the lead that was just to hold the pieces of glass together?

Professor
Well, lead is strong and flexible so it's ideal for joining pieces of glasses cut in different shapes and sizes. But up to the 15th century the lead strips also helped create the design. They were worked into the window as part of the composition. They were used to outline figures to show boundaries just like you might use solid lines in a pencil drawing.

Student
How did they get the color'? I mean how did they color the glass?

Professor
Well up until the 16th century stained glass was colored during the glass making process itself. You got specific colors by adding metallic compounds to the other glass making ingredients.

So if you wanted red you added copper, if you wanted green you added iron. You just added these compounds to the other ingredients that the glass was made of.

Student
So each piece of glass is just one color?

Professor
Yes, at least up until the 16th century. Then they started... um.. .you started to get painted glass. Painted glass windows are still referred to as stained glass but the colors were actually painted directly onto clear glass after the glass was made. So um ... with this kind of stained glass, you could paint a piece of glass with more than one color.

Student
And with painted glass they still used the lead strips?

Professor

Yes, with really large windows it took more than one piece of glass, so you still needed lead strips to hold the pieces together. But the painters actually tried to hide them. So it was different from before when the lead strips were part of the design. And it is different, because with painted glass the idea of light corning through to create the magical effect wasn't the focus any more. The paintwork was.

And painted glass windows became very popular. In the 19th century, people started using them in private houses and public buildings. Unfortunately, many of the original stained glass windows were thought to be old fashioned and they were actually destroyed, replaced by painted glass.

Student
They actually broke them? That showed good judgment, real foresight, didn't it?

Professor
Yes, if only they had known. Uh, and it's not just that old stained glass is really valuable today, we lost possibly great artwork. But luckily there was a revival of the early techniques in the mid-I 800s and artists went back to creating colored glass and using the lead strips in their designs. The effects are much more beautiful.

In the 19th century, Louis Tiffany came up with methods to create beautiful effects without having to paint the glass. He layered pieces of glass and used thin copper strips instead of lead, which let him make these really intricate flowery designs for stained glass, which he used in lampshades. You've heard of Tiffany lampshades, right? These of course took advantage of the new innovation of electric lighting. Electric light bulbs don't give quite the same effect as sunlight streaming through stained glass, but it's close. So layered glass, Tiffany glass, became very popular and still is today.

So let's look at some examples of different types of stained glass from each era.

TPO 17

Conversation 1

Narrator
Listen to a conversation between a student and a professor.

Professor
OK, let' s see. Right, Modern Stagings of a Shakespearian Classic. Well, like I told you last week, I think that's a great topic for you paper. So the title would be something like ... uh ...

Student
I am not really sure, probably something like 20th
century stagings of A Midsummer
Night's Dream.

Professor
Yes, I like that. Straightforward and to the point. So how is the research going?

Student
Well, that's what I came to talk to you about. I was wondering if you happen to have

a copy of the Peter Brook production of A Midsummer Night's Dream in your video collection. I've been looking for it everywhere and I am having a really hard time tracking it down.

Professor

That's because it doesn't exist.

Student

You mean in your collection ? Or at all?

Professor

I mean at all. That particular production was never filmed or recorded.

Student

Oh no. I had no idea. From what I read, that production, like, it influenced every other production of the play that came after it. So I just assumed it had been filmed or videotaped.

Professor

Oh, It definitely was a landmark production. And it's not like it ran for just a week, but either it was never filmed or if it was the film's been lost. And it' s ironic because there's even a film about the making of the production, but none of the production itself.

Student

So now what do I do? If there is no video.

Professor

Well, think about it. This is the most important 20th century staging of A Midsummer Night's Dream, right?

Student

But how can I write about Brook's interpretation of the play if I can't see his production.

Professor

Just because there's no recording doesn't mean you can't figure out how it influenced other productions.

Student

Yeah, I guess there's enough material around, but it will be a challenge.

Professor

True. But think about it, you are writing about dramatic arts, the theater, and that 's the nature of theater, isn't it?

Student

You mean because it is live, when the performance is finished ...

Professor

That's it. Unless it' s filmed, it's gone. But that doesn't mean we can't study it. And of course some students in this class are writing about productions in the 19th century, there are no videos of those. You know, one of the challenges for people who study theater is to find way of talking about something that 's really so transient, about something that, in a sense, doesn't exist.

TPO 17 Lecture 1 Art History(Prehistoric Art Dating)

Narrator

Listen to part of a lecture in an art history class.

Professor

Good morning, ready to continue our review of prehistoric art? Today, we will be covering the Upper Paleolithic Period, which I am roughly defining as the period from 35,000 to 8,000 BC. A lot of those cave drawings you have all seen come from this period. But we are also be talking about portable works of art, things that could be carried around from place to place. Here is one example. This sculpture is called the Lady with the Hood1 , and it was carved from ivory, probably a mammoth's tusk. Its age is a bit of a mystery. According to one source, it dates from 22,000 BC. But other sources claimed it has been dated closer to 30,000 BC. Amy?

Amy

Why don't we know the exact date when this head was made?

Professor

That's a fair question. We are talking about prehistory here. So obviously the artists didn't put a signature or a date on anything they did. So how do we know when this figure was carved?

Tom

Last semester I took an archaeology class and we spent a lot time on, studying ways to date things. One technique I remember was using the location of an object to date it, like how deep it was buried.

Professor

That would be Stratigraphy. Stratigraphy is used for dating portable art. When archaeologists are digging at a site, they make very careful notes about which stratum(strata), which layer of earth they find things in. And, you know, the general rule is that the oldest layers are at the lowest level. But this only works if the site hasn't been touched, and the layers are intact. A problem with this dating method is that an object could have been carried around, used for several generations before it was discarded. So it might be much older than the layer or even the site where it was found. The stratification technique gives us the minimum age of an object, which isn't necessarilly its true age. Tom, in your archaeology class, did you talk about radiocarbon dating?

Tom

Yeah, we did. That had to do with chemical analysis, something to do with measuring the amount of radiocarbon that's left in organic stuff. Because we know how fast radiocarbon decays, we can figure out the age of the organic material.

Professor

The key word there is organic. Is art made of organic material?

Tom

Well, you said the lady with the hood was carved out of ivory. That 's organic.

Professor

Absolutely. Any other examples?

Amy

Well, when they did those cave drawings. Didn't they use, like chacoal or maybe colors, dyes made from plants?

Professor

Fortunately, they did, at least some of the time. So it turns out that radiocarbon dating works for a lot of prehistoric art. But again there's a problem. This technique destroys what it analyzes, so you have to chip off bits of the object for testing. Obviously we are reluctant to do that in some cases. And apart from that, there's another problems. The date tells you the age of the material, say, a bone or a tree, the object is made from, but not the date when the artist actually created it. So, with radiocarbon dating, we get the maximum possible age for the object, but it could be younger.

Ok, let' s say our scientific analysis has produced an age range. Can we narrow it down?

Amy

Could we look for similar styles or motives? You know, try to find things common to one time period.

Professor

We do that all the time. And when we see similarities in pieces of art, we assume some connection in time or place. But is it possible that we could be imposing our own values on that analysis?

Tom

I am sorry. I don't get your point.

Professor

Well, we have all kinds of pre-conceived ideas about how artistic styles develop. For example, a lot of people think the presence of details demonstrates that the work was done by a more sophisticated artist. While a lack of detail suggests a primitive style. But trends in art in the last century or so certainly challenge that idea. Don't get me wrong though, analyzing the styles of prehistoric art can help dating them. But we need to be careful with the idea that artistic development occurs in a straight line, from simple to complex representations.

Amy

What you are saying is, I mean, I get the feeling that this is like a legal process, like building a legal case, the more pieces of evidence we have, the closer we get to the truth.

Professor

Great analogy. And now you can see why we don't have an exact date for our sculpture, the lady with the hood.

TPO 17 Lecture 2 Environmental Science(Milankovitch Hypothesis)

Narrator

Listen to part of a lecture in an environmental science class.

Professor

Ok, so we have been talking about theories that deal with the effects of human activity on the climate. But today I'd like to talk a little bit about other theories that can explain variations in climate. And one of the best-known is called the Milankovitch Hypothesis.

Now what the Milankovitch Hypothesis is about? It says that variations in earth's movements, specifically in its orbit around the sun, these variations lead to differences in the amount of solar energy that reaches the earth. And it is these differences in the amount of energy that's reaching earth from the sun, it is what causes variations in earth's climate.

Ok, a lot of people think of earth's orbit around the sun as being perfectly circular, as smooth and as regular as, say, the way that hands move on a well -made watch, but it just doesn't work that way. You are probably aware that the earth's orbit around the sun, it is not shaped like a perfect circle. It is more of an oval, it is elliptical. But the shape of this orbit isn't consistent, it varies over time, over a period of about a thousand years. Sometimes it is a little more circular, sometimes it is more elliptical. And when earth's orbit is more elliptical, earth is actually closer to the sun during part of the year. Which makes earth, and in particular, the northern hemisphere, warmer. And why is that important? well, because most of the planet's glaciers are in the northern hemisphere, and if it gets too warm, then glaciers will stop forming. And we've already talked about how that affects earth's overall temperature.

The second movement involved in the hypothesis has to do with axial tilt. The tilt of earth's axis, that imaginery pole that runs through the center of the earth. And depending on the angle it tilts at, the seasons can be more or less severe. It makes winters cooler and summers warmer, or what some might say it is doing now, it makes summers less hot, and more importantly, the winters less cold. Which just like what I mentioned before, can also stop, prevent glaciers from forming, or cause them to melt.

There is a third movement the hypothesis covers called precession. Precession, basically is the change in the direction of earth's axis of rotation. It will take me a million years to explain even just the basics of this movement as precession is quite complex. And all these details are way beyond our scope. What's important for you to understand is that these three movements, well, they are cyclical, and they work together to form, to produce complex but regular variations in earth's climate, and lead to the growth or decline of glaciers.

Now, when Milankovitch first proposed this theory in the 1920s, many of his colleagues were skeptical. Milankovitch didn't have any proof. Actually there wouldn't be any evidence to support his hypothesis until the 1970s, when oceanographers were able to drill deep into the seafloor and collect samples, samples which were then analyzed by geologists. And from these samples they were able to put together a history of ocean temperatures going back hundreds of thousands of years, and this showed that earth's climate had changed pretty much the way Milankovitch's hypothesis suggested it would. So this evidence was pretty strong support for the Milankovitch Hypothesis. And by the 1980s, most people accepted this theory.

However, in the late 1980s, some scientists were exploring Devil' s Hole, which is basically an extensive water-filled cave, far from the ocean, in Nevada2

, in the

western United States. Over millions of years, groundwater left deposits of a mineral

called calcite3
, on the rock within Devil's Hole. And by studying these clacite deposits,
we can determine the climate conditions, the temperatures over the last half million years. Well, the Devil' s Hole findings contradicted the ones obtained during the 1970s, so basically the question was, were the ages of one or both the samples were wrong, or were scientists misunderstanding the significance of the evidence.

Well, in the 1990s, a new study was done on the two samples. And the ocean floor samples were found to be correct, as were the samples from Devil's Hole. And now it is generally believed that the sample from Devil's Hole correspond to variations in local climate, in the western United States, rather than global climate changes.

TPO 17 Conversation 2

Narrator

Listen to a conversation between a student and a food service manager.

Student

Excuse me, Mrs. Hanson. My name is John, John Grant. I work as a waiter in the campus dining hall, in the faculty dining room.

Manager

What can I do for you, John?

Student

Well, I work week nights, except for Friday. I was wondering if I could switch from working the dinner service to working at lunch.

Manager

That's going to be a problem. I am afraid we don't have any openings at lunch time. A lot of students want to work then, so it is really rare for us to have an open spot at that time of day.

Student

Oh, you see, I have joined this group, the University Jazz Band, and the band's practice time is right around dinner time. You know, it is so hard to get into this group, I must have auditioned like ten times since I have been at the school, so I am ... Anyway, so I was really hoping to have the dinner hour free so I can go to practice.

Manager

Well, we do have other open times, like breakfast.

Student

Eh, that won't work, I am sorry. I mean that, I can't work that early. I have this very important music class I got to take, and it is like, first thing in the morning.

Manager

Well, if you don't mind working in the kitchen, we've got some pretty flexible hours for students doing food-prep work, anything from early morning to late afternoon.

Student

What's prep work?

Manager

You prepare food for the cooks. You know, like cutting up vegetables for soup, or cleaning greens for salads.

Student

Oh, that doesn't sound, I mean... Being a waiter, I get to see a lot of the professors, like in a different light, we joke around a little you know. In the classroom, they always have to be pretty formal, but ...

Manager

Well, the money is no different since we pay students the same amount for any of the jobs here in food service, so it's up to you.

Student

Oh, man. I always thought that sacrificing for my art, that'd mean working long hours as a musician for, like, no money. I didn't think it'd mean, peeling carrots.

Manager

Let me see, I am offering you something that has the hours you want, it is right here on campus, and you make as much money as you did being a waiter, quite a sacrifice.

Student

I am sorry, I know you are just trying to help. I guess I should look into the food-prep job.

Manager

Ok, then, I'll tell the kitchen manager that you will stop by tomorrow to talk about the job and schedule your hours. And I will let the dining hall manager know that he needs to find a new waiter for the evening.

Student

Oh, ok, I guess that' s it. Thanks, Mrs. Hanson.

TPO 17 Lecture 3 History(Ancient Egyptian Calendar)

Narrator

Listen to part of a lecture in a history class. The professor has been discussing ancient Egypt.

Professor

Ok, so one of the challenges that faced ancient civilizations like Egypt was timekeeping, calendars. When you have to grow food for whole cities of people, it is important to plant your crops at the right time. And when you start having financial obligations, rents, taxes, you have to keep track of how often you pay.

So today we will look at how the Egyptians adressed these problems. In fact, they ended up using two calendars, one to keep track of the natural world, or their agriculture concerns, and another one, that was used to keep track of the business functions of the Kingdom. So let’s take a look at the hows and whys of one ancient Egyptian calendar system, starting with the Nile River.

Why the Nile? Well, there’s no other way to put it. Egyptian life basically revolved around the mysterious rise and fall of the river. The success of their agriculture system depended upon them knowing when the river would change. So, naturally, their first calendar was divided up into three seasons, each based on the river ’s changes: inundation, subsidence and harvest.

The first season was the flooding, or inundation, when the Nile valley was essentially submerged in water for a few months or so. And afterwards during the season of subsidence, the water would subside, or recede, revealing a new layer of fertile black silt and allowing for the planting of various crops. And finally the time of the year would arrive when the valley would produce crops, such as wheat, barley, fruit, all ready to harvest. Ok, so it was important to the ancient Egyptians to know when their Nile based seasons would occur, their way of life depended upon it.

Now, the way they used to count time was based on the phases of the moon, which, regularly and predictably, goes through a cycle, starting with a new moon, then to a full moon, and back again to the new moon. Now this cycle wes then used to determine the length of their month. So, um, one lunar cycle was one Egyptian month, and about four of the months would constitute a season. Now, 12 of these months was an approximately 354-day year. So they had a 354-day agricultural calendar that was designed to help them determine when the Nile would inunadate the land.

Well, of course it had to be more complicated than that. The average amount of time between floodings wasn’t actually 354 days. I mean, although it varies, the average was clearly longer than 354 days. So how did they keep this short calendar in step with the actual flooding of the Nile?

Well, their astronomers had discovered that at a certain time of year the brightest star, Sirius, would disappear. Actually, it’d be hidden in the glare of the Sun. And then, a couple of months later, one morning in the eartern sky just before dawn, Sirius would reappear. And it happened regularly, about every 365 days. Even more significantly, the reappearance of Sirius would occur around the same time as the Nile’s flooding. And this annual event is called a heliacal rising4

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The heliacal rising was a fair indicator of when the Nile would flood. The next new moon, after the heliacal rising of Sirius, which happened in the last month of the calendar year, marked the New Year. And because the ancient Egyptians were using the lunar cycle in combination with this heliacal rising, some years ended up having 12 lunar months, while others had 13 lunar calender months, if Sirius didn’t rise in the 12th month.

Even though the length of the agricultural calendar still fluctuated, with some years having 12 months and others having 13, it ended up being much more reliable than it was before. They continually adjusted it to the heliacal rising of Sirius, ensuring that they never got too far off in their seasons. This new calendar was ideal, because, well,

it worked well for agricultural purposes as well as for knowing when to have

traditional religious festivals. So, that was their first calendar.

But was it any way to run a government? They didn't think so. For administrative purposes, it was very inconvenient to have years of different lengths. So another calendar was introduced, an administrative one. Probably soon after 3,000 BC, they declared a 365-day year, with 12 months per year, with exactly 30 days each month, with an extra 5 days at the end of each year. This administrative calendar existed alongside the earlier agricultural and religious calendar that depended on the heliacal rising of Sirius. This administrative calendar was much easier to use for things like scheduling taxes and other things that had to be paid on time. Over time, the calendar got out of step with seasons and the flooding of the Nile, but for bureaucratic purposes, they didn't mind.

TPO 17 Lecture 4 Biology(Octopus)

Narrator

Listen to part of a lecture in a biology class.

Professor

Ok, now I want to talk about an animal that has a fascinating set of defense mechanisms. And that's the octopus, one of the unusual creatures that live in the sea. The octopus is prey to many species, including humans, so how does it escape its predators? Well, let me back up here a second. Anyone ever heard of Proteous? Proteus was a

God in Greek mythology who could change form. He could make himself look like a lion or a stone or a tree, anything you wanted, and he could go through a whole series of changes very quickly. Well, the octopus is the real world version of Proteus. Just like Proteus, the octopus can go through all kinds of incredible transformations. And it does this in three ways: by changing color, by changing its texture, and by changing its size and shape. For me, the most fascinating transformation is when it changes its color. It's a normal skin color, the one it generally presents, is either red or brown or even grey, and it 's speckled with dark spots. But when it wants to blend in with its environment to hide from its enemies, it can take on the color of its immediate surroundings: the ocean floor, a rock, a piece of coral, whatever. Charles?

Student

Do we know how that works, I mean, how they change colors?

Professor

Well, we know that the reaction that takes place is not chemical in nature. The color changes are executed by two different kinds of cells in the octopus ' skin, mainly by color cells on the skin's surface call chromatophores

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Chromatophores consist of tiny sacks filled with color dye. There might be a couple hundred of these color sacks per square millimeter of the octopus ' skin, and depending on the species, they can come in as many as five different colors. Each one of these sacks is controlled by muscles. If the muscles are relaxed, the sack shrinks, and all you see is a little white point. But if the muscle's contract, then the sack expands, and you can see the colors. And by expanding different combinations

Student

And just with various combinations of those five colors, they can recreate any color in their environment?

Professor

Well, they can no doubt create a lot with just those five colors, but you are right, maybe they can't mimic every color around them, so that's where the second kind of cell comes in.

Just below the chromatophores is a layer of cells that reflect light from the environment, and these cells help the octopus create a precise match with the colors that surround them. The colors from the color sacks are supplemented with colors that are reflected from the environment, and that 's how they are able to mimic colors with such precision. So, that's how octopus mimic colors.

But they don't just mimic the colors in their environment; they can alos mimic the texture of objects in their environment. They have these little projections on their skin that allow them to resemble various textures. The projections are called

papillae6

. If the octopus wants to have a rough texture, it raises the papillae. If it wants to have a smooth texture, it flattens out the papillae, so it can acquire a smooth texture to blend in with the sandy bottom of the sea. So the octopus has the ability to mimic both the color and the texture of its environment. And it’s truly amazing how well it can blend in with its surroundings. You can easily swim within a few feet of an octopus and never see it.

Student

I read that they often hide from predators by squirting out a cloud of ink, or something like that.

Professor

Yes. The octopus can release a cloud of ink if it feels threatened. But it doesn’t hide behind it, as is generally believed. Um, the ink cloud is ... it serves to distract a predator while the octopus makes its escape. Um, now there’s a third way that octopus can transform themselves to blend in with or mimic their environment, and that’s by changing their shape and size, well, at least their apparent size. The muscular system of the octopus enables it to be very flexible to assume all sorts of shapes and postures. So it can contract into the shape of a little round stone, and sit perfectly still on the seafloor. Or it can nestle up in the middle of a plant and take the shape of one of the leaves. Even Proteus would be impressed, I think.

TPO-18

Conversation 1

A: Hi ! I hope you can help me . I just transferred from Northeastern State University near Chicago.

B: Well welcome to Central University .But Chicago is such a great city. Why did you leave?

A: Everyone asks that. It’s my hometown. And it was sure convenient to go to a school nearby. But Northeastern is still fairly small. And it doesn’t have the program I’m interested in. I want to major in international studies. And the only program int the State is here.

A: We do have a great program. Well how did you get interested in international studies?

B: My family hosted a few foreign exchange students while I was growing up. Then I took part in an international summer program after I graduated from high school. I thought I really I like meeting people from all over, getting to know them.

A: OH! Ok! And that led you to our program. Right now though I think you are looking for a job.

B: Yeah, a part time job on campus. I thought I’d save money ,being away from the big city. But it doesn’t seem to be working that way .Anyway I’m not having much luck.

A: I’m not surprised. Most of our campus jobs are taken in the first week or two of the semester. What work experience have you had?

B: Well, I worked in the university library last year. But I already checked at the library here. They said their remaining positions were for work-study students getting financial aid. I’ve never run into that before.

A: Well, I guess each school has its own policies. Uh, we really don’t have much right now. You might be better. If you really want something, how are your computer skills?

B: About average I’d say. I helped teach some of the basic computer classes. Northeastern offers for new users, if that helps any.

A: OK, The technology support department needs people to work its helpdesk. It’s basically a customer service job, answering questions, helping people solve their computer proplems,give you a chance to develop your people skills.

B: Something every diplomat needs. But is there some problem? I mean why is the job still open?

A: Well, they have extended hours, from 6am to 2am every day. So they need a large staff. But right now they only need people early mornings, late nights, and weekends. You’d probably end up with a bit of everything rather than a regular spot. On the bright side you’ll probably be able to get some studying done between calls. At least it could be a start and then you can try for better hours next semester .

B: Um, I see why the hours might be a problem. But I guess I can’t afford to be too picky if I want a job. Still maybe we can work something out..

TPO 18 Lecture 1 Astronomy

We are going to start a study of **sunspots** today, and I think you’ll find it rather interesting. Now I’m going to assume that you know that sunspots, in the most basic terms, are dark spots on the Sun’s surface. That will do for now. The ancient

Chinese were the first to record observations of sunspots as early as the year 165. When later European astronomers wrote about sunspots, they didn't believe that the spots were actually on the Sun. That's because of their belief at the time that the heavenly bodies, the Sun, Moon, Stars, and Planets, were perfect, without any flaws or blemishes. So the opinion was the spots were actually something else, like shadows of planets crossing the Sun's face. And this was the thinking of European astronomers until the introduction of the telescope, which brings us to our old friend, Galileo. In the early 1600s, based on his observations of sunspots. Galileo proposed a new hypothesis. He pointed out that the shape of sunspots, well, the sunspots weren't circular. If they were shadows of the planets, they would be circular, right? So that was a problem for the prevailing view. And he also noticed that the shape of the sunspots changed as they seemed to move across the Sun's surface. Maybe a particular sunspot was sort of square, then later it would become more lopsided, then later something else. So there is another problem with the shadow hypothesis, because the shape of a planet doesn't change. What Galileo proposed was that sunspots were indeed a feature of the Sun, but he didn't know what kind of feature. He proposed that they might be clouds in the atmosphere, the solar atmosphere, especially because they seemed to change shape and there was no predicting the changes, at least nothing Galileo could figure out. That random shape changing would be consistent with the spots being clouds. Over the next couple hundred years, a lot of hypotheses were tossed around. The spots were mountains or holes in the solar atmosphere through which the dark surface of the Sun could be seen. Then in 1843, astronomer named Heinrich Schwa be made an interesting claim, Trobe had been watching the Sun every day that it was visible for 17 years, looking for evidence of a new planet. And he started keeping tracks of sunspots, mapping them, so he wouldn't confuse them, so he wouldn't confuse them with any potential new planet. In the end, there was no planet, but there was evidence that the number of sunspots increased and decreased in a pattern, a pattern that began repeating after 10 years, and that was a huge breakthrough. Another astronomer named Wolf kept track of the Sun for an even longer period, 40 years actually. So Wolf did 40 years of research, and Trobe did 17 years of research. I think there is a lesson there. Anyway, Wolf went though all records from various observatories in Europe and put together a history of sunspot observations going back about 100 years. From this information, he was able to confirm the existence of a pattern, a repeating cycle but Wolf detected an 11-year cycles? Dose that sound familiar to anyone? No? Well, geomagnetic activity, the natural variations in Earth's magnetic field, it fluctuates in 11-year cycles. Well, we'll cover this later in this semester, but for now, well, scientists in the late 19th century were aware of geomagnetic cycles, so when they heard that the sunspots' cycle was also 11 years, well, they just had to find out what was going on. Suddenly, everyone was doing studies of the possible relationship between the Sun and the Earth. Did the sunspots cause the geomagnetic fields or did the geomagnetic fields cause the sunspots? Or is there some other thing that caused both? And astronomers did eventually figure out what sunspots had to do with magnetic fields. And the fact that sunspots are magnetic fields accounts for their dark appearance. That's because magnetic fields reduce the pressure exerted on the gases inside of them, making the spots cooler than the rest of the Sun's surface. And since they are cooler, they are darker.

A: Today we'll continue our examination of ancient Roman sculpture. We've already looked at portrait sculpture which are busts created to commemorate people who had died, and we've looked at relief sculpture, or sculpting on walls. And today we'll look at yet another category of sculpture-made copies of famous Greek sculptures.

B: Why did they do that?

A: Well no one knows for sure. You see, in the late 4th century B.C., the Romans began a campaign to expand the Roman Empire, and in 300 years they had conquered most of the Mediterranean area and parts of Europe. You know the saying, copies. Roman sculptors often "To the victor belong the spoils"? Well, the Roman army returned to Rome with many works of Greek art. It's probably fair to say that the Romans were impressed be Greek art and culture and they began making copies of the Greek statues. Now the dominant view in traditional art his that Roman artists lacked creativity and skill especially compared to the Greek artists who came before them. Essentially, the traditional view, a view that's been prevalent for over 250 years, is that the Romans copied Greek sculptures because they couldn't create sculpture of their own. But finally some contemporary art historians have challenged this view. One is Elaine Gazda . Gazda says that there might be other reasons that Romans made copies. She wasn't convinced that it was because of a lack of creativity. Can anyone think of another possible reason? Well maybe they just admired these sculptures. You know, they liked the way they looked. Yes. That's one of Gazda's points. Another is that while nowadays reproduction is easy, it was not so easy in Roman times. Copying statues required a lot of skill, time and effort. So Gazda hypothesizes that copying didn't indicate a lack of artistic imagination or skill on the part of Roman artists, but rather the Romans made copies because they admired Greek sculpture. Classical Greek statues represented an idealization of the human body and were considered quite beautiful at the time. Gazda also believes that it's been a mistake to dismiss the Roman copies as, well, copies for copy's sake and not to consider the Roman function and meaning of the statues.

B: What do you mean the Roman function? Weren't they just for decoration?

A: Well, not necessarily. Under the Emperor Augustus at the height of the Roman Empire, portrait statues were sent throughout the empire. They were supposed to communicate specific ideas about the emperor and the imperial family and to help inhabitants of the conquered areas become familiar with the Roman coins were also distributed throughout the empire. Anybody care to guess what was on them?

The emperor's face? That's right! The coins were easy to distribute and they allowed people to see the emperor or at least his likes and served as an additional reminder to let them know, well, who was in charge. And the images helped people become familiar with the emperor. Statues of him in different roles were sent all over the empire. Now, actually some Roman sculptures were original but others were exact copies of Greek statues and some Roman sculptures were combinations of some sort. Some combined more than one Greek statue and others combined a Greek god or an athlete with a Roman's head. At the time of Julius Caesar, I wasn't uncommon to create statues that had the body of a god and the head of an emperor. And the Romans were clever. What they did was they made plaster casts from molds of the sculptures. Then they shipped these plaster casts to workshops all over the empire, where they were replicated in marble or bronze. And on some statues the heads were removable. They could put an emperor's head on different bodies, showing him doing different things. And then later when then time came they could even use the head of the next emperor on the same body.

TPO 18 Conversation 2

A: Well, I'm glad you redid your outline. I fed a few comments, but nothing you have to act on. It's in good enough shape for you to start writing you paper.

B: Thanks! At first I was afraid all that prep work would be a waste of time.

A: Well, especially with a challenging topic like yours: factors leading to the emergence of sociology as an academic discipline. There's just so much history to consider; you could get lost without a solid outline. So did you have a question?

B: Yeah, it's about…you mentioned needing volunteers for a research study?

A: Yep, it's not my study. It's my colleague's in the marketing department. She needs people to watch various new TV programs that haven't been broadcast yet, then indicate on a survey whether they liked it, why, if they'd watch another episode. It'd be kind of fun plus participants get a $50 gift certificate.

B: Wow, well I like the sound of that. But…so they are trying to predict if the shows are gonna succeed or fail, right, based on students' opinions? Why would they care what we think?

A: Hey, don't sell yourself short. People your age are a very attractive market for advertisers who promote their products on television. The study is sponsored by a TV network. If enough students don't like the show, the network may actually reconsider putting it on the air.

B: OK, well, how do I sign up?

A: You just add your name and phone number to this list and check a time slot, although it looks like the only times left are next Monday morning and Thursday evening.

B: Oh, well, I have marketing and economics Monday mornings and Thursday.

A: OH, you are taking the marketing class? Who's teaching it?

B: It's Professor Largin - Intro to Marketing. Hr hasn't mentioned the study though.

A: Oh, well, the marketing department's pretty big. I happen to be friends with a woman who is doing the TV study. Ok, well, we don't want you missing class. How's Thursday?

B: Oh, I work from 5 till 9 that night. Hmm, no flexibility with your schedule? Where do you work?

A: Oh, I like Fox's. I eat there every week. Maybe you could switch shifts with someone.

B: I'm still in training. And the only night my trainer works is Thursday. Look!

A: I know the owners there really well. Why don't you let me give them a call and explain the situation?

B: OK! It'd be cool to be part of a real research study. And the gift certificate wouldn't hurt either.

TPO 18 Lecture 3 European History

In order to really study the social history of the Middle Ages, you have to understand the role of spices. Now, this might sound a little spurring, even a little strange. But what seem like little things now were back then actually rather big things. So first let's define what a spice is. Technically speaking, a spice is part of an aromatic plant that is not a leaf or herb.

Spices can come from tree bark like cinnamon, plant roots like ginger, flower buds like cloves. And in the Middle Ages. Europeans were familiar with lots of different spices, most important being pepper, cloves, ginger, cinnamon, maize and nutmeg. These spices literarily dominated the way Europeans lived for centuries, how they traded and even how they used their imaginations. So why this medieval fascination with spices? We can boil it down to there general ideas briefly. One was cost and rarity. Uh two was exotic taste and fragrance. And third, mysterious origins and kinds of mythical status. Now for cost and rarity, spices aren't native to Europe and they had to be imported. Spices only grew in the East Indies and of course transportation costs were incredibly valuable even from the very beginning. Here is an example. In 408 AD, the Gothic General who captured Rome demanded payment. He wanted 5000 pounds of gold among other things but he also wanted 3000 pounds of pepper. Maybe that would give you an idea of exactly where pepper stood at the time. By the Middle Ages, spices were regarded as so important and expensive they were used in diplomacy, as gifts by heads of state and ambassadors. Now for the taste. The diet then was relatively bland, compared to today's. There wasn't much variety. Especially the aristocracy who tended to eat a lot of meat, they were always looking for new ways to prepare it, new sources, new tastes and this is where spices came in. Now, this is a good point to mention one of the biggest myths about spices. It's commonly said that medieval Europeans wanted spices to cover up the taste of spoiled meat. But this isn't really true. Anyone who had to worry about spoiled meat couldn't afford spices in the first place. If you could afford spices, you could definitely afford fresh meat. We also have evidence that various medieval markets employed a kind of police to make sure that people did not sell spoiled food, and if you were caught doing it, you were subject to various fines, humiliating public punishments. So what actually was true was this: In order to have meat for the winter, people would preserve it in salt, not a spice. Spices actually aren't very effective as preservatives. And throughout winter, they would eat salted meat, but the taste of the stuff could grow really boring and depressing after a while. So the cook started looking for new ways to improve the taste and spices were the answer, which brings us to mysterious origins and mythical status. Now the ancient Romans had a thriving spice trade and they sent their ships to the east and back. But when Rome collapsed in the fifth century and the Middle Ages began, direct trade stopped, and so did that kind of hands-on knowledge of travel and geography. Spices now came by way of the trade routes with lots of intermediaries between the producer and the consumer. So these spices took on an air of mystery. Their origins were shrouded in exotic travels. They had the allure of the unknown, of wild places. Myths grew up of fantasy lands, magical faraway places made entirely of food and spices. And to that, spices themselves had always been considered special or magical not just for eating and this was already true in the ancient world where legends about spices were abundant. Spices inspired the medieval imagination. They were used as medicines to ward off diseases, and mixed into perfumes, incent. They were used in religious rituals for thousands of years. They took on a life of their own and they inspired the medieval imagination, spurred on the age of discovery in the 145^{th} and 16^{th} centuries. When famous explorers like Columbus and da Gama and Magellan left Europe in their ships, they weren't looking for a new world.; they were looking for spices. And we know what important historical repercussions some of those voyages had.

TPO 18 Lecture 4 Biology

A：Well, it's finally looking like spring is arriving. The last of the winter snow would be melting away in a few days. So before we close today, I thought I'd mention a biological event that's a part of the transition from winter to spring, something you can go outside and watch if you have some patience. There is a small creature that lives in this area; you've probably seen it. It's the North American wood frog. Now the wood frog's not that easy tosspot since it stays pretty to close to the ground, under leaves and things and it blends in really well with its background as you can see. But they are worth the effort because they do something very unusual, something you might not have even thought possible. OK North American wood frogs live over a very broad territory or range. They're found all over the northeastern United States and all through Canada and Alaska, even inside the Arctic Circle. No other frog is able to live that far and north. But wherever they live, once the weather starts to turn cold and the temperature starts to drop below freezing, as soon as the frog even touches an ice crystal or a bit of frozen ground, well, it begins to freeze. Yeah...yes to me. You look a little bit taken aback.

B: Wait, you mean it's still alive but it freezes, solid?

A: Well, almost. Ice forms in all the spaces outside the cells but never within a cell.

B: But… then how does its heart beat?

A: It doesn't.

B: But…then how could it…….

A: You are gonna do such a thing? Well, that first touch of ice apparently triggers a biological response inside the frog. That first of all starts drawing water away from the center of its body, so the middle part of the frog, its internal organs, its heart, lungs, liver, these start getting drier and drier while the water that's being pulled away is forming a puddle around the organs just underneath the skin. And then that puddle of water starts to freeze. OK, up to known, the frog's heart is still beating, right? Slower and slower but…and in those last few hours before it freezes, it distributes glucose, a blood sugar throughout its body, its circulatory system, sort of acts like an an antifreeze.

B: A solution of antifreeze like you put in your car in the winter?

A: Well, you tell me. In frogs, the extra glucose makes it harder for the winter inside the cells to freeze. So the cells stay just slightly wet, enough so that they can survive the winter. Then after that, the heart stops beating altogether. So is that the same?

B: I don't really know, but how long dose it stay that way?

A: Well, it could be days or months, all winter in fact but umm, see the heart really doesn't need to do any pumping now because the blood is frozen too.

B: I just, I guess I just don't see how it isn't, you know, clinically dead.

A: Well, that's the amazing thing and how it revives is pretty amazing too. After months without a heartbeat, spring time came around again, the earth starts to warm up and suddenly one day, ping, a pulse, followed by another one, then another until maybe ten, twelve hours later, the animal is fully recovered.

B: And does the thawing process have some kind of trigger as well?

A: Well, we are not sure actually, the clearer thing is even though the sun is warning the frog up on the outside, its inside thaw out first, the heart and brain and everything. But somehow it all just happens that way every spring.

B: But after they thaw does it affect them like their lifespan?

A: Well, hmm, we really don't know a lot about how long a wood frog normally lives, probably just a few years but there is no evidence its longevity. It does have some other impacts though. In studies, we found that when it comes to reproduction, freezing diminishes the mating performance of males. After they've been frozen and thawed of course, they don't seem quite as vocal. They move slower and they seem to have a harder time recognizing a potential mate. So if the male frog could manage not to go through this freezing cycle, he'd probably have more success in mating.

TPO 19

Conversation 1

Listen to a conversation between a student and the professor.

Student
Hi, professor Handerson. That was a really interesting lecture in class today.

Professor
Thanks, Tom. Yeah, animals' use of deception, ways they play tricks on other animals, that's a fascinating area. One we are really just starting to understand.

Student
Yeah, you know, selective adaptations over time are one thing. Oh, like, non-poisonous butterflies, that have come to look like poisonous ones. But the idea that animals of the same species intentionally deceive each other, I have never heard that before.

Professor
Right, like, there are male frogs who lower their voices and end up sounding bigger than they really are.

Student
So they do that to keep other frogs from invading their territory ?

Professor
Right, bigger frogs have deeper voices, so if a smaller frog can imitate that deep voice. Well ...

Student
Yeah, I can see how that might do the trick. But, anyway, what I wanted to ask was, when you started talking about game theory. Well, I know a little bit about it, but I am not clear about its use in biology.

Professor
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Yeah, it is fairly new to biology. Basically, it uses math to predict what an individual would do under certain circumstances. But for example, a buisness sells, oh computer, say, and they want to sell their computers to a big university. But there is another company bidding too. So, what should they do?

Student
Well, try to offer the lowest price so they can compete, but still make money.

Professor
Right, they are competing, like a game, like the frogs. There are risks with pricing too high, the other company might get the sale, there is also the number and types of computers to consider. Each company has to find a balance between the cost and benefits. Well, game theory creates mathematical models that analyze different conditions like this to predict outcomes.

Student
Ok, I get that. But how does it apply to animals ?

Professor

Well, you know, if you are interested in this topic, it would be perfect for your term paper.

Student

The literature review ?

Professor

Yeah, find three journal articles about this or another topic that interests you and discuss them. If there is a confict in the conclusions or something, that would be important to discuss.

Student

Well, from what I have looked at dealing with game theory, I can’t say I understand much of the statistics end.

Professor

Well, I can point you to some that presents fairly basic studies, that don’t assume much background knowledge.

You’ll just need to answer a few specific questions: What was the researchers’ hypothesis? What did they want to find out? And how did they conduct their research? An then the conclusions they came to. Learning to interpret these statistics will come later.

TPO 19 Lecture 1 Linguistics(Proto-Indo-European)

Narrator
Listen to part of a lecture in a linguistics class.

Professor
All right, so far we have been looking at some of the core areas of linguistics, like syntax, phonology, semantics, and these are things that we can study by looking at one language at a time, how sounds, and words, and sentences work in a given language. But the branch of historical linguistics, involves the comparison of several different languages, or the comparison of different stages of a single language.

Now, if you are comparing different languages, and you notice that they have a lot in common. Maybe they have similar sounds and words that correspond to one another that have the same meaning and that sound similar.

Let's use a real-world example. In the 18th century, scholars who have studied the ancient languages, Sanskrit, Latin and Greek, noticed that these three languages had many similarities. And there might be several reasons why languages such as these had so much in common. Maybe it happened by chance, maybe one language was heavily influenced by borrowed words from the other. Or maybe, maybe the languages developed from the same source language long ago, that is, maybe they are genetically related, that was what happened with Sanskrit, Latin and Greek. These languages had so many similarities that it was concluded that they must have all come from the same source. And talk about important discoveries in linguistics, this was certainly one of them.

The scholars referred to that source language as Proto-Indo-European, Proto-Indo-European is a reconstructed language. Meaning, it is what linguists concluded a parent language of Sanskrit, Latin and Greek would have to be like. And Proto-Indo-European branched out into other languages, which evolved into others, so in the end, many languages spoken all over the world today can trace their ancestry back to one language, Proto-Indo-European, which was spoken several thousand years ago.

Now, one way of representing the evolution of languages, showing the way languages are related to each other, is with the family tree model. Like a family tree that you might use to trace back through generations of ancestors, only it's showing a family of geneticall related languages instead of people. A tree model for a language family starts with one language, which we call a mother language, for example, Proto-Indo-European. The mother language, is the line on the top of this diagram, over time, it branches off into new daughter languages, which branch into daughter languages of their own, and languages that have the same source, the same mother, are called sisters, they share a lot of characteristics, and this went on until we are looking at a big upside down tree languages like this. It is incomplete of course, just to give you an idea. So that's the family tree model, basically.

Now, the tree model is a convenient way of representing the development of a language family and of showing how closely related two of more languages are. But it is obviously very simplified, having a whole language represented by just one branch on a tree doesn't really do justice to all the variations within that language. You know, Spanish that spoken in Spain isn't exactly the same as Spanish that is spoken in Mexico, for example.

Another issue is that languages evolve very gradually, but the tree model makes it look like they evolve over night,like there was a distinct moment in time when a mother language clearly broke off into daughter languages. But it seems to me it probably wasn't quite like that.

TPO 19 Lecture 2 Astronomy(Radio Astronomy & Optical Astronomy)

Narrator

Listen to part of a lecture in an astronomy class.

Professor

So how many of you have seen the Milky Way, the Milky Galaxy in the sky? You, you have?

Student

Yeah, I was camping, and there was no moon that night, it was super dark.

Professor

Anybody else? Not too many. Isn't that strange that the Milky Way is the galaxy that the planet earth is in, and most of us have never seen it? Now, what's the problem here?

Student

Light pollution, right? From street lights and stuff ...

Professor

Yes, Especially unshielded street light, you know, ones that aren't pointed downward. Now, here's an irony, the buiding we are in now, the astronomy building not far from our observatory, has unshielded lights.

Student

So the problem is pretty widespread.

Professor

It is basically beyond control, as far as expecting to view the night sky anywhere near city, I mean. I have lived around here my whole life. And I have never seen the Milky Way within city limits, and I probably never will. There is a price for progress, eh? But let's think beyond light pullution, that's only one kind of a technological advance that has interfered with astronomical research.

Can anyone think of another? No? Ok, let's look at it this way, we don't only gain information by looking at the stars, for the past 70 years or so, we have also used radio astronomy1 , which lets us study radio waves from the sky.

Student

How can you observe radio waves? I mean, tell anything about the stars from that.

Professor

Well, in optical astronomy, using a telescope and observing the stars that way, we rely on visible light waves. What we are seeing from earth is actually electromagnetic radiation that's coming from stars. And just one part of it is visible light. But there are problems with that. When photons2 and light waves hit objects in our atmosphere, water droplets, oxygen and nitrogen molecules, dust particles and so on. These objects are illuminated, they are lit up, and those things are also being lit by all our street lights, by the moon, all these ambient light. And on top of that, when that visible radiation bounces off those molecules, it scatters in all directions. And well, light from stars, even nearby in our own galaxy, doesn't stand a chance against that. Basically the light bouncing off all these objects close to earth is brighter than what's coming from the stars.

Now, radiowaves are electromagnetic radiation that we can't see. Nearly all astronomical objects in space emit radio waves, whether nearby stars, objects in far away galaxies, they all give off radio waves. And unlike visible light waves, these radio waves can get through the various gases and dusts in space, and through our own earth's atmosphere comparatively easily.

Student

Ok, then we might as well give up on optical astronomy and go with radio astronomy.

Professor

Well, the thing is, with the radio astronomy, you can't just set up a telescope in you backyard and observe stars. One problem is that radio waves from these far away objects, even though they can get through, are extremely faint. So we need to use radio telescopes, specially designed to receive these waves and then, well, we can use computers to create pictures based on the information we receive.

Student

That sounds cool. So, how do they do that?

Professor

Well, it is kind of like the same way a satellite dish3 receives its signal, if you are familiar with that. But radio telescopes are sometimes grouped together, is the same effect as having one big telescope to increase radio wave gathering power. And they use electronics, quite sophisticated. Yeah, it is neat how they do it, but for now why don't we just stick with what we can learn from it. Some very important discoveries have been made by this technology, especially you consider that some objects in space give off radio waves but don't emit any light. We have trouble discovering those sorts of bodies, much less studying them using just optical telescopes.

Student

Well, If the radio waves are so good at getting throught the universe, what's the problem?

Professor

Well, answer this. How come people have to turn off their cell phones and all our electronic devices when an airplane is about to take off?

Student

The phones interfere with the radio communication at the airport, right?

Student

Oh, so our radio waves here on earth interfere with the waves from space?

Professor

Yes, signal from radios, cell phones, TV stations, remote controls, you name it. All these things cause interference. We don't think about that as often as we think about light pollution. But all those electrical gauges pollute the skies, just in a differen way.

TPO 19 Conversation 2

Narrator

Listen to a conversation between a student and the director of the student cafeteria.

Student

Hi, I... I am sorry to interrupt, could I ask you a few questions?

Director

Sure, but if it is about you meal plan, you'll need to go to Room 45, just down the hall.

Student

Eh, no, I am OK with my meal plan. I am actually here about the food in the student cafeteria.

Director

Oh, we do feed a lot of students, so we can't always honor individual requests. I am sure you understand.

Student

Of course. It is just that I am a little concerned, I mean, a lot of us are, that a lot of the food you serve isn't really that healthy. Like there are so many deep-fried foods.

Director

As a matter of fact, we recently changed the type of oil we use in our fryer . It is the healthiest available. And would you believe that at least ten students have already complaint that their french fries and fried chicken don't taste as good since we switched?

Student

Oh, I try not to eat too many fried foods anyway. I am just aware that, eh...You see, I used to work in a natural food store. They had all these literature4 advising people to eat fresh organic growing food. Working there really open my eyes.

Director

Did you come to the organic food festival we had to celebrate Earth Day?

Student

Oh, sorry, I must have missed that.

Director

We served only certified organic food, most of which was from local farms. It is not something we can afford to do on a daily basis, and there aren't too many organic farms around here. But sometime the produce we offer is organically grown. It depends on the season and the prices of course.

Student

That's good to know. I like the fact that organic farms don't use chemical pesticides or anything that can pollute the soil or the water.

Director

I do too. But let me ask you this. Is it better to buy locally grown produce that is not certified as organic or is it better to get organically grown fruits and vegetables that must be trucked in from California, three thousand mile away. What about fossile fuels burned by the trucks' engine. Plus the expense of shipping food across long distances. And nutritionally speaking, an apple is an apple however it is grown.

Student

I see your point. It is not so clear-cut.

Director

Why don't you visit our cafeteria's website? We list all our food suppliers. You know, where we buy the food that we serve. And the site also suggests ways to make your overall diet a healthy one. You can also find some charts listing fat and calorie content for different types of seafood, meat and the other major food groups.

Student

I didn't realize you thought about all these things so carefully, I just noticed the high-calorie food in the cafeteria.

Director

Well, we have to give choices so everyone is satisfied. But if you wish to pursue this further, I suggest that you talk to my boss.

Student

That's OK, seems like you are doing what you can.

TPO 19 Lecture 3 Marine Biology(Plant Life in Salt Marshes)

Narrator
Listen to part of a lecture in a marine biology class.

Professor
Ok, today we are going to continue our discussion of plant life in coastal salt marshes
5 of North America. Salt marshes are among the least inviting environments for plants. The water is salty, there is little shade and the ocean tide comes in and out, constantly flooding the marsh, so the variety of plants found in salt marshes is limited, but there is a plant genus that thrives there, the Spartina. In fact, the Spartina genus is the dominant plant found in salt marshes. You can find one type of the Spartina, Saltmarsh Cordgrass, growing in low marsh areas. In higher marsh areas, you are likely to find a Spartina commonly called Salt-meadow Hay. So how is the Spartina able to survive in an envrionment that would kill most plants? well, it is because salt marsh grasses have found ways to adapt to the conditions there.

First of all, they are able to withstand highly saline conditions. One really interesting adaptation is the ability to reverse the process of osmosis6

. Typically, the process of osmosis works... Well, when water moves through the wall of a plant cell, it will move from the side containing water with the lowest amount of salt into the side containing the highest amount of salt. so imagine what would happen if a typical plant suddenly found itself in salt water, the water contained in the plant cells, that is water with very little salt would be drawn out toward the seawater, water with a lot of salt. So you can see the fresh water contained in the plant will be removed and the plant will quickly lose all its water and dehydrate. But what about the Spartinas, well, they allow a certain amount of salt to enter their cells, bringing the salt content of the water within the plant, to a slightly higher concentration than that of the surrounding seawater. So instead of fresh water moving out of the plant cells, salt from the seawater enters, reverse osmosis, and this actually strengthens the cells.

Another adaptation to the salty environment is the ability to excrete excess salt back to the environment. That’s why you might see a Spartina shimmering in the sunlight. What’s reflecting the light is not salt from seawater that has evaporated, although that’s a good guess. But it is actually the salt that came from within the plant. Pretty cool, eh? You can really impress your friends and family with that little ? the next time you are in a salt marsh.

But coping with salt is not the only challenge for plants in the salt marsh. Soil there is dense and very low in oxygen, so Spartinas have air tubes, air enters through tiny openings on the leaves, the tubes provide direct pipe line for oxygen, carrying it down the leaves through the stems and into the roots, where it is needed. If you pull up a Spartina, you might even notice some reddish mud on some of the roots, this is caused by oxygen reacting with iron sulfide in the soil, and it produces iron oxide or rust.

Now, although the Spartinas have adapted several chemical and physical mechanisms that allow them to thrive in salt water and to feed oxygen to their roots. There is yet another aspect of the harsh environment that they have to adapt to, the force of tides and occasional violent storms. Wind and water are constantly crashing into these plants. So as you might have guessed, they have developed a means of solidly anchoring themselves into the soil. How? They have tough sort of underground stems called rhizome, rhizomes from one plant grow through the muddy soil and interlock with those of other nearby plants, the plants form a kind of colony, a community that will thrive and perish together. Because alone as single plants, they cannot survive. \

Of course the plants in these colonies also need tough resilient stems above the soil, stems that can bent a lot but not break as water constantly crashes into them. So in addtion to the interlocking underground rhizomes, they have yet another adaptation, and it is ... well, we are back to reverse osmosis again, by adjusting the osmotic pressure so that the cells are always fully inflated, the plant is able to withstand great pressure befor snapping, so Spartinas may look like simple marsh grass, but they are really a wonder of chemistry, physics and structural engineering that allows them to survive and even thrive in an evironment in which most plants will wilt7 and die within hours.

Recommended Reading:
Salt Marsh Life
Life in New Hampshire Salt Marshes
Dynamics of the Salt Marsh

TPO 19 Lecture 4 Art History(Cecilia Beaux)

Narrator: Listen to part of a discussion in an art history class.

Professor: All right, let's continue our discussion of portrait artists(portraitist) and portraiture. Who remembers any of the important points we made last time? Sandra?

Student: Well, artists have done portraits of people for centuries, of famous people and regular people, and most portraits convey the artists' personal vision, like their feelings and insights about a person.

Professor: Great, that's a crucial point, and I'd like to explore that a little today. A great example of that, that vision in portraiture, is Cecilia Beaux. Cecilia Beaux was born in 1854, and after learning to paint and studying with several important artists of the time, Beaux became known as one of the best portrait painters in the United States. She was very successful. She even had portraits of the wife and children of Theodore Roosevelt, while he was president. Some did not get much more prestige than that. Now, those portraits also reflect the kind of subjects that Beaux tended to use, which were mostly women and children. For example, in her first major work, her subjects were ..., the painting featured her sister and her nephew. Yes, Mark?

Student

Yeah, it just seems interesting. I was wondering if that was unusual to have a portrait artist who is a woman become so well-known and successful in the 19th century.

Professor

Great question. Yeah, she really stood out back in the 1800s. And today, she is still considered one of the greatest portrait painters of her time, male or female. In fact, she was the first full-time female instructor at the Pennsylvania Academy of the Fine Arts, and she was a full member of the National Academy of Design. These are pretty important institutions, so, yeah, she definitely made headway for women artists. Ok, so let's look at one of her portraits now, this painting is called The Dreamer. It is one of my favorites. And I think it is especially characteristic of Beaux's work. So what you see here is a portrait of a close friend of Cecilia Beaux. So tell me what's the first thing that draws you to this painting? What catches your eye first.

Student

Well, for me, it is her face and hands, I think they are really expressive, and also, they make the woman seem very comtemplative, seems like she is thinking pretty seriously about something.

Student

Yeah, her eyes kind of draw you in. But what strikes me is the contrasting colors, the white dress and the dark background. It kind of reminds me of that painting we discussed a few weeks ago, by ...eh... John Singer Sargent. I think it was called MadameX?

Professor

I agree, good point. Yes, Beaux had high regard for Sargent's work. And this is something, a technique you will find in both of their work. Ok, but the painting is called The Dreamer. What do you see is dreamlike about it?

Student

Well, the background behind the woman is pretty vague. Like, maybe there is no real context, like no definite surroundings, expecially compared to the woman herself, since she is so clear and well-defined.

Professor

Yes, the unclear background definitely contributes to that dreaminess. It is meant to show a sense of isolation I think. With the woman is deep in a daydream and not really aware of anything eale. This painting shows how insightful Cecilia Beaux was as a portrait artist. Besides her excellent technical skills, like her use of brush strokes and color to make an impression, both respectives come through. Her portraits reveal her own interpretation of her subject's state of mind. This is what it is all about, not just likenesses

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Now, the undefined background also shows how Cecilia Beaux was influenced by the French Impressionists, who believed, like Beaux, in a personal rather than conventional approach to their subject matter. Beaux used some impressionist techniques and share much of their phylosophy, but her style, it was all her own.

TPO20

Section1 Conversation1-Student&Librarian

Narrator

Listen to a conversation between a student and a library employee.

Student

Excuse me, I received a letter that I am supposed to return a book that I checked out back in September , it's called Modern Social Problems. But I am writing my senior thesis, so I thought I was allowed to keep the book for the whole academic year .

Librarian

So you signed up for extended borrowing privileges?

Student

Yeah.

Librarian

And we are still asking you to bring the book back?

Student

Uh-huh. Do I really have to?

Librarian

Well, let me check the computer . The title was ... Modern Social Problems?

Student

Yeah.

Librarian

Eh... Ok, yeah. It's been recalled. You can keep it all year as long as no one else requests it, but someone else has, it looks like one of the professors in the sociology department. So you have to bring it back. You can check it out again when it is returned in a couple of weeks.

What if the person renews it? And I really need it right now.

Librarian

All of it? Or is there a certain section or chapter you are working with?

Student

Well, there's one chapter in particular I am working with, but why?

Librarian

Well, we normally don't do this, but because of the circumstances we can photocopy up to one chapter for you. Why don't you do that for the one you are working with right now? And by the time you need the rest of the book, maybe it'll have been returned.

Student

Oh, that would be great.

Librarian

Do you have it with you?

Student

Eh... no, it's in my dorm room. These are books I want to check out today. Is it OK if I bring that one by in a couple of days?

Librarian

Actually, the due day is tomorrow. After that, there'll be a two dollar per day fine. But you need to return it today if you want to check out any books today. That's our policy.

Student

Oh, I see.

Librarian

Yeah, not a lot of people realize that. In fact, every semester we get a few students who would have their borrowing privileges suspended completely because they haven't returned books. They are allowed to use books only in the library. They are not allowed to check anything out because of unreturned books.

That's not good. I guess I should head back to the dorm right now.

Librarian

But before you go, what you should do is fill out a form requesting the book back in two weeks. Then the person who requested it won't be able to renew it. You'll get it back quickly.

Student

I'll do that right now.

TPO20 Lecture1-Linguistics(Gricean Maxims)

Narrator

Listen to part of a lecture in a linguistics class.

Professor

Ok, the conventions or assumptions that govern conversation, these may vary from one culture to another , but basically, for people to communicate, there is a ... they have to follow certain rules. Like if I am talking with you and I start saying things that are not true, if you can't tell when I am lying and when I am telling the truth, well, we are not going to have a very satisfactory conversation, are we? Why? Because it violates one of the Gricean Maxims, that's a set of rules or maxims a philosopher name H.P .Grice came up with in 1970s. One of these Gricean Maxims is... well, I've already given you a hint.

Student

Oh, you just can't go around telling lies.

Professor

Right, or as Grice put it, "Do not say what you believe to be false." That's one of Grice's Maxims of Quality as he called it. So that's pretty obvious. But there are others just as important. Like, eh... suppose you would ask me what time it was and I replied 'my sister just got married' , what would you think?

Student

You are not really answering my question.

Professor

No, I am not, am I? There is no connection at all, which feels wrong because you generally expect to find one. So one important maxim is simply: be relevant. And using the so-called Maxim of Relevance we can infer things as well, or rather the speaker can imply things and the listener can make inferences. For instance, suppose you say you would really love to have a cup of coffee right now, and I say 'there's a shop around the corner' . Now, what can you infer from what I said?

Student

Well, the shop sells coffee for one thing.

Professor

Right, and that I believe it is open now. Because if I won't implying those things, my response would not be relevant. It'd have no connection with what you said before. But according to the maxim, my response should be relevant to your statement, meaning, we should assume some connection between the statement and the response. And this maxim of relevance is quite efficient to use. Even if I don't spell out all the details, you can still make some useful logical inferences, namely, the shop is open and it sells coffee. If we actually have to explain all these details, conversations would move along pretty slowly, wouldn't they?

OK, then there's the maxims of manner, including things like be clear , and avoid ambiguity.

And another more interesting maxims is one of the so-called maxims of quantity, quantities of information, that is. It says, to give as much as is required in the situation. So suppose you asked me what I did yesterday and I say ‘I went to the Art Museum.’ You would likely infer that I saw some works of art. Suppose, though, that I did not go inside the museum, I just walked up to it then left. Then I violated the quantity maxim by not giving enough information. So you can see how important implications are to our ability to carry on a conversation.

But there are times when people will violate these maxims on purpose. Let’s say a boss is asked to write a letter of recommendation for a former employee seeking an engineering job. The letter he writes is quite brief. Something like, uh, Mr . X is polite and always dresses quite neatly. So what does this really mean?

Student

Oh, I see. By not mentioning any important qualities related to the job, the boss is ... like, implying that this is best that can be said about Mr . X that he is really not qualified.

Professor

Exactly. It’s a written letter not a conversation, but the principle is the same. The boss is conveying a negative impression of Mr . X without actually saying negative about him. So, by violating the maxims, we ...eh... but ... it can be a way to be subtle or polite, or to convey humor through sarcasm or irony.

Sometimes though people will violate maxims for another purpose: to deceive. Now, can you imagine who might do such a thing?

Student

Some politicians.
Student
Or advertisers.

Professor

Right. Anyone who may see an advantage in implying certain things that are untrue without explicitly saying something untrue. They think, hey, don’t blame us if our audience happens to draw inferences that are simply not true. So next time you see an advertisement saying some product could be up to 20% more effective, think of these maxims of quantity and relevance, and ask yourself what inferences you are being led to draw. Think, more effective than what exactly? And why do they use those little phrases ‘could be’ and ‘up to’? These claims give us a lot less information than they seem to.

TPO20 Lecture2-Environmental Science(Interglacial Periods)

Narrator

Listen to part of a lecture in an environmental science class.

Professor

I’d like to take you back about 11 thousand years ago when Earth entered the latest interglacial period. Interglacial periods are, typically periods of time between Ice Ages, when the climate warms, and the glacial ice retreats for a time, before things cool off again and another Ice Age begins. And for over the past several million years, Earth’s sort of default climate has actually been Ice Age, but we have experienced periodic regular thaws, and the last one, the one we are in now, started about 11 thousand years ago.

Now, the typical pattern for an interglacial period, and we have studied several, is that the concentration of carbon dioxide and methane gas actually reaches it... its peak, that is, there is the most carbon dioxide and methane gas, uh, greenhouse gases in the atmosphere just after the beginning of the interglacial period. And then, for reasons which are not entirely clear , the concentration of greenhouse gases gradually goes down. Now, the climate continues to warm for a while because there is a lag effect. But uh, gradually as the concentration of greenhouse gases goes down, Earth starts to cool again, and eventually you slip back into an Ice Age.

Um, however , for the latest interglacial period, the one we are in now, this pattern did not hold, that is, the concentration of carbon dioxide and methane dipped1 a little bit after, uh, uh, after peaking at the beginning, near the beginning of the interglacial period, but then it began to rise again. Um ... What was different about this interglacial period than the other ones?

Well, one of the big differences is human activity. People began to raise crops and animals for food instead of hunting for them. This is the agricultural revolution. And it began to happen in the earliest stages about 11 thousand years ago.

Now, scientists have tended to regard ... the ... uh ... agricultural revolution as a beneficiary of the ... uh ... fortuitous shift in climate. However , some new theories of climate, new theorists of climate have proposed that perhaps humanity was having an effect on the climate as far back as the beginnings of the agricultural revolution. When you grow crops and uh, pasture your animals , one of the things you do is you cut down the forests. If you cut down the forests, when you burn the trees for fuel and don’t replace them with other trees, or when you just leave them to rot and don’t allow other trees to grow, you end up with a lot more carbon in the form of carbon dioxide getting into the atmosphere.

Um ... another gas associated with the spread of agriculture is methane. Methane forms in large concentration above wetlands, and as it turns out, the cultivation of certain grains creates vast areas of artificial wetlands, and probably drastically increases the amount of methane getting into the atmosphere, over and above what would be there.

So, um... agriculture, the ... the spread of agriculture, you know we are talking over thousands of years, um... but this could very well had a profound effect on the composition of Earth’s atmosphere. It’s kind of ironic to think that absent that effect, it maybe that we would be heading into an Ice Age again. In fact, back in the 1970s, a lot of theorists were predicting that, you know, the climate would start to cool and we’d slowly enter into the new Ice Age. And then they were puzzled as to why it didn’t seem to be happening.

Umm... now, what are the implications for the future? Well, um... it is a little tricky. I mean, you could say, well, here is an example of ... um ... human activity, the agricultural revolution which actually was beneficial, we altered the climate for the better , perhaps, by preventing an Ice Age. But then industrialization, of course, has drastically increased the amount of carbon dioxide that humans are putting into the atmosphere, the burning of fossil fuels tends to put a lot of CO_2 into the atmosphere. Um... so we are entering into uncharted territory now, in terms of the amount of carbon dioxide, the concentrations of carbon dioxide that are now being put into the atmosphere as a result of industrialization and the use of fossil fuels.

TPO20 Section2 Conversation2-Student&Professor

Narrator

Listen to a conversation between a student and a professor .

Student

Professor Jennings, I hope I am not interrupting, but you wanted to see me?

Professor

Oh, hello, Suzane. Yes, yes, come right in. How are you doing?

Student

All right.

Professor

Well, good. The reason I wanted to talk to you was that while you were presenting you linguistics project in class the other day, well, you know, I was thinking you are a perfect candidate for the dean's undergraduate research fund.

Student

Um ... Professor , I am really sure what the... um ... dean ....

Professor

Undergraduate research fund is ... It is a mouthful I suppose. OK. Here's the thing. Every year the school has a pool of money to fund a number of research projects of undergraduate students. Because as you can imagine, indepth research often requires monetary support.

Student

I would like to expand on my research.

Professor

Good. First a panel of professors reviews the applications for the grant. And then they decide which project should be funded. The alloted money could be used for travel expenses, to attend a conference for example, or things like supplies, research equipment, resources that are necessary to conduct the research.

Student I

see.

Professor

Right. And I think you should apply for this grant. Your project is definitely eligible

. And you can

expand it if you have the necessary resources. So, does it sound like something you would be interested in?

Student

Oh, yeah, sounds great. I thought the topic I work on was very interesting, and it is certainly relevant to my linguistics major . I assume it will also look good when I try to get into graduate school. But how do I apply for the grant?

Professor

It is pretty straightforward. A brief description of your proposed project, and an estimated budget. How much you need to spend and what you intend to spend it on. Also a glowing letter of recommendation from a linguistics professor wouldn't hurt, which I'd be more than happy to write up for you.

Student

OK. Cool. I am pretty clear on how to carry out my project, but I am not sure where I can find more information on the subject.

Professor

Well, I have already thought of that. There's this private library at a university in Boston. By the way, because I graduated from that school, I can get you access to it, no problem. You see, the library houses lots of unpublished documents that are relevant to your topic.

Student

So I can put that on the application for the grant, that I plan on using material from that library for my research and figure a trip to Boston into my budget?

Professor

Exactly. I really think judging from your work in class, and the relevance and clarity of this project, you really have a good chance of getting the funding.

Student

OK. I'll definitely apply then.
Professor
The sooner the better . It is due in a few weeks. Gook Luck! And I'll get that letter written up right away.

TPO20 Lecture3-Literature(Folktales)

Narrator

Listen to part of a lecture in a literature class.

Professor

All right, so now we've talked about folk legends and seen that their ... one of their key features is there's usually some real history behind them. They are often about real people, so you can identify with the characters, and that's what engages us in them. The particular stories might not be true and some of the characters or events might be made up. But there's still a sense that the story could have been true since it is about a real person. That's distinct contrast from the other main branch of popular storytelling, which is folk tales.

Folk tales are imaginative stories that ... um ... like folk legends, they have been passed down orally, from storyteller to storyteller for ... since ancient times. But with folk tales you don't ever really get the sense that the story might have been true. They are purely imaginative and so quite revealing, I think anyway, about the culture and the connection between folk tales and culture, which we'll talk about.

But first let's go over the various types of folk tale and focus specifically on Norwegian folk tales since they illustrate the variety pretty well. There are in general three main types of Norwegian folk tales.

One is animal stories, where animals are the main characters. They can be wild animals or domestic, and a lot of times they can talk and behave like humans, but at the same time, they retain their animal characteristics too. They tend to involve animals like bears, wolves and foxes. The point of these stories, their, their internal objectives, so the speak, is usually to explain some feature of the animal, how it arose. So there's one about a fox who fools a bear into going ice fishing with his tail. When the bear puts his tail into the water through a hole in the ice, to try and catch a fish, the ice freezes around it, and he ends up pulling his tail off. So that's why bears to this day have such short tails.

The second category of Norwegian folk tale is the supernatural. Eh ... stories about giants and dragons and trolls, and humans with supernatural powers or gifts, like invisibility cloaks. Or where people are turned into animals and back again into a person, those are called transformation stories.

There's a well-known Norwegian supernatural folk tale, a transformation story called East of the Sun and West of the Moon, which we'll read. It involves a prince who is a white bear by night and a human by day. And he lives in the castle that's east of the Sun and west of the Moon, which the heroine in the story has to try to find. Besides being a good example of a transformation story, this one also has a lot of the common things that tend to show up in folk tales. You will find the standard opening, 'once upon a time ... ' . And it has stock characters like a prince, and a poor but beautiful peasant girl, she is the heroine I mentioned. And ... um ... it has a very conventional form. So no more than two characters are involved in any one scene. And it has a happy ending. And it's ... the story is presented as though ... well, even though a lot of the actions that occurred are pretty fantastic, so you'd never think of it as realistic. The characters still act like ... they resemble real people. They are not real or even based on historical figures. But you might have a supernatural story involving a king, and he'd act like you'd expect a Norwegian king to act.

OK. The third main kind of folk tale is the comical story. We'll say more later about these, but for now, just be aware of the category and that they can contain supernatural aspects, but they are usually more playful and amusing overall than supernatural stories.

Now, as I said, traditionally, folk tales were just passed down orally. Each generation of storytellers had their own style of telling a story. But ... um ... in Norway, before the 19th century, folk tales were just for kids. They weren't seen as worthy of analysis or academic attention. But this changed when the romantic movement spread throughout Europe in the mid-19th century. Romantics looked at folk tales as sort of a reflection of the soul of the people. So there was something distinctly Norwegian in folk tales from Norway. And there was renewed pride in the literature and art forms of individual countries. As a result, the first collection of Norwegian folk tales is published in 1852. And there have been many new editions published since then. For the people of Norway, these stories are now an important part of what it means to be Norwegian.

TPO20 Lecture4-Biology(Snowshoe Hare)

Narrator

Listen to part of a lecture in a biology class.

Professor

Now, James, you said you had been to the State of Maine, right?
Student
Yeah, actually I lived in western Maine until I was about sixteen.

Professor

Great. So why don't you tell everybody what is like there in the winter?
Student
The winter? Well, it's cold. And there's lots of snow, you wouldn't believe how much snow we used to get.

Professor

Actually I would. I did field research up there a couple of winters. And it really is an incredible environment. And to survive in that sort of environment, animals have to adapt, to evolve in response to their surroundings. As you recall, an adaptation is any feature, um... physical or behavioral feature of a species that helps it survive and reproduce. And in adapting to extreme climates, like Maine in the winter time, animals can evolve in pretty interesting ways. Take, for example, the snowshoe hare.

Ok, the snowshoe hare, and of course, that's H-A-R-E, like a rabbit. Although I probably should mention that technically a hare is not exactly the same as a rabbit, even though it is very similar . The primary difference is that a rabbit's young are born blind and without fur , while a hare's babies are born with a full coat and able to see.

Now, the snowshoe hare, tell me, what sort of adaptations do you think it has developed that help it survive the Maine winters? I'll give you a hint. Food isn't an issue. The hare actually has abundant food in the small twigs it finds.

Student
Well, I don't know. I mean, I know we used to try to look for these rabbits, eh... hares, when we went hiking in the winter , but it was often hard to find them in the snow.

Professor

Yes. That's exactly right. The major concern of the snowshoe hare in the winter is predators. And now that includes humans. So one of its adaptations is basically camouflage. In other words, its coat, its fur , turns from brown in the summer to white in the winter , which makes it harder for the hare's predators to see it against the white snow.

Student

Yeah, but I could swear I remembered seeing rabbits in the snow a couple of times, I means hares, that were brown.

Professor

Well, you may very well have. Timing is really important, but the snowshoe hare doesn't always get it exactly right. Its chances for survival are best if it turns white about the time of the first snowfall. And it's the amount of daylight that triggers the changing of the hare's coat. As the days get shorter , that is, as the Sun is up for a shorter and shorter time each day, the snowshoe hare starts growing white fur and shedding its brown fur . The hare does a pretty good job with its timing, but sometimes when there's a really early or late snow, it stands out. Plus, it takes about a month for the snowshoe hare's coat to completely change color . So if there's a particularly early snowfall, it's very likely that the hare's fur would not yet be totally white. And that would make this a particularly dangerous time for the hare.

OK. What else? Other adaptations? Susan?
Student
Well, it's called the snowshoe hare, so are its feet somehow protect it from the cold?

Professor

Well, this animal's name does have to do with an adaptation of its feet. Uh... though, not like it has warm furry boots or something to keep its feet from getting cold. You've probably never needed to wear snowshoes. But, well, snowshoes are not like thick furry shoes designed to keep the feet warm, they are actually quite thin, but very wide. What they do is spread out the weight of the foot coming down on the snow. See, the problem with walking on snow is that you sink in with every step. But with snowshoes, you don't sink in, you walk on top of the snow. It makes walking through the Maine countryside in the winter much easier .

Anyway, the snowshoe hare has an adaptation that plays on the same idea. It has hind feet that act like snowshoes. I mean, it's paws are wide and they allow the hare to hop and run just at the surface of deep snow. And this is a huge advantage for the snowshoe hare since by contrast, the feet of its predators usually sink right down into the snow.

Now, another advantage related to this is that unlike many animals in winter, snowshoe hares can stay lean and light weight. They accumulate essentially no body fat. Can anyone guess why this is so?

Student

They don't eat very much?
Professor
Well, yes. But not because there isn't enough food around. It's because, like I said, food is almost always within reach, and they don't have to store up a lot of food energy for the harsh winters.

TPO-21

Conversation1

Narrator
Listen to a conversation between a student and a professor.

Professor Excuse me, can I help you? You look a little lost.

Student Yeah, I am. This is my first day on campus, and I don't know where anything is.

Professor Can't find your orientation session?

Student Uh-huh. What a way to begin! Lost going to orientation

Professor Well, my guess is in the auditorium, that's where they usually are.

Student You're right, the general ones. I went to one of those sessions ealier today. But now I need the one for my major, engineering. My schedule says the meeting room is in ... Johnson Hall? In the engineering department, which should be right here in front of us, according to the map. But this building is called the Morgan Hall.

Professor Well, your map reading skills are fine actually. This used to be Johnson Hall, all right. Trouble is they changed the name to Morgan Hall last spring. So they sent you a map with an old name? I am surprised.

Student Well, this was actually mailed out month and month ago. I got a second pack in the mail more recently with another one of these maps in it. I guess they must have the updated name. I left that one in my dorm room.

Professor Well, things change fast around here. This building was renamed after one of our professors. She retired a few months ago. She is very well-known in the world of physics. Too bad for Johnson, I guess.

Student Who is Johnson anyway?

Professor Oh, one of the early professors here. Unfortunately, I thinks his ideas are going out of style. Science kept marching forward.

Student I'll say it does. That's why I transferred to this university. I was really impressed with all the research equipment you guys have at the laboratories. You are really on the forefront.

Professor Um... so do you know what kind of engineering you want to specialize in?

Student Yeah, aerospace engineering.

Professor Well, the aerospace engineering department here is excellent! Eh... do you know that this university was the first one in the country to offer a program in aerospace engineering?

Student Yeah, I know. And a couple of students who graduated from here became astronauts and orbited the Earth.

Professor Right. The department has many prominent alumni. Well, you might end up taking some of your advanced math course with me. I get a lot of students from the engineering department because I teach the required applied mathematics courses.

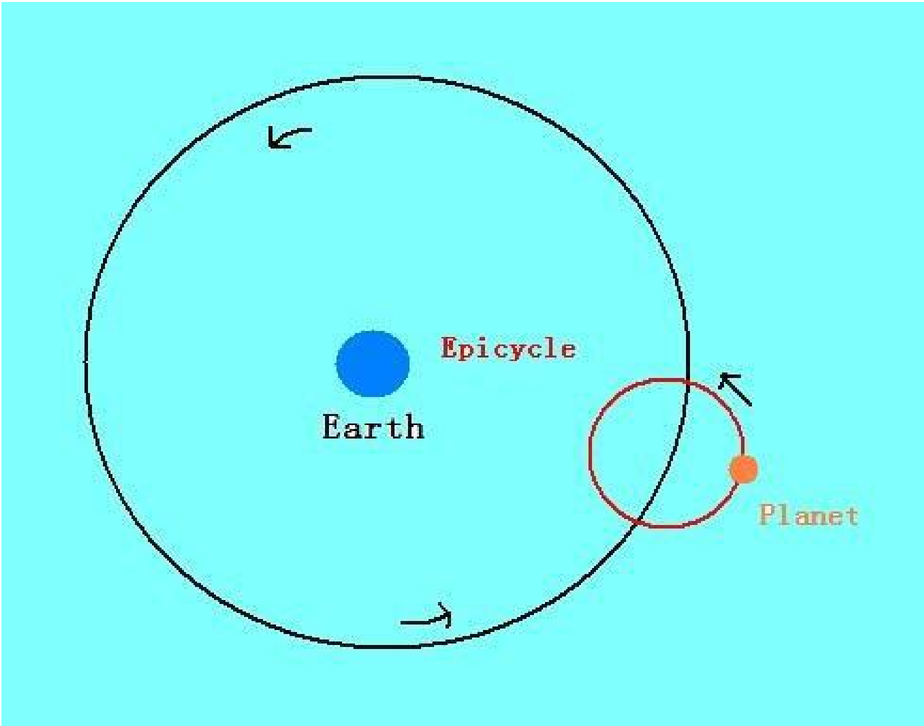
Student Oh, cool. Actually, I want to get a minor in math.

Professor Excellent. Hmm... A major in aerospace engineering with a minor in math, you’ll go far with that degree. More of our students should do that. There are so many more opportunities available in the field when you have a strong math background.

Student I’m glad to hear you say that.

TPO 21 Lecture 1 Astronomy(Geocentric&Heliocentric theory)

Narrator Listen to part of a lecture in a history of science class. Aristarchus-Heliocentric Theory



Professor Ok, we have been talking about how throughout history, it was often difficult for people to give up ideas which have long been taken for granted as scientific truth, even if those ideas were false. In Astronomy, for example, the distinction between the solar system and the universe wasn’t clear until modern times. The ancient Greeks believed that what we called the solar system was in fact the entire universe, and that the universe was geocentric. Geocentric means Earth-centered, so the geocentric view holds that the Sun, the planets, and the stars, all revolve around the Earth, which is stationary. Of course, we now know that the planets, including Earth, revolve around the Sun, and that the solar system is only a tiny part of the universe.

So, why did the ancient Greeks believe that the Earth was the center of the universe? Well, it made sense to them. Observations of the sky make it appear as if the Sun, the moon, and the stars all revolve around the Earth everyday, while the Earth itself stayed in one place. And this view is also supported by their philosophical and religious beliefs about the origin and structure of the universe. It was presented in the works of well-known Greek philosophers as early as the fourth century B.C.E., and the geocentric theory continue to prevail in Western thought for almost 2,000 years, until the 17th century.

Now, what’s especially interesting is that when astronomical observations were made that seemed to be inconsistent with the geocentric view, the ancient Greeks did not really consider alternative theories. It was so intuitive, so sensible that the Earth was the center of the universe that astronomers found ways to explain those seemingly inconsistent phenomena within the geocentric view.

For example, Greek astronomers made excellent, very accurate observations of the movements of the planets, but the observations revealed a bit of a problem. The geocentric theory said, that the planets would move around the Earth in one direction. However, astronomers noticed that at times, several planets seem to stop moving in one direction and start moving backward in their orbits around the Earth, and they came up with a theory that these planets themselves moved in smaller circles called *epicycles* as they travelled around the Earth. Here’s a picture of what they imagined. You see how this *epicycle* theory could account for the seemingly backward motion of the planet. Of course, today we know that this appearance of backward motion is caused by the fact that Earth, as well as other planets, all move in their own orbits around the Sun, and the relative movements of the planets with respect to each other can get quite complex.

However, there were a few astronomers in Greece and other places who didn't agree with the geocentric view, for example, a Greek astronomer who lived in the third century B.C.E. He proposed the theory that our planetary system might be heliocentric, his name was Aristarchus. Heliocentric means Sun-centered, that the Earth revolves around the Sun. Aristarchus recognized from his calculations that the Sun was much larger than the Earth and other planets. It was probably this discovery that led him to conclude that the universe is heliocentric. I mean, isn't it more sensible to think that a smaller heavenly body would orbit a larger one, rather than the opposite?

However, his proposition was rejected largely based on other scientific beliefs held at the time, which all made sense in a way even if they were incorrect. Let me mention two objections Greeks made to Aristarchus's theory. First, they believe that everything that moves creates its own wind, so to speak, everyone has this experience when you are running, right? So, they thought that if the Earth itself was moving, there would have to be a constant wind blowing, sweeping them off their feet, and of course there wasn't. And second, the idea of an Earth that moved didn't fit in with the ancient Greeks' understanding of gravity. They thought that gravity was basically a natural tendency of all things to move towards the center of the universe, which was the Earth, or the center of the Earth, so that explains why apples and other falling objects were falling straight down. If the Sun was at the center of the universe, things would fall toward the Sun and away from the Earth, which of course they didn't. So these were some of the reasons they rejected the heliocentric theory.

TPO21 Lecture 2 Computer Science(Software Development)

Narrator Listen to part of a lecture in a Computer Science class. The professor is discussing software engineering.

Professor We've been talking about the software development cycle, and today I'd like to move on to the next stage of that cycle-testing, and why finding bugs during testing is actually a great thing. Eh...eh... the quality of the software product often relies heavily on how well it's been tested. Liz?

Student Um... just a quick thing. Bugs is the word for problems in the program code, right?

Professor

Yeah, in code or in a computer itself. There is a bit of a story behind that term. Um... back in the 1940s, when the computer industry was just starting, a group of computer scientists was working late one night, and there was a problem in one of the computers' circuits1. When they examined it, they found a five-centimeter long moth caught in there. Once they debugged the computer, it worked just fine. And ever since then, all kinds of computer problems have been known as bugs.

Anyway, you want to find bugs while the software is still in the development and testing phases. Finding them when the software product has already been put on the market can be quite embarrassing. Generally speaking, every software development project has a group of testers and a group of developers. Jack?

Student And they are different people?

Professor They are generally completely different group of people. My personal opinion is that they have to be different groups of people because developers often have a bias for their own work, and it blinds them to certain problems that might be obvious to somebody else. So it is always good to have a different set of eyes to go in there and make sure that everything is tested properly.

Ok, now, here's the key. Developers and testers have different mentalities. The mentality of the software developer is construtive, creative, they are spending long hours working together to create and build something new. A software tester, on the other hand, their entire goal is to look at this product and find problems with it, to improve it. Now, this difference between the testers and the developers can lead to an environment where there is a bit of friction. And that friction sometimes makes it difficult for the two teams to work together.

There are two projects that I worked on a couple of years ago. One, which I'll call *Project Split*, well, the testing and development teams did not work well together. And the other, I'll call *Project Unity*, during which both teams worked very well together. Now, during *Project Split*, we had defect meetings where the developers and the testers met together, eh... eh... to discuss various problems and how they should be fixed. And you could sense the conflict just by walking into the room. Literally, the testers and the developers sat on opposite sides on the table. Um... and ... and the developers were very defensive about the feedback.

Student Well, if bugs are being pointed out they wouldn't be too happy since its their work.

Professor Exactly. Now, 'cause the two teams weren't working well together, the fixes were coming very very slowly. And you know, a lot of times when you fix bugs you introduce new bugs, or you discover bugs and other areas that only come to light because something has been changed, so fixing all those new additional bugs was also being delayed. Um... the test process went on much longer than expected and we ended up having to put the product on the market with known bugs in it, which was obviously not ideal.

Student Ok, and what about *Project Unity*? How was it different?

Professor

Um... this was different because two teams worked closely together during the defect meetings, instead of put up walls. Um... we didn't even talked about, you know, who should fix this, who is at fault2. We all acknowledge what needed to be fixed. So if we had ten bugs, we said, 'Hey, you know what? Let's do this one first 'cause this would expose another whole bunch of defects that we haven't even seen yet.' So we were being proactive3 and effective. And because we were so much more effective with our time, we were actually able to do more than just fix the bugs, we even put in some improvements that we hadn't planned.

TPO21 Conversation 2

Narrator Listen to a conversation between a student and her public relations professor.

Student Hi, professor Gordin. I really learned a lot from your lecture, the one about analyzing all those different segments of the population. Oh, the official term is audience, right? I never imagine that one company could have over thirty audiences to communicate with.

Professor Yeah, a lot of students are taken aback by this, and some public relations consultants don’t figure it out until they’ve worked in the field a while.

Student Everyone thinks, public relations, eh, PR is easy, but there’s a lot to it. You really got to know what you are doing.

Professor Absolutely. So, Stacy, your email implied that you needed my advice about graduate school?

Student No, since my undergraduate degree will be in public relations, I’ve already decided to get a master’s degree in marketing. Sorry, I wasn’t clear. My issue is, I have got two require courses and two electives. I am trying to figure out which elective course is to take. My advisor suggested economics and accounting, but I am not really sure.

Professor About?

Student Well, I endured accounting and economics in high school and barely stayed awake, they were so ...

Professor Ok, Ok. I hear you. Eh... you say you wanted a master’s in marketing, you have got one more semester till graduation. Have you taken any marketing courses yet?

Student No, I figured I’ve got the marketing basis already since I have take every PR in communication courses offered here.

Professor Well, there’s some overlap between PR and marketing, but there are important differences too. Marketing focuses on selling your product or service, eh, you know, attracting customers through advertising, and also buiding relationships with customers. That’s what a marketing department does. PR is all about, it involves relationships too, that’s why I am saying the two fields overlap. But in PR, you are developing relationships with a wider range of audience.

Student Right. Like employees, suppliers, the media. I do understand this in theory, but aren’t you still selling your product, just in a different way?

Professor Not necessarily. Ok, do you remember that PR strategy I alluded to the other day? The one our university uses, a strategy that doesn’t overlap its marketing strategy?

Student You mean how the university invites local residents to attend certain lectures and classes for free?

Professor Yeah, this cultivates a sense of good will and helps the university avoid becoming isolated from the larger community. Bringing neighbours into our classrooms is good PR, but it is not marketing since our neighbours aren’t our customers, for the most part.

Student That’s why I want to focus on marketing in graduate school. Wouldn’t having expertise in PR and marketing giving me more career options?

Professor Yeah, but you’ll also want to enjoy your work. So for you electives, why don’t you take advertising principles and intro to marketing, which I teach. This way, you’ll find out if marketing is something you really want to pursue. Graduate School tuition is expensive, and these courses will give you a good overview of the field before committing yourself.

Student I wish my advisor had suggested those courses.

Professor Well, I am someone who has worked in both marketing and PR, so I can offer a different perspective than someone who only teaches ...

TPO21 Lecture3 Biology(Snake Evolution)

Narrator Listen to part of a lecture in a biology class.

Professor Probably back in some previous biology course you learned that snakes evolved from lizards, and that the first snakes weren't venomous and then along came more advanced snakes, the venomous snakes. Ok, venomous snakes are the ones that secrete poisonous substances or venom, like the snakes of the viper family or cobras. Then there is non-venomous snakes like constrictors and pythons. Another family of snakes, the colubrids, don't really fit neatly into either category though. Colubrids, and you probably learned this too, although they are often classified as venomous snakes, they are actually generally non-venomous. They are classified as venomous snakes because they resemble them, their advanced features more than the other non-venomous snakes.

Now, what if I told you that there is a good chance that most everything I just said is wrong? Well, everything except the part about snakes evolving from lizards. See, the basic theory about snake evolution has been challenged by a recent study that revealed a whole new understanding of evolutionary relationship for reptiles, you know, which reptiles descended from which ancestors. The researchers study the proteins in the venom genes of various species of colubrids. Emm... snake venom is a mixture of proteins, some toxic, poisonous, and some not. By analyzing the DNA, the genetic material of the proteins, the researchers could focus on the toxic genes and use them to trace the evolution of snake venom, and from this, the evolution of snakes.

Traditionally, to understanding evolutionary relationships, we looked at various easily observed physical characteristics of animals, their skeleton, the size of their brain, and... and then classify them based on similarities and differences. The problem with this method is that characteristics that appear similar may actually have developed in quite different ways. For example, some venoms are chemical-based, and others are bacteria-based, so they clearly had to have developed along different routes and may not be as closely related as we thought.

Now, and not everyone will agree about this. The classification based on DNA seems to be much more reliable. Ok, back to the research. The researchers found that venom evolved before snakes even existed, about a hundred million years before. Now, a couple of venomous lizards were included in this study. And the researchers found some of the same DNA in their venom as in the snakes' venom. This suggested that the common ancestor of all snakes was actually venomous lizard, which means that actually, according to this research, anyway, in terms of the snakes' ancestry, there is no such thing as a non-venomous snake, not even colubrids. What separates colubrids from other snakes we have been classifying is venomous, is not the lack of venom, but the lack of an effective way to deliver the venom into its prey. In most venomous snakes, like vipers and cobras, the venom is used to catch and inmoblize the prey; but in colubrids, venom drips onto the prey only after the prey is in the snake's mouth. So for colubrids, the venom must serve some other purpose, maybe linked to digesting prey. As the different families of venomous snakes evolved, the teeth moved forward, becoming larger, and the venom becoming stronger, so the evolution of the obvious venomous snakes, like cobras and vipers, is about the evolution of an efficient delivery system, not so much the evolution of the venom itself.

So, if there are no truly non-venomous snakes, were the so-called non-venomous snakes, like constrictors and pythons, were they venomous at some point in their evolution? Well, that's not clear at this point. Constrictors have evolved to kill their prey by crushing, but perhaps they once were venomous, and then at some point their venom-producing apparatus4 wasn't needed anymore, so it gradually disappeared. There's one species of snake, the brown tree snake, that uses both constriction and venom, depending on its prey. So, well, it is possible.

So, we have these new concepts of snakes' evolution and a new DNA database, all these information on the genetic makeup of snake venom. And what we have learned from this has led researchers to believe that venom proteins may have some exciting applications in the field of medical research. You see, venom alters biological functions in the same way certain drugs do, and the big benefit of drugs made from snakes venom would be that they target only certain cells, so maybe that’ll create fewer side effects. Now, it sounds far-fetched5, venom is the basis for human drugs. So far, only one protein has been targeted for study as a potential drug, but who knows, maybe someday.

TPO21 Lecture 4 Art History(Alice Neel)

Narrator Listen to part of a lecture in an Art History class.

Professor

All right, so today we are moving on to Alice Neel, N-E-E-L. Um... Alice Neel painted portraits, she was born in Pennsylvania, and she lived from 1900 to 1984. And I guess you might say, she experienced difficulties as an artist. She was in her 70s, before she had her first major solo exhibition. Um, and this is due at least in part to eh... or... because of photography. After photography became regarded as an art form, portrait painting became less prestigious6, less respected as an art form. And, well, art photography kind of took its place, so you can imagine that a portrait artist, would have had a hard time finding acceptance.

Eh, but the real reason I want to look at Neel, is that I really find her style ... eh, she had interesting ways of portraying people. She combined some elements of realism. What's realism, Alison?

Student It's like painting something exactly how it is, so an artist would try to make it as accurate, um... and objective as possible. Painting stuff just how it appears on the surface.

Professor Ok, good. So Neel combined realism with, well, actually, with expressionism. And that is? We, we just covered this.

Student Um... It's into emotion, like artists are trying to, well, express themselves through the painting, right?

Professor

Yep. The artist is depicting subjective emotions, showing the inner reality as interpreted by the artist rather than the outward form. So the image itself might be distorted or exaggerated in some way. The expression overrides7 objective representation. Ok, so, Alice Neel combined these two styles ... Yes?

Student Em... How is that even possible? How can your portray something exactly as it is and at the same time distort it with emotions? I don't get it.

Professor

All right, good question. It is actually a good lead-in8 to some of the techniques that Neel used, that she employed to bridge that contradiction. In a minute, I'll show you some of her portraits, and I'll want you to notice a few things about them.

First, Neel's use of bold color. All right? You'll see she uses color to convey emtion and feeling, like the subjects' clothing for instance, it appears brighter than it really is. And the subjects, the people being portrayed, Neel paid special attention to faces. The way she paints the eyes and how the faces are portrayed, these are quite realistic, like the realists' work. But another thing Neel did was use elongated, sort of stretchy figures.

Student But didn't a lot of expressionist painters do that? So really your are saying that Neel's techniques were similar to what other artists were doing. What was it that she did, that was like all her own?

Professor Ok, well, I think it has to do partly with the way she combined these techniques. So, for example, those realistic faces and eyes, but bright, distorted figures. It is a mix. You'll see that her portraits do reflect reality, the people that were actually sitting there. Realism was important in the sense that she wanted to show people as they really were, much like a photographer would. But Neel wasn't satisfied with photo-like realism, she went beyond that. And this is where expressionism comes in.

She believed in capturing the whole person, not just what was on the surface, that’s where the expressionists’ distortion is important, in an attempt to reveal the subjects’ character or personality.

But Neel’s paintings are distinctive for her time in part because they are portraits. Remember I said that photography and art photography had largely taken the place of portraiture, to the extent that some critics had declared the genre of portraiture to be dead. But Neel felt that painting should reflect reality, a real realist’s stance9 you could say. And to her, individuals, people best reflect the reality of their time, of the age that they lived in, so she painted portraits. And if you look at her work, we are talking in the vicinity of10 three thousand paintings. If your looked at them, it is like this gallery of the whole century, an enomous range of subjects: families, women, children, artists, people in poverty--these paintings really span class, age and gender. It is like she transformed the genre, it is not just formal depictions of presidents and ancestors any more.

But keep in mind that she was doing this when abstract art dominated the art scene. Representations of people weren’t fashionable in the art world. And it wasn’t until fairly late in the century that critics recognized the power of what she did.

TPO 22

Conversation 1 (Faculty Advisor)

Narrator: Listen to a conversation between a student and a faculty advisor for the university newspaper.

Student: Hi, I am sorry to bother you, but…

Faculty advisor: Yes?

Student: This is about the newspaper.

Faculty Advisor: Oh, Ok. Well. I am only the advisor; the newspaper office is off campus on Pine Street. Eh…what was it? Did you want to work for the paper? We are always looking for writers.

Student: Well, my problem was with the writing actually, with an article that was published in yesterday’s newspaper.

Faculty Advisor: Oh? Which one?

Student: The one about the student government and its president Sally Smith.

Faculty Advisor: Is this something to do with what the editor wrote about the statue? Eh, the statue at the main entrance of the university?

Student: Well, that’s part of it. But you know, the editor used the situation to say some really unfair things, about the student government, and the president Sally Smith in particular. I think the paper should publish a retraction, or at the very least an apology to Sally.

Faculty Advisor: Ok. Um… if I remember correctly, what you are referring to wasn’t a news story, but an editorial, right? Eh, it was on the opinion page, it was signed by one of the editors, and was clearly labeled as commentary.

Student: Well, yes. But the thing about the statue, Sally made this simple comment that was in really bad condition and should be replaced. And, well, the tone in the editorial was demeaning. It accused her of not respecting the past and it had some personal stuff that seemed unnecessary.

Faculty Advisor: Wait a minute. Remind me.

Student: Well, you know, it implied that Sally doesn't know much about the university's history and it called her a big city politician because she's from Boston. It's just mean-spirited, isn't it?

Faculty Advisor: Haven't you heard the saying "all publicity is good publicity"?

Student: Well…

Faculty Advisor: I'd say the article is bringing attention to the student government organization, which is pretty invisible. Eh, you rarely hear about what the student government is doing.

Student: But this article…

Faculty Advisor: And the piece, well, yeah, it had a bit of an exaggerated tone. It was satirical, or at least it was meant to be. It wasn't just poking fun at Sally, but the whole idea that our school is sort of rural, and you know, not cosmopolitan.

Student: Well, none of us thought it was very funny.

Faculty Advisor: Well, sometimes it's best just to roll with it. It is just a cliché; everybody knows it is not true.

Student: But I thought we could expect better than that here.

Faculty Advisor: Well, I am certainly in favor of getting a variety of viewpoints. [so why don't you go talk to the editor, Jennifer Hamilton, and tell her you want equal time? You or Sally could write a response.]

Student: [Really? She would let us do that?] Didn't she write it?

Faculty Advisor: I'll let Jennifer know you are coming, she feels the same way I do. She is journalism major. She would be happy to publish another point of view.

TPO22 Lecture 1 (Anthropology)

Narrator: Listen to part of a lecture in an anthropology class.

Professor: One of the big questions when we look at prehistory is why did the earliest states form?
Well, to begin we'd better define exactly what we mean when we talk about states. The human groups that are the smallest and have the least social and political complexity, we call bands. The groups that are the largest and most socially and politically complex, we call states. So, the level of complexity here refers to the organization of people into large, diverse groups, and densely populated communities. And there are four levels in total: bands, tribes, chiefdoms and states.

But, but back to my original question. Why did early states form? Why not just continue to live in small groups? Why become more complex?

One theory called the environmental approach hypothesizes that the main force behind state formation was population growth. It assumes that centralized management was critical to dealing with issues caused by sudden population surges, like a strain on limited food supplies.

At the least complex end of the spectrum, the few families living in bands are able to meet their own basic needs. They usually hunt together and forage whatever foods are available to them, instead of domesticating animals and planting crops. In order to efficiently take advantage of the wild foods available, bands are often nomadic and move around following herds of animals. This strategy is feasible when you have a small population.

But when you have a large population, well, the whole population can't just get up and move to follow a wild herd of animals. So you need sophisticated technologies to produce enough food for everyone. And there is an increase need to resolve social problems that arise as people begin to compete for resources. To manage intensified food production, to collect, store and distribute food, you need centralized decision-making, centralized decision-makers.

It's the same thing when it comes to maintaining social order. You need to create and efficiently enforce a formal legal code. It makes sense to have a centralized authority in charge of that, right? So a hierarchy forms. By definition, states had at least three social levels. Usually, an upper class of rulers, a middleclass comprised of managers and merchants, and a lower class of crop producers and agricultural laborers.

The environmental approach hypothesizes that states appear in certain environmental settings, settings which have a severe population problem or a shortage of agricultural land. But not everyone agrees with the theory. It definitely has some weaknesses. For example, states have developed in places like the mild lowlands of Mesoamerica and in Egypt's Nile River Valley. Both places had vast areas of fertile farmland, no shortage of agricultural land. And what about population increase? Well, there were some early states that formed where there wasn't any sudden population increase. So it seems that these are valid criticisms of the environmental approach.

TPO22 Lecture 2 (Astronomy)

Narrator: Listen to part of a lecture in an astronomy class.

Professor: Today, I want to talk about a paradox the ties in with the topic we discuss last time. We were discussing the geological evidence of water, liquid water on Earth and Mars three to four billion years ago. So, what evidence of a liquid water environment did we find in rock samples taking from the oldest rocks on Earth?

Student: Eh… Like pebbles, fossilized algae?

Professor: Right. And on Mars?

Student: Dry channels?

Professor: Good. All evidence of water in liquid form, large quantities of it. Now, remember when we talked about star formation, we said that as a star ages, it becomes brighter, right? Hydrogen turns into Helium, which releases energy. So our standard model of star formation suggests that the Sun wasn't nearly as bright three to four billion years ago as it is today, which means the temperatures on Earth and Mars would have been lower, which in turn suggests…

Student: There would have been ice on Earth or Mars?

Professor: Correct. If the young Sun was much fainter and cooler than the Sun today, liquid water couldn't have existed on either planet.

Now, this apparent contradiction between geologic evidence and the stellar evolution model became known as the faint young Sun paradox.

Now, there have been several attempts to solve this paradox.

First, there was the greenhouse-gas solution. Well, you are probably familiar with the greenhouse gas effect, so I won't go into details now. The idea was that trapped greenhouse gases in the atmospheres of Earth and Mars might have caused temperatures to raise enough to compensate for the low heat the young Sun provided. And so it would have been warm enough on these planets for liquid water to exist. So, what gas do you think was the first suspect in causing the greenhouse effect?

Student: Um…carbon dioxide, I guess. Like today?

Professor: In fact, studies indicate that four billion years ago, carbon dioxide levels in the atmosphere were much higher than today's levels. But the studies also indicate that they weren't high enough to do the job—make up for a faint Sun.

Then some astronomers came up with the idea that atmospheric ammonia might have acted as a greenhouse gas. But ammonia would have been destroyed by the ultra-violet light coming from the Sun and it had to be ruled out too.

Another solution, which is proposed much later, was that perhaps the young Sun wasn't faint at all, perhaps it was bright. So it is called the bright-young-Sun solution, according to which the Sun would have provided enough heat for the water on Earth and Mars to be liquid. But how could the early Sun be brighter and hotter than predicted by the standard model? Well, the answer is mass.

Student: You mean the Sun had more mass when it was young?

Professor: Well, if the young Sun was more massive than today's, it would have been hotter and brighter than the model predicts. But this would mean that it had lost mass over the course of four billion years.

Student: Is that possible?

Professor: Actually, the Sun is constantly losing mass through the solar wind, a stream of charged particles constantly blowing off the Sun. we know the Sun's current rate of mass loss, but if we assume that this rate has been steady over the last four billion years, the young Sun wouldn't have been massive enough to have warmed Earth, let alone Mars, not enough to have caused liquid water.

Student: Maybe the solar wind was stronger then?

Professor: There is evidence that the solar wind was more intense in the past. But we don't know for sure how much mass our Sun's lost over the last four billion years. Astronomers tried to estimate what solar mass could produce the required luminosity to explain liquid water on these planets. They also took into account that with a more massive young Sun, the planets would be closer to the Sun than they are today. And they found that about seven percent more mass would be required.

Student: So the young Sun had seven percent more mass than our Sun?

Professor: Well, we don't know. According to observations of young Sun like stars, our Sun may have lost as much as six percent of its initial mass, which doesn't quite make it. On the other hand, this estimate is based on a small sample. And the bright-young-Sun solution is appealing. We simply need more data to determine the mass loss rate of stars. So there's reason to believe that we will get an answer to that piece of the puzzle one day.

TPO22 Conversation 2 (Professor)

Narrator: Listen to part of a conversation between a student and his music history professor.

Student: So, I was wondering what I could do to improve my paper before the final draft is due.

Professor: Well, Michael, I have no problem with your writing style. It's graceful and clear. Eh, and it's interesting that you are writing about your grandmother's piano concert.

Student: Yeah, when you said we had to attend a concert and write about it, I immediately thought of her. I have been to lots of her concerts. So I am really familiar with her music.

Professor: That's not necessarily an advantage. Familiarity sometimes makes it hard to see things objectively.

Student: So I shouldn't write about my grandmother?

Professor: No, no, no. I am just talking in general. But as I mentioned in my comments, I'd like you to place your grandmother's concert in… in a broader context.

Student: Yeah, I saw that, but I wasn't sure what you meant. I mean, I mentioned my grandmother's childhood, how much her parents love music, how she played the piano at all our family gatherings.

Professor: Ok. I see what happened now. By broader context, I mean how the concert relates to some period in music history.

Student: I see. Ok. Um… I have an idea.

Professor: Ok.

Student: Well, as you read in my paper, my grandmother performs classical music.

Professor: Yes.

Student: That's her true love. But for most of her career, she performed jazz. She originally studied to be a classical pianist. But jazz was in its heyday back then, and when she got out of the conservatory, she was invited to join a jazz orchestra. And the opportunity was just too good to turn down.

Professor: Really. Well, that's fascinating. Because she probably had to reinvent her whole musical style.

Student: She did. But jazz was where the money was at that time, at least for her.

Professor: But she eventually went back to classical?

Student: Right. But only recently.

Professor: Ok.

Student: So if I can show how her choices relate to what was happening in the world of music at the time…?

Professor: I think that might work very nicely.

Student: And if I do that, I guess I'll have to like, interview her.

Professor: Right.

Student: And I guess that would mean…

Professor: You'll have to rewrite most of your paper.

Student: Ouch!

Professor: Yeah. Would an extra week ease the pain?

Student: Definitely.

Professor: Ok. So are there other musicians in your family?

Student: Yeah. My mother plays piano, too. Not as well as my grandmother, but…

Professor: And you?

Student: I don't play any instruments, but I sing in the university choir. In fact, we are performing next week, and I have a solo.

Professor: That's great! Could I tell the class about your concert?

Student: Um…sure. But…about my paper… what question should I be asking my grandmother?

Professor: You know what, I have a meeting now. Why don't you come to class a few minutes early tomorrow?

Student: Will do.

TPO22 Lecture 3 (Zoology)

Narrator: Listen to part of a lecture in a zoology class.

Professor: A mass extinction as when numerous species become extinct over a very short time period, short, geologically speaking that is, like when the dinosaurs died out 65 million years ago. And the fossil record, it indicates that in all the time that animals have inhabited Earth, there have been five great mass extinctions, dinosaurs being the most recent. In each of the others up to half of all land animals and up to 95 percent of marine species disappeared.

Well, today we are witnessing a sixth mass extinction, but unlike the others, the current loss of bio-diversity can be traced to human to human activity. Since the Stone Age, humans have been eliminating species and altering ecosystems with astounding speed. Countless species have disappeared due to over-hunting, habitat destruction and habitat fragmentation, pollution and other unnatural human causes.

So, as a way of repairing some of that damage, a group of conservation biologists has proposed an ambitious, or some might say, a radical plan, involving large vertebrates, or , megafauna. Megafauna include elephants, wild horses, big cats, camels, large animals. Eh, actually, the proposal focuses on a particular subset of megafauna, the kind that lived during the Pleistocene epoch.

Ok. The Pleistocene epoch, most commonly known as the Ice Age, stretched from 1.8 million to 11,500 years ago. In the Americas, many megafauna began disappearing by the end of the Pleistocene.

So here's the biologists' idea. Take a select group of animals, megafauna from places like Africa and Asia, and introduce them into other ecosystems similar to their current homes, beginning in the United States. They call their plan Pleistocene rewilding.

Now, the advocates of Pleistocene rewilding cite two main goals. One is to help prevent the extinction of some endangered megafauna by providing new refuges, new habitats for them. The other is to restore some of the evolutionary and ecological potential that has been lost in North America. What do I mean by restore evolutionary potential? Well as you know the evolution of any species is largely influenced by its interactions with other species.
So during the Pleistocene epoch… let's take the now extinct American cheetah, for instance. We believe it played a pivotal role in the evolution of the pronghorn antelope, the antelope's amazing speed, to be exact, because natural selection would favor those antelope that could outrun a cheetah. When the American cheetahs disappeared, their influence on the evolution of pronghorn and presumably on other prey animals stopped. So it is conceivable that the pronghorn antelope would have continued to evolve, get faster maybe, if the cheetahs were still around. That's what's meant by evolutionary potential. Importing African cheetahs to the western United States could, in theory, put the pronghorn back onto its… uh, natural evolutionary trajectory according to these biologists.
Another example is the interaction of megafauna with local flora, in particular, plants that rely on animals to disperse their seeds. Like Pleistocene rewilding could spark the re-emergence of large seeded American plants, such as the maclura tree. Many types of maclura used to grow in North American, buy today, just one variety remains and it is found in only two states. In the distant past, large herbivores like mastodons dispersed maclura seeds, each the size of an orange in their droppings. Well, there aren't any mastodons left, but there are elephants, which descended from mastodons. Introduce elephants into that ecosystem and they might disperse those large maclura seeds, like their ancestors did.

Get the idea? Restoring some of the former balance to the ecosystem? But as I alluded to earlier, Pleistocene rewilding is extremely controversial. A big worry is that these transplanted megafauna might devastate plants and animals that are native to the western United States. In the years since the Pleistocene epoch, native species have adapted to the changing environmental there, plants, smaller animals, they have been evolving without megafauna for millennia. Also, animal species that went extinct 11,000 years ago, uh, some are quite different genetically from their modern-day counterparts, like elephants don't have thick coasts like their mastodon ancestors do when they graze the prairies of the America West during the Ice Age. Granted, the climate today is not as cold as it was in the Pleistocene. But winters on the prairie can still get pretty harsh today. And there are many more considerations. Well, you see how complex this is. If you think about it though, the core problem with this sixth mass extinction is human interference. Pleistocene rewilding is based on good intentions, but you know, it probably would just be more of the same thing.

TPO22 Lecture 4 (Music History)

Narrator: Listen to part of a lecture in a music history class.

Professor: So, uh, if you are a musician in the United States in the early twentieth century, where could you work?

Student: Same as now, I suppose. In an orchestra, mainly.

Professor: Ok. And where would the orchestra be playing?

Student: Uh, in a concert hall or a dance hall?

Professor: That's right. And smaller groups of musicians were needed in theaters as accompaniment to visual entertainment, like cabarets and variety shows. But the largest employer for musicians back then was the film industry, especially during the silent-film era.

Student: Really? You mean being a piano player or something? I thought movie theaters would have used recorded music.

Professor: Well, no. Not during the silent-film era. We are talking a period of maybe thirty years where working in movie theaters was the best job for musicians. It was very well-paid. The rapid growth of the film industry meant movie theaters were popping up everywhere. So suddenly there was this huge demand for musicians. In fact, over 20,000 jobs for musicians were gone, disappeared at the end of the silent-film era, 20,000. Ok. So from the beginning, music was a big part of film, even at the first…

Student: Excuse me, professor. I think I read somewhere that they used music to drown out the sound of the film projectors?

Professor: Yeah. That's good story, isn't it? Too bad it keeps getting printed as if it were the only reason music was used. Well, think about it. Even if that were the case, noisy projectors were separated from the main house pretty quickly, yet music continued to accompany film. So, as I was saying, even the very first public projection of a film had piano accompaniment. So music was pretty much always there.

What's strange to me though, is that at first film music didn't necessarily correspond to what was on the screen. You know, eh, a fast number for a chase, deep bass notes for danger, something light and humorous for comedy. And that's instantly recognizable now, even expected. But in the very early days of film, any music was played. A theater owner would just buy a pile of sheet music and musicians will play it, no matter what it was. Pretty quickly though, thankfully, everybody realized the music should suit the film. So eventually, film makers tried to get more control over the musical accompaniment of their films., and specify what type of music to use and how fast or slow to play it.

Student: Are you saying there was no music written specifically for a particular movie?

Professor: Yeah. Original scores weren't common then. Rarely a filmmaker might send along an original score composed especially for a film, but usually a compilation of music that already existed would be used. Yeah, that was a good time for a lot of musicians. But that all changed with the introduction of sound on film technology. Actually, even before that, organs could mimic a number of instruments and also do some sound effects. So they were starting to replace live orchestras in some movie theaters, and it only takes one person to play an organ.

Student: Ok. But even after that someone still had to play the music for the sound for the sound recordings, the soundtracks.

Professor: Yeah. But think of all the movie theaters there were, most employing about six to eight musicians, some even had full orchestras. But in the early 1930s, most theater owners installed new sound systems. So suddenly a lot of musicians were looking for work. Once recording technology took off, studio jobs working exclusively for one film company, eh, studio jobs did become available. But the thing is, each major movie company pretty much had only one orchestra for all their productions, a set number of regular musicians. So if you could get it, studio musician was a good job. If you were cut out for it, musicians had to be able to read music very well, since the producers were very conscious of how much money they were spending. They didn’t want to waste any time. So a musician was expected to play complicated pieces of music pretty much without any preparation. If one couldn’t do it, there were plenty of others waiting to try. So there was a lot of pressure to do well.

TPO 23

CONVERSATION 1

Narrator: Listen to a conversation between a student and the director of campus activities.

Student: I'm here 'cause... well, there's something I don't understand. I set an announcement for an event. And this morning I checked the events section of the university's website. And nothing, there is no mention of it.

Director: And when did you summit this request?

Student: Last Wednesday. I followed the instructions very carefully. I am sure it was Wednesday, because know announcements have be submitted three business days ahead of the posting day.

Director: And what's it for?

Student: A reading.

Director: A reading?

Student: Yes. A poetry reading.

Director: Oh, OK. When is it?

Student: In three days. It is an author from France we have been trying to get for a while. And now that he has finally agreed to come, no one will be there.

Director: Wow. This person is really coming all the way from France?

Student: Oh, no. He is teaching promising there will be in New York City this year. We were able to sell him on a nice size crowd , felt confident about that. Because the idea by I know how enthusiastic our group is.

Director: And your group ? do you have a name?

Student: Um ? it is kind of a loose group, you know, just a bunch of students in the French department who are interested in French literature. There's no formal structure or anything. I guess you could call us the French Literature Reading Group.

Director: OK. And it is a recognized group? By the university, I mean.

Student: No

Director: OK.

Student: But the French Department is funding this, on the condition that we do all the legwork.

Director: All right. Hold on a second while I check. Well, it looks like we did receive your announcement last Wednesday. Uh, looks like the editors must have decided not to include your event in this week's listings.

Student: Not included? Why?

Director: Well, we don't post things automatically. We get so many requests that we couldn't possibly post them all. So events that are thought to be too specialized, without the potential for really wide appeal...

Student: Wow, I got to say that does surprise me. What am I going to do now? I mean, he really is quite famous. I really do think there would be a genuine interest beyond my group. It would be a shame if no one shows up because there isn't enough publicity. Is there anyone else I can talk to?

Director: I don't think that would do you much good since we are already working on next week's schedule. But maybe you could ask the French department to post the announcement on its website. And maybe you could approach some other departments as well, you know, relevant ones.

Student: I knew we should have done a poster. But everybody was like, oh, you can just post it online. In any event, thanks for you help. It's something to consider.

TPO23 Lecture l- Archaeology (Antikythera (Mechanism)

Narrator: Listen to part of a lecture in an archaeology class.

Professor: I was talking to one of my colleagues in the physics department the other day, and we ended up discussing how one discovery can change everything. My colleague mentioned how the theory of relativity completely changed the field of physics. At any rates, that conversation got me thinking about archaeological finds that really changed our understanding of ancient civilizations. So I want to talk about the discovery of the Antikythera Mechanism.

The Antikythera Mechanism was found a hundred years ago, under water in an ancient Greek shipwreck in the Mediterranean Sea. It was in extremely poor condition and in many corroded pieces. But once we figured out what it was and reconstructed it. Well, I simply don't have the words to convey how extraordinary this find was.

The Antikythera Mechanism is a relatively small device, roughly the size of a shoebox, made of gears fitted inside a wooden case. In its original state, there were rotating dials and other indicators on the top, with letters and drawings showing the Sun, the phases of the moon and different constellations. Inside the box, bronze gears would have rotated the displays. The displays, uh, the indicators of the Antikythera Mechanism, would then moved to show the motion of the Sun and moon relative to the planets and stars. The device could be used to tell the different phases of the moon and much more.

Well, scientists have recently analyzed the inscriptions on the mechanism and re-examine the other cargo in the ship wreck, and the evidence makes an absolute case that this device dates back to ancient Greece somewhere between 150 and 100 B.C.E. What makes that so fascinating is that before we found the Antikythera Mechanism, the earliest device we had that could track the Sun and moon like this was invented over 1,000 years later. So when this was first found, people literally would not believe it. Some of my colleagues insisted it had to have been made well after 100 B.C.E. But this physical evidence was conclusive. It was that old.

Of course part of what made this find so unusual is that the Antikythera Mechanism is constructed of bronze. Now, it is not that bronze was all that rare in Greece then, it is just that bronze was valuable and could easily be recycled. It would have been relatively easy for a person with knowledge of metals to melt down bronze objects and forge them into ? well, say, coins. Bronze was used to made money back then. Or mold the bronze into anything else of value for that matter.

We are very fortunate that the device ended up under water, because otherwise it probably would have ended up recycled into ? who knows what. Now, it was a challenge to figure out the Antikythera Mechanism. It spent over 2,000 years at the bottom of the sea before it was discovered. And even after it was discovered, it was still a number of years before we really understood what it was. You see, the mechanism had corroded underwater, and many of the gears were stuck together in a mass. Cleaning it was only partly successful. We could only get a good look at the structure of the gears after gamma-rays were used to see inside, very similar to the way X-rays are used to see your bones.

Now, once we got a good look inside, we saw a really complex device. The many gears not only moved in a way that could indicate the phases of the moon. The Antikythera Mechanism also tracked both the lunar year and the solar year.

Additionally, the gears also moved to match the motions of the planet and predicted eclipses. But one thing that is particularly notable is that the mechanism was so precise that it even took into account a particular irregularity in the moon's orbit, which requires some very complex math to replicate in mechanical device.

You could say that the Antikythera Mechanism was a very precise calendar, which stands to reasons calendars were very important to ancient peoples. Religious festivals had to be held at the right time of year, crops needed to be planted at the right time as well. And let's not forget that eclipses in planetary motions had important symbolic meanings.

TPO23 Lecture2 - Environmental Science (Earth Budget)

Narrator: Listen to part of a lecture in an environmental science class.

Professor: Basically, a cloud either contributes to the cooling of Earth's surface or to its heating. Earth's climate system is constantly trying to strike a balance between the cooling and warming effects of clouds.

It's very close, but overall the cumulative effects of cloud are to cool Earth rather than heat it. And this balance between the amount of solar radiation, energy from the Sun, that's absorbed by Earth, and the amount that's reflected back into space. We call this Earth's radiation budget. And one way we keep track of the radiation budget is by looking at the albedo of the different surfaces on the planet.

A surface's albedo is the percentage of incoming solar energy, sunlight, that's reflected off that surface back into space. Oceans have a low albedo, because they reflect very little energy. Most of the solar energy that reaches the ocean gets absorbed and heats the water. Um... rainforests also have low albedos. Well, by contrast, deserts and areas covered by ice and snow, these places have high albedos. And clouds, in general, cloud also have high albedos. That means that a large percentage of the solar energy clouds receive is reflected into space.

OK. Now, when we say that clouds have a high albedo. We are talking about the effect of all the clouds on earth averaged together. But different types of clouds have different reflective properties, they have different albedos.

Student: So which type of clouds cools Earth? And which type heat it?

Professor: Well, high thin clouds contribute to heating while low thick clouds cool Earth. High thin clouds are very transparent to solar radiation, like, uh, clear air. So they mostly transmit incoming solar energy down to Earth. There's not much reflection going at all. At the same time, these clouds trap in some of Earth's heat. Because of the trapped heat, these clouds have an overall heating effect.

Student: Oh. OK. Since low thick clouds are not transparent to radiation...

Professor: Exactly. They block most of the solar energy so it never reaches Earth's surface. They reflect much of it back out into space.

Student: So that's how they contribute to cooling?

Professor: Yep. And as I said earlier, this cooling effect predominates. Now, what if there was a process that could control the type of clouds that form?

Student: Are you talking about controlling the weather?

Professor: Well, I am not sure I would go that far. But we recently noticed an increase in cloud cover over an area of the ocean waters around Antarctica. An increased area of low thick clouds, the type that reflects a lare portion of solar energy back to space and cools the Earth.

Well, the reason for this increased cloud cover, it turns out, is the exceptionally large amount of microscopic marine plants. Well, the current hypothesis is that these microorganisms produce a chemical, dimetho sulfide that interacts with the oxygen in the air, creating conditions that lead to the formation of the low thick clouds we observed. Well, that's true. It could have huge implications. So, maybe we are talking about controlling the weather. Perhaps, if the microorganisms near Antarctica really are responsible, perhaps we can accelerate the process somehow.

TPO 23 Conversation 2

Narrator: Listen to a conversation between a student and his English professor.

Professor: Hi, Bob. How is it going? Are you enjoying the Introduction to Literature class?

Bob: Yeah, it's great. Araby, that short story by James Joyce we read last week, it was awesome.

Professor: I'm glad you like it. Most of Joyce's work is very complex. A lot of students say that he is hard to understand. Normally, you wouldn't tackle Joyce in an Intro class, but I'd like to give my first year students a taste of his style, his psychological approach to literature, because ? mainly because it influenced other writers. I only wish we had more class time to discuss it.

Bob: Me too. So why did you pick Araby instead of some other story?

Professor: Well, um, first you should know that Araby is one of fifteen short stories by Joyce in a book called Dubliners. Uh, all the stories are related to one another, and they are set in the same time period. But Araby is the easiest one to follow. Though all the stories in the collection are written in stream of consciousness, which as you know, means they are told through the narrator's thought, through an inner monologue, as opposed to dialogue or an objective description of events. But Araby is easier because it's linear, the story unfold chronologically.

Bob: Still, I wish we could read whole novels by Joyce and discussed them in class.

Professor: That's what happens in my Master Writer Class.

Bob: Master Writer Class?

Professor: Yeah, I teach one on Joyce every spring. It's such a privilege, spending an entire term diving into a single body of work. And my students, they bring so much insight to the table that it's easy to forget who the professor is.

Bob: Oh, wow. That could actually solve my dilemma, uh, what I originally wanted to ask you ? um, I am working on my schedule for next term, and I've got room for one more course, and I'd like to take more literature. Could I take your Master Writer Class on Joyce?

Professor: I'm sorry. I should have mentioned. Uh, Master Writer is an advanced seminar. So students need to get a strong foundation in literary theory and criticism before I let them in the room.

Bob: But I have gotten really good grades on all my paper so far, I'm sure I can keep up. Couldn't you make an exception?

Professor: Your grades are excellent. But in our intro class, you are reviewing the basics, like plots, setting and character and getting your first real exposure to different literary styles.

Bob: But why do I have to study different styles to understand Joyce's novels?

Professor: There are a lot of little details involved in interpreting literature. And like with Joyce. His novels have very unique structures. The only way to appreciate how you meet there is by studying a variety of authors.

Bob: Oh, OK. So could you suggest a different literature class then?

Professor: Sure. There's doctor Clain's course on nineteenth-century novels. It's more focused than the class you're in now. But it will build on your current knowledge base and give you the background you need. That, plus a couple more foundational classes, and you will definitely be ready for my seminar.

Bob: Sweet. Thanks.

TPO23 Lecture3 Biology (Dolphins)

Narrator: Listen to part of a lecture in a marine biology class.

Professor: We have been talking about how sea animals find their way underwater, how they navigate, and this brings up an interesting puzzle, and one I'm sure you'll all enjoy. I mean, everybody loves dolphins, right?

And dolphins, well, they actually produce two types of sounds. Uh, one being the vocalizations you are probably all familiar with, which they emit through their blowholes. But the one we are concerned with today is the rapid clicks that they use for echolocation, so they can sense what is around them. These sounds, it has been found, are produced in the air-filled nasal sacs of the dolphin.

And the puzzle is how does the click sounds get transmitted into the water? It's not as easy as it might seem. You see, the denser the medium, the faster sound travels. So sound travels faster through water than it does through air. So what happens when a sound wave um ? OK.

You've got a sound wave traveling merrily along through one medium, when suddenly; it hits a different medium, what does gonna happen then? Well, some of the energy is going to be reflected back, and some of it is going to be transmitted into the second medium. And ? and ? and if the two media have really different densities, like air and water, then most of the energy is going to be reflected back, very little of it will keep going, uh, get transmitted into the new medium. I mean, just think how little noise from the outside world actually reaches you when your head is underwater.

So, how did the dolphin's clicks get transmitted from its air-filled nasal sacs into the ocean water? Because given the difference in density between the air in the nasal cavity and the seawater, we'd expect those sounds to just kind of go bouncing around inside the dolphin's head, which will do it no good at all. If it's going to navigate it, needs those sounds to be broadcast and bounced back from objects in its path.

Well, turns out dolphins have a structure in their foreheads, just in front of their nasal sacs, called a melon. Now, the melon is kind of a large sac-like pouch, made up of fat tissue. And this fat tissue has some rather fascinating acoustical properties. Most of the fat that you find in an animal's body is used for storing energy, but this fat, which you find in dolphins, and only in the melon and around the lower jaw. This fat is very different, very rich in oil. And it turns out it has a very different purpose as well.

Now, one way to um, modify the overcome this mismatch in the density of air and water would be ? if you travels through velocity of the sound wave, make it precisely match the speed at which water. And that's exactly what marine biologists have discovered the melon Note that the bursa, these little projections at the rear of the melon, are right up against the air-filled nasal sacs. And these bursa, it turns out, are what's responsible for transferring sound to the melon.

The sound waves are then transmitted by the bursa through the melon. First through a low velocity core, and then through a high velocity shell, where their speed is increased before they are transmitted into the surrounding seawater. So now the signals can be efficiently transferred into the water, with minimal reflection.

The only other place, this special fatty tissue, like that in the melon, the only other place is found in the dolphin, is in the lower jaw. Turns out that the lower jaw, well, it is made of a specially thin bone. And it is very sensitive to vibrations, to sound energy traveling through the seawater. It turns out that the jaw is primarily responsible for capturing and transferring returning sound waves to the dolphin’s inner ear. So these rapid clicks that are sent out bounce off objects, maybe a group of fish swimming over here, a boat coming from over there. The sounds bounce off them and the lower jaw captures the returning sounds, making it possible for the dolphin to sense what's in the surrounding water and decide where to swim.

TPO23 Lecture4 Choreography (Screen Dance)

Narrator: Listen to part of a lecture in a choreography class.

Professor: Now, when you think about choreography, well, uh, for your last assignment, you choreographed the dance that was performed on stage in front of live audience. Now, screen dance is very different. It is a dance routine you will be choreographing specifically to be viewed on a screen, on a computer screen, a TV screen, in a movie theater, any screen. So the question we have to ask is, what's the difference between choreography for a live performance and choreography for on-screen viewing?

OK. Think for a minute. When you see a movie, is it just a film of people acting on a stage? Of course not. Movies use a variety of camera angles and creative editing. Movies can distort time, slow movement down, or speed it up, show actors fading in and out of scenes, etc. All of these ? all of these film-making techniques, things that can't be used in a live performance, are possible in a screen dance. Now, we'll cover these concepts in greater detail later, but you should be getting the idea that I don't want you to just film dancers on stage and turn it in as your screen dance project. Uh, Yes?

Debbie.

Student: But isn't something lost here, Professor Watson? I am a dancer, and when I perform on stage, I am so energized by the audience's reactions, the applause. I actually, and for a lot of dancers, it ? it really inspires us.

Professor: You're right. Screen dance, which is a relatively new, isn't for everyone. Uh, some dancers may seem reluctant to participate in your project, because they do thrive on the immediacy of performing live. If this happens, you could point out that screen dance offers other ways for dancers to connect to their audience. For example, dancers can express themselves, even change the whole mood of the scene through a facial expression. And you could film close-up shots of their faces. Facial expressions aren't as important in live performances generally, because the choreographer knows that someone in the back row of a theater may not be able to see a dancer's face clearly.

Student: But ? um, I have never used a movie camera or edited film before. How will we learn everything we need to know to ? ?

Professor: Oh, don't worry. The cameras you will be using are pretty simple to operate. And you'll get to play with the film-editing software several times before beginning your project. You'll also have the option of working with a student in the film department, someone who's familiar with the technology. But the choreography and the end result will be your responsibility of course.

Student: Could you talk some more about the film - making techniques, you know, the ones that work best forscreen dances?

Professor: I'll show some of my favorite screen dances next week to give you a better idea. But, uh, OK. Here's one technique that can create the illusion of flow in a screen dance. You film the same dancer, entering and exiting the frame several times. Moving slowly at first, then faster and faster. Then in the editing room, you can digitally manipulate these images, like you might put five or ten or twenty copies of that same dancer meeting himself in the middle of the screen, to make it look like he is dancing with himself.

Obviously, this can't be done in a live performance. Another example, in one screen dance I saw, the dancers leap through sheets of fire in a big abandoned building. Of course, the building wasn't really on fire. A technique called super-imposing was used. The dancers were filmed and layered in the editing room. The fire was added to the background.

Student: That sounds awesome. But if anyone can watch a dance on a computer screen. Why would they pay to go see a live performance? What if screen dance got so popular that it replaced live dance?

Professor: Screen dance is an entirely different type of presentation. It could never replicate the immediacy, the kind of drama that live performance offers. There will be an audience for that. I think what screen dance will do, though, is heighten awareness of dance in general. Because it is a way ? u h, it can reach people in their homes, in their workplaces, at anytime really. And if someone discovers that they love dance by watching a screen dance, there's a good chance they will get interested enough to buy a ticket to see a live performance.

TPO 24

Conversation l Student & Clerk in the Bookstore

Narrator: Listen to a conversation between a student and a clerk in the bookstore.

Student: Hi. Can you tell me where to find New Kind of Science? By, uh, by Stephen Wolfram.

Clerk: OK

Student: ...uh, I couldn't find it

Clerk: OK. Let me look it up on the computer for you. Who would you say the author was?

Student: It's a Stephen Wolfram.

Clerk: OK. Let's see... Hmm... no, it's not coming up. Hmm..,. I am not seeing it

Student: Um...hmm.

Clerk: This is for a course here at the university, right?

Student: Yeah, It's assigned reading for a class I am taking.

Clerk: It's for the semester, right? You are not buying it in advance for next year or anything.

Student: No, no. It's for a class I am taking now.

Clerk: Hmm...

Student: Oh, oh, you know what? Um, it's for a graduate class. Would that maybe make a difference? I mean, I am an undergrad, but I am just taking this one class in the graduate department, so...

Clerk: No, no. I don't think that's it. That shouldn't make any difference. But, hmm... let me see... maybe it's just...it could be that whoever that entered it misspelled the title or the author's name, so I can't find it on the computer and I can't tell if it's sold out. But if it's sold out, we would probably be getting a new shipment within about a week or so.

Student: Well, uh, I was hoping to get it sooner because like we already have assignments and you know, I mean, I guess I can get it from the library.

Clerk: Right, of course. But I am trying to check. If we've ordered more, then that back orders information should be in the computer too. Let's see... back order... Wolfram, Stephen..,. no, no. I am not seeing it. I am sorry. We just don't seem to carry it.

Student: Uh-huh.

Clerk: This is odd though. What is...what's your professor's name? I could try searching for his or her classes in the database. That might help

Student: Um...OK. It's professor Kayne.

Clerk: K-A-N-E?

Student: No. It's professor Kayne, K-A-Y-N-E. He's in the computer science department.

Clerk: Oh. It's for a computer science course, is it?

Student: Yeah.

Clerk: Well, that must be it. Computer science books are sold across the street in the computer bookstore.

Student: Are there signs up anywhere?

Clerk: I don't know.

Student: Maybe they should put some up. It could have save us both some time.

Clerk: Yeah. Well, anyway, I'll bet that's the problem. Check across the street. I’ll bet they have it. But if not, come back, and I'll help you find it somewhere else. I can call around to see if other bookstores might have it. OK?

Student: OK. Thanks a lot. Bye

Clerk: Bye

TPO 24 Lecture l-Biology (Crocodile Vocalization)

Narrator: Listen to part of a lecture in a Biology class.

Professor: OK. For today, let's look at a reptile, a predator that hasn't evolved much in the last seventy million years. No discussion of reptiles would be complete without some mention of crocodiles.

Now, we tend to think of crocodiles as, uh, kind of solitary, hiding out in a swamp, uh, kind of mysterious creatures. But we are finding out that they aren't as isolated as they seem. In fact, crocodiles interact with each other in a variety of ways. One way is with vocalizations, you know, sounds generated by the animal. This is true of the whole crocodile family, which includes crocodiles themselves, alligators, etc.

Take American alligators. If you were to go to a swamp during the breeding season, you'd hear a chorus of sounds, deep grunts, hisses, these are sounds that male alligators make.

And some of them are powerful enough to make the water vibrate. This sends a strong, go-away message to the other males. So the alligator can focus on sending other sound waves through the water, sound waves that you and I couldn't even hear since they are at such low frequency. But they do reach the female alligator, who then goes to find and mate with the male.

Vocalization is um...well, it is used for other reasons, like getting attention or just, um... letting others know you are distressed. Let's see. New-born crocodiles, or hatchlings and their interactions with their mothers. When they are born, croc... baby crocodiles have a sort of muffled cry while they are in their nest. Hatchlings are really vulnerable, especially to birds and small mammals when they are born. But their mother, who has been keeping vigil nearby, hears their cry for help and carries them to safety, meaning, to water.

So she takes them out of the nest. Uh, uh, all the eggs hatched at once, so she has about forty newborns to look after. Well, she takes about fifteen out of the nest at a time, carrying them in her mouth to the nearby water. While she is taking one load of hatchlings, the others wait for her to come back.

But do you think they are quiet about it? No way. They are clamoring for the mother's attention, sort of squeaking and practically saying-don't forget about me!

I heard some great examples of this on the television program on crocodiles last week. Anyone catched it? It had a few interesting bits. But you know, uh, you have to be careful, think critically. Sometimes I don't know where these shows find their experts.

Student: Excuse me. But, um... does all that crying defeat the purpose? I mean, doesn't it attract more predators?

Professor: Hmm...good question. I guess, well, I am guessing that once the babies have the mother's attention, they are safe. She's never too far away, and, and I think...I mean, would you mess with a mother crocodile?

So after the mother transports all the youngsters, they still call to each other, and to their mother. This communication continues right through to adulthood. Crocodiles have about eighteen different sounds that they can make.

There's...um...um… you have deep grunting sounds, hisses, growls, are many different sounds to interact or send messages. This is more typical of mammals than of reptiles. I mean, crocodiles' brains are the most developed of any reptile. In that sense, they are closer to mammals' brains than other reptiles' brains. And we know that mammals, dogs for example, dogs vocalize many different sounds. Crocodiles have a similar level of, uh, vocal sophistication, if you will, which makes them unique among reptiles.

Another thing would be, um, if a hatchling gets separated from the rest of its family, once the others get far enough away, its survival instinct kicks in. It will make a loud distress call, which its siblings answer. It calls again. And they continue calling back and forth until they all find each other again.

Another thing, something that wasn't on that TV show I mentioned. Um... mother crocodiles lead their young from one area to another, like when they have to find a different source of water. Usually she will lead them at night, when it is safer for them, moving ahead and then letting out calls of reassurance so that they will follow her. Her voice helps give the babies the courage they need to leave the area and go some place that's a more desirable home for them.

TPO 24 Lecture2-Art History (Modern Dance)

Narrator: Listen to part of a lecture in a dance history class.

Professor: As we have been studying, ballet, the classical ballet, is based on formalized movements, specific positioning of the arms, feet and the body. So, now let's move on to modern dance, also known as theatrical dance. Modern dance evolved in the late nineteenth, early twentieth century, and in most cases, audiences were very receptive to this radical new type of performing art.

Student: Um... what made modern dance so radical?

Professor: Well, for example, I think the best analogy to modern dance is modern art or modern music. Compared to their classical predecessors, these newer art forms are freer, more experimental, more improvisational.

Modern dance seeks to show how deep emotions and the music itself, how these intangible attributes can affect and inspire physical movement, and how movement can convey emotions to the audience. As I said, in classical ballet, emotions are conveyed through a set of strictly formalized movements.

Now, a pioneer of modern dance was Isadora Duncan, who was born in 1878. Isadora Duncan did study ballet briefly as a child, but she quickly developed her own unique style, which she called free dance. And by age fourteen, she was teaching her free dance to young children and giving recitals.

Her early dance technique was loosely based on the natural movements of children, running, skipping, acting out stories, also on motions from nature, waves crashing onto shore, trees swaying in the wind. Her expressive gestures were motivated from within rather than from being dictated by strict technique. Duncan also wore her hair down, ballerinas typically wear their hair in a tight bun behind the head. And instead of the short steep skirts and rigid toeshoes worn by ballerinas, Duncan wore loose, flowing tunics, and she dance bare foot. Now, that was something her audiences had never seen before.

Duncan performed in Paris composers, but avoiding set audiences, for the most part, and other European cities, dancing to the music of classical movements and steps, no two performances were alike. And adored her.

In 1904, she opened a school of modern dance in Berlin. And the next year she performed in Russia. But the Russian critics were not really kind. Some said Duncan's art form was closer to pantomime than to dance. But her style was a clear rebellion against ballet, and ballet is extremely important in Russia. A question, Julie?

Student: Yeah. What did Duncan have against ballet? I mean, she studied it as a child.

Professor: As a youngster, she might have found it too restrictive, uh, not creative enough. I think that feeling is exemplied by something that happened earlier in her career, in Russia. Duncan attended a ballet, and the lead dancer was the renowned Russian ballerina， Ana Pavlova. The following day, Pavlova invited Duncan to watch her practice.

Duncan accepted but was appalled by what she saw. To her, the exercises that Pavlova and the other ballerinas were doing seemed painful, even harmful, standing on tiptoe for hours, moving their bodies in unnatural ways. After seeing this, Duncan publically denounced ballet as a form of acrobatics, uh, complicated and excruciating mechanism she called it. This critic generated I think some undue rivalry between ballet and modern dance, and it would take a long time, many years in fact, for the rivalry to calm down.

TPO 24 Conversation 2 一 Student & Geography Professor

Narrator: Listen to a conversation between a student and his geography professor.

Student: Hi. Professor Brown.

Professor: Hi. Paul. What can I do for you?

Student: I have a question about the final exam. I mean, will it cover everything we've done all term? Or just what we've been doing since the mid-term exam.

Professor: Everything we've done all term.

Student: Oh, boy. You know, I am still not too clear about the hydrologic cycle, um, the transfer of water back and forth between the earth and the atmosphere. I really blew the question about it on the mid-term exam. I want to do better on the final exam. But I am still having trouble with it.

Professor: Well, uh, have you been to the tutoring center?

Student: No, not for geography anyway. Isn't that just for when you need help with writing, like an essay or a research paper.

Professor: Oh, no. you can get tutoring in a lot of subjects. Some graduate students from this department tutor there.

Student: That's good to know. But I hardly go there because I have a part-time job. I never seem to be free when they are open.

Professor: Well, they will be extending their hours when final exams begin. You might try then. But um... Well, since you are here now, can I help you with something?

Student: Well, the hydrologic cycle. I remember we went over a diagram in class. And from what I remember, water changes back and forth from water in lakes and oceans to vapor, and then back to water again when it falls as rain or snow, as precipitation. It's constantly being recycled through evaporation and condensation.

Professor: That's it. Basically. Um... so exactly what is it you don't understand?

Student: OK. I guess what I am really confused about is how the topography of the land, the mountains and valleys and stuff, affects precipitation.

Professor: OK. Good question. Precipitation is influenced by topography among other things. Um, why don't we talk about lake-effect snow? It's a phenomenon that occurs anywhere you have a large lake that doesn't freeze and have cold air flowing over it, mostly in the Northern Hemisphere

Student: Like the great lakes in the United States?

Professor: Yeah. What happens is that the cold arctic air blows across the lake from the north in winter. And as the air crosses the lake, the lower layer is warmed by the lake water, which is much warmer than the arctic air. And as this air is warmed and picks up moisture, it becomes lighter than the air above it.

Student: So it starts to rise, right?

Professor: Yes. And clouds begin to form. When the air gets closer to the shore, it's slowed down by the land and starts to pile up. So it rises even faster because it has nowhere else to go, that's where topography comes into the picture.

Student: And then it snows because as the air rises, it cools off and loses its capacity to hold water vapor.

Professor: That's right.

Student: OK. Thanks. Any chance you'll have this question on the final?

Professor: I don't know yet. But you seem to have a handle on it.

TPO 24 Lecture3-Archaeology (Megafauna in North America)

Narrator: Listen to part of a lecture in an archaeology class.

Professor: Between 11,000 and 10,000 B.C.E., North America was populated by a wide variety of great beasts, like mammoth and mastodons, both elephant-like creatures with big tusks, and camels, giant sloths, the list goes on. By about 10,000 B.C.E., all those giant creatures, the Metgauna of North America were gone. We don't know exactly what happened to them, but there are some theories.

One theory is that they were hunted to extinction by humans. The humans who coexisted with these giant species in North America at that time were what we today called the Clovis Peopple. And there is a Clovis site in a valley in southern California where the remains of thirteen mammoths were found. And spear points, tools for processing meat, and fire places.

That would appear to be some pretty compelling evidences. Mammoth bones have also been found at some other Clovis sites.

But then at other Clovis sites, there's also a lot of evidence that the Clovis people mostly gather plants and hunted small game, like rabbits and wild turkeys. Also there are several places in North America where you have natural accumulations of mammoth bones that look very similar to the accumulations at the Clovis site, except there's no human debris, where the mammoth almost certainly died as a result of some kind of natural disaster. So I think it is quite likely that those thirteen mammoths in southern California also died of natural causes, and that the Clovis people simply took advantage of the situation. Um...OK. That's the hunting theory.

Now let's look at another theory, uh, an alternative to the hunting theory, the climate change theory. At around 11,500 B.C.E.，the world was coming out of an Ice Age .And with that came increased seasonality, that is, the summers became warmer, and the winters actually became colder. These extreme shifts would have put a lot of stress on the bodies of animals that were used to a more moderate range of temperatures.

But the most important impact of this increased seasonality may very well have been its effect on the distribution of plants.

Today we take for granted that there horizontal bands of plant communities. In the far north, it is tundra, which gives way to forest as you move southward. And even farther south, grasslands take over. But during the Ice Age, these plant communities actually grew together, mixed with one another. So Ice Age animals had access to many different types of plants, different types of food. But when the seasons became more distinct, the plant communities were pulled apart, that meant, in any given area, there was less plant diversity. And as a result, uh, so the theory goes, the Ice Age animals that depended on plant diversity couldn't survive. And the great beasts were the ones that needed the most diversity in their diet. Again, we have what at first seems like a pretty attractive theory, but then, how do you explain the fact that this has happened before? You know, global cooling followed by global warming, and there was no extinction then.

Uh, you know, I recently read an interesting article about an archaeologist who tried to solve this puzzle with the help of his computer. What he did was, he wrote a computer program to simulate what would happen to mammoth under certain conditions. Say, for example, there is a drought for a couple of decades, or hunters are killing or five percent of the population, and so on.

One thing he found was that humans didn't necessarily have to kill these animals in great numbers in order to nudge them toward extinction. That's because very large animals have a slow rate of reproduction, so all you have to do is remove a few young females from the herd, and you can, fairly quickly, significantly reduce the population. And then he came up with a scenario that combined some hunting by humans with some environmental stress, and...Bang! The simulated mammoths were extinct within decades.

So it seems the mixture of hunting and climate change is a likely scenario. Uh, of course, computer simulations are not a substitute for hard evidence.

TPO 24 Lecture4-Astronomy (Shield Volcanoes on Venus)

Narrator: Listen to part of a lecture in an astronomy class.

Professor: Many people have been fascinated about Venus for centuries because of its thick cloud cover, this so-called planet of mystery and all of that. Well, what's under those clouds? What's the surface of the planet like? Some questions about the surface are still unresolved but, but we have learned a lot about it in the past several years.

First of all, let me talk about how we have been able to get past those clouds. First, there were Soviet modules2 that landed directly on the surface and sent back some images of what was around them. Second, we did some radar imaging from satellites from above. Radar can get through the clouds. So what have we learned? Yes, Karen?

Student: Well, I remember reading that there's not really a lot going on, that the surface of Venus is just flat and smooth in a lot of places.

Professor: Yeah, smooth in a lot of places. But that's not, um... that's not the whole picture. In other areas, you've got canyons, ripped valleys, meteo craters, uh, lava domes, these lava formations that look like giant pancakes. And also volcanoes.

Well, one of the most interesting features on the surface are in fact the shield volcanoes. Shield volcanoes formed when magma comes out of the ground in the same spot over and over again. Remember, magma is hot molten rock that's underground, and it is called lava when it reaches the surface. Uh, so the lava builds up, and hardens, and a volcano forms.

Now, the lava on Venus is thin. It spreads out easily. So shield volcanoes have very gentle sloping sides. They are called shield volcanoes, because viewed from above, they kind of resemble shields, you know, like a warrior's shield.

But what's particularly interesting about these volcanoes is that most of the volcanoes here on Earth are not shield volcanoes. Instead, they are other volcano types, like strata volcanoes, for example, which are a result of tectonic plate movement. Remember tectonic plates?

Underneath the Earth's crust, there are a number of shifting slabs or plates that are slowly moving. And in the zones on the edges of the plates where different plates meet and interact, that's where we get most of Earth's volcanoes

On Venus, however, volcanoes are not clustered in discrete zones like they are on Earth. Instead, they are more or less randomly scattered over Venus's surface. Well, that's significant. Venus has mostly shield volcanoes, and they are randomly scattered, that indicates that Venus does not have moving tectonic plates, and that's a big difference compared to Earth. Here on Earth, moving tectonic plates are a major geological element, just crucial for the whole surface dynamic, right?

So why doesn't Venus have them? Well, there are a few theories. One of them is that this has to do with the fact that Venus has no surface water that's needed to kind of lubricate the movement of the plates, you know, like oceans on Earth. Yeah, I forgot to spell that out. Uh, Venus has no surface water.

Student: Wait a second. Did you say we have shield volcanoes on Earth? Can you give an example?

Professor: Sure. The volcanoes in the Hawaii islands, in the Pacific Ocean are shield volcanoes. They are formed over a hot spot of magma. So while on Earth we have several types of volcanoes, on Venus there's mostly the one type. Uh, Eric?

Student: Are the volcanoes on Venus still active?

Professor: Well, that's an interesting question. There is still some discussion on that point. But here's what we do now. First, the level of sulfur dioxide gas above Venus's clouds shows large and very frequent fluctuations. It is quite possible that these fluctuations, the huge increase and decrease of sulfur dioxide, happening again and again. It's quite possible that this is due to volcanic eruptions, because volcanic eruptions often emit gases. If that's the case, volcanism could very well be the root cause of Venus's thick cloud cover. And also we have observed bursts of radio energy from the planet's surface. These bursts are similar to what we see when volcanoes erupt on Earth. So this too suggests ongoing volcanic activity. But although this is intriguing evidence, no one's actually observed a Venus volcano erupting yet, so we can't be positive.

TPO 25

Section1

Conversation1

Narrator

Listen to a conversation between a student and his academic advisor.

Professor

Hi, Mark. What can I do for you?

Student

I am just filling out this approval for graduation form for the dean's office, and I don't know, I hope I will be able to graduate next semester.

Professor

Well, as long as you've met the departmental requirements and you submit the form on time, you shouldn't have any problem. Make sure you include all the classes you will have taken for your degree in finance and the electives too.

Student

Yeah, but as I look over the form, I got confused because of the way, um…they've changed the requirements. So now I am not sure I will be qualified to graduate next semester. I know I would, before, under the old requirements.

Professor

Well, when the business department changed the curriculum to include more courses in international business, to ... well, because of the increasing globalization of business. We made sure that students who have finished their second year, that is, those who are in their third or fourth year, wouldn't be affected. The new rules only apply to students in their first or second year.

Student

That's good to know. Uh... the department's hiring new faculty too I heard, to teach some of the new courses. But I want to...

Professor

Yes. One new faculty member has been hired. She will be teaching International Banking as a matter of fact.

Student

Actually, that's what I want to ask about - International Banking. I took International Banking l, but I never took International Banking 2. It used to be that the second semester of International Banking was an elective, but now it says it's a required class.

Professor

Yes. But that's one of the recent changes. So...

Student

Oh, Oh, OK. Oh. And ... and I am planning to take a management course next semester, but I don't know if it's ... if it will count toward my major.

Professor

What's the course?

Student

Organizational Behavior.

Professor

Yes. That will count toward your major. That's a difficult class, you know. But well worth it. So it looks like you will have all the required classes you need. You should be just fine.

Uh... I assume you have taken a seminar?

Student

Yeah, I took the marketing seminar.

Professor

OK. You are looking good. Just to be on the safe side, why don't you talk to someone in the dean's office before you give them the form?

Student

OK. So should I just explain to them that even though one of these classes got changed from an elective to a required class, I don't have to take it?

Professor

Yes. You've met the requirements for graduation. And if there's something I need to do ... if I need to write a letter or whatever, just let me know.

Student

OK. Thanks. I'll let you know if I need that letter.

Lecture1-Conservation Biology [Assisted Migration)

Narrator

Listen to part of a lecture in a Conservation Biology class.

Professor

One consequence of global warming is extinction. There's compelling evidence that global warming will be a significant driver of many plant and animal extinctions in this century. So we are considering various strategies to help some threatened species survive this unprecedented, this warming trend which, as you know, is caused mainly by greenhouse gases produced by the burning of fossil fuels.

Um... the most radical strategy being debated among conservation biologists is Assisted Migration. Assisted migration means picking up members of a species, or members of a group of interdependent species and physically moving or translocating them. Um... translocating threatened species to a cooler place, to higher latitudes or higher elevations, for example.

Now, migration is a natural survival strategy. Over the past two million years, colder glacial periods have alternated with warmer interglacial periods. And so, um, in response to these gradual climatic swings, some species have shifted their ranges hundreds of kilometers.

So perhaps you are wondering why not let nature take its course now? Well, we can't. The main problem is today's fragmented habitats. During previous interglacial periods, when glaciers retreated, they left behind open land in their wakes. Today human development has paved over much of the natural world. Ecosystems are fragmented. Housing developments, highways and cities have replaced or sliced through forests and prairies. There are a few quarters left for species to migrate through without help. So conservationists are trying to save as many species as possible.

Now, assisted migration could become a viable part of our rescue strategy, but there are a number of uncertainties and risks.

Without more research, we can't predict if Assisted Migration will work for any given species. A translocated species could die out from lack of food, for example. At the other extreme, we might successfully translocate the species, but within five or ten years that species could proliferate and become an invasive species. Like a non-native plant that chokes out native plants by hogging the nutrients in the soil. Translocated animals can become invasive too. It happened in Australia. The cane toad was introduced back in 1935 to control an insect pest that was destroying Australia's sugarcane plantations. But the cane toad itself became a pest and has destroyed much of the wildlife on that continent.

Also, many species are interdependent, intimately connected to one another. Like animals that eat a certain plant and that plant relies on a certain fungus to help it get nutrients from soil and on a certain insect for pollination. We probably have to translocate entire networks of species and it's hard to know where to draw the line.

And in addition to all that, it is not even clear that assisted migration or any migration for that matter, will help at least for some species. Earth was already in one of its warm interglacial periods when we started burning fossil fuels. And in the twenty-first century, global temperatures are expected to rise two to six degrees. That rate of heating is far greater than during the last glacial retreat some 12,000 years ago.

Um ... whether to use Assisted Migration, this debate is mostly within the biology community right now. But the ultimate decision-makers, in the United States at least, will be the government agencies that manage natural resources. Assisted Migration really needs this level of oversight, and soon. Currently there's no public policy on using assisted migration to help species survive climate change. People aren't even required to seek permits to move plants or invertebrate animals around as long as they are not classified as pests. In one case, a group of conservationists has already taken it upon itself to try on their own to save an endangered tree, the Florida Torreya tree, through Assisted Migration.

There's only about a thousand individual Florida Torrey as left. And global warming is expected to significantly reduce or eliminate this tree's habitat. So this conservation group wants to translocate seedlings, Florida Torreya seedlings, 500 kilometers north in order to expand the species' range. The group believed its effort is justified, but I and many other biologists will be watching very closely how this maverick group makes out, because like I said, there could be unintended consequences.

Lecture2-Music History (Béla Bartók)

Narrator

Listen to part of a lecture in a music history class.

Professor

So I just finished reviewing your papers on the influence of nationalism on the composers' music. And initially I was surprised none of you chose to write about Béla Bartók, that is until I remembered we haven't had a chance to discuss him in class yet. He was a wonderful and ground-breaking composer.

Béla Bartók was a Hungarian, whose life stretched from the late nineteenth century to the middle of twentieth century. But he was not a fan of the Romantic style of music that was popular in his homeland during his youth.

Student

Wait, Hungary wasn't a country in 1900, was it?

Professor

You are right. I should have been clear. Bartok was born in Austria-Hungary, a nation that broke apart when he was about forty years old. Actually, the town where he was born is presently part of Romania. The political history of that region is complex. Suffice to say that Bartok is generally known as a Hungarian composer.

So during Bartók's youth, the music played in the concert halls of Austria-Hungary was dominated by Romantic pieces by mostly German composers. We discussed the Romantic style last week. These pieces were long and lyrical. They were meant to have a sort of grandeur about them. And in the early 1900s, composers who worked in the Romantic style were the most popular in Austria-Hungary. But Bartok, he was part of the musical community that was trying to change this. And it led him to ... well, the first thing it did was lead him to travel（此处，演讲者就是有语法错误，理解意思就行）. He looked at the countryside for the music of the farmers and the people who lived in small towns, and their music, well, you could say he discovered the music that was popular in those areas.

Student

What do you mean?

Professor

Well, all the music we have been talking about the past few weeks, it really was all in the cities, that's where the composers and the orchestras were. Out in remote areas of the countryside, in rural locations, music was more traditional, the same songs that were enjoyed by previous generations. Bartók went out, he travelled to a significant portion of Eastern Europe actually. He roamed the countryside and listened to the music heard in small towns and in all sorts of celebrations. He attended weddings, dances and religious ceremonies, where he heard a very different sort of music from the Romantic stuff being played in the concert halls in the cities. The music he heard is what we would consider folk music.

Student

And then he had those same songs played in the concert halls?

Professor

No. At first he went around to document the folk music. He really wanted to make sure the folk songs were written down before they disappeared. In fact, Bartók didn't start out the trip thinking of himself as a composer. He was an ethnomusicologist. He studied the traditional music of the region. But it turns out that what would later have a notable influence on European music on the whole, was the way Bartók used elements he heard in folk songs in his own compositions. He adopted a number of elements from what he heard, like unusual rhythms. And he liked to use the glissando as his hallmark, which he probably got from listening to Croatian folk music. A glissando is ... well, I have got a recording of Bartok here. Let's wait until the music is fresh in our minds Susie, do you have something you want to ask first?

Student

Yeah. Before, you mention nationalism and…

Professor

Ah, right, yes. When Bartok had his new pieces performed, their folk music roots made them instantly popular. It happened to be a time of strong nationalism in Austria-Hungary, so his compositions came at just the right time. He became very successful there. Particularly, when Bartok's ballet The Wooden Prince opened, there was great excitement for music that included musical elements from local folk songs, music that reflected the region's musical traditions. However, as popular as Bartok was in his homeland, he did not get much international recognition during his lifetime.

Conversation2

Narrator

Listen to a conversation between a student and his biology professor.

Student

Well, you know, I am writing that paper about whales and the path they travel as they swim through the ocean, their migration patterns.

Professor

Yes. I remember.

Student

And well, I was thinking about it and I realized I don't understand how they hold their breath underwater. lt's a little crazy for me to be writing about migration patterns without actually knowing how they stay underwater for so long.

Professor

Did you do any research to find out how they do it?

Student

Yeah, I did. I searched on the internet and there was a lot of information about whales, their habitats, the way they communicate, you know, their songs. But if there was anything about whales and how they hold their breath, I missed it. I've got a bunch of books. Actually, I have got so much information, it's a little overwhelming.

Professor

I am surprised there is nothing about it in any of those books.

Student

Well, to be honest, l've only skimmed them so far. I am still working on finding sources.

Professor

OK. I know I encourage everyone in class to look at a substantial number of sources, but I don't want you to get overwhelmed. Looking at a number of sources gives you a good knowledge base, but students only have a limited amount of time to work on each paper. I don't expect you to read a dozen books on whales for this assignment. Focus on just a few.

Student

Ok. Thanks.

Professor

You know, since you are already here. I can give you a quick summary of how whales hold their breath underwater. lt's just a matter of certain adaptations in their anatomies, specifically in their circulatory system.

Student

So the blood flow is what makes the difference?

Professor

Yes, and in a couple of ways. First, blood makes up a larger share of a whale's weight than in other mammals.

Student

So they can store more oxygen because they have more blood?

Professor

Yes, but that's only part of it. They also have a greater capacity than land animals to store oxygen in their blood.

Student

So how does having more oxygen in their blood help them stay underwater longer?

Professor

It's the way the whale's blood carries oxygen to the rest of its body. Whales carefully conserve their oxygen when underwater in a couple of ways. When a whale dives, its metabolic rate drops, causing its heartbeat to slow down. And the blood flow to its muscles and some of its non-vital organs, like its kidneys, is also cut off. A whale's muscles and non-vital organs are able to function without oxygen for an extended period of time.

Student

I see. Well, now I can concentrate on my topic.

Lecture3-History (Egyptian Hieroglyphs)

Narrator

Listen to part of a lecture in a history class. The professor has been discussing Egyptian Hieroglyphs.

Professor

Egyptian Hieroglyphs are the ancient Egyptian writings found in ancient Egypt on walls, monuments and on the inside and outside of temples. Hieroglyphic writing ended abruptly about 1600 years ago. And it mystified the mot brilliant minds in the study of Egyptian artifacts and archaeology for many many centuries. Finally, the possiblity of deciphering hieroglyphs came about with the discovery, in 1799, of the Rosetta Stone.

The Rosetta Stone is arguably the most famous archaeological artifact ever discovered. It contains the same exact text written in three different alphabets: Greek, demotic, hieroglyphic.

But we didn't even know at first that the three texts on the Rosetta Stone contain the same information. And two of the three alphabets are ancient Egyptian scripts that stop being used: the hieroglyphic and the demotic The demotic script found on the Rosetta Stone, well, demotic was not as elaborate as hieroglyphic writing. It was used for more mundane matters, oh, like administrative documents. These ancient Egyptian scripts were replaced by Coptic scripts. But eventually, the Arabic language replaced Coptic and this cut off the linguistic link between ancient and modern Egypt.

Now, the Rosetta Stone was remarkable because as I said, on it, was the same text in three different alphabets: Greek, demotic and hieroglyphic. The Stone was essentially the dictionary that scholars needed to interpret the meaning of the hieroglyphs. And it took a uniquely equipped researcher to finally decipher and understand what was written on the stone.

Thomas young, an English scholar, was the first to seriously attempt to decipher the symbols on the Rosetta Stone. He suspected rightly that the hieroglyphs were phonetic symbols, that they represented its sounds rather than pictures. Until then, all scholars assumed that hieroglyphs were pictographs, that they symbolize objects or concepts. Thomas Young focused his attention on one set of hieroglyphs that he thought would probably spell out a single word: the name of a King or Queen. He guessed that the symbols represented the name of the early Egyptian ruler Ptolemy, since Ptolemy was also written in Greek on the stone and was indeed a Greek name. And Young did actually prove that these hieroglyphs represented sounds rather than whole words. Strangely though, he gave into the dominant thesis of the day that hieroglyphs were pictographs. He actually dismissed his own findings as an anomaly because the Ptolemaic dynasty was Greek, not Egyptian. in other words, he figured it was an exception to the rule. It was phonetic because it was Greek, not Egyptian. How else could an Egyptian depict a Greek name other than spell it out? And that brings us to the hero of our story: Jean-Francois Champollion.

Champollion built on Young's work, showing that different hieroglyphs spelled the names of Kings and Queens like Alexander or Cleopatra. But his critics noted that this was still not traditional Egyptian names. He hadn't done any more than Young had been able to do, so he couldn't disprove the dominant theory.

Then in 1822, Champollion was shown a set of hieroglyphs that contain traditional Egyptian names. The first two of these symbols were unknown, but Champollion knew that the repeated hieroglyphs to the far right symbolized an "S" sound. He then drew on his linguistic knowledge to arrive at the solution to the problem. You see, unlike any of the other scholars who had tried to crack the code, Champollion happened to be fluent in Coptic. He wondered, and this was the real breakthrough, if Coptic was the language symbolized by the hieroglyphs on the Rosetta stone. And if so, then perhaps that first disc-shape symbol might represent the Sun. And the Coptic word for Sun is "ra". See where this is headed? So if the symbol were Coptic, the first symbol would be "ra". And then an unknown symbol followed by a double "S" sound. Was this, Champollion wondered, the name Rameses[1]? He was eventually able to confirm that it was. So, he had figured it out. Hieroglyphs were mainly phonetic, they represented sounds, not pictures, and the underlying language was Coptic. A lot of work remained, but Champollion had cracked the code.

下面是黄晓红老师很贴心的贴出了维基百科里关于本篇文章内容的链接，说实话，本篇文章真的是过于专业，而且专业词汇也过多了。

Links

http://en.wikipedia.org/wiki/Champollion

http://en.wikipedia.org/wiki/Coptic_language

http://en.wikipedia.org/wiki/Demotic_(Egyptian)

http://en.wikipedia.org/wiki/Rosetta_stone

http://en.wikipedia.org/wiki/Thomas_Young(scientist)

http://en.wikipedia.org/wiki/Cleopatra

http://en.wikipedia.org/wiki/Ptolemaic_dynasty

http://en.wikipedia.org/wiki/Ra

[1]Rameses (/ræməsi:z/;also commonly spelled Rameses or Ramses /ræmsi:z/) is the name conventionally given in English transliteration to 11 Egyptian pharaohs of the later New Kingdom period. The name essentially translates as “Born of the sun-god Ra”.

Lecture4-Animal Behavior

Narrator

Listen to part of a lecture in an animal behavior class.

Professor

All right. I hope you all had a chance to finish the assigned readings about animal play, because I want to spend some time discussing the different viewpoints presented in those articles. Let's start with the play-as-preparation hypothesis. Jerry, can you explain it?

Male Student

Yeah, Play-as-preparation. Young animals play in order to get really good at certain specific things they will need to do when they are adults, things like chasing, pouncing, climbing. In other words, they play in order to practice survival skills, like movements used in hunting and fighting. That hypothesis makes a lot of sense, like, maybe the most sense of all the theories we read about.

Professor

And what leads you to that conclusion?

Male Student

Well, like wolves, the young pups, they fight a lot and bite, you know, not to hurt each other, but ... It just seems obvious why those wolf pups play like that. It gives them practice with skills that will make them better hunters or fighters as adults.

Female Student

Oh, I don't know about that. I mean, some of the things a young animal does while playing are totally different from the things they'll do as an adult. There was a really good example in the second article. I can't remember what it is called exactly, uh, self-…

Professor

Self-handicapping.

Female Student

Right. Self-handicapping. Like during a fake fight, a play fight, if one of the animals is winning, the winning animal might just stop and give up its advantage.

Professor

Yes. And often it shifts to a submissive posture too. Of course self-handicapping hardly ever happens in a real fight. Because in a real fight, well, the point is to win. So, this self-handicapping, it is important to take this into account before just deciding to go with that first explanation. And in fact, there really isn't much in the way of solid experimental evidence to support the play-as-preparation hypothesis.

Female Student

What about the other one? The flexibility hypothesis?

Professor

Ah, yes. Let's talk about that. As you say, play is much more than just pretend fighting or practicing other adult behaviors. Apparently, it also contributes to the development of a brain that's flexible, a brain that's quickly able to get a handle on unfamiliar situations. This notion, the flexibility hypothesis, well, many of my colleagues find it quite persuasive.

Female Student

So, like with kids, a little kid might play a game with a friend, and then they might race each other across the field. So they are switching from one type of play to another. There's a lot of variety? I mean, they are learning to respond to whatever happens?

Professor

Well, that's the general idea. But let's hold off on talking about human behaviors from now. OK. According to the flexibility hypothesis, yes, the diversity, the variety in play can lead to a broader behavioral vocabulary.

Male Student

A broader behavioral vocabulary? Can you explain what that means?

Professor

Well, sometimes playing results in an animal doing something it would not normally do. That can lead to the animal learning to adapt, to come up with new behaviors that can help it cope with major problems later on, like staying safe or finding food.

Female Student

Yeah. And there was that brain study you had us read about too.

Professor

Oh, the one on how play affects development within the brain?

Female Student

Right. That’s it. About the animals raised in an environment where they did not get opportunities to play?

Professor

Yes. Wasn't the conclusion interesting? That playing literally stimulates growth, creates connections within the brain? We need to do further studies, but ...

Female Student

Excuse me, can we go back to play fighting for a minute? I am wondering, can the flexibility hypothesis really explain that?

Professor

Play fighting? Actually, that's something the flexibility hypothesis explains very well. Since play fighting includes variations in speed and intensity, and quick role reversals involved with self-handicapping. An animal that's play fighting is constantly responding to changes. So it's earning to be flexible.

Conversation1

Narrator

Listen to a conversation between a student and a university print shop employee.

Student

Hi. I saw your ad in the campus news paper.

Employee

Oh. We don't have any job opening right now.

Student

Oh, no. I meant the other ad, about the services you provide for students. You see, I have been working at the campus tutoring center as a math tutor. But things have changed, including my schedule. And now I want to start doing tutoring work independently. But in order to, basically, start my own business, I need to get the work out.

Employee

Ok.

Student

I was thinking I should get something printed up that I can hand out to people.

Employee

Ah. Well, actually, I just printed up some great-looking flyers for someone doing the same thing.

Student

Flyers. Yeah, that's an idea. I guess then I could post them around the campus.

Employee

Yeah. And you can hand them out too. But, oh, you know what? I did something really neat for someone last week. She didn't want to go the traditional route, you know, business cards, flyers, so we customized pencils for her.

Student

Pencils?

Employee

Yeah. You know, a little message printed on the pencil.

Student

Oh, that's cool.

Employee

Yeah. But you should know, it's not our cheapest option. Oh, and you know those little sticky notes?

Student

You do those too?

Employee

Well, we did once. I think those bright pieces of paper would be real attention getters. You know, student use them all the time, so they should be good for business. I don't know why we haven't done more.

Student

Wow.

Employee

So you've got some options.

Student

Right. Well, what about business cards? My friend has these business cards. She does tutoring too. And she got them at this place in town, but they were kind of expensive.

Employee

For business card? Well, I don't know what your friend paid. But we could do something real simple and it wouldn't be much. Like for a batch of 250 for one of our standard designs, 20 dollars maybe.

Student

20 dollars sounds okay.

Employee

Now, there are some other choices that'll affect the cost. You know, like different background patters, using color ink, that sort of thing. And it also depends on how many words you want to include.

Student

Ok. Well, I know what I want them to say. But I am just thinking, I kind of like that pencil idea.

Employee

Yeah. I thought it was neat. Now, of course you can only fit your name and phone number, and like, in your case, math tutoring on it.

Student

Right. Well, I could custom design the business cards through, right? That's what my friend did. She said she designed them at the computer right there at the print shop.

Employee

Well, you can do that here too. But a custom design would be a bigger investment for your business than one of our standard designs.

Student

Well, I don't know. I am interested in business cards, so can I look at the standard designs?

Lecture1- Advertising(Green Marketing)

Narrator

Listen to part of a lecture in an advertising class.

Professor

Last class someone asked about green marketing. Green marketing refers to companies promoting the products as environmentally friendly. Companies often turn to advertising experts to help them do this.

Green marketing seems recent, but advertising professionals grew interest in it several decades ago. The seeds for green marketing were probably planted in 1970, when the first Earth Day took place. Rallies all over the United States were organized to protest environmental degradation. Some 20 million demonstrators participated in that first Earth Day. And it helped spark dozens of environmental laws. The biggest was the Endangered Species Act of 1973, which protects imperiled animal species from extinction. There was also passage of the Clean Water Act and the Clean Air Act was strengthened.

Earth Day, Environmental Laws, Environmental Issues in the news, Being Green was entering the mainstream. And business started saying, hey, we can get involved in this. So in 1975, a major advertising trade group held its first workshop on ecological marketing. A few years later, we began seeing ads tapping into people's environmental concerns.

But some green marketers learned the hard way, green marketing must still involve all the same principles of a traditional marketing campaign. You ad must attract attention, stimulate consumers' interest, create a desire for your product, and motivate people to take action to buy your product.

So let me tell you about one green marketing campaign that failed at first and explain why. It was a compact fluorescent light bulb. We'll call it the eco-light. It was first introduced, I believe, in the late 90s. It cost far more than a regular incandescent bulb. The advertising message was, basically, "use this eco-light and save the planet". But that message wasn't effective. Research shows that consumers don't want to let go off any traditional product attributes, like convenience, price and quality. Even though surveys indicate that almost everybody cares about the environment.

So the company reintroduced the eco-light with a new message, one that emphasized cost savings, that the eco-light lowers electric bills and lasts for years. So it's good for earth, cost-effective and convenient because it doesn't have to be changed every few months. This ad campaign worked like a charm.

Something else, uh, the company that makes the co-light, researchers would consider it an 'extreme green company', not only because its product are energy-efficient, but because the company tries to reduce its environmental impact in other ways too. Like in addition to selling Earth— friendly products, its offices and factories are designed to conserve energy and use all sorts of recycled materials. A company that only recycles office paper, researchers would classify as a ' lean green company'. And there are other degrees of greenness in between.

So if your green marketing strategy's gonna work, your message should be valid on all dimensions. When a company as a whole is credited for reducing its environmental impact, this can lead to brand loyalty. People will come back and buy your product more and more. However, let's say you're fine for violating the Clean Water Act while manufacturing products from recycled materials. The public would eventually find out. You can't just make the claim that a product is environmentally friendly and not follow through on.

Lecture2-Biology(Carbon Cycling)

Narrator

Listen to part of a lecture in a biology class

Professor

OK. Just before the end of the last class, we started talking about trace metals, metals found in living organisms in very small quantities that serve an important biological, important nutritive function in those organisms. And one trace metal that serves a nutritive function is zinc.

Zinc assists in a number of processes in humans, but we are going to focus on just one, one that applies to a number of organisms, not just humans. See, zinc plays a major role in carbon cycling, the conversion of various kinds of molecules with carbon, Iike carbon dioxide, into other kinds of molecules with carbon that organisms can use. So, take respiration. Our bodies, our cells produce carbon dioxide when they
break down sugars. We need to get the CO2 out of our bodies, so the CO2 is converted into carbonic acid, which the blood is able to carry to the lungs. Once the carbonic acid reaches the lungs, it's converted back into carbon dioxide so that we can breathe it out.

Now, this whole conversion process relies on a particular enzyme. Uh, who remembers what an enzyme is? Bob?

Student

Uh, it's a protein, a specific kind of protein, one that speeds up chemical reactions.

Professor

Exactly. Different enzymes assist in different chemical reactions. Now, the one that speeds up the conversion of carbon dioxide has zinc in it. So this zinc enzyme is critical for getting CO2 out of our bodies through the lungs. And it's also extremely important for plants. Bob, can you tell us why?

Student

For making food, for photosynthesis?

Professor

Exactly. For photosynthesis. Plants also convert carbon dioxide into different forms of carbon-containing molecules and the conversion process used relies on the very same enzyme that works in humans. So zinc is also important for plants.

OK. But zinc is scarce in certain environments. And it's particularly scarce in waters near the surface of rivers and lakes and

shallower parts of oceans, which might make us wonder how plants could live there at all. In fact, there are a lot of marine plants that survive, that grow and reproduce in surface waters. In particular, there are a lot of diatoms.
Diatoms are microscopic, photosynthetic organisms and they are a major source of food for other organisms in the ocean. There are a number of different types of diatoms, and, well, diatoms play a very important role in the carbon cycling process, because they help make carbon available to other organisms in deeper parts of the ocean. The carbon that these diatoms use in photosynthesis is transferred to other parts of the ocean when the diatoms are eaten, say, by a fish that absorbs the carbon and then swims to another part of the ocean, or when diatoms die and fall to the ocean floor.

So how did diatoms survive if zinc is so scarce? Well, recently researchers discovered that a specific type of diatom makes a different enzyme that serves the same purpose. But this enzyme doesn't contain zinc. Instead this new enzyme incorporates another trace metal, cadmium. Kelly, you've got a question?

Student
Yeah. I thought cadmium was toxic. Didn't you say that?
Professor
It is poisonous to humans. Uh. actually, we used to think that it was toxic to all biological life, that it didn't serve any biological purpose. But new study suggests that cadmium can actually substitute for zinc, that organisms can use it instead of zinc when there isn't enough zinc in their environment.

Now, the discovery of this cadmium—based enzyme is really important for a number of reasons. It's actually the first enzyme we have discovered that uses cadmium. So it's possible that other not so typical trace metals may be used in chemical processes, that marine organisms might make enzymes from other trace metals when the essential one is scarce. And there may be other types of diatoms that use cadmium
to cycle carbon.

But there's something else to think about. What is one of the most common greenhouse gases in our atmosphere, one of the major culprits in global warming. Carbon dioxide, right?

Now, if all these diatoms are taking carbon dioxide from the surface, converting it and transporting it to the bottom of the ocean, well, maybe there's more to that whole process, that cycle, something that we've overlooked. So further research might tell us more about these warming cycles too.

Conversation2

Narrator
Listen to a conversation between a student and her biology professor.
Professor
Hi, Jean. How was the…uh, the conference, right? the conference on volunteerism? That's where you were last week.
Student
Yeah. It was great. I met a lot of people from some really amazing organizations that are working in the area. Now it would be a lot easier to get students to volunteer in the community. Plus, I've never been to any of the beaches here before. Being at the beach was definitely a plus.
Professor
Well, I hope you had time to look over the notes from the class you missed. You did get the notes, right?
Student
Yup. I'II look them over before tomorrow's class.
Professor

Good． And let me know if you have any questions.

Student

Well, there is something that I wanted to ask you now． It’s about something I noticed at the beach．

Professor

Oh, what’s that?

Student

Well, see, there are a lot of jellyfish there, floating in the water.

Professor

That couldn’t have been pleasant.

Student

Not for swimming. But it was interesting. I mean, the jelleyfish were glowing．I swear they were．And I am wondering what that’s about．

Professor

Ah, glowing jellyfish．That is interesting. Uh, it’s called bioluminescence．And actually we are going to talk about it later in the semester． Basically, bioluminescence is light that’s produced by a chemical reaction.

Student

Really? Inside the jellyfish?

Professor

Well, not all jellyfish, about half of them． Actually, a lot of marine organisms have this ability, especially in deeper parts of the ocean．

Student

Oh? I get it. Like the darker it gets, the more the fish needs light, right?

Professor

Well． bioluminescence serves a number of functions． Most aquatic organisms use it for communication and for attracting prey． But jellyfish usually use it as a defense against predators． Some jellyfish produce bright flashes of light that confuse predators, to, uh, to startle them． But jellyfish closer to the surface, probably like the jellyfish you saw, they use bioluminescence to hide． The light they produce matches the color of the dim sunlight, so they blend in, and, uh, and predators can’t see them．

Student

Wow, really? Well, I am looking for a topic for my term paper ,so maybe I could do it on these glowing jellyfish．That’s why I wanted to ask you about them, you know, to find out if there was really something to write about．

Professor

It’s a great topic． But you’II have to make sure the topic is manageable． Like I said, about half of all jellyfish are bioluminescent, so you may want to look at a particular type of jellyfish or several types that benefit from bioluminescence in the same way, or you could investigate current research on bioluminescence, on, on the chemical process, or…Here’s an idea． You seem to be very involved in local issues． See if you can identify the jellyfish you observed on the beach and how they fit into the local ecosystem．

Student

Yeah, you know, some of the environmental groups I met last week might even be able to help me．

Lecture3-Astronomy (Comets)

Narrator

Listen to part of a lecture in an astronomy class.

Professor

0K. We have been looking at some of the smaller members of our solar system, comets. You already know about the structure of comets. Let's continue our discussion now by talking about orbits, especially those of the so-called periodic-orbit comets. These are the comets that circle around the Sun pretty regularly. They return again and again, predictably, after a certain period of time. That's why we say their orbits are periodic. Probably the most famous and brightest of these is Halley's comet.

Halley's comet comes from far out in the solar system, goes in close to the Sun, and then out again. At its closest approach to the Sun, Halley's comet is about twice as close to the Sun as Earth is. And at its farthest. It's about thirty-five times farther from the Sun than we are, which puts it out beyond Neptune. Basically, the idea here is that a periodic comet, with its very elongated orbit, just keeps coming back around again and again. With Halley's comet, well, it returns every 75 years, roughly.

But where is Halley's comet during most of this time? Well, like all orbiting bodies, a comet moves faster when it's closer to the Sun. So it only spends about a year or two in our neighborhood, inside the orbit of Jupiter. Most of its time is spent way out beyond Jupiter's orbit, poking along near the farther reaches of it own orbit. Because of this, we can only see Halley's for a few months every 75 years, first on its way in toward the Sun, and then on its way out again.

Now, you remember from our previous discussion that a comet's nucleus ,its core, is made up of ice and dust, like a frozen snowball. And as it approaches the Sun, it starts to heat up. And some of the ice vaporizes into gas and spreads out from the nucleus. The gases that vaporize from the comet, the comet never collects them back again, so on every orbit, the comet leaves part of itself behind.

OK. How old is this solar system ?Four and a half billion years. remember ?And Halley's is going around the Sun once every 75 years and losing stuff each time. So the comet should be long gone by now, right? I mean, how come Halley's is still there? After four and a half billion years. How could it be? Well, the answer is that this comet hasn't always been in such a short periodic orbit, since once a comet gets into
an orbit that keeps it coming in close to the Sun quite frequently. Well, that comet's probably not going to be around too much longer. So this kind of periodic orbit is only a phase in a comet's life. A phase that just precedes its final breakup. We've seen comets do that, going toward the Sun and then come back around ,torn into pieces.

But lots of comets aren't like that. They come in, pass behind the Sun, and then travel back out. But with an orbit so large, and its farthest place so far away from the Sun that we just don't know how far out it goes. We just can't determine that very accurately from the close-in part of the orbit that we do see. So these are often called parabolic-orbit comets. Parabolic means the orbit is open at the far end. Actually the orbit probably does close and return the comet to the vicinity of the Sun eventually, but the period might be tens of thousands of years. And basically, we can't determine it. So we just, we refer to them as open-ended parabolic-orbit comets.

So, what can change a comet with one of these long orbits where they only come by the Sun occasionally into a much more frequent periodic visitor? Well, gravitational interaction with planets, right? lf a comet on one of these long period orbits at some point comes close to Jupiter or Saturn or one of the other planets, then the pull of that planet's gravity might alter the orbit, maybe make it much shorter. So this comet, if it happens to pass by a planet just the right way, it can be drawn into a new orbit, one that'll capture it and keep it coming back around the Sun much more often.

Lecture4-Art Conservation (Archimedes Palimpsest)

Narrator

Listen to part of a lecture in an art conservation class.

Professor

So far we have been talking all semester about restoring and preserving pieces of art，like ancient frescos，early oil paintings，etc. But although our field is called art conservation，it also involves…what?

Student

Um. . . preserving other types of cultural materials too

Professor

Very good. Not just art. Old artifacts are very valuable when they represent early technologies, all contain important historical information. In fact，let me give you an example. You've heard about the Greek scholar Archimedes，who lived more than 2，000 years ago，I am sure. Archimedes was a great mathematician. For example，he discovered the formula for the volume of a sphere. Not much of his work has Survived，but what has Survived is brilliant. And then in 1906，a Palimpsest of Archimedes' writing was discovered.

Now, a palimpsest is a type of manuscript that contains writing that's hidden because something else was written over it later. I'll explain in a minute. This Archimedes palimpsest, as it's now called，is by far the most important palimpsest anyone has ever seen. Because it contains the only known existing copy of Archimedes'treatise, called Method. Archimedes shows in it how maths can be applied to physics and physical reasoning back to maths problems, which is how he calculated the volume of the sphere，for example. This maybe commonplace today, but was revolutionary in his time. A few years ago, the palimpsest was sold at an auction for 2 million dollars. It could have ended up tucked away in a private collection，but fortunately, the collector who bought it has agreed to have experts restore every single word Archimedes wrote，so the contents can be shared with the world and studied.

But there are two main problems. What do you think the first one might be?
Jennifer?

Student

Um…well，it sounds like it's extremely old. So probably some pages are at the point of crumbling into dust?

Professor

True. And some are moldy, and some were eaten away at by bookworms. This thing's really decayed. But on top of that，there's another issue. And this is the reason why it's a palimpsest. You see，the text apparently sat around in a library in Constantinople until 1229 A. D. But then a scribe erased，scraped away the writing as clean as he could in order to use the pages to write his own book on. Why would he do that? Take a guess.

Student

Must have been a paper shortage?

Professor

Well? they used parchment to write on, but yes, there was a parchment shortage.

Student

So you are saying the parchment was basically recycled?

Professor

Correct. Then，even later on，in the twentieth century, a forger painted ancient—looking pictures on several of the pages in order to make the book seem older and increase its value. So unfortunately, that's quite a history.

Student

But professor Wilkens，if the scribe scraped away Archimedes'words and if these paintings covered the pages，how can the original work be recovered?

Professor
Ah, that’s why I am telling you the story. That’s our task as conservationists, isn’t it? To find a way. There were still faint traces of Archimedes’words on the pages. First，we tried to make the Archimedes’words stand out with a variety of technologies，using ultraviolet light. But that didn’t work on every page. But then，there was this new idea that came from a scientist studying spinach.
Student
Spinach?
Professor
Yes. Spinach. This physicist，Uwe Bergman，does research that involves studying iron in spinach. He was reading an article about problems with the palimpsest and it said that there is iron in the original Archimedes’ ink. So he came up with an idea to use the same method of looking at iron in spinach to view the iron on the palimpsest pages. And his idea worked. Bergman’s technique allows X—rays to pass through the forged paintings, pass through the scribe’s writing to hit the iron traces from the ink of the original Archimedes’ text and create an image just of the iron on the pages. The iron—based letters seem to just pop off the page. The original text and diagrams emerged，line by line. diagram after diagram. And that’s kind of typical of our field. There’s a lot of interdisciplinary work. People from several different fields might be
involved in working with a single art.
相关内容：http://en.wikipedia.org/wiki/Archimedes_Palimpsest

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Section 1

Conversation1-In the Library

Narrator
Listen to part of a conversation at the information desk in the library.

Librarian
Hi. Can I help you?

Student
Where do I go, besides the computers, to look for books on New Zealand?

Librarian
OK. You mean you don’t want to use the computer?

Student
Well, I haven’t had any luck on the computers here.

Librarian
OK. I mean the reason I am asking is you pretty much have to go to the computer to find out where a book is. But I can help you find it on the computer if you like.

Student
That would be great. I just spent half an hour and I couldn’t find anything.

Librarian
I know how you feel. When I first started working here, I couldn’t find anything either. So you are looking for information on New Zealand, is that right?

Student
Yes.

Librarian
Is it like travel information that you are looking for?

Student
Uh… No. Actually what I am looking for is information on a volcano in New Zealand.

Librarian
Oh. OK. Because I know a travel agency that specializes in tours in New Zealand and Australia.

Student
Oh. I’d love to go. I heard it’s beautiful.

Librarian
Yeah.

Student
Maybe someday.

Librarian
Yup. OK. Let’s see … OK. If you want to search the library holdings and don’t know the author’s name or the exact title of the book or an article, you have to set up a keyword search. It is a special function. Then you can just type in some keywords and let the computer do the search.

Student
I see.

Librarian
OK. Oh, how about if we search for volcanoes and New Zealand.

Student
Sounds good.

Librarian
It’s for a geology class?

Student
Mhmm.

Librarian

Ha! You must be from Professor Simpson's class.

Student
No.

Librarian
Oh. Well, he is a volcano expert, so I thought he might be teaching your class.

Student
No, I've heard he is really good though.

Librarian
Yeah. That's what everyone says. Do you know the name of the volcano?

Student
Mount Ruapehu.

Librarian
Can you spell that?

Student
Sure. It is R-U-A-P-E-H-U.

Librarian
OK. Mount Ruapehu. Let's see. So are you a geology major?

Student
Hem. Hardly.

Librarian
Let me guess, you have to take a science course and you don't want to have to deal with biology, chemistry or physics.

Student
Exactly. But it's actually turned out to be a pretty interesting class.

Librarian
Well, that's good. Um… does it have to be a book? Or could you use a journal article?

Student
Mhmm… no, either one would be fine.

Librarian
OK. Well, here's a journal article. Let me check to see if we have it. OK. We have the article, but it is from 2001. Is that OK, you think?

Student
Well, I'd like to have a look at it. The focus is really on eruptions in the last five years, but it might have some useful background material.

Librarian
OK. Well, let's see what else we can find.

Student
Sounds good.

Lecture1-Marine Biology (Coral Reefs)

Narrator
Listen to part of a lecture in a marine biology class.

Professor

So we have been fairly thorough in our discussion about coral reefs, which of course are prominent, oceanic features made of hard limestone skeletons produced by tiny coral animals. We've gone over where coral reefs are usually formed – along the edges of shallow ocean banks in tropical or subtropical regions, and the fact that they are declining at an alarming rate. But I don't want to leave you with the impression that all is lost. There are several techniques being employed today that could prove useful in assuring the future of the reefs.

Now, we've talked in depth about coral bleaching, or whitening, which as you recall, is a symptom of …well that the coral is suffering. As you know, coral is very sensitive to water temperature. Even though one or two degree Celsius rise in sea surface temperature for a relatively short amount of time can cause bleaching. Recently, researchers have used data collected by monitoring surface water temperatures to improve the ability of a reef to recover from bleaching. One future possibility is that improved monitoring can help predict where and when bleaching will occur, which might potentially enable us to mitigate its effects.

And there's another technique that's been experimented with to try to help coral reefs recover from bleaching. It's called coral transplantation. This involves moving young coral from a healthy reef onto a degraded reef, you know, in an attempt to regenerate the degraded reef by encouraging young healthy coral to take over. There has been some success with this, but it's still somewhat controversial. Some scientists support it because, well for one thing, it means you don't have to rely on the existing coral to reestablish itself because it might not be able to. But in my opinion, transplanting coral should only be used as … well as a last resort. I mean, this method is not only costly but it's … well even if it's successful, it still fails to address the ongoing problem, the root causes of the degradation, which really is paramount to devising an effective solution. So I don't really take comfort in the successes they have had with transplantation.

Perhaps some more constructive use of our time could be spent at researching corals that do survive, like in areas known as refugia. Refugia are areas on the reef that are seemingly, well resistant to bleaching. See, when coral reefs experience bleaching, it's rarely a case of the whole reef being affected. There are almost always pockets of coral on the reefs that remain unaffected. And these are often the lower areas of the reef, those located in deeper water, where temperatures are lower.

Now, we have evidence that corals in these locations are able to escape the destructive bleaching that affects portions of the reef in shallower or warmer water. So in my mind, it's these refugia that are the key components of overall reef resilience. These should be the area of concentration for researchers to locate and protect those regions as a way to sustain coral reefs.

And we can also protect the reefs by protecting the surrounding ecosystems, like mangrove forests and seagrass beds. Both of these grow in coastal waters, often in the vicinity of coral reefs. By protecting these areas, we also protect the coral. Let's take, for example, the mangrove forests. Mangrove root systems have the ability to absorb and well trap sediments and pollutants in water that flows through them before they enter the ocean. This of course has beneficial results for the nearby coral reefs.

And fishery's management is another key strategy. Overfishing can be seriously disruptive to coral. Let me give you a couple of examples. Overfishing certain species of fish and shellfish like snappers, barracudas and even lobsters. Well all of these creatures feed on snails, worms and other organisms that eat coral. So depleting the number of lobsters, for example, means that we are adding to the threat of coral decline. Sea urchins are another example. They eat algae and prevent it from overwhelming the coral. Since the disappearance of sea urchins from the waters up the coast of South Florida, many coral reefs there have been smothered by the uncontrolled growth of algae.

Lecture2-History of Musical Instruments (Violins)

Narrator
Listen to part of a lecture in a history of musical instruments class.

Professor

So musical instruments evolved in ways that optimize their acoustical properties, how the instrument vibrates and sends those vibration through the air to our eardrums.

Now professional musicians are very particular about their instruments, they want instruments that help them fully express the intent of the composer, which of course translates into a more enjoyable listening experience for the audience members. Yet most audience members probably aren't even aware of how much the instrument matters. I mean, OK. Think about the last concert you attended. When you applauded, what went through your mind?

Student

I recently heard a violinist who totally blew me away. So when I applauded, I guess I was showing my appreciation for his skill, the hours of practicing he must have put in.

Professor

And his violin?

Student

Didn't really think about it. It looked exactly like mine, which is inspiring in a way knowing my violin could also produce beautiful tones, that maybe I would sound that good someday.

Professor

I hope you do. But if your violin isn't as good as his…

Student

You mean he might not sound as good playing my violin?

Professor

As I said, tone quality differs from instrument to instrument. The question is why. Why does one instrument sound more beautiful than another, even if they look identical?

There's a particularly interesting case with an extraordinary generation of violins made in Northern Italy, in the city of Cremona, back in the late 1600s - early 1700s. These vintage Cremonese violins are considered the best in the world. But it’s not like the makers of those violins were any more skilled than their modern-day counterparts. They weren’t. Today’s top violin makers can pretty much replicate all the physical attributes of a Cremonese violin. But it’s generally thought that the acoustical quality of modern violins doesn’t live up to the quality of the vintage ones.

Student

So what attributes of the old violins have been replicated?

Professor

Oh, their dimensions, shape, their fingerboard height, uh, general craftsmanship. For a long time, people thought the varnish used to coat and protect the violins was special. But research showed it was the same ordinary varnish used on furniture. However, researchers have discovered that there are something special about the wood the violins were made from. And recently they have been able to replicate that too.

Student

How? Unless the trees that Cremonese used are still alive.

Professor

The trees weren't replicated, just the wood, specifically the wood's density. Density is determined by how trees grow. Trees, old trees that don't grow in the tropics grow seasonally, they grow faster early in the year in the springtime than they do later in the year. So early growth wood is relatively porous. Late growth wood is denser, less porous. And this variation shows up in the trees growth rings. The denser layers are generally darker than the less dense layers. We call this variation the density differential. Variations in wood density affect vibrations, and therefore, sound. When scientists first analyzed the wood of vintage Cremonese violins in compared with the modern violin wood, they calculated the average density and found no difference. Later, other researchers measured the density differential and found a significant difference. Modern violins had a greater variation, a larger differential.

Student

So you mean the density of the wood in the Cremonese violins is, is more uniform?

Professor

Correct.

Student

But Northern Italy isn't in the tropics.

Professor

No. But climate matters. Turns out the Cremonese violins were made from trees that grew during a Little Ice Age, a period when temperatures across Europe were significantly lower than normal. So the trees grew more evenly throughout the year, making the density differential relatively small.

Student

But you said someone replicated the Cremonese wood.

Professor

The density differential was replicated.

Student

What did they do? Try to simulate an Ice Age climate in their greenhouse and grow some trees in there?

Professor

No, what happened was a material scientist figured out a way to process wood to make it acoustically similar to the Cremonese wood. He basically exposed the wood to a species of fungus, uh, a mushroom. In the forest, fungi are decomposers. They break down dead wood. But this particular fungus nibbles away only at certain layers in the wood, leaving other layers alone. As a result, the density differential of the fungi-treated wood approach that of the Cremonese wood.

Section2

Conversation2-Hydroponics (Chinampas)

Narrator
Listen to part of a conversation between a student and the professor of his history of technology class.

Student
Would it be okay to focus on something related to agriculture?

Professor
Sure, farming technology is fine, as long as it's pre-modern. But this isn't a long paper, so are you going to need to pick a specific area of pre-modern agriculture, like irrigation or food crops of ancient Greece.

Student
I am actually interested in hydroponics.

Professor
Hydroponics. Growing plants in water instead of soil.

Student
Well, not in pure water, in water that has the proper mix of nutrients.

Professor
OK. But is it a pre-modern technology? I mean, hydroponics isn't really my specialty but from the research I have read, we are talking the nineteenth century, maybe the seventeenth century if you really stretch it.

Student
Oh? But the Aztec civilization back in the thirteenth century in basically where Mexico city is today … An article I read said the Aztecs were using hydroponics in something they called … I have got the word right here. Um. Chinampas.

Professor
Chinampas, the so-called floating gardens.

Student
Exactly. So yeah the chinampas, the article said very clearly these floating gardens are proof that the Aztec invented hydroponic farming.

Professor
Well, chinampas are artificial islands built up in shallow lakes. Islands made from packed earth and weeds and uh, material from the bottom of the lake. They may have appeared to be floating in the water, but in fact they reach all the way to the bottom of the lake. So the primary growing medium, what the plants draw nutrients from, is actually soil, not water.

Student
So the article was wrong about that? Too bad, it seems like a great topic, but I guess…

Professor

Wait a minute. Just because chinampas were not technically hydroponic doesn't mean this couldn't be an appropriate topic for your paper. Chinampas were still a great technological achievement. I mean, they enabled the Aztecs to grow plenty of food in an area without much available farmland.

Student

But I wondered why the author wrote that chinampas were hydroponic.

Professor

Well it's pretty common for writers to generalize, say use a term like hydroponics to describe other types of agriculture. Personally, I would never say hydroponic except for plants growing in liquid. The crops on chinampas definitely benefited from the water surrounding them. But… hydroponic…

Student

OK. So I will go with chinampas but leave out with the hydroponics part.

Professor

Actually, there's an important lesson here. We should pay attention to what happened in history but also how historical events are presented. Why, for example, would writers use a word like hydroponics so casually?

Student

I guess 'cause it's a popular topic people want to read about?

Professor

Or to help modern-day readers to understand something historical, maybe these writers think a familiar frame of reference is needed.

Student

Well that article was in a popular magazine, not a scholarly journal for historians.

Professor

OK. But historians sometimes do the same thing.

Student

So I guess then that all historians might not describe chinampas in quite the same way either.

Professor

Good point. Why not look into that too? And include it along with your description and analysis.

Lecture3-Zoology (Sauropods)

Narrator
Listen to part of a lecture in a zoology class.

Professor

Your reading for today touched on dinosaur fossils from the Mesozoic era, which ended about 65 million years ago. Today we will be discussing the sauropods. I think our discussion of sauropods will illustrate what we can learn by comparing the fossil record to modern animals. By fossils, we mean traces of prehistoric animals such as bones, which become mineralized, or impressions of bones or organs that are left in stone.

Now sauropods were among the largest animals to exist ever! They were larger than blue whales, which are the largest animals alive today. They weigh up to one hundred tons, twenty times as much as elephants. Also, they were an extremely successful kind of dinosaur. There's evidence of sauropods in the fossil record for an unusually long time, over one hundred million years.

So, why were sauropods so successful?

Biologically speaking, sauropods shouldn't have been successful. Large animals like elephants, say, they require much more food and energy and have fewer offspring than smaller animals. This makes maintaining a population harder. The largest animals today don't live on land. But in the ocean where food is easier to find, a blue whale, for instance, can eat up to 8,000 pounds of food a day. And they give birth only once every few years. We also know that body heat, that… well, large animals can't easily get rid of excess body heat. But for an oceangoing whale, that's not a problem. For a 100-ton land animal, it can be.

For years, we have assumed it was the abundant plant life of the Mesozoic that allowed these giants to thrive. However, we now know that since oxygen levels were much lower in the Mesozoic than we assumed, there was much less plant life for sauropods to eat than we thought.

So now, well, we are looking at other… we are, we are trying to understand the biology of sauropods, comparing their fossils to the anatomy of modern animals to get a better idea of how they lived. What we've found is that sauropods were experts at conserving energy. They had enormous stomach capacity, the ability to digest food over a long period, converting it to energy at a slower pace, saving it for later. For animals with small stomachs, it takes lots of energy to constantly look for food and then digest it. With larger stomachs and slower digestion, you don't need as much energy. Joseph?

Student

Does… do scientists actually know about sauropods from looking at… I mean, how much can we actually learn looking at some ancient bones compared to all we can learn from modern animals? And, comparisons between animals that lived millions of years apart? well, it just seems… more like guessing.

Professor

There’s always some guesswork when studying extinct animals. But that’s exactly what leads to discoveries, a hypothesis, a type of guess is made. We guess the hypothesis by looking for evidence to support it. Then some questions are answered, which may lead to new questions. For example, let’s look at one of these comparisons.

We know sauropods couldn’t chew food. Their skulls show they had no chewing muscles. Lots of modern animals, like birds and reptiles, also can’t chew food. They need to swallow it whole. But modern animals have an interesting aid for digesting food. They swallow stones, stones that are used to help grind up the food before it’s actually digested in the stomach. These stones are called gastroliths. Gastroliths make food easier to digest, essentially smashing food up, just as we do when we chew. Over time, gastroliths inside the animal are ground down and become smooth and rounded.

Now, sauropod fossils are commonly found with smooth stones. For years we thought these were gastroliths. They look just like gastroliths and were found in the area of the sauropods’ stomachs. A recent study measured the gastroliths in modern animals, in ostriches. And the study showed that ostriches need to ingest about one percent of their total body weight in gastroliths. But we have been able to determine that the stones found with sauropods totaled much less proportionally, less than a tenth of one percent of their body weight.

So now we are not quite sure what these sauropods’ stones were used for. It could be they were accidently ingested as the sauropods foraged for food, that they served no real purpose. Other researchers speculate that sauropods ingested these stones as a source of some the minerals they needed, such as calcium.

So the original hypothesis that the stones found with sauropods were gastroliths, even though it hasn’t been supported, has helped us to make new hypotheses, which may eventually lead to the answer.

Lecture4-Studio Art (Primary Colors)

Narrator

Listen to part of a lecture in a studio art class.

Professor

OK. As you probably know, primary colors are, theoretically speaking, the basic colors from which all other colors can be made. But as you'll find out when you start working on your painting projects, the three primary colors – red, blue, yellow – don't always make the best secondary colors. Combining red and blue, you will probably never get a fantastic violet. To get a nice violet, you'll have to add white. Combining yellow and blue, you will almost never get a satisfactory green. You are better off using a pure green pigment.

The idea of primary colors, and specifically the idea of red, yellow and blue being THE primary colors, didn't exist until about 200 years ago. Until then, the dominant theory about color was one that had been proposed by Isaac Newton. Newton gave a scientific and objective explanation of colors. He used a prism to break white light down into the various colors of the spectrum. And he theorized, rightly so, that different colors are essentially different wavelengths of light. But he made no mention of primary colors. That idea came from, or was at least published by a man named Johann Wolfgang von Goethe.

Goethe was a well-known author. He wrote many famous novels, plays, poems. So why did he start thinking about colors?

Well Goethe was part of the Romantic Movement in western literature. And he was a Romantic, through and through, meaning that he explained objects and phenomena in terms of the spiritual, emotional impact they had, as opposed to explaining them in terms of their scientific nature. He rejected an objective understanding of color, in favor of a more subjective understanding. He believed that when we see color, it stimulates our emotions. And different colors appeal to or inspire different emotions in different people.

Student

That sounds like psychology.

Professor

Well, color theory is used in psychology too. Some psychologists do use their field's version of color theory to diagnose and treat patients. Um… anyway, Goethe conducted a number of experiments trying to figure out which colors corresponded to which emotions. And in terms of that goal, he wasn't very successful. But his experiments actually did show a lot about the relationships between colors themselves, about how colors change when placed next to other colors, about how they interact with one another. Scientists studying optics and chromatics today still marvel at his findings. But Goethe wasn't really able to establish a clear connection between colors and emotions.

Then in 1806, he received a letter from a relatively unknown German artist, a painter named Philipp Otto Runge. In the letter, Runge outlined his own color theory, specifically the connections he made between colors and emotions. And his ideas about what colors symbolize, about the emotions that different colors inspire were based on the colors red, yellow and blue. Runge's choice of red, yellow and blue had nothing to do with what we know from modern-day chromatics, it had to do with Runge's complex system of symbolism, his experience of nature, particularly with his experience of the quality of light at various times of the day, morning, noon and night. So each color had a specific symbolic value.

Well, four years later, Goethe published a book entitled Color Lesson. In Color Lesson, Goethe COINCIDENTLY cites the same colors as primary colors. At this point, Goethe was already a well-known author, so he was easily able to popularize this idea of primary colors, and specifically the idea of red, yellow and blue as THE primary colors.

Student

But he didn't mention Runge?

Professor

Well, he did put Runge's letter in the book, at the end. But he added a disclaimer implying that Runge's letter didn't influence his work. Apparently, what Goethe was saying was that they just HAPPENED TO come up with the same theory at the same time.

TPO 28

Section1

Conversation1

Narrator
Listen to part of a conversation between a student and a professor.

Student
I am so sorry I am late. Professor Mills. I just finished at the student medical center. I twisted my ankle playing soccer this morning. It took longer than I expected to see the doctor.

Professor
That's okay. Don't worry about it. David. So let's get started. Your paper on John Dewey's political philosophy has a few issues I'd like to cover. You gave a great biographical sketch in the beginning. Okay.

But then as you get into his political philosophy, I don't think you've done enough to situate his philosophy within the time period. In other words, you haven't connected Dewey's philosophy to the thinking of other intellectuals of the time.

Student
So I haven't captured the most critical influences, the influences that were most significant to his political thinking?

Professor
Exactly. OK. Now, look back up at the section here, where you wrote about Dewey's view of individuality. This is all good content. But you haven't presented the information in a systematic way. I really think this portion on individuality needs to come later, after your paragraphs on Dewey's intellectual influences.

Student
After my revised paragraphs on what influenced them.

Professor
Yes. Revised. Let me ask. Uh. When you were finished writing, did you go back and ask yourself if all of the material was relevant?

Student
Well, no.

Professor
I do think there are areas that can be cut. I guess what I am saying is that your paragraphs aren't really presented in a logical order. The direction of your argument isn't crystal clear. And there's some unnecessary material getting in the way.

Student
OK. Sounds like I have a lot to do.

Professor
And one more thing, do you have a copy of the department's document on the correct format for index, citations and references?

Student
No. I mean, I look at it online when I was working on this assignment.

Professor
You really should print it out. You are going to need it for every paper you write in the political science department. It looks like you are getting it mix up with another referencing system.

Student
Oh. Yeah. I used something different in high school. It's so confusing switching to a new system.

Professor
I know. But remember, everything needs to be consistent when it comes to referencing. It is a very important academic convention.

Oh, also, I wanted to ask you… Will you be at the political science club meeting Saturday?

Student
Definitely. The topic is John Dewey.

Professor
Yes. Are you interested in leading part of the discussion? Tom Hayward is looking for someone to help out. I think you'll have a lot to contribute.

Student
That'll be fun. I will give him a call.

Lecture1-Philosophy

Narrator
Listen to part of a lecture in a philosophy class.

Professor
Okay. So, uh, to continue our discussion… When philosophers talk about the basis of knowledge, they don't mean the source of information about any particular subject. They mean how we know what we know.

Let's start with one philosophical view—foundationalism.

Foundationalism is the view that our knowledge claims, what we think we know, that is, they need to have a base. And think of knowledge as a house, you need a solid foundation on which to build your house. And if you have a strong foundation, your house is more likely to be solid. Well, foundationalists think the same thing is true of knowledge. If you have a solid base for your knowledge claims, then your knowledge structure is more likely to be strong, valid, true.

First, you need some good foundational knowledge claims, and then the rest of the knowledge claims can be based on these. Now, as to what kinds of knowledge claims are foundational, well, that's where this gets particularly interesting, in fact it sort of depends on which philosopher you ask. Take John Locke for instance.

Locke's viewpoint essentially was that when humans are born, their minds are like blank slates, that is, we don't have any kind of knowledge when we are born. We get our knowledge from our senses, you know, taste, touch, smell, sight, hearing. So, when we look at the world, first as babies and then as we grow, that's where our knowledge comes from. Our senses, our experiences serve as the foundation for our knowledge.

Now, for a very different view, let's turn to another philosopher—René Descartes.

Descartes thought that you have to go much deeper to find the foundations. He believed that our senses are not to be trusted. So he wanted to find a more solid foundation for knowledge. He began with what has come to be called methodological doubt. And when we say methodological doubt, well … Descartes believed that everything should be questioned, that is, approach it with doubt and that if you could find one thing that cannot be false, that one thing would serve as a foundation for all other knowledge claims.

So unlike John Locke, Descartes doubts that knowledge comes to him from his senses. He points out that at some time or another, everyone has been deceived by their senses. We have all had experiences where our senses have been wrong—illusions, perhaps, mirages. When driving in a car on a hot summer day, you may see what looks like shimmering water on the road, which, as science tells us, is really just a mirage, an illusion caused by the heating of the air. Our senses are wrong, they've deceived us. And Descartes thinks that since our senses can deceive us, we ought not take for granted that what they tell us is really true. That's the first step in his methodological doubt.

From there he wonders, well, ok, I can doubt my senses, but can I doubt that I am sitting in this room? Can it seem that we are not really here? That we are somewhere else? He conceives that most of us would know that we are sitting in the room. But then he says, well, couldn't I just be dreaming? He's had dreams that were so real that he thought he was awake when in fact he was actually asleep. And this is another good point. It's really hard to be sure that you are not actually dreaming. Yet another proof for Descartes that we can't always trust what our senses are apparently telling us. We could be dreaming. And there's really no good way to prove that we are not.

So the common sense picture of reality, that the world is really the way it looks to us, Descartes shows that we cannot just assume this to be true beyond all doubt. And he does this by talking about illusions and also by arguing that we could be dreaming. But consider this, he says, while one is thinking or doubting, or doing any of those sorts of mental activities, one has to exist, right? To even think that I doubt that I exist, you have to exist! And so what Descartes has done is find at least one thing that he can be certain of. He says, "I exist." And that's a start. And other knowledge he tells us can be based on that foundation.

Lecture2-Animal Behavior

Narrator

Listen to part of a lecture in an animal behavior class.

Professor

As you know, researchers have long been interested in discovering exactly how intelligent animals are. Today we are going to talk about a particular cognitive ability some animals seem to have—the ability to recognize themselves in a mirror.

Student

Oh. I've heard about that. Chimpanzees have it.

Professor

Right. Chimpanzees and other primates, chimps, gorillas, orangutans, and of course, humans. But it's also been found in elephants and bottlenose dolphins, a bit of a surprise. It's very rare. Most animals don't have it. And it's called mirror self-recognition, or MSR.

Student

Well, how does it work? I mean, how do researchers know if elephants or chimps recognize themselves?

Professor

Researchers give them a mirror mark test. In the mirror mark test, researchers put a mark on the animal where the animal is unable to see it or smell it or feel it, like on the side of their head, without looking in the mirror.

Now, typically, when animals first see themselves in the mirror, they think they are seeing another animal. Often they will look for this animal behind the mirror. They may even exhibit aggressive behavior.

But some animals, after this period of exploration, exhibit behaviors that show they know they are looking at themselves. For instance, elephants will touch the mark on their heads with their trunks.

Now, it's been assumed that primates and some other mammals stood alone at the top of the hierarchy of cognitive evolution. But recently, birds have been found to possess some of the same cognitive abilities! In particular, researchers have discovered these abilities in corvids, birds of the corvidae family.

Corvids include ravens, jays, crows and magpies among others. And what kinds of cognitive abilities are we talking about? Well, corvids and some mammals have the ability to plan for the future, to store food for instance, in places where they can find it later. It's been suggested in fact that jays, corvids known for stealing each other's food, may hide their food precisely because they are projecting their own tendency to steal onto other jays.

So let's talk about a study recently conducted with magpies. As I said, magpies are corvids. And because corvids have these other cognitive skills, researchers wanted to see if they were also capable of mirror self-recognition. So they gave them the mirror mark test, placing yellow sticker on the birds' black throat feathers. At first, the magpies all engage in the same social behaviors that other animals do—looking behind the mirror, etc. But eventually, some of the birds, while looking in the mirror, kept scratching at the mark until they got rid of it. And they didn't scratch at it when there was no mirror around. So they passed the test.

Student
Wow! Do any other birds have this ability?

Professor
Well, not that we know of. There was a study using pigeons, where researchers attempted to reduce MSR to a matter of conditioning, that is, they claimed that the ability to recognize oneself in a mirror could be learned. So these researchers basically trained some pigeons to pass the mirror mark test.

But two things are noteworthy here. One, no one's ever replicated the study. But more importantly, it misses the point. The issue isn't whether some behavior can be learned. It's whether a species has developed this ability spontaneously.

Student
So what does the test tell us about corvids or chimpanzees?

Professor
Good question. For one thing, it is important because it sets animals with a sense of self apart from those without a sense of self. But more importantly, many researchers believe that MSR is indicative of other advanced cognitive abilities. Self-awareness, even in its earliest stages, might entail an awareness of others, the ability to see their perspective, to look at the world from another's point of view. This is crucial, because it implies a high level of cognitive development. It's perhaps the first stage toward the development of empathy.

Student
But birds' brains are so small compared to primates.

Professor
True. Though corvids do have unusually large brains for birds. But size isn't the whole story. It's thought that primates are so intelligent because of a certain part of their brains, which birds simply don't have. But there is an area in birds' brains that researchers believe governs similar cognitive functions.

So primates and birds' brains have evolved along different tracks, but ended up with similar abilities.

Section2

Conversation2

Narrator

Listen to part of a conversation between a student and a professor.

Student

Hi. Sorry. I'm late. Professor Blane.

Professor

No problem. Jim. So you've got some questions about your senior thesis requirement?

Student

Yeah. I've got a couple of problems actually. So, the first thing is, you normally write it during the first half of the academic year. Right? In your final year of studies.

Professor

Right.

Student

But I have my student teaching scheduled for that time. I want to teach high school English after graduation. So I really need to give that my full attention. And I just worry that I won't be able to if I am writing my senior thesis at the same time. I mean, it's supposed to be 35 to 40 pages. That's a serious commitment.

Professor

You are right. But it really isn't a problem.

Student

Really?

Professor

No. A lot of English majors get teacher certification, so we have students like you do their senior thesis after their student teaching. It works out well, because many students want to use a unit they taught as the basis of their paper. So you'll just enroll in a thesis seminar for the second semester.

Student

Well, that's a big relief. But it brings us to my second problem. I'd really focus my studies on old and middle English literature. I am even thinking about doing a graduate degree with a concentration in that after I taught for a while. So I was hoping to do my senior thesis on Chaucer, on The Canterbury Tales, because that would obviously be useful if I do go on. But …

Professor

Ah. But Professor Johnson …

Student

Exactly. Professor John is going to be taking a sabbatical to do research in France during the second half of the year. So without him around, I am not sure how I could do a senior thesis on The Canterbury Tales. I mean, the focus of his teaching and research is unique around here.

Professor

Yes. I understand. It would be difficult to do your paper without professor Johnson around. Hmmm… would you allow me to try to sell you on an alternate plan?

Student

Well, you can try. But Chaucer is sort of my hero, if you know what I mean.

Professor

Well, I am teaching a course on the literature of the Renaissance in the first half of the year. It'll meet late in the day, so it won't interfere with your teaching. And I haven't offered it in quite a while now, so I doubt you ever studied that period on the college level.

Student

No. I haven't.

Professor

If you would be interested in taking the course, I'd be happy to give you supplemental readings, and I'd also be happy to be your advisor for your paper later on.

Student

Well, I never looked at that area before, but I have always had an interest in it. So that does have a certain appeal.

Professor

Well, if you do decide to go this route, I would make that decision soon and I would use this summer productively. After all, this is not going to be like taking an intro course.

Lecture3-Botany

Narrator
Listen to part of a lecture in a botany class.

Professor
OK. Last time we talked about photosynthesis, the process by which plants use light to convert carbon dioxide and water into food. Today I want to talk about another way light affects plants. I am sure you all know from physics class about how light moves in microscopic ways and that we can only see light when the wavelength of that light is in a specific range. Plus, depending on the wavelengths, we see different colors.

Well, plants are also capable of distinguishing between different wavelengths of light. Now, I don't want to confuse you. It is not like plants have eyes. Plants don't see in the sense that humans or animals do, but they do have photoreceptors.

Photoreceptors are cells that respond to light by sending out a chemical signal. And the organism, the plant, reacts to this signal. In fact, the signals that plants get from their photoreceptors sometimes cause significant reactions.

And many plants are seasonal. And one way they know when winter is ending and spring is beginning is by sensing the change in light. The time when an adult plant flowers is based on the amount of light the plant senses. Certain plant species won't flower if they sense too much light and some plants will only flower if they sense a specific amount of light. Of course, these aren't conscious reactions. These plants just automatically respond to light in certain ways.

Plants are also able to distinguish between specific wavelengths of light that the human eye cannot even see! Specifically there's a wavelength called far-red. Although why they call it far-red … I mean, it is not red at all. It lies in the infrared range of the spectrum. We can't see it, but plants can sense it as a different wavelength.

OK. Now I need to mention another thing about photosynthesis. I didn't explain how different wavelengths of light affect photosynthesis. When a plant absorbs light for performing photosynthesis, it only absorbs some wavelengths of light and reflects others. Plants absorb most of the red light that hits them, but plants only absorb some of the far-red light that hits them. They reflect the rest. Remember this, because it's going to be relevant in an experiment I want to discuss.

This fascinating experiment showed that plants not only detect and react to specific wavelengths of light, plants can also detect and react to changes in the ratio of one wavelength to another. This experiment was called the Pampas experiment.

The idea behind the Pampas experiment had to do with the response of plants to changes in the ratio of red light to far-red light that the plants sense with their photoreceptors. Some biologists hypothesize that a plant will stop growing if it's in the shade of another plant, a reaction that's triggered when it senses an unusual ratio of red light to far-red light. OK.

Imagine there are two plants. One below the other. The plant on top would absorb most of the red light for photosynthesis, but reflect most of the far-red light. That would lead to the plant in its shade sensing an unusual ratio. There will be less red light and more far-red light than normal.

What that ratio signifies is important. A ratio of less red and to more far-red light would cause a reaction from the plant. It would stop growing taller, because that plant would sense that it wasn't going to get enough sunlight to provide the energy to grow large.

To test their hypothesis, researchers took some electrical lights, um… actually, they were light-emitting diodes, or LEDs. These light-emitting diodes could simulate red light. So they put these LEDs around some plants that were in the shade. The LEDs produce light that the plants sensed as red. But, unlike sunlight, the light from these LEDs did not support photosynthesis. So the plants sensed the proper ratio of red light to far-red light and reacted by continuing to grow taller, while in reality these plants were not getting enough energy from photosynthesis to support all of that growth. And because they weren't getting enough energy to support their growth, most of the shaded plants died after a short time.

Lecture4-Archaeology

Narrator
Listen to part of a lecture in an archaeology class.

Professor
It's every archaeologist's dream to find a lost civilization, to make some huge discovery, to find artifacts no one else has laid a hand on in millennia. You might think that this never happens any more, given all the research in archaeology that's been done. But in the late twentieth century, archaeologists discovered the remains of a sophisticated people whose settlement might have been the hub of a civilization few people even thought existed.

They found this site at the edge of a desert in Turkmenistan, in central Asia, where a series of mounds rise up from the plains. Now, you might remember because we've talked about this, archaeologists know that mounds such as these are the kinds of geological features that indicate the presence of ancient settlements. Jim?

Student
Um…mounds can be different things, right? Some are burial places…

Professor
Exactly. And some are the remains of cities. The inhabitants would build houses and temples you know, what have you. And over time, those buildings would fall down or be torn down and then be built over. Over time, generations of building and rebuilding in the same area would result in a large hill the size of a city. Careful excavation and documentation of layers in a mound can reveal a wealth of information about the everyday life of a people in a settlement over many periods of occupation.

Now, this particular site is called Gonur-depe. What was found at Gonur-depe was amazing: the ruins of a huge palace complex, the foundations of shops and houses, the remains of thick walls and towers that fortified the city. There was even an elaborate canal system and a lot of very intricate jewelry. All these findings seem to indicate that they are the remains of an ancient civilization that was every bit as advanced as other more famous civilizations of the time. Like those in Egypt, or, or China. And the site dates back to 3,000 B.C.E.

Student
Did they trade with those other civilizations? Because if they did, wouldn't there've been some evidence of that? You know, an artifact found in the ruins of other civilizations?

Professor
That's a good question. I mentioned Jewelry, well, Jewelry have been found in Mesopotamia and at archaeological sites in modern-day Pakistan. But archaeologists didn't know where it came from. Only after the site at Gonur-depe was excavated were archaeologists able to identify it as coming from Gonur-depe. Uh, Sheryl?

Student
I wonder why nobody found this site before.

Professor
Well, before the discovery of this site, it was commonly believed that central Asia had always been occupied by mostly

nomadic people. So there would be no record of major settlements. A couple of small finds have been made in the area, but really, no one had looked very hard.

Now, one mystery regarding this site is that archaeological records show it was inhabited for only a few centuries.

Student
What happened to the people who lived there?

Professor
Well, the site was close to the Murgab river, which they would have depended on for their water. And the Murgab river, which runs toward the west, is the kind of river that shifts its course over time. So one theory is that the river's course shifted toward the South, and they simply followed it and built new towns to the South.

Another theory is that they were involved in wars with neighboring settlements. But we might never know the truth.

One thing we do know is that in the decades since Gonur-depe was discovered, the site has deteriorated significantly. I mean, it's been disturbed for the first time in millennia. And being exposed to the Sun and wind has taken its toll on the ancient city.

So now the question is, do we partially restore and rebuild the site before the entire thing disintegrates? It will take a lot of funding to restore it and I am not sure it'll be made available, which would be a pity. Even a partly altered site can provide valuable information, which would be lost otherwise.

TPO 29

Section1

Conversation1

Narrator
Listen to part of a conversation between a student and an employee at the registrar's office.

Employee
Morning. How can I help you?

Student
Well, I am kind of confused about my schedule. I printed it out this morning. But one of the classes I registered for is missing.

Employee
OK. Let's see if we can figure this out. What's your name?

Student
Lisa Johnson.

Employee

Alright. I am bringing up your schedule on the computer. Hmmm…It looks like you're registered for Introduction to Astronomy, Survey of American Literature, and Introduction to Government and Politics.

Student
Well, yes, but I also registered for a language class—Level One Japanese. Did they…I don't know, maybe cancel it?

Employee
I doubt it. The Japanese classes are quite popular. But let's take a look at the list of Japanese classes being offered this semester just to make sure. Um… what section did you register for?

Student
I don't remember the section number. But it's the one that meets at eleven.

Employee
Ah! That would be section five. Well, according to this, the class is completely full. Are you sure…you, um, you registered online, right?

Student
Yeah.

Employee
Did you get a confirmation message?

Student
What do you mean?

Employee
Well, once you've successfully registered for a class, the computer gives you a message saying you are in.

Student
Oh. You mean that message at the bottom of the screen that says you're now registered for this class? Actually, I didn't get that message. I got one that said "instructor's signature required." I thought I just needed to get to professor's signature on the first day of class.

Employee
Well, you do. But the professor might no sign it. It depends on how full the class is and how many additional students the professor is willing to let in.

Student
So that means I am not registered for the class. Not unless the professor signs me in. What, uh, what should I do now?

Employee
Let me give you the form the professor needs to sign. Go to the class on the first day, get there early, so you can talk to the professor before class starts. Find out if he or she is willing to let you in. If so, bring the signed form back here and we'll register you for the class.

If not, well, you'll have to find a different class. I'd start looking for alternatives now, just in case.

Student

What do you think my chances are of getting into this class?

Employee
Students often add and drop classes once the semester begins, so there is a real chance a seat would open up. But of course there are no guarantees.

Student
It’s just that I need a language course to graduate and that’s the only Japanese class that fits my schedule.

Employee
Yes. But according to our records, you are only in your first year here. If you can’t take the class this semester, you still got time.

Student
I know. I was just hoping to take care of my requirements earlier rather than later.

Employee
I understand. I just wanted to make sure you know you had options.

Lecture1-Ecology(Pedodiversity)

Narrator
Listen to part of a lecture in a plant ecology class.

Professor
So far we have covered biodiversity in the hard wood forest here in the upper peninsula of Michigan from a number of angles. We've looked at everything from how biodiversity relates to species stability, to competition for forests resources and more.

But now I want to discuss what's called pedodiversity. Pedodiversity is basically soil diversity. When we analyze pedodiversity within an area, we are measuring how much variability there is in soil properties and how many different types of soil there are in a particular area.

So we look at soil chemistry. For example, how much nitrogen or magnesium there's in the soil in one spot. And we compare it with the chemistry of the soil a short distance away.

Until recently, there hasn't been a whole lot of attention paid to pedodiversity. But that's changing rapidly. More and more studies are being done in these fields. There's a link between biodiversity and pedodiversity, an obvious relationship between soils and flora and fauna, which is why pedodiversity really should be considered in forest management.

A high degree of soil variability in a small area is common, particularly within forests. If you compare soils from a forest with soils that don't come from a forest, the amount of variability will most likely be greater in the forest's soil. It generally has more diversity.

Um…OK. There are three main causes of pedodiversity within old-growth forest here in our region of Michigan.

One is tree species. Different species have different influences on soil formation and soil properties. For example, pine trees drop pine needles. And those needles add a lot of acid to the soil. The organic litter of another tree species might add less acid but more of something else. A lot of different types of trees in an area might mean more pedodiversity.

Another cause? Gaps … created when trees fall. You see, where there are gaps, open areas in the forest, the soil there changes. Um… for instance, without a tree to absorb radiation from the Sun, to offer shade, the full intensity of that radiation reaches the ground. The soil where the tree used to be heats up. And without a tree to soak up moisture from the ground, the soil remains wetter than in the surrounding forest. With a higher temperature and more moist conditions, the process of organic matter decomposition speeds up. In other words, organic matter gets broken down and added into the soil more quickly in these gaps than in the surrounding forest.

OK. And the third cause—trees being uprooted. When a tree is uprooted, it might fall into some other trees on its way down, thus falling only partway over. Or it might crash all the way down to the forest floor. Either way, if its roots are pulled up from out of the ground as the tree topples over, then there's usually a big hole, a pit left in the ground where the roots used to be. And there's still a lot of soil attached to the roots, clinging to the roots. As that soil is eventually shed from the roots by rain and wind and the movement of squirrels climbing around, things like that. Um... as the soil is shed, it drops down and forms a little hill of dirt, a mound.

Pits and mounds have significantly different soil properties than other areas in the forest. You get a redistribution and mixing of soil as deep roots are ripped up from the ground. Rock fragments can be pulled up too, if they've gotten entangled with the roots over the years. So rock fragments from the subsoil can end up concentrated on the surface.

There are forests management implications I want to point out. Forests management impacts soil quality. And when we better understand pedodiversity, we will be better able to predict the impact of forest management on soil. But in general, for positive impact, forest management practices should mimic natural forest processes. And the goal should be to promote pedodiversity, and through this, biodiversity in general.

I have a handout, an article on pedodiversity in a section of forests near here. I want you to read it, because it makes a point that I've only touched on. From what I have been saying about the causes of pedodiversity, you might assume that the relationship between forest dynamics, what happens to the trees, and pedodiversity is a one-way street. As the article explains, forest dynamics affects pedodiversity. But pedodiversity also affects forest dynamics. It's worth bearing in mind.

Lecture2-Architecture(Reverberation)

Narrator
Listen to part of a lecture in an architecture class.

Professor
Today I'd like to talk a bit about the relationship between the built world and sound. Uh, the design of buildings like concert halls or theaters. So, what's the most important aspect in the design of such a building?

Student
Acoustics?

Professor
Yes. Now, people have been concerned about how sound carries in auditoriums and theaters for at least 2,000 years. But it was not until the beginning of the twentieth century that architectural acoustics became a scientific field. That was when the physicist Wallace Sabine started to do extensive studies on reverberation.

Sabine wanted to find out why the audience could not understand speakers at a lecture hall in Boston. He designed a series of studies on reverberation to figure it out. So, what is reverberation? It's the persistence of sound in a room after the source has stopped making sound. You see, sound made in a room reflects off the walls, floors and ceiling. That's the reverberant sound. The time it takes for the reverberant sound to die down is important for the acoustic quality of a room. Sabine recognized this and he came up with an equation to measure a room's reverberation time.

So, what happens if the reverberation time is very long?

Student
Wouldn't it be difficult to hear new sounds if you can still hear the old sounds?

Professor
Exactly. A long reverberation time may cause musical notes to drown one another out.

On the other hand, if the reverberation time is very short … meaning, the reverberations are absorbed very quickly, the room is called dead. Performers would feel they have to struggle to fill the room with sound. We don't want that. In a concert hall or theater, we prefer a live room, where the sound has fullness.

So we need to control the reverberation time. After all, we don't want the listeners or the performers have to struggle, right?

So what are some important considerations when we design a theater or a concert hall?

Student
The size of the place?

Professor
Absolutely. The larger the room, the longer the reverberation time. So we'll have to take into account what the room will be mainly used for, since music requires more reverberation than speech. A room intended for music needs to be designed

differently from a room intended for drama. For music, we need a very large room, a concert hall, actually I should say for full orchestras. Because for a single instrument, say something like a piano recital, a room with a short reverberation time is better. So for a solo piano a smaller room works well. Yes?

Student
I read that concert halls designed for symphony orchestras have too much echo for jazz music.

Professor
That doesn't surprise me. Most small jazz groups would need rooms with a shorter reverberation time.

But besides the size of the room, another variable affecting reverberation is the shape of the room. Let's say you design a rectangular box-like space with bare walls and ceiling, this would allow the sound to act like a ball in a racquetball court, you know, bouncing around and hitting some parts of the walls and ceiling but missing many others. If that happens in a concert hall, audience members may hear some sounds, but not others.

So what can be done to distribute the sound evenly in every direction? The answer is: avoid straight, parallel walls.
Karen?

Student
But I think I've seen photos of rectangular concert halls.

Professor
Right. Older concert halls from the 1800s are generally rectangular. But they all have a lot of decorations on the walls inside, lots of ornamental plasterwork like statues, which distribute sound very efficiently, reflecting it in all different directions.

And that brings me to another variable we need to consider. The acoustic characteristics of the building materials as well as the wall and floor coverings. In fact, most objects you see in a concert hall or theater serve double duty. The plush chairs absorb sound and soften reverberation. And the beautiful crystal Chandeliers? They are very good at diffusing sound. You see, everything must be planned down to the last detail in order to predict the acoustic performance of a room.

That being said, there's something that can't be controlled by the architect. The audience has an effect on acoustics too. The heads of people are good diffusers of sound. And Architects try to account for this effect in their design, but they can't guarantee a full auditorium.

Section2

Conversation2

Narrator
Listen to a conversation between a student and his music history professor.

Student
Um, professor Jenkins. The listening journal you assigned us to keep for the Intro to World Music class, well, I am not sure I understand what to do. I listened to the pieces you assigned this week more than once, but when I tried to write about them, I didn't know what to say.

Professor
Well, it's not easy to write about music, even for people who are supposedly expert at it.

Student
That makes me feel a little better. But I am just not familiar with how you keep a listening journal. I've kept journals for other classes, summarizing and writing about how I felt about readings.

Professor
Well, a listening journal isn't all that different, I want you to note your feelings about musical compositions too.

Student
OK. There were pieces I like more than others, but I think you want our comments to be a little more…I don't know, analytical. Right?

Professor
Well, whether you like a piece or not is important, but you should be able to explain why you like a particular piece and be able to talk about its historical and musical context. Actually, the listening journal is a tool to help you listen to music actively, to think about what you are hearing.

Student
Maybe I am finding it difficult because I am not real familiar with most of the music you assigned. I mean, if it's hip-hop or something I listen to with my friends…

Professor
Yes, because hip-hop is a form that's familiar and meaningful to you. But you'll see as the semester progresses and you start learning more about musical forms, you'll become a more adept listener. And you'll start noticing patterns.

Student
OK. So the songs we listened to this week, the …the Canto?

Professor
The Cante jondo[1]. You remember we said it means "deep song" in Andalusian Spanish? Not only because it's sung in a

[1] Spanish *hondo* = "deep". The name is spelt with a j as a form of eye dialect because traditional Andalusian pronunciation has retained an aspirated h lost in other forms of Spanish.

deep register, but also because it’s a song about deeper or serious matters, certainly not lighthearted.

Student

Really? Hmm…I guess I didn’t catch the double meaning. That’s kind of cool. But anyway, even with the translations you gave us for the lyrics and everything, I don’t know, I could tell it’s sad, but I wasn’t trying to analyze it, from a musical perspective that is.

Professor

OK. So this is what you should do. Go back and listen to the song selection and this time pay attention to the melody, to repetition, to the …

Student

There was plenty of that. Some parts sounded like the same note played over and over again.

Professor

That’s exactly the kind of observation you would record in a listening journal. So, melody repetition, rhythm, how the piece is structured, as well as your reasons for liking or disliking it.

You know what? I thought everyone was clear about this, but you’ve just given me a great idea. I am going to draw up a list of questions everyone should keep in mind when they are writing their journals. Other students may be having the same problem you are having.

Lecture3-Archaeology(Clovis Culture)

Narrator
Listen to part of a lecture in an archaeology class.

Professor
We will be looking at the original settlement of the Americas next, and I'll spend the next few classes talking about the Clovis people and the two big questions archaeologists have about them.

The two big questions are, when did the Clovis people arrive in the Americas? And of course, were they the first people in the Western hemisphere. And we'll get to that. But for today, let's try to get an idea about, well, a question that's not addressed as much as the others and that's – what was their culture like? And how do we figure that out?

Now, again, there's a great debate about when the Clovis people first arrived in the Americas. And I am not like a lot of archaeologists who want to push the number way back, so let's use a round number and probably a safe number and say 11,000 years ago. The Clovis people were likely settling North America 11,000 years ago. And leave it at that for now.

Now, most of what we know about the Clovis people comes from one of their tools—the Clovis point. When we talk about a point we are referring to a piece of stone that's worked to a sharp point, in this case probably to be attached to a spear. The Clovis point may be the most analyzed artifact in archaeology. And the point used by Clovis people differs slightly from later points, in the way that the base of the stone is thinned, uh, it's thinner toward the base, the part that's attached to the spear. So when one is found, it's usually not confused with points made by later groups.

Clovis points have been discovered at both hunting grounds and camp sites, which you might expect. But another fascinating place we find them is in Clovis caches. A cache is just something stored or hidden away. It's also the term for the place where it's hidden.

The Clovis caches are collections of tools, stone points and other tools made of stone or bone, often at various stages of manufacturing, some were left unfinished. The traditional explanation is that these were emergency supplies, uh, meant to be used at a later time. Since the Clovis people were highly mobile, it's plausible that they would set up spots along established travel routes where they keep a variety of items. Either so that they wouldn't have to carry everything with them or so they could save time once they arrived at a site by not having to make stuff from scratch.

But there's another theory about the caches based on the quality of some of the points we've found. You see, the points in some caches differ from other points, from points at Clovis camp sites for example. For one thing, these cache points are quite large, up to twice as large as regular points, so big that you couldn't attach one to a spear say, and expect to throw the spear accurately over any distance. So what were they for?

Well, it was originally thought that they were unfinished, that someone was working away a point, then had to stop and put it aside in one of these caches to work on later. The problem is: it's unlikely that a point would have started out as large as the points in these caches, that would be a lot of stone to chip away. A toolmaker starts with a smaller piece. And actually, far from being unfinished, a lot of these points really show excellent craftsmanship and attention to detail. And not just with respect to the skill, but also with respect to the raw material, it seems that cached points are made from the very best pieces of stone.

So we have to ask—could these points have served another purpose? Maybe be they weren't just tools. Look at it this way. When the Clovis people first arrived in the Americas, they had a lot to learn about their new environment. Over time, they would have begun to recognize some places as special, important for some reason. Maybe there was always water available there. Or the hunting was especially good. So maybe the cache was a way to mark the place as significant.

Lecture4-Structural Engineering(Carbon Nanotubes)

Narrator

Listen to part of a lecture in a structural engineering class.

Professor

Today let's begin to look at structural engineering in the Space Age. Uh, new problems…new possibilities mean we can think in new ways, find radically different approaches. So let's consider…uh, well, what would you say is the biggest obstacle today to putting structures, equipment, people …uh, anything really, into space?

Student

Well, the cost, right?

Professor

Exactly. I mean, just taking the space shuttle up and back one time is hugely expensive. Uh, why?

Student

I guess a lot of it is for fuel, right? To…to get the rocket going fast enough.

Professor

OK. Fast enough to…

Student

To escape Earth's gravity.

Professor

Good. So we are burning up an enormous amount of fuel at every launch just to get the rocket up to what's known as escape velocity. Now, escape velocity is around 11 kilometers a second, pretty fast. But do we really have to go this fast?

Student

Well, yeah. I mean, how else can you, um…escape? I mean, that's the whole point of escape velocity, right? Otherwise gravity will pull you back down to the Earth.

Professor

Actually, that's a common misconception. Escape velocity is simply the speed of an object that's …uh, let's say, shot out of a cannon the minimum initial speed so that the object could later escape Earth's gravity on its own. But that's just if there's no additional force being applied. If you keep on supplying force to the object, keep on pushing it upward. It could pull away from Earth's gravity at any speed.

Student

Even really slow? So you're saying …like, if you had a ladder tall enough, you could just climb into space?

Professor

Yeah! Uh, well, theoretically. I mean, I can see some practical problems with the ladder example. Uh, like you might get just a little bit tired out after the first few thousand kilometers or so, uh, especially with all the oxygen tanks you'll have to be hauling up with you.

No. I was thinking more along the lines of an elevator.

Student
Wait! You are serious?

Professor
Sure. An elevator. That’s a new idea to most of us, but in fact it’s been around for over a century. If we could power such an elevator with solar energy, we could simply rise up into space for a fraction of the cost of a trip by rocket or shuttle.

Student
But wait, elevators don’t just rise up. It have (sic2) to hang on some kind of wire or track or something.

Professor
Uh, true. And for decades that’s exactly what’s prevented the idea from being feasible or even just taken seriously. Where do we find the material strong enough yet lightweight enough to act as a cable or track. I mean, we are talking 36,000 kilometers here. And the strain on the cable would be more than most materials could bear.

But a new material developed recently has a tensile strength higher than diamond, yet it’s much more flexible. I am talking about carbon nanotubes.

Student
OK. I’ve read something about carbon nanotubes. They are strong, alright, but aren’t they just very short little cylinders in shape?

Professor
Ah, yes. But these cylinders cling together at a molecular level. You pull out one nanotube or row of nanotubes, and its neighbor’s come with it, and their neighbors, and so on. So you could actually draw out a 36,000-kilometer strand or ribbon of nanotubes stronger than steel, but maybe a thousandth the thickness of a human hair.

Student
OK. Fine. But what’s going to hold this ribbon up and keep it reach enough to support an elevator car?

Professor
Well, we definitely have to anchor it at both ends. So what we need is a really tall tower here on the ground right at the equator and a satellite in geostationary orbit around the Earth. There’s a reason I mentioned that figure of 36,000 kilometers. That’s about how high an object would have to be orbiting straight up from the equator to constantly remain directly above the exact same spot on the rotating planet Earth. So once you are in this geostationary orbit right over the tower, just lower your carbon nanotube cable down from the satellite, tether it to the tower here on Earth. And there you have it!

Student
So you really think this is a possibility? Like, how soon could it happen?

Professor
Well, the science fiction writer Arthur C. Clarke talked about building a space elevator back in the 1970s. And when someone asked him when he thought this idea might become a reality, his reply was, “Probably about fifty years after

[2] You write sic in brackets after a word or expression when you want to indicate to the reader that although the word looks odd or wrong, you intended to write it like that or the original writer wrote it like that. Sic 表示“原文如此”。从语法上讲原文应为 it has，但听力中的说话者确实用了 it have，这是口头表达时语法不像书面语那么严谨的缘故，类似情况已在托福听力中出现了若干次。

everybody quits laughing.”

http://discovermagazine.com/2009/jul-aug/09-ways-carbon-nanotubes-just-might-rock-world

TPO 30

Section1

Conversation1

Narrator
Listen to a conversation between a student and an employee at the student activity center.

Student
This is the administrative office, right?

Employee
Uh-huh. How can I help you?

Student
Well, I am stopping by to reserve a place for my school club that meet and work, pretty much on a regular basis. Ideally, our preference would be to have our own office.

Employee
Hmm…well, we are out of private offices. But we do have some semi-private options still available.

Student
What do you mean?

Employee
Well, it’s a setup where you’ll have a larger workspace shared by two other clubs. In other words, each club would have its own work area within that one room.

Student
Oh. Are there any divider, walls or anything?

Employee
Oh, yes. There will be a couple of dividers, so there’s some privacy.

Student
Um. We’ll work with that then. I wouldn’t want to be without an office.

Employee

OK. Here are the two forms you have to fill out. Why don't you do it now while I set that up through out computer system.

Student
OK.

Employee
So what's your club's name? And the last name of the club president.

Student
Oh, it's the photography club. And it's Williams. That's me. John Williams.

Employee
Hmm…that's not pulling up anything on my screen. Um…let me try something else. Uh, how about your faculty advisor's name?

Student
Sarah Baker. She is in the Arts Department.

Employee
Hmm…No. Strange. You know your club is just not showing up in my online records. Is this an established club?

Student
No. Actually it's a brand-new one.

Employee
Hmm…have you completed the registration process?

Student
Yeah, last week. That was my very first step.

Employee
Right. Well, for my purposes, a club definitely has to be registered before I can proceed further. At the moment, however, it appears that there's no record of your club's registration.

Student
Really? I thought everything was finalized last week.

Employee
Well, it is surprising. Usually there's a 24-hour turnaround in our computer database. So then do you have the registration approval letter from the review committee? That would give me the verification I need.

Student
Yeah. I do. I mean, well, I don't have it with me. But … I… I, uh, can get it from my dorm room, bring it back with me and submit it with those forms you need from me.

Employee
Great! That'll work. And just so you are aware, there're lots of benefits to being registered.

Student

Oh, yeah. I think the university will give us permission to set up a website, right? I want to get students sharing their ideas on the website, you know, establish a photography blog.

Employee

Yes. You'll be able to do that. And…um…actually there's more. You'll be allowed the use of audiovisual equipment at no cost. You'll receive a club mailbox and a club email address. You'll be allowed to post your flyers and posters around the campus for publicity. And you could be eligible for funding for club events.

Student

Well, we are definitely interested in hiring a professional speaker at one of our campus events at some point in the semester. And speakers almost always charge a fee. So I'll definitely follow up on that.

Lecture1

Narrator

Listen to part of a lecture in a psychology class.

Professor

We've been talking about animal cognition—the study of animal intelligence. Now, much of the research in this area is motivated by the search for animal analogues, or parallels to human cognitive processes. And one of the processes we've been investigating is metacognition.

What is metacognition? Well, it's being aware of what one knows or feels, uh, um… having an awareness of one's state of mind. And making decisions about behavior based on what one knows. Researchers have long been interested in whether animals possess this capability, but…but couldn't test it because animals aren't able to report their feelings.

But recently one group of researchers found a way to solve this problem. They did studies with…with monkeys and dolphins that provide evidence that these animals have the ability to feel uncertainty, to feel unsure about something and…and…well, to know that they are uncertain.

So how could these researchers figure out if an animal feels uncertainty. Well, it began with a study one of them did on a dolphin, who had been trained to recognize a particular high-pitched tone. The dolphin was taught to press one of two paddles depending on whether it heard the high tone or one that was lower. Food was a reward for a correct response. But if the wrong paddle was pressed, the dolphin had to wait several seconds before it could try again. The task varied in difficulty according to the pitch of the second tone. The closer it came in pitch to the first one, the hard it became for the dolphin to correctly identify it as low. And the researcher noted that the dolphin is quite eager to press the paddle when it was sure of the answer, but exhibited hesitation during difficult trials.

Next the researcher introduced a third option, a third paddle that would initiate a new trial, giving the dolphin the choice of passing on difficult trials. Once the dolphin figured out the result of pressing this new paddle, it did choose it frequently when the trial was difficult. The researcher took that as an indication that the animal wanted to pass because it didn't know the answer and knew it didn't know.

But there was a problem. Other researchers protested that the… the opt-out response was simply a learned or conditioned response. You remember intro to psychology, right? In other words, by pressing the pass paddle, the dolphin avoided having to wait and hasten the possibility of a full reward by moving directly to the next trial. So the experiment didn't necessarily indicate that the dolphin had knowledge of its own uncertainty, just that it wanted to avoid negative consequences.

So more recently, our researcher and his colleagues devised a new study, this time using monkeys. In this experiment, the monkeys had to identify certain patterns displayed on a computer screen. These patterns were analogous to the tones used in the dolphin study. One type of pattern was of a specific density and was to be classified as dense, while the second type of pattern could vary in density, but was always less dense than the first one. And the monkeys' task was to identify this second type as sparse. So the denser the second type of pattern was, the more difficult the task became.

And as in a previous study, the monkeys were given a third choice that would allow them to pass on to a new trial. But unlike in the dolphin experiment, the monkeys had to complete four trials before they got any feedback. They didn't know if they responded correctly or incorrectly after each trial because there was no reward or punishment. At the end of four trials, feedback was given. The monkeys received a full reward for each correct response. And a time-out during which a buzzer was sounded for each incorrect response. But the monkeys had no way to tell which reward or punishment was associated with which response. And they didn't get either reward or punishment for choosing the pass option, the…um…the uncertainty response. But nevertheless they still chose this option in the appropriate circumstances when the trial was particularly difficult. And this is evidence that it wasn't a conditioned response, because that response didn't guarantee a faster reward.

So what does all this tell us about animal consciousness or animals' awareness of themselves and their state of mind? Can we really know what's going on in the minds of animals? No. Of course not. But exploring the metacognitive capacity of animals could become an important criterion in highlighting the similarities and differences between human and animal minds.

Human
By Michael S. Gazzaniga
http://books.google.com/books?id=nD4u-YdmX88C&pg=PA317&lpg=PA317&dq=metacognition+dolphin+press+paddles&source=bl&ots=co2_Da3oLo&sig=FSfz5EeoUh0j-sPyqmOfbCiSNys&hl=en&sa=X&ei=D_bjUcn9E6T7ygHE4oGQCw&ved=0CEcQ6AEwBA#v=onepage&q=metacognition%20dolphin%20press%20paddles&f=false

Lecture2-Paleontology

Narrator
Listen to part of a lecture in a paleontology class.

Professor
As we've discussed, birds are apparently descendants of dinosaurs and shared many commonalities with some dinosaur species, like…um…feathers and maybe even flight and of course egg laid. OK.

So, many paleontologists, myself included, have wondered about other similarities between dinosaurs and birds. Since adult dinosaur fossils have sometimes been discovered near or on top of nests, we've been looking at the dinosaur parenting behavior.

Student
Parenting behavior, well, that sounds so gentle and caring. But dinosaurs were ferocious reptiles and reptiles don't take care of their young, do they?

Professor
Well, some reptiles incubate their eggs, crocodiles do. And as for popular attitudes towards dinosaurs…well, take the Oviraptor for instance.

In the 1920s, a paleontologist discovered the fossil remains of a small dinosaur near a nest containing eggs. He assumed the dinosaur was stealing the eggs, so he named it Oviraptor that means egg thief in Latin, which fueled the generally negative public image of such dinosaurs.

But by the 1990s, other experts had convincingly made the case that instead of robbing the nest; the Oviraptor was probably taking care of the eggs. You see, dinosaurs' closest living relatives – birds and crocodiles – display nesting behavior. And dinosaur fossils have been found in postures that we now believe to indicate brooding behavior, that is, sitting on the eggs until they hatch.

So we are curious about the type of care dinosaurs gave to their young. And we'd like to figure out which dinosaur parent, the male or the female gave the care.

Student
Shouldn't the behavior of crocodiles and birds give us some clues then?

Professor
Well, with crocodiles, it is the female who guards the nest, and with birds, it depends on the species, it can be the male or the female that takes care the eggs, or both. In over 90 percent of all bird species, both parents take care of the eggs and the young birds.

Student
But sometimes it's just the male?

Professor
Well, exclusive care by the male parent is much less common, but it does occur. Now, for animals other than birds, the care

of young by both parents is pretty unusual in the animal kingdom. Males contribute to parental care in fewer than five percent of all mammalian species. It's even less frequent among reptiles. And exclusive care by the male is very rare. So researchers have wondered about the evolution of male parenting behavior in birds for quite some time. And now there's research showing that for some of the birds' dinosaur relatives, it's likely that the male parent was also in charge of taking care of the eggs.

Student
How did they figure that out?

Professor
Well, first they looked at clutch volume, that's the number of eggs in the nest of crocodiles, birds and three types of dinosaurs, including Oviraptors that are thought to be closely related to the dinosaur ancestors of birds.

So when researchers examined fossilized remains of nests, they found that the dinosaurs had larger clutch volumes, more eggs in the nests that is, than most of the crocodiles and birds that were studied. But, and this is important, their clutch volumes matched those of birds that have only male parental care. You see, bird species in which only the males take care of the nest tend to have the largest clutches of eggs.

Student
So what's the connection between bird and dinosaur behavior?

Professor
Well, researchers now believe, because of this study, that the male parenting behavior of these birds might have its origins in the behavior of dinosaurs.

Student
Based only on evidence of clutch volume size, the number of eggs?

Professor
No, there's more. They also examined the fossilized bones of those three types of dinosaurs that were found on or near nests to determine their sex. You see, adult female birds during egg production produce a layer of spongy bone tissue inside certain long bones. And so did female dinosaurs of the kinds that were investigated. This spongy tissue serves as a source of calcium for eggshell formation. But when the dinosaur fossils were examined, there were no spongy bone deposits.

Student
Meaning that those dinosaurs on the nests were probably adult males who wouldn't have needed calcium for making eggshells.

Professor
Exactly. And then there's this: birds like the kiwi, the ostrich and the emu; they share certain physical characteristics with these dinosaurs. And interestingly, they also show a consistent pattern of nest care by the male.

http://en.wikipedia.org/wiki/Origin_of_birds

Are Bird really Dinosaurs?
http://www.ucmp.berkeley.edu/diapsids/avians.html
http://www.wbu.com/chipperwoods/photos/dinos.htm
http://www.dino-web.com/birds.html
http://9e.devbio.com/article.php?ch=16&id=161.%22

http://www.enchantedlearning.com/subjects/dinosaurs/Dinobirds.html
http://www.sciencedaily.com/releases/2013/04/130418104324.htm
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http://answers.yahoo.com/question/index?qid=20090410204910AAkxv2n

Section2

Conversation2

Narrator
Listen to a conversation between a student and his art history professor.

Professor
How was the museum?

Student
Great. I hadn't been there for a few years.

Professor
Did you enjoy the Van Gogh painting?

Student
That's the thing. Looks like I have to change my topic.

Professor
Hmm… we are getting close to the deadline. You were writing about the theme of night in the paintings of Vincent Van Gogh.
It's a wonderful topic.

Student
I know. People don't usually think of Van Gogh as an artist of nocturnal themes. They think of brightness, sunshine, all that yellow and orange.

Professor
You are right of course about the intense light associated with his daytime paintings. But his night paintings don't exactly lack brightness.

Student
That's the paradox that I really like, the paradox of painting a nighttime scene using so much color and light. So I was planning to focus mostly on his painting Starry Night.

Professor
But?

Student
When I went to the museum to look at the actual painting, like you told me to. It wasn't there.

Professor
Really? Isn't it part of the permanent collection?

Student
Yes. But it's on loan right now to a museum in Europe.

Professor
Ah, I see. Well, I am strict about having students write about paintings they can observe firsthand.

Student
Well, I found another painting I could study instead.

Professor
OK.

Student
I read that there are two paintings called Starry Night. The first one was done by the French realist painter Millet. It may have been the inspiration for Van Gogh's painting. Millet's painting is located near my family's house in Connecticut. And I am going there this weekend and could study it then. I made sure it's not out on loan.

Professor
That definitely would work then. Van Gogh copied many of Millet's compositions. We know that he really admired Millet's work. And a lot of us think Van Gogh saw this particular painting by Millet in Paris in the late 1700s.

Student
Yeah. Although Millet was a realist painter, and Van Gogh a post-impressionist, the two paintings still share lots of features, not just the name. The most striking shared feature has got to be the amazing light effects. I am excited to go see it. But one other thing …

Professor
Uh-huh.

Student
I was thinking about getting a head start on my next assignment while I am at the gallery in Connecticut, the assignment on miniatures. They have a lot of miniature portraits of children as part of their permanent collection.

Professor
American miniatures?

Student
Yeah. So I figured I could also get started on that essay, study a few while I am there. I'd focus on the meaning of the objects that some of the children are holding, some are holding flowers, one child has a rattle, another a toy violin…

Professor
That would be fine. Uh, those objects…we call them attributes. The attributes chosen to be included in a particular miniature was often meant to communicate parents' hopes and dreams for their child. So I think you'll learn a lot about how people viewed children at the time the miniature paintings were done.

Lecture3-Astronomy

Narrator

Listen to part of a lecture in an astronomy class.

Professor

There's been a lot of talk recently about life on Mars, at the level of microorganisms anyway, mainly because of a few important discoveries and inventions.

For example, one major discovery was that at one point water was present on Mars. How do we know? Well, in 2004, an exploration robot discovered jarosite there.

Jarosite is a yellowish brown mineral with a crystalline structure that's also found on Earth. It contains iron, potassium and hydroxide. The interesting thing is that on Earth at least it needs highly acidic water to form. So we've got water or had it at one point. And since most planetary scientists believe that water is essential to life, the presence of jarosite means that one prerequisite for life was once present on Mars.

But there's another thing about jarosite. One step in its formation on Earth involves microorganisms; they actually speed up the formation of jarosite dramatically. Now, theoretically it is possible for jarosite to form without the help of biological life forms. But we don't really know for sure if this happens 'cause… well, because every corner of Earth has some form of biological life.

But jarosite on Earth incorporates all kinds of microorganisms into its crystalline structure. So it's possible that if the jarosite on Mars was also formed with the help of microorganisms, we might be able to detect remnants of them in the samples we find. And we have instruments now that will enable us to try to do this. For example, there's a new instrument called the microfabricated organic analyzer, or M.O.A.

The organic analyzer is an amazing tool. It will be able to collect soil samples and analyze them right there on Mars, pure, untouched samples. It will let us eliminate the risk we would take of contaminating the samples if they were brought back to Earth. And what they'll look for specifically in the soil is amino acids.

Amino acids, as you may know, are the building blocks of proteins. In fact, there are twenty standard amino acids involved in making proteins and lots more that aren't.

And here's the important thing. Amino acids are what we call handed. They can exist in two forms, which are mirror images of each other like hands. Right and left hands have the same number of fingers in the same order plus one thumb. But right and left hands are not the same; they are mirror images. Well, like hands, amino acids can be right or left-handed. And the twenty that make up the proteins on Earth are all left-handed.

Now, one reason the M.O.A., the organic analyzer is so impressive is that it tests not just for the presence of amino acids but also for the handedness of amino acids. If amino acids are found, it would be especially interesting if they show a prevalence of one type of handedness, either left, like amino acids on Earth, or right.

See, other physical processes in space, processes that don't involve living organisms, can create amino acids. But the ones synthesized through abiotic processes, which is to say not involving microorganisms, occur in equal numbers of right- and left-handed.

So, a prevalence of left-handed amino acids would indicate they were biological in origin, which would be amazing! A prevalence of right-handed ones…well, that would be really amazing!! Because the organisms that created them would be unlike anything we have on Earth, which produce only left-handed ones.

Lecture4-Music History

Narrator
Listen to part of a lecture in a music history class. The professor has been discussing music of the twentieth century.

Professor
And what instrument comes to mind when you think of rock ‘n’ roll?

Student
The electric Guitar?

Professor
Exactly. I think it’s fair to say that the sound of the electric guitar typifies the rock ‘n’ roll genre, which became popular in the 1950s. But really the instrument we know today was the result of a continuing development that started for our practical purposes in the 1920s.

But long before that even, people were experimenting with ways to modify traditional acoustic guitars. The first guitars were wooden. This is the Spanish guitar and the strings were made from animal products. Then came steel strings. And that led to the lap guitar, which is also called the steel guitar because the player slides a steel rod up and down the neck. And those are all acoustic guitars. OK?

But then eventually we have electric guitars. Over the years, many inventors and musicians contributed to the design of these instruments. And each design was intended to alter the sound in some way, at first at least with the electric guitar, to make it louder.

So let’s get back to when the steel guitar was first introduced in the United States. It was right after the Spanish-American war in the late 1890s. US sailors who were stationed in Hawaii—then a US territory—were very enamored with the music they heard there. Uh, Hawaiian music was based on the steel guitar I just described. Some sailors learned how to play the steel guitar and brought it home to the States. Before long, Hawaiian steel guitar music was all the rage3 in the mainland US. It actually had a strong influence on the development of several musical genres, rock ‘n’ roll most notably, but also jazz and blues.

Anyway, by the 1920s, with the advent of the public dance movement, people were gathering in large groups to listen to steel guitar music. But they had trouble hearing it, especially in large public settings. As I mentioned, the instrument was played horizontally, on the lap. Since the strings faced upward, the sound was projected toward the ceiling rather than outward toward the audience. Something had to be done, because the music venues and the audience kept getting larger and larger. So what would you do?

Student
Find a way to amplify the sound?

Professor
Yes. And to do that, inventors started attaching electronic devices, electrical coils to the acoustic guitars. And the electronics worked! But attaching electronics didn’t just affect how loudly you could play. It also changed the quality of the sound.

[3] a widespread temporary enthusiasm or fashion: *computer games are all the rage* .

These early electric guitars were hollow and these early amplifiers caused vibrations in the bodies of the instruments. So as the sound got louder, it became more distorted, fuzzy-sounding. And what musicians at the time wanted was a pure, clean sound.

Student
So where does Les Paul fit in? Wasn't he the first to electrify acoustic guitars?

Professor
Uh…no. Electrified guitars already existed by the time Les Paul came into the picture around 1940. What Paul did was experiment with ways of removing the distortions and he succeeded. He designed a guitar with a solid body that relied solely on electronics. Paul's solid body eliminated the vibrations, and thus the distortions.

Student
Excuse me. But when I think of electric guitar music, I think of Jimi Hendrix.

Professor
Jimi Hendrix, one of my favorites.

Student
But Hendrix's style really was all about distortion, that's what's so great about his music, all those special effects. I think a lot of rock 'n' roll fans prefer that to a pure sound.

Professor
Yeah. You are getting ahead of me here. But good, because the point I was going to make is that the sound of rock 'n' roll changed over the years. And the designs and technology of electric guitars made those changes possible.

So whereas Les Paul's goal was to remove the distortion, later musicians wanted to produce it. And by the time Jimi Hendrix came around. Well, essentially, Hendrix reinvented the electric guitar, in the sense that he created amazing effects and vibrations that changed the sound of rock 'n' roll completely. So eventually, people tried to improve on Les Paul's model, well, to modify it I should say.

TPO 31

Section1

Conversation1 (Community Planning in the Colonies)

Narrator
Listen to part of a conversation between a student and her United States History professor.
Professor
So, Amanda, you've asked a lot of questions about trade during the colonial period of the United States. Has our discussion clarified things for you?
Student
Well, yeah, but now, I think writing about trade for my paper isn't going to work.
Professor
Oh, so your questions about shipping routes were for your research paper?
Student
Yeah. But now, I see that I probably need to come up with a new paper topic. Actually, there was one other idea I had. I have been thinking about doing something about community planning in the early British settlements in Eastern North America.
Professor

Oh. OK. I am curious. Why are you interested in doing something on community planning in colonial times?
Student
Well, I am much more into architecture. It's my major and I mean, planning out a town or city goes along with that. I mean, not that I don't like history…I am interested in history…really interested…But I think, you know, for a career, architecture is more for me.
Professor
That's great. I've gotten some very thought-provoking papers from students whose interests go beyond history.
Student
OK. But for the paper you wanted us to try to include a comparison, right?
Professor
Yes. Actually, that was really the purpose of the assignment. The way the United States developed or perhaps I should say the colonies, since the land that would become the Eastern United States…uh…there were British colonies there four hundred years ago. But anyway…uh… development in the colonies differed greatly depending on geography. I am looking for papers that have ideas about something that happened one way in the Northern colonies happened a different way in the Southern colonies.
Student
Is that true in terms of urban planning?
Professor
Very true. Towns in the Northern colonies were centralized and compact. They provided a meeting point for exchanging goods, for participatory government, and for practicing religion. Houses would be built along the roads that led into town. And just outside the developed area, there would usually be an open area of some sort for grazing animals and also group activities. Actually, the model for planning a town in the Northern colonies was not unlike the model for the development of towns in medieval Europe. After all, the colonists had just come from Europe and the medieval period was just ended.
Student
Medieval Europe. But what about the South? If I remember correctly… In the South, at least initially, they didn't build towns so much as they built trading posts.
Professor
That's right. Most of the settlers in the North wanted to start a whole new life. But most of the people who came from Europe to the South just wanted to make some money and then go back. It is not surprising that some of most common buildings were storage facilities and port facilities.

Lecture1-Music (Ancient Greek Music & Plato)

Narrator
Listen to part of a lecture in a music class.

Professor
Today we are going to do something a little different. In the past few classes, we've listened to traditional music from around the world and we've talked about the characteristics of these music, what makes these styles distinctive, what kinds of instruments are used. And you've talked about what sounds familiar to you and what sounds strange. And many of you found some of what we've listened to very strange indeed.
Well, today I want to start talking about western music and I am going to start in ancient Greece. But, now here's the part that's different. We're not going to talk very much about the actual music. Instead, we are going to talk about what the Greeks believed about music.
Now, there are some very good reasons to approach the material in this way. First, well, we don't have very much ancient Greek music studied. Only about 45 pieces survived…uh…these are mostly records of poems and songs. And we are not sure how well we can reproduce the melodies or rhythms, because they were apparently improvised in many cases. So we really don't know all that much about what the music sounded like.

What we do know about - and this really is the most important reason I am approaching today's lecture the way I am - is the Greek philosophy about music and its continuing influence on western attitudes toward music.

Now, if we're going to understand the philosophy, we have to first understand that music for the Greeks was about much more than entertainment. Yes, there was music at festivals and we have sculptures and paintings showing people listening to music for many of the same reasons that we do. But this isn't the whole story.

The important thing about music was that it was governed by rules, mathematical rules. And for those of you who are also studying music theory, you'll see that it is in fact highly mathematical.

Um…and for the Greeks, the same mathematical principles that govern music also govern the universe as well as the human character, the essence of personality. People's characters were believed to be very sensitive to music. If you started playing around with the rules, you know, messing up the mathematical order, you could do serious harm. That's why music was considered so powerful. If you knew the rules, it could do great good. But if you broke them, you could do great harm to the character of the listener.

So, we have this Greek idea that music is directly related to human character and behavior.

The philosopher, Plato, talks about this in the context of education. For Plato, music is an important element in education, but only the right kind of music. That means the kind of music that builds the kind of character a good citizen or a future leader would need. Yes. For Plato, there is a kind of music that instills the qualities of leadership, just as there is a kind of music that makes a person soft and weak.

Now, Plato has very specific, very conventional kinds of music in mind. He is not fond of innovation. There were musicians in Plato's day who were experimenting with different melodies and rhythms. A definite no-no for Plato. He thinks that breaking with tradition leads to all sorts of social problems, serious problems, even the breakdown of the fabric of society. I am thinking back now to when I first started listening to rock 'n' roll and I remember my father saying it was a bad influence on us. I think he would have gotten along well with Plato.

Anyway, I don't need to tell you what I think about Plato's ideas about innovation, do I? Though I have to say it's interesting that the same arguments against new music and art are still being made. Perhaps like the Greeks, we recognize, and maybe even fear the power of music.

Lecture2-Geology (Movement of Tectonic Plates)

Narrator

Listen to part of a lecture in a geology class.

Professor

As we've discussed, Earth's crust is made up of large plates that rest on a mantle of molten rock. These plates…uh…now these tectonic plates support the continents and oceans. Over time, the tectonic plates move and shift, which moves the continents and the ocean floors too. Once it was understood how these plates move, it was possible to determine past movements of Earth's continents and how these slow movements have reshaped Earth's features at different times.

OK. Well, (as)studying the movements of the plates can tell us about the location of the continents in the past, it can conceivably tell us about their location in the future too, right? So, in recent years, some geologists have used plate tectonic theory to make what they call geopredictions. Geopredictions are guesses about what Earth's surface might look like millions of years from now.

So, we know how certain continents are currently moving. For example, the continents of Africa has been creeping north toward Europe. And Australia has been making its way north too, toward Asia.

Does anyone know what's happening to the Americas? I…I think we've talked about that before. Lisa?

Student

They are moving westward, away from Europe and Africa. Right?

Professor

Right. And what makes us think that?

Student
The Atlantic Oceanfloor is spreading and getting wider, so there is more ocean between the Americas and Europe and Africa.
Professor
OK. And why is it spreading?
Student
Well, the seafloor is spilt. There is a ridge, a mountain range that runs north and south there. And the rock material flows up from Earth's interior here, at the split, which forces the two sides of the ocean floor to spread apart, to make room for the new rock material.
Professor
Good. And that means, over the short term…uh… and by short term I mean 50 million years, that's a blink of the eye in geological time. Um…over the short term, we can predict that the Americas will continue to move westward, farther away from Europe, while Africa and Australia will continue to move northward.
But what about over the long term? Say 250 million years or more. Well, over that length of time, forecasts become more uncertain. But lots of geologists predict that eventually all the continents, including Antarctica, will merge and become one giant land mass, a super continent, one researchers callingPangaea Ultima, which more or less means the last super continent. The above text is a transcript of this lecture prepared by lady&bird.
Now, how that might happen is open to some debate. Some geologists believe that the Americas will continue to move westward and eventually merge with East Asia. This hypothesis is based on the direction the Americas are moving in now. But others hypothesize that a new super continent will form in a different way. They think that a new subduction zone will might occur at the western edge of the Atlantic Ocean.
Paul, can you remind us what a subduction zone is?
Student
Yeah. Um…basically, a subduction zone is where two tectonic plates collide. So if an ocean floor tectonic plate meets the edge of a continent and they push against each other, the heavier one sinks down and goes under the other one. So the…um…the oceanic plate is made of denser and heavier rock, so it begins to sink down under the continental plate and into the mantle.
Professor
Right. So the ocean floor would kind of slide under the edge of the continent. And once the ocean plate begins to sink, it would be affected by another force – slab pull. Slab pull happens at the subduction zone.
So to continue our example… As the ocean floor plate begins to sink down into the mantle, it would drag or pull the entire plate along with it. So more and more of this plate, the ocean floor, would go down under the continent into the mantle. OK?
So, as I said, currently the Atlantic Ocean floor is spreading, getting wider, but some researchers speculate that eventually a subduction zone will occur where the oceanic plate meets the continental plate of the Americas. If that happens, slab pull could draw the oceanic crust under the continent, actually causing the Americas to move eastward toward Europe and the ocean floor to get smaller. That is, the Atlantic Ocean would start to close up, narrowing the distance between the eastern edge of the Americas and Europe and Africa. So they form a single super continent.

Section2

Conversation2 (Credits for Internship)

Narrator
Listen to a conversation between a student and an employee at the university center for off-campus study.
Student
Hi. I am Tom Arnold. I am supposed to pick up a packet from the regional center for marine research. I am doing an internship there this summer.
Employee

Yes. I have it right here. The mail carrier dropped it off a few minutes ago.
Student
Thanks. Um…I wanted to ask about getting credits for the internship. I don't know if…
Employee
I might be able to help you with that. Is there a problem?
Student
I just wanted to make sure the details have been corrected. The system should show that I am registered to earn four credits. But as of Friday, nothing was showing up yet. I was told it would be fixed this morning.
Employee
Well, I can check on the computer for you. Tom Arnold, right?
Student
Yes.
Employee
Well, it is showing credits…but only three.
Student
Really?! So now what? These all have to be finalized last week.
Employee
Well, yes. The course enrollment period ended last week. But since our office was supposed to get this straightened out for you before then… Let me see what I can do.
Uh…did the university give approval for you to earn four credits for this internship? Because the other students at the center for marine research are only getting three.
Student
Um…I am pretty sure those other students are doing the internship at the center's aquarium, taking classes in marine biology and then teaching visitors about the various displays. I am doing a special research internship with the center. We'll be collecting data on changes to the seafloor out in the open ocean.
Employee
Oh. That sounds quite advanced.
Student
Well, the internship requires me to have scuba diving certification and to be a senior oceanography student. I want to do advanced study in oceanography when I graduate. So I really want to get a sense of what real research is like.
Employee
I see. Now let's try and see if we can… Oh. OK. I see the problem. There are two kinds of internships listed here—regular and research. Yours is listed as regular so it is only showing three credits.
Student
Can you switch it?
Employee
Not yet. But it lists Professor Leonard as…
Student
She is in charge of all the internships.
Employee
She just needs to send an email so I have an official record. Then I can switch it. And that should solve everything.
Student
Great! And I know Professor Leonard is in her office this afternoon, so I can go there later. It will be such a relief to get all these paperwork completed.

Lecture3-Marine Biology (Coral Reefs & CoT starfish)

Narrator

Listen to part of a lecture in a Marine Biology class.

Professor

We've been talking about the decline of coral reefs in tropical areas all over the world…um… how natural and man-made stresses are causing them to degrade, and in some cases, to die.

So now let's focus on a specific example of a natural predator that can cause a lot of damage to coral reefs—the Crown of Thorns, or CoT starfish. The Cot starfish is found on coral reefs in the tropical Pacific Ocean and it eats coral. Now, in small numbers, the starfish don't affect coral reefs dramatically. But periodically, starfish population explodes. And when that happens, the reefs can become badly damaged or even destroyed, something we are trying very hard to prevent. For example, during the 1960s, there was an outbreak of CoT starfish in the Great Barrier Reef, off the east coast of Australia. Luckily, the CoT starfish population gradually declined on its own and the reefs recovered.

But we were left wondering – what cause the population to increase so suddenly? Well, over the years, we've come up with a few hypotheses. All still hotly debated.

One hypothesis is that it's a natural phenomenon, that the starfish naturally undergo population fluctuations following particularly good spawning years.

There are also several hypotheses that suggest some sort of human activities are partly responsible, like fishing. There are fish and snails that eat starfish, particularly the giant triton snail, which is the main predator of the starfish. These fish and snails have themselves experienced a decline in population because of overfishing by humans. So with a decline in starfish predators, the starfish population can increase.

Another hypothesized human-related cause is fertilizer runoff. People use fertilizer for their crops and plants and a lot of it eventually makes its way from land into the seas. It's fertilizer, so it has a lot of nutrients. These nutrients have an effect on the starfish, because they cause an increase in the growth of phytoplankton. Phytoplankton are microscopic plants that grow in the ocean. Larval CoT starfish eat phytoplankton in their first month of life, so more fertilizer in the ocean means more phytoplankton, which means more starfish, bad for the reefs.

Now, the final hypothesis has to do with storm events. If some reefs are destroyed by storms, starfish populations that inhabited those reefs would have to condense and concentrate on the reefs that are left. So this can cause a kind of mass feeding frenzy.

So we have ideas, but no real answer. And because we aren't sure of the causes for starfish population increases, it's difficult to prevent them. I mean, some progress has been made. For example, new survey techniques have enabled us to detect population increases when the starfish are quite young, so we can be ready for them. But meaningful progress requires much better evidence about the cause.

On the bright side, in all the research being done on causes, we have discovered something related to how starfish populations might affect coral reef diversity. We think that when reefs are damaged, after a few years, the fastest-growing corals repopulate the areas. And these fast-growing species can grow over the slower-growing species of coral, denying them light and preventing them from recovery. However, the faster-growing species are the preferred food of the CoT starfish. So when an outbreak of CoT starfish occurs, they thin out the fast-growing coral and may give the slower ones a chance to reestablish. So without the outbreak, the diversity of coral would be reduced.

Lecture4-Anthropology (the Botai People & Horses)

Narrator

Listen to part of a lecture in an anthropology class.

Professor

So now that we’ve discussed how people in ancient societies tamed animals like cows and chickens for food and other uses. I’d like to talk about an ancient culture that domesticated horses. It’s the Botai people.

The Botai culture thrived over 5,000 years ago in central Asia, in what is now northern Kazakhstan. Pretty much all of what we know about the Botai comes from three archaeological sites. And we learned that the Botai were able to build large perennial villages, sometimes with hundreds of homes. We also found horse bones at these sites and these can be traced back to the time of the Botai settlements. The climate that the Botai culture lived in…it was harsh. And the Botai people…they didn’t really seem to have much in the way of agriculture going on. So their whole economy was really based on horses. And because horses can withstand the tough climate, they can survive ice storms and they don’t need heated barns, the Botai people could settle in one place and rely on the horses for food, clothing and transportation.

Student

So the Botai were the first to domesticate horses?

Professor

Well, we are pretty sure that horses were first domesticated a bit earlier, to the northwest, in the area that is now Ukraine and western Russia. It’s quite possible that some of those people later migrated east to Kazakhstan.

Student

But what exactly tells us that these Botai people, that the horses in their area were really domesticated?

Professor

As with most ancient history, there is not much that we can be certain about. But we know there was a significant population of wild horses in that area. So there were plenty of opportunities for the Botai people to find horses to domesticate. We also know that horse milk was an important source of food for the Botai people. What? Milking a wild horse? Well, now, that would be impossible…to milk a wild horse. And then… there’s the…

Oh. Yes? Eric.

Student

So you said last week that for some animals, like for dogs, there were physical changes taking place over the course of generations of dogs because of domestication. So can we tell from those horse bones if it was sort of the same for horses?

Professor

Actually, it wasn’t. We know that horses have not changed a lot physically as a result of domestication. So those ancient horse bones don’t tell us much about domestication. But…we’ve found that…um…we’ve found what maybe pens or corrals in the Botai settlements. And not too long ago, a new approach was used to find out if the Botai people were keeping horses. Soil samples from these pens or corrals show ten times the concentration of phosphorus.

Student

Um…phosphorus?

Professor

Yes. Phosphorus is a very significant indicator that horses, large numbers of horses were being kept in the settlements. You see, horse manure, horse waste is rich in phosphorus and also nitrogen compared to normal soil. But nitrogen is an unstable element. It can be washed out when it rains or it can be released to the atmosphere, whereas phosphorus combines with calcium and iron, and can be preserved in the soil for thousands of years.

The soil from the Botai settlement sites was found to have high concentrations of phosphorus and low nitrogen concentrations, which is important since it suggests that what we’ve got is really old, not something added to the soil more recently.

Student

Wait. So if horses have been there recently, there’d still be lots of nitrogen in the soil.

Professor

That’s right. Yes. Karen.

Student

I just read an article. It said that one way to determine if there was an ancient fireplace at an archaeological site was to check the soil for phosphorus. So couldn’t the phosphorus at the Botai sites just be from the frequent use of fireplaces?

Professor

You are absolutely right. However, when a fireplace leaves behind a lot of phosphorus in the soil, we'd also find an unusually high concentration of potassium. But the soil at the Botai settlements, it was found with relatively little potassium, which makes it far more likely that the phosphorus came from horses. OK?

Now, later on, people of the same region, northern Kazakhstan, started raising sheep and cattle. And that led to a more nomadic culture. Since sheep and cattle can't survive harsh climates, they needed to be taken south every winter. Moving around meant working harder but the trade-off was far richer, fattier milk year round and warm clothing from the sheep.

TPO 32

Conversation1

Listen to a conversation between a student and a bookstore employee.

Employee

Hi. Can I help you?

Student

Yeah. I need to sell back a textbook. Are you the person I speak to about that?

Employee

I am. But we can't buy textbooks back just yet, because the bookstore's buyback period isn't until next Thursday.

Student

I thought it started this week.

Employee

It is only in the last week of the semester after classes are over.

Student

Oh. Well, can you tell me if this book will be on the buyback list?

Employee

I can look. But we are still putting the list together. Professors have to tell us what books they'll definitely need again next semester, and the deadline for them to let us know isn't for a couple of days. So the list I have here is not really complete. Um…what class was the book for?

Student

Intro to economics, with Professor Murphy.

Employee

Professor Murphy. OK. I checked earlier and I know she hasn't gotten back to us on that class yet. So we don't know if she'll use the same book next time. Usually if an updated edition of a textbook is available, professors will go for that one.

Student

Um…so if this book doesn't end up on the buyback list, what can I do? I spent over a hundred dollars for it, and I want to get something back.

Employee

Well, if a professor didn't assign it for a class here, we could buy back for a whole seller who would distribute it for sale at another university bookstore.

Student

OK.

Employee

Anyway…if Professor Murphy does put it on the list, it is important thatyou come in as early as possible next Thursday. There's only a limited number of books we would buy back. Once we get the number of books we need for next semester, we would stop buying them.

Student

OK. So how much money will I get for the book?

Employee

Well, if it's on the buyback list, we'll pay fifty percent of what the new price was. But that also depends on what condition the book is in, so it needs to be cleaned up as much as possible.

Student

Cleaned up?

Employee

Because used books show wear and tear, you know, water stains, scruffy covers, yellow highlighting…You really need to make sure there are no pencil marks on the book. The price you can get for a text depends on the shape it's in.

Student

You mean I have to erase all the pencil marks?

Employee

If you want the best price for it…

Student

And what if you decide the book is too beat-up and don't buy it back?

Employee

That does happen. Hmm…well, one more thing you can try is to place an ad in the student newspaper to see if you can sell it directly to another student.

Lecture1-Archaeology (Bananas & African History)

Listen to part of a lecture in an archaeology class.

Professor

One of the important aspects of the field of archaeology…one of the things that excites me about the field…is that seemingly insignificant things can suddenly change the way we think about a culture.We are always making new discoveries that have the potential to challenge widely held beliefs.

Take something like the banana, for example. It turns out that this ordinary fruit may be forcing scientists to rewrite major parts of African history! We know the bananas were introduced to Africa via Southeast Asia. And until recently, we thought we knew when they were introduced—about 2,000 years ago. But discoveries in Uganda, that's in Eastern Africa, are throwing that into question. Scientists studying soil samples there discovered evidence of bananas in sediment that was 5,000 years old!

Now, let me explain that it's not easy to find traces of ancient bananas. The fruit is soft and doesn't have any hard seeds that might survive over the ages. So after 5,000 years, you might think there would be nothing left to study. Well, fortunately for archaeologists, all plants contain what are called phytoliths in their stems and leaves. Phytoliths are microscopic structures made of silica, and they do not decay. When plants die and rot away, they leave these phytoliths behind. Because different plants produce differently shaped phytoliths, scientists can identify the type of plant from ancient remains.

So, those scientists in Uganda, dug down to sediments that were 5,000 years old. And what do you think they found? Banana phytoliths! Obviously this meant that we had to rethink our previous notions about when bananas first arrived in Africa. But, well, this discovery had other implications for history.

As soon as bananas appear in the archaeological record, we know we have contact between Africa and Southeast Asia. It

would appear now that this contact occurred much earlier than previously thought.
Al…although…now here's where the uncertainty comes in…we don't really have any solid evidence of trade between the peoples of these two regions that long ago. Presumably, if people were bringing bananas to Africa, they'd also be bringing other things too: pottery, tools…all sorts of objects made for trade or daily use. But any such evidence is missing from the archaeological record.

The early appearance of bananas also suggests that agriculture began in this part of Africa earlier than scientists imagined.You see, bananas, at least the edible kind, can't grow without human intervention. They have to be cultivated. People need to plant them and care for them. So if bananas were present in Uganda 5,000 years ago, we would have to assume…that…that…that someone planted them.
The above text is a transcript of this lecture prepared by lady&bird (QQ519626928).
But, there are questions about this too. We know that bananas can be a staple food that can support large populations, as they did in Uganda in the more recent past. If bananas were grown thousands of years ago, why don't we see evidence of large populations thriving in the area earlier?

So, we are left with this mystery. We have what appears to be strong biological evidence that bananas were being cultivated in Uganda as early as 5,000 years ago. But we are missing other kinds of evidence that would conclusively prove that this is so.
Clearly, more research needs to be done. Perhaps by some new scholars from this university? At least give it some thought.

Lecture2-Biology (Populations in an Ecosystem)

Listen to part of a lecture in a biology class.

Student
Professor, since we are going to talk about changes in animal populations in the wild, I'd like to ask about somethingI read in an article online, about how the population size of some animal species can affect other animal species, and how other environmental factors come into play too.
Professor
Right. Relationships between animal species in a given ecosystem can get pretty complex. Because in addition to predator-prey relationships, there are other variables that affect population size.
Student
The article mentioned that populations of predators and their prey might go up rapidly and then decline all of a sudden.
Student
Oh. Yeah! I read about that in my ecology class. It happens in cycles. I think that's called a boom-and-bust cycle. Right?
Professor
OK. Well, hold on a second. First I want to go over some key concepts. Let's say there was a species that had access to plenty of food and ideal conditions. Under those circumstances, its population would increase exponentially, meaning it would increase at an ever-accelerating pace.
Student
Wow! That sounds a little scary.
Professor
Well, it doesn't usually happen. Like you said, a rapid population growth is often followed by a sudden decline. But we do occasionally see exponential growth in nonnative species when they are transplanted into a new environment. Um…because they face little competition and have favorable growing conditions.

But for most species, most of the time, resources are finite. There's only so much available…which leads me to my point. Every ecosystem has what we call a carrying capacity. The carrying capacity is the maximum population size of a species that can be sustained by the resources of a particular ecosystem. Resources are, of course, food, water, and just as important, space.

Although every species has a maximum rate at which the population of that species could increase, assuming ideal conditions for the species in its environment. There are always going to be environmental factors that limit population growth. This is called environmental resistance. Environmental resistance is important becauseit stops populations from growing out of control. Factors such food supply, predation and disease affect population size, and can change from year to year or season to season.

Student

OK. I think I get it.

Professor

Well, let's look at a case study. That should make things clear. Some years ago, some of my colleagues conducted an experiment in an oak forest involving three different species: white-footed mice, gypsy moths and oak trees.The above text is a transcript of this lecture prepared by lady&bird (QQ519626928).

OK. Now let me explain what the situation is in this forest. Oak trees produce acorns, and acorns are a primary food source for white-footed mice. Another food source for the white-footed mice is the gypsy moth. So the size of the gypsy moth population is controlled by the white-footed mice, which is a good thing because gypsy moth caterpillars are considered pests. They strip away the leaves from the oak trees every ten years or so.

Student

So the mice eat both acorns from the oak trees and gypsy moths. And the gypsy moth caterpillars eat oak tree leaves.

Professor

Right. Now, what makes this set of relationships particularly interesting is that oak trees only produce a large number of acorns every few years.

Student

So during the years with fewer acorns, the white-footed mice have to deal with a smaller food supply.

Professor

Yes. But in the years with large amounts of acorns, the mice have more food, which leads to…?

Student

The white-footed mice population growing.

Professor

And the gypsy moth population decreasing.

Student

How can we know that for sure? It seems like a big jump from more acorns to fewer gypsy moths.

Professor

Well, we can know for sure because in this oak forest, the researchers decided to test the links between acorns and the two animal species. In some parts of the forest, they had volunteers drop a large number of extra acorns on the forest floor. And in another section of the forest, they removed a number of white-footed mice. In the forest areas where extra acorns had been dropped, the gypsy moth population soon went into a significant decline. But in the section of the forest where the white-footed mice had been removed, the gypsy moth population exploded.

Conversation2

Listen to a conversation between a student and an anthropology professor.

Professor

So how was the field trip to the Nature Center yesterday? You are in that biology class, aren’t you?

Student

Yeah. I am. The trip was amazing. We took a hike through the woods and our guide pointed out all kinds of animal and plant species. She could identify every bird, every tree…I have to tell you. I was very impressed with her knowledge.

Professor

I am glad to hear you enjoyed the trip.

Student

Well, I am interested in getting an advanced degree in forestry after I graduate from here. So I love all this stuff.And actually, yesterday’s trip got me thinking about my research paper for your class.

Professor

Wonderful! Tell me more.

Student

So our guide was talking about how the human need for resources had shaped the environment. And I just assumed that the human impact on the environment was always destructive.

Professor

Ah…but that’s not necessarily true.

Student

Yeah. That’s what she was telling us. She said there’s archaeological evidence that some prehistoric cultures relied heavily on dead wood for fuel, or…um…just cut off some of the branches of trees instead of killing the whole tree.

Professor

It is so funny you mentioned that. I was just reading an article about an archaeological site in Turkey where scientists found evidence that ancient people had been harvesting the branches from pistachio and almond trees.The above text is a transcript of this conversation prepared by lady&bird (QQ519626928). Of course, when you prune these trees, cutting off just the branches like that, you are actually encouraging more growth! And you end up with a bigger crop of nuts. So this was a pretty smart strategy for collecting wood.

Student

See, that’s what I’d like to write about. I want to look at ancient methods of wood harvesting that didn’t result in the destruction of the whole forest.

Professor

Hmm…so you want to write your entire paper on wood harvesting?

Student

Is…is that a problem?

Professor

Well, it’s certainly a timely topic. Researchers are investigating this now. Uh…it’s just that…well…I am not sure how it fits with the assignment. Remember you are supposed to be focusing on a particular culture or region.

Student

Yeah. Um…actually I was planning on writing about the wood harvesting practices of the people who lived here. You know, the Native Americans who were living in this area and what that might tell us about how they lived.

Professor

OK. Well, that’s a possibility. I just want to make sure you can find enough information on that topic to write a well-developed paper. I’d like you to get started on your research right away. Maybe even talk to that nature guide and show me what information you can find. Then we can talk about whether or not your topic will work.

Lecture3-Earth Science (the Copper Basin)

Listen to part of a lecture in an earth science class. The professor is discussing an area of the United States called the Copper Basin.

Professor

Now, you may not have heard of the Copper Basin. It's in the Eastern United States, in the Tennessee River Valley. It got its name because settlers discovered copper there in 1843. And soon afterwards, it supported one of the largest metal mining operations in America. At one time, four mining companies employed 2500 workers in the Copper Basin. For that time period, it was a huge operation.

Well, this mining operation turned the Copper Basin into a desert. In the 1840s, when mining operations started, it was a dense green forest. But in the 1940s, 100 years later, it was as barren as the moon.

Efforts to reclaim the land and restore the basin to the fertile valley it once was…well, actually, those efforts are still ongoing. It's been a long and tedious process. In fact, it was many years before any results were seen. Copper mining had gone on there for more than 90 years! The damage couldn't be reversed overnight.

Although I should mention that by 1996, the water in one of the rivers flowing through the basin was clean enough that it was the site of the Olympic whitewaterkayaking competition. And that river is still used now for recreation.

But…anyway…let's analyze the problem. It wasn't the mining itself that caused such massive destruction. It was what happened after the copper ore was extracted from the mines. It was a process called heap roasting.

Copper ore contains sulfur. And heap roasting was a way to burn away the sulfur in the copper, so they'd be left with something closer to pure copper. Well, in the process, large vats of raw copper ore are burned slowly, for two or three months actually, to lower the sulfur content. And this burning, well…let's look at the results.

First, the mines were fairly remote, so there was no way to bring coal or other fuel to keep the fires going. So they cut down local trees for fuel. And like I said, the fires burned for months. Uh…that's a lot of fires and a lot of trees. Deforestation was occurring at a rapid rate. And it was accelerated by the smoke from the burning ore. Big clouds of sulfuric smoke, which was toxic to the trees, formed over the areas. Trees that hadn't been cut for fuel were killed by the fumes.

The sulfur also mixed with the air and created sulfur dioxide. And the sulfur dioxide settled in the clouds fell to the land in droplets of rain and sank into the soil. This is what we now call acid rain. You've probably heard of it. But no one used the term back then. Anyway…the acid rain created highly acidic soil. Well, soon the soil became so acidic that nothing could grow, nothing at all. Vegetation and wild life disappeared.

And it wasn't just the land and the air, it was the water too. What do you think happen to the rivers? Well, there are no trees to absorb the rain, and there was a lot of rain! So the rain eroded the soil and swept it into the rivers. This is called silting, when soil particles are washed into the rivers. And the silting continued at an alarming rate. But this was toxic soil and toxic runoff, the acid and metals in the soil made the once clear rivers flow bright orange.

So it was really that one step in the process of producing copper…the problems just built up and up until there was a desert where a beautiful forest used to be.

OK. Now let's look at reforestation and land reclamation efforts.

Lecture4-Architectural History (Irwin & Hexagonal House)

Listen to part of a lecture in an architectural history class.

Professor

So last week we started our unit on residential architecture in the United States. So today we'll be surveying a number of architects who made contributions to residential architecture in the 19th century.

Now, it's worth noting that people who designed homes at that time probably had to deal with a certain amount of discouragement. Since there were other architects who thought it was more respectable to design the kind of buildings…and maybe other structures…that were less…less utilitarian in their function. In fact, an article from an 1876 issue of a journal called The American Architect and Building News stated that, and this is a quote, they stated that "the planning of houses isn't architecture at all"!

So keep that journal article in mind as we look at the work of an architect named Harriet Morrison Irwin. Harriet Morrison Irwin was from the South, born in North Carolina in 1828. At the time, there weren't many architects from the southern United States. And as you might imagine, very few of them were women. So Irwin was really a pretty exceptional case. And she wasn't even formally trained as an architect. Her educational background was in literature. The above text is a transcript of this lecture prepared by lady&bird (QQ519626928).

Yes, Vicky?

Student

So she just had like…unnatural gift for architecture?

Professor

Yes. She was actually a writer for several years. But she did have a penchant for math and engineering, so she read a lot about it on her own. Um…especially the architectural essays written by the British critic – John Ruskin. And John Ruskin believed what?

Student

Um…that buildings should have a lot of access to the outdoors, to nature. Ruskin said that being close to nature was great for people's mental and physical health.

Professor

Right! So that was an influence.

Now, Harriet Irwin's contribution to architecture was relatively minor but still quite interesting and unique. She designed a house with a hexagonal shape. Josh?

Student

A house with six sides? Instead of the standard, you know, four-sided home?

Professor

Yeah. The rooms inside the house were also hexagonal, six-sided. So one important thing was that the rooms were arranged around a chimney in the center of the house, which could provide heat for the whole house through flues, uh, small air passageways into each room, as opposed to having a fireplace in every room, which would require more cleaning and make the air inside the house dirtier.

The house's shape also allowedfor more windows. Each room had a large wall that could fit a couple of big winters, giving every room a nice view of the outdoors.

Student

Plus there would be good airflow through the house.

Professor

Yes. In warm weather when you can open all the windows. Good.

The doors to the house as well…uh…the house didn't have a main entrance or any hallways. So there could be a couple of entry doors in different places, which like the windows, provided ready access to the outdoors.

So, what other advantages might there be to hexagonal rooms?
(Pause…no response)
OK. Think about cleaning. What part of a room is usually the hardest to clean? Like…to sweep with a broom.
Student
Oh! The corners. Because in square or rectangular rooms, the corners are at 90 degree angles. It's hard to reach all the dust that gathers in the corners. But if Irwin's rooms were closer to a circle than a square, it would be easier to reach all the dust and dirt with a broom. Right?
Professor
Exactly.
Now, um…biographers who wrote about Irwin in the 19th century, I feel, sort of downplayed the ingenuity of her design. But I think if she had designed this house today, the same biographers would praise her for coming up with a floor plan that emphasized function, efficient function of a house, as well as a design that's creative and unique.
In any cases, three houses were built in Irwin's time that used her hexagonal design. And in 1869, when she was 41, Irwin became the first woman in the United States to receive a patent for an architectural design. And that speaks volumes if you ask me.

TPO 33

Conversation1

Narrator
Listen to a conversation between a student and a university employee.

Student
Hi. I am a little lost. Um, is this the housing maintenance office?
Employee
You found it. How can I help you?
Student
Oh, good. I have a quick question. Are we allowed to keep electric heaters in our rooms?
Employee
Actually, you are not. What's going on? Your room cold?
Student
It's freezing in my room. I think the heat went out or something.
Employee
Are you sure it's out? Maybe it just got turned out too far.
Student
Oh, no. I tried adjusting the, uh, the heat control, but it doesn't make any difference. It's so cold in my bedroom I can't sleep at night. I've actually been sleeping on the sofa in the front room. The heat still works in there. Actually, we get hot air in all the bedrooms except ours.
Employee
Wow! Do you have a roommate?
Student
Yeah. But she said she isn't bothered by the cold. But on the sofa, I am kept up by the noise out in the hall. The dorms can sometimes get pretty noisy. So what can be done about it?
Employee
Well, OK. There's a couple of things we can do. I can have a custodian take a look at it and see if he can do something.

Student

Actually, I asked the custodian yesterday to take a look. But he said he couldn't find anything wrong. He said that some of the other rooms have lost heat also and that if we'd come here you guys would fix it.

Employee

Oh, he did? That's weird, because I would have…well, the custodians themselves are usually supposed to report any problems right away. OK. In that case, then what you need to do is…here, fill out this form.

Student

I have to fill out a form?

Employee

Yeah, but at least that'll put your heater problem in a work order for the maintenance crew and they'll get to you as soon as possible. Just so you know, because it's not winter yet and it's not as cold as it could be, it may take a few days for a maintenance crew to get to you.

Student

A few days? I can't even sleep in my own room! Can't we just get an electric heater?

Employee

I am sorry. But students just aren't allowed. OK. I can see that this is a problem, and not just with your room. So if you can get the form back to me this afternoon, I'll try to get a maintenance crew to look at your problem by tomorrow. How's that?

Student

Oh, that would be great. Seriously. I have to take off now. But when I fill this form out, I give it to you, right?

Employee

Right. And if I am not here, just put it in my box and I'll get it.

Lecture1 – Archaeology (The Great Pyramid)

Narrator

Listen to part of a lecture in an archaeology class.

Professor

The Great Pyramid of Giza in Egypt might be the most famous building in the world. We know exactly when it was built. Construction started in 2547 B.C.E., about 4500 years ago. We know who had it built. That was the pharaoh Khufu. We know who oversaw its construction—the pharaoh's brother. We know so many things about it, but the funny thing is: we still don't know exactly how it was built.

This picture will give you an idea of the size of the Pyramid and the size of the blocks it's made out of that. About two million stone blocks were used to build the Great Pyramid and they are incredibly massive. The average weight is two and a half tons.

The problem that has puzzled scholars for centuries is how were these blocks lifted up the height of this massive structure and then fit into place and without the benefit of modern technology. Of course, there've been a lot of theories over the centuries.

The oldest recorded one is by the Greek historian Herodotus. He visited Egypt around 450 B.C.E., when the Pyramid was already 2000 years old. His theory was that cranes were used, much like we use cranes today to construct tall buildings. And Herodotus may have seen Egyptians using cranes made of wood. But the problem with this theory has to do with simple mechanics. A crane needs a wide and sturdy base to stand on or it will fall over. Well, as you get toward the top of the Pyramid, there's really no place for a crane to stand. The stone blocks are too narrow to provide a base. Well, so much for that theory.

The next one has to do with the use of a ramp that would allow workers to drag a stone block up the side of the structure. Of course the ramp can't be too steep. It has to have a long gentle slope. And that's the problem. If you build a ramp with a slight slope up to the top of a Pyramid that's over 130 meters high, it would have to be almost two kilometers long. Well, the Pyramid is built on a flat area called the Giza Plateau. The Plateau is simply not big enough to accommodate a two-kilometer-long ramp.

OK. So what now? Well, if you've ever driven on a mountain road, you'd know that it has a lot of twists and turns and bends in it, because that's how engineers keep the road from having to be too steep. So why not wrap the ramp around the Pyramid? Building the ramp around it as you go. Sounds like a pretty good idea. Except it's got a serious problem. See…one of the most remarkable things about the Great Pyramid is how accurate the proportions are. The dimensions are almost perfect. To get that perfection, the engineers must have had to measure it repeatedly during construction. And the way you'd measure it is from the four corners of the base. Well, if you got a ramp spiraling up from the base of the Pyramid, those corners would be buried by that ramp during construction.

Well, who says the ramp has to be on the outside of the Pyramid? And now we get to the latest idea. If the ramp were on the inside of the Pyramid, the corners at the base would be exposed, so the engineers could do their measurements while they were building.

Well, an architect named Houdin has spent a few years working on making computer models of the building of the Pyramid. And what Houdin believes is that an exterior straight ramp was used to construct the bottom third of the Pyramid, this ramp would have been fairly short. It probably rose less than 50 meters. Then the rest of the Pyramid was constructed using an internal ramp that spiraled around the inside of the Pyramid.

But how can we test this idea? Well, there are several ways to look inside the Pyramid.

One is called microgravimetry. Microgravimetry is a technique that's used to detect voids inside a structure. You can then take the data and generate an image that shows any empty spaces in the interior. Well, in 1986, French scientists completed a microgravimetric survey of the Pyramid. And one of the images they produced showed an empty spiral-shaped space inside it. The shape of that space corresponds exactly to what Houdin thought the ramp would look like. I think Herodotus would be convinced. We might very well be at the end of centuries of guessing.

Lecture2 – Environmental Science (Water Management)

Narrator

Listen to part of a lecture in an environmental science class.

Professor

I'd like to continue with the topic of managing water resources, but I want to focus on a particular case. Uh, um, an example of water management that's made us reconsider the methods we use when we make these decisions. So let's look at what's happening in the Colorado River basin.

The Colorado River basin is a region in the Southwest United States. Seven states rely on the Colorado's water. And as you can imagine, as the populations of these states began to grow, it became clear that a system to distribute, uh, to make sure each state got its fair share of water…some kind of system had to be created. And in 1922, a water-sharing agreement was made. Elizabeth, you have a question?

Student

Well, how exactly do you figure out how to share a river? I mean, you can't…like cut it up into pieces.

Professor

Well, let's start with the first step. And that's trying to figure out how much water on average flows through the river each year. Now, researchers had started gathering data on water flow back in the late 1890s using instruments they placed in the river. When the 1922 water-sharing agreement was made, there were about twenty years of data on water flow available. The average annual flow was calculated. And, well, the agreement was based on that calculation. The same basic agreement is in effect today.

Student
Wait! That was all the data they had? And they based their decision on that?

Professor
Yes. And we'll why that was a bad decision in a moment. OK. As decades passed, it became clear that measuring river flow was much more complicated than we had thought. See…a river has periods of low flow and periods of high flow. And this wasn't taken into consideration when the 1922 agreement was made. In the 1970s, the population of the area was rising while the amount of water flowing through the river seemed to be falling. By this time, we had…what? A hundred years of recorded data to look at? That's still a pretty short time for an ancient river.
To get more data, we looked at a different source—a source that was able to tell us about hundreds of years of the river's history—tree rings. OK. Let me explain.
You probably know that we can determine a tree's age by counting the rings on a cross section of its trunk. Each ring represents one year of the tree's life. So if you know the year the tree was cut, you can count inwards and date each ring all the way back to the center. You can also tell how much moisture the tree got during each of those years by looking at the width of the rings. A wide ring means plenty of water while a narrow one indicates less.
Fortunately for us, certain areas of the Colorado River basin are home to some very old trees, some 800 years old and older. Researchers can drill core samples, uh, basically get a cross section of a tree without having to kill it, look at the rings and get a picture of what the climate was like in the basin for each of the tree's years.
Well, the results tell us something we wouldn't have known without this data, that over the past 500 years or so, the Colorado River basin has experienced severe droughts, some worse than any we've ever recorded. They also showed that the early to mid-1900s, when most of the data that led to the water-sharing agreement was collected…well, this was the wettest period in the past 400 years. Well, obviously, had water management officials known then what we know now, the 1922 agreement would have been handled differently.
But today we can use the past to help prepare us for the future. With the demand for water in the basin stays increasing and with the real likelihood of lower flows in the river, if history is our teacher, we can develop innovative methods of water conservation and reevaluate how water is distributed.

Conversation2

Narrator
Listen to a conversation between a student and his biology professor.

Student
Professor Landrea.
Professor
Hi, Dennis. You are right on time. Come on in and have a seat.
Student
Great! Thanks.
Professor
So like I told you in class, I just wanted to take a few minutes to meet with everyone to make sure your class presentations for next week are all in order and coming along well. And as you know, you are supposed to report on some area of recent research in genetics, something…you know…original.
Student
Well, I think I found just the thing! It actually occurred to me a couple nights ago while I was eating dinner in the cafeteria. Tell me professor, do you like broccoli?
Professor

Broccoli? You mean the vegetable broccoli?
Student
Yeah.

Professor
Well, I guess not really.
Student
Me neither. I have never liked it or most other vegetables for that matter…Brussels sprouts, asparagus, cauliflower…you name it. They just taste bitter and…well…nasty to me. My mother always called me a picky eater.
Professor
OK…And?
Student
And so I got to wondering: I mean, I am obviously not the only person like this. So is this just because of some…like trauma from our childhoods? Some bad experience we've had with some vegetables? Or could there be some genetic explanation for why some people are picky eaters and others aren't?
Professor
OK. I see. Well, I suppose it's a possibility.
Student
Actually, it turns out it's more than a possibility. I started doing some research in the library that night and I found out that a biologist at the National Institutes of Health has been looking at that very question recently.
Professor
Well, I guess that's not too surprising. And this is great stuff actually. So what's the verdict?
Student
Well, this guy seems to have discovered a particular gene that actually makes it possible for people to taste the bitterness in certain green vegetables. But people who have a mutation in that gene cannot taste the bitterness.
Professor
Well…that's certainly fascinating! But…so this biologist is basically claiming that people who like to eat these vegetables actually have some sort of sensory deficit? Sort of makes us picky eaters than normal ones, doesn't it? I mean, that's kind of turning things on their head, isn't it?
Student
Well…then again, it wouldn't be the first time, would it? Think of it this way: humans originally needed to have a stronger sensitivity to bitter-tasting foods so they could learn what plants were good for them and which ones might be poisonous. But at some point, as people figured out what they could safely eat, this need became less crucial and a segment of the population lost that ability.
Professor
OK. Well, you make a compelling case. I can't wait to hear more about this when you deliver your report.

Lecture3 – Biology (Notothenioids)

Narrator
Listen to part of a lecture in a biology class.

Professor
Ways in which animals adapt to their environment are often quite ingenious actually. And as an example of this, let me tell you about a fish, a group of fish known as the Notothenioids. There's over 90 known species of Notothenioids and they inhabit both shallow and very deep waters, mostly around Antarctica. Many are fairly small, though the largest species can weigh up to 150 kilograms.

Notothenioids can be identified by their large eyes, which are covered by a thick insulating layer of clear tissue. This tissue protects their eyes from freezing. Remember, the freezing point of ocean water, salt water, is lower than for fresh water, negative 1.9 degree Celsius (-1.9°C). So it can get a lot colder for fish in an ocean, say, than in a river or lake. So this means that the ocean waters around Antarctica are cold enough to freeze most types of fish, but Notothenioids don't freeze. In fact, they thrive. They account for some 95% of all fish in the southern ocean, the ocean that surrounds Antarctica.

So, how unusual is that? To have a single family of fish dominating an entire ocean. I mean, think of…say, tropical or temperate marine environments, which have incredibly diverse fish populations. Coral reefs, for example, support over 4000 types of fish, along with sponges, crustaceans, and many other organisms.

So, exactly when and how did the Notothenioids come to dominate the southern ocean?

Well, around 30 million years ago, the waters around Antarctica were a lot warmer than they are today. Um...at that time, Antarctica was connected to South America, which means that warm air from the north could flow southward and heat up the Antarctica waters. Because the water around Antarctica then was relatively warm, it supported many types of fish. And we know this from fossil evidence.

But the 90 or so species of Notothenioids that exist today didn't exist at all back then. In fact, only one ancestral Notothenioid species existed. But somewhere between 5 million and 14 million years ago, two major changes took place.

First, what we call a chance mutation. A tiny genetic change occurred in that one Notothenioid species. Its DNA allowed for the production of a special protein, a protein that prevents the fish from freezing. The way this…this anti-freeze protein works is: it binds to any ice crystals that form inside the fish. This binding action prevents the ice crystals from growing larger. And this is what prevents Notothenioids from freezing.

Now, at that time, the waters the Notothenioids inhabited were still not freezing cold, so the protein didn't really make a difference as far as the fish's survival. But this would change, because in the same period of geologic time there was a shift in the earth's continental plates. Continental drift caused Antarctica to move apart from the landmass of South America and to drift into the Southern Polar Region. This resulted in a powerful water current encircling Antarctica, which prevented the Antarctic waters from mixing with warmer water. So the southern ocean, isolated from that warm airflow from the north, cooled down drastically, to the kinds of sub-freezing temperatures we associate with it today.

Now, most fish species couldn't survive in this frigid environment and they became extinct. But that one Notothenioid species, with its unique ability to produce that anti-freeze protein, thrived. It had virtually the entire southern ocean to itself!

So? Well, there was little or no competition for food or space. You might think of it as…um…as a…a kind of ecological vacuum. And the Notothenioids exploited fully. The species migrated into different habitats throughout the southern ocean. And its population increased dramatically, with various sub-populations migrating into different parts of the ocean. Over time these sub-populations in all those different habitats…well, they developed very different physical traits. They adapted to survive in their particular ecological niche, their…their position within a particular ecosystem.

We call this type of species diversification within a species adaptive radiation. And what adaptive radiation is is: an evolutionary process by which a parent species rapidly undergoes changes resulting in various new species in order to fill multiple ecological niches. So in the case of the Notothenioids, that single species started colonizing empty habitats to such an extent that it evolved into a broad range of new species, the 90 or so Notothenioid species that we have today. So let me switch to adaptive radiation with regard to another species that's also been very successful.

Lecture4 – Art History (Renaissance Gardens)

Narrator

Listen to part of a lecture in an art history class.

Professor

OK. We have been talking about the art and architecture of the Italian Renaissance, from around A.D. 1400 to around A.D. 1600. Last class, we had a look at some of the magnificent palaces and villas built during this time period. And just as class was ending, someone asked about the gardens associated with these palaces and villas. And so I'd like to say a few things about them before we move on.

Now, when I say gardens, I don't mean vegetable gardens or simple flower gardens. These were lavishly constructed, finely detailed gardens that covered hundreds of acres, with exotic plants and ornamental statues. And they were just as much a symbol of their owners' social position as their palaces and villas were. Again, what was the inspiration for the Renaissance? Rebecca.

Student

Classical art and architecture of the ancient Greeks and Romans.

Professor

That's right. As we've said before, the main point of the Renaissance was to revive the genius of the ancient Greeks and Romans, which is why designers of Renaissance gardens designed them as the ancient Romans would have designed them, or at least as they imagined the ancient Romans would have designed them.

Student

How did they know what ancient Roman gardens look like?

Professor

Well, they didn't have any pictures. But they did have some very detailed descriptions of ancient Roman villas and their gardens that had been written by famous Roman authors who lived during the height of the Roman Empire. And at least three of those authors, one was a scholar, one was a poet, and one was lawyer, were very authoritative, very reliable sources. Ah…and interestingly enough, there was another source that didn't describe classical gardens but still became a great influence on Renaissance gardens. It was also written back during the height of the Roman Empire by a mathematician known as Hero of Alexandria. Hero was a Greek. But he lived in Alexandria, Egypt, which was at the time part of the Roman Empire. Hero compiled descriptions and sketches of seventy some clever little mechanical devices, most of which utilized compressed air to cause water, or in some cases wine, to flow from one place to another, or sometimes to squirt or to make some kind of noise. Yes? John?

Student

Could you give an example?

Professor

Well, one of the devices was a sacrificial vessel that was obviously designed for a temple, not for a garden. Anyway, if you drop money into this vessel, water would flow out of it. Well, creative minds in the Renaissance realized that this little device could be nicely repurposed as a nifty little fountain. Designers of Renaissance gardens loved this sort of thing. They loved to incorporate novelties and tricks, things to amuse and impress guests.

Student

And that was the purpose? To impress people?

Professor

Sure. As a nobleman or wealthy landowner, one purpose of having a fabulous villa with a fantastic garden was to impress people. It was a way of proving your social position.

Student

Well…OK. You also mentioned tricks.

Professor

Well, for example, some gardens had plaster or marble birds that sang when water flowed through them. Some fountains were designed to squirt people with water.

Student

And these things were popular?

Professor

Yes. They may have been the most popular features of the gardens. I mean, flowers and statues can be nice to look at, but these things were a lot more fun. And the more clever the device is, the more famous the garden and the greater prestige the landowner enjoyed. Yes? Rebecca.

Student

What about mazes? I read that they were a major part of the Renaissance gardens.

Professor

Oh, yes. They certainly were! Mazes or labyrinths, as they're also called, were very common in Renaissance gardens. How that came to be though is a bit of a mystery. Mazes have a long history going back to the ancient Egyptians, but they started appearing in gardens only during the Renaissance, or perhaps just a little bit prior to that. According to one source, what happened was: in the late 1400s, a highly respected expert published a book on architecture. And readers somehow mistakenly inferred from that book that ancient Romans had mazes in their gardens. So then designers of Renaissance gardens thinking they were following in the footsteps of the ancient Romans…well…guess what they did.

TPO 34

Conversation1

Narrator

Listen to a conversation between a student and an employee in the university library.

Librarian

Ready to check out?

Student

Just about. Before I do though, this book on early navigation…I have been using this book quite a bit for a research project. And I would like to own it actually. And well…it's an old book, and there were two copies on the shelf just now, so I was wondering if I could buy one. I was talking to this guy the other day, and he said the library sold books on occasion. Is that right?

Librarian

He is probably talking about our annual book sale. We have one every spring.

Student

OK. How do you decide which books to sell? Are they duplicates?

Librarian

A lot are duplicates. If we have more than one copy of a title and it hasn't been checked out in a few years, in that case it might end up at the sale.

Student

I've actually tried to find this book online but no luck so far. I was really hoping to buy it.

Librarian

Well, that particular book…well, it probably won't be up for sale this year. Most books in the sale come from off-site storage.

Student

Off-site storage?

Librarian

That's where we keep books that haven't been used for several years. They are still in the catalog, which means they can be checked out if you fill out a form. It takes maybe a day or two to retrieve one of them.

Student

I see.

Librarian

And then before we decide to include a book in the sale, we review its circulation history again, which can take a while. We've got a lot of books in storage.
Student
So it's basically the unpopular books that get put up for sale then?
Librarian
Well, that…plus the main thing is to make sure students have access to the information in the books. A lot of them are available in electronic format these days, even the really old ones. You know, they have been preserved that way.
Student
So most of the books for sale are older books.
Librarian
Well, we get book donations too. And lots of those are new. Again, a librarian reviews them and decides whether to catalogue them or put them up for sale.
Student
Is this sale open to the public?

Librarian
On the second day. It's a two-day sale. The first day is for students, faculty and staff though, which is great. We usually need about twenty volunteers for the sale. And well, if you volunteer, you get first shot at everything in advance.
Student
Really? What do volunteers have to do?
Librarian
You help sort the books and set up the tables. But keep in mind those positions fill up quickly.
Now, about this particular book, it wouldn't hurt to send a formal request to the collection department. They might be able to let you know if it would be up for sale.
Student
I'll do that. Thanks.

Lecture1-Art History (Dadaism)

Narrator
Listen to part of a lecture in an art history class.

Professor
All right. So last week we started talking about the painters and sculptors who were part of the art movement called Dada. But I don't want you to think the ideas we introduced last time were limited to painting, sculpture, that sort of thing. So today I want to move beyond the visual arts and talk a bit about Dada in the performing arts, in theater.
But let's start by reviewing what Dada is. OK? As you will recall, Dada began in Switzerland, in the city of Zurich, in 1916. The artists who studied it were reacting against traditional notions of beauty, of reason, of progress, which had been standards of western thought since the 18th century. They looked around. And well, I mean, the First World War was raging, so they didn't see much beauty, reason or progress in the world. Instead, they saw a world that was chaotic, random, a world that didn't make sense. And if that's the way the world was, well, they wanted their art to reflect that.
So let's…let's review a couple of key ideas that were the backbone of Dada art.
First, the Dadaists wanted to completely reject the classical idea of art. Classical ideas like proportion, balance…all the

things you think about when you think about great art. Great art involved reason, the logic, the beauty that the Dadaists wanted to overthrow.

So, well, you know, to a Dadaist, classical artwork was a reflection of outdated thinking! That's why Dadaists created sculptures like the ones we saw last week. Remember the stool with the bicycle wheel mounted on top? I wouldn't exactly called that beautiful, would you? But of course it wasn't meant to be. That was the point!

OK.

So another key Dada idea we talked about was the embracing of randomness. Right? Uh…if life is random, said the Dadaists, why would we make art that has order and logic? And so we have that collage we looked at, with an artist took different, you know, cut-out squares of colored paper, threw them onto the canvas, and wherever they landed, that was the composition of the work! The above text is a transcript of this lecture prepared by lady&bird (QQ5l9626928).

Another favorite of the Dadaists was something called chance poetry. A chance poet would pull words out of a hat and that would be…that would make up the poem! And this idea of chance and randomness was a key element of Dadaism because the whole world seemed so random to them.

So now let's take a look at how Dadaist ideas represented to audiences in highly unconventional…well…I am not even sure how to categorize these theatrical events. I suppose you just have to call them shows. These shows started in Zurich in a place called the Cabaret Voltaire.

The rejection of classical western art, well, you see this in the nature of what took place at the Cabaret Voltaire. They didn't put on plays or operas there. What they did was throw out all conventions.

They mixed everything and anything together. They would…it might start with somebody reading a poem. Then somebody else playing an instrument, followed by a display of paintings, followed by somebody else chanting, followed by somebody else banging on a big drum, and someone dressed in a robot costume jumping up and down. So it's not like a play. There's no real plot development here like you'd find in the traditional theatrical performance.

The performers at the Cabaret Voltaire would also get the audience involved, which was extremely unusual. Think about a traditional play. The action's self-contained. The actors act as if there is no one watching, right? It's like a world unto itself. Well, at the Cabaret Voltaire, audience members could get up on stage and dance, or chant, or shout and sing from their seats.

And every night would be different, because there would be a different audience and a different set of acts and displays.

So all these could get pretty chaotic. No barriers between the performers and the audience, and no barriers between kinds of art either. Think about it: poetry, paintings, music, dance…all on the same stage and often at the same time!

This is what the Dadaists had in mind. When they set out to make art that reflected their own idea of reality, it didn't make sense. But why should it?!

Lecture2-Environmental Engineering (APS digestion)

Narrator

Listen to part of a lecture in an environmental engineering class.

Professor

At the end of yesterday's class, we were discussing landfills and the hundreds of millions of tons of everyday garbage which are deposited into them each year in the United States. It's a growing problem! Quite simply, we are running out of space to put our garbage. And this is especially true for solid organic waste: food scraps from home or food processing plants, waste from farms, that sort of thing. Did you know that two thirds of the waste sitting in our landfills is organic material? We have government recycling programs for materials like plastics, glass and metal, yet widespread solutions for organic waste materials haven't really been addressed in the United States. I think this is just asking for trouble in the future.

So today I want to talk about a technology that offers a potential solution to the problem—Anaerobic Phased Solids digestion, or APS digestion.

First of all, what does anaerobic mean? Anyone?

Student
Without oxygen?
Professor
Correct! APS digestion uses anaerobic bacteria, ones that thrive in the absence of oxygen, to consume, to break down organic material.
Student
Excuse me. Professor. Um…those anaerobic bacteria you are talking about…well, aren't anaerobic bacteria also used in waste water treatment plants?
Professor
Yes. They are. Would you like to explain this to the class?
Student
Sure! So when waste water is treated, one of the byproducts is a thick liquid called sludge. And aren't anaerobic bacteria used to break down the sludge?
Professor
That's right. Anaerobic bacteria have been used in waste water treatment for decades.
Student
So how is this technology different?
Professor
Good question. The anaerobic digestion systems used in waste water plants are designed to treat sludge, not solids. Now, in the past, researchers have attempted to treat solid organic waste with that same equipment.
But there was always a problem.
In order to process the solid waste, the kind we find in landfills, you had to pretreat the solids to turn them into sludge.
First, by breaking the material apart mechanically into small particles and then adding a lot of water until you got a kind of thick, soupy mix that the equipment could handle. But that extra step took time and required a lot of energy.
Student
That sounds like it would cost a lot.

Professor
That's right. But APS digestion is designed specifically to handle solid waste. So it is much more cost-effective.
The new technology processes organic waste in two phases. Remember, APS stands for Anaerobic Phased Solids digestion.
First, the waste material is loaded into a large, closed container, along with different types of anaerobic bacteria. The bacteria break the solids down into acids and hydrogen gas. The hydrogen is extracted and the remaining acids are transferred into a different container for the second phase of the process. There another type of bacteria converts the acids into methane gas.
Student
Aren't hydrogen and methane gas bad for the environment though?
Professor
The answer in this case is no, because they don't escape into the atmosphere. The gases are captured and can be burned to produce electricity, which saves a lot of money and ultimately decreases our need for fuels like petroleum and coal, which are not only expensive but are also polluting.
Student
So organic waste from landfills could be processed this way?
Professor
It is certainly one possibility. And APS digestion systems are very versatile. They can be installed just about anywhere. See, anaerobic digestion systems used at waste water treatment plants are huge tanks that hold thousands of gallons of waste water. But the APS containers are small enough to be set up on site, where the waste is generated, like at food processing plants or on farms. So garbage doesn't have to be transported long distances. As a matter of fact, a couple of universities successfully set up demonstration projects. They collected food scraps from dining halls and local restaurants and process them in APS facilities. Not only did the university save money, we are also learning even more about the APS process.

What is the next step forward?

Well, APS digestion uses several different types of anaerobic bacteria, right? So what are the most efficient bacteria in the process? If researchers can figure that out, the highest performing bacteria mix for a system could be determined. Ultimately the goal would be to grow enough of these particular bacteria to support large-scale commercial APS systems.

Conversation2

Narrator

Listen to a conversation between a student and her creative writing professor.

Student

Hello. Professor Thomson. Could I talk to you for a minute?

Professor

Oh. Hi. Laura. We missed you last class.

Student

Yeah. I was sick for a few days. Um…I was wondering...did I miss a lot of work?

Professor

Let's see…well, we discussed the story that you have been assigned to read for class. A Memory by Eudora Welty. And then we listened to a recording of an interview with Welty. The recording is on reserve at the library. You'll need to listen to it. So…did you have a chance to read the story?

Student

Yeah. I did.

Professor

What did you think?

Student

Well…I was a little surprised. I mean, the first time I read it anyway.

Professor

What surprised you?

Student

You know, it just seemed like there was nothing going on in the story. I mean, a girl is just sitting at the beach thinking about one of her memories. And at the same time, she is watching other bathers on the beach, and sort of just thinking about what they are doing too. And that's all that happens! So at the end of the story, I thought, that's it?!

Professor

I know what you mean. There's no surprise ending like in O. Henry's story The Gift of the Magi or some big adventure like in Faulkner's The Bear.

So you didn't like the story?

Student

Well, actually, while I was reading it the second time, I sort of realized that you don't need surprises or excitement to have a great story. . The girl's memory and the stuff she was thinking about while she was watching the other people on the beach were really interesting to read about. And you know, it made me think that when I write my story, the one we have to write for this class, I can maybe use my own memories to get me started.

Professor

Well, in fact, I'd hoped you'd see that. Of course, there are many levels to the story. But what I really wanted the class to take away from it was that you don't need to write about the great exciting world when you write you stories. Even writing

about a memory can work.
Student
Like I could write about one of the times I took a walk in the woods when I was a kid.
Professor
Exactly! You know, as the due day of your stories approaches, I am hearing from a lot of students that they are worried because they don't have anything exciting enough to write about. But Welty said in the interview we listened to and in her autobiography that her worst stories were the ones where she tried to write about people or places that were unfamiliar to her. That's why a lot of her stories are set in Mississippi, where she is from. Welty stressed that, for her anyway, familiarity with her subject matter was the key to a successful story.
Student
Familiarity. That makes sense. Thanks Professor Thomson.
Professor
No problem. Now, don't forget to listen to that recording.

Lecture3-Botany (Plants and Pollinators)

Narrator
Listen to part of a lecture in a botany class.

Professor
When we talk about pollination ecology, we are talking about the relationship between a plant and its pollinator. From the plants' perspective, the ideal pollinator is an animal that is under-fed, ready to eat and in a hurry. The pollinator, on the other hand, wants to remain well-fed with as little effort as possible. These factors help drive the evolution of plants and their pollinators, both of which depend on this balanced and delicate relationship. Sometimes only certain insects or birds can pollinate certain plant species. So to really understand pollination ecology, both the flower and its pollinators must be studied.
Let's start with flowers.
There are several important factors associated with pollination: when and how often a plan flowers, how long the flowering cycle lasts, and the number of flowers that open at the same time. For example, flowering may coincide with the migration of a certain animal species that pollinates the plant, or producing many flowers at once may increase the number of pollinators a plant attracts.
Other characteristics of flowers are also important. Features such as color, scent and shape attract pollinators, as does the reward in the flower, the pollen or the nectar, that feeds the pollinator. For example, flowers that attract bats tend to be green or cream-colored, because visibility is important. Bats are practically blind, remember. And these flowers bloom at night when bats are active.
Now, there's a flower in the Amazon rainforest called a royal water lily and the characteristics of its flowers change during the pollination process. The royal water lily uses color, temperature and scent to attract the beetles that pollinate it. When the flowers of the royal water lily first open up, when they first bloom, they are white. They also emit a strong odor and their temperature rises. Producing heat serves two purposes. It magnifies the scent of the flower and it helps the beetles maintain their body temperature. When a beetle arrives at the flower, the flower closes around it for about 24 hours so that the beetle becomes covered with pollen. Then when the flower opens, its color changes to red and it cools down. When the beetle flies out, it carries the pollen to a different, heated, white, fragrant flower.
As you can see, plants go to a lot of trouble to attract attention. So what kind of attention are they attracting? And why?
Well, sometimes flowers provide shelter for insects, a place to lay eggs for instance. But usually the attraction is food: nectar and pollen. Nectar is mainly a sugar solution, while pollen is a grain made up of part of the plant's cell structure. In both nectar and pollen production, quality and quantity vary over time. But they are always related to the needs of the

pollinator.

You can see that the relationship between pollinators and plants are delicate, so any number of factors can disturb them.

Human development is one. And agriculture is generally believed to be the most harmful. It can fragment habitats in a variety of ways, reducing the number of pollinators, which in turn may reduce the number or size of the flowers, which of course affects the animals that feed on them. Exotic plant species not native to the area can move in and compete. Even bees brought in to pollinate crops can alter natural pollen dispersal systems of rainforest plants.

On the other hand, recent studies have shown that the disruption of one aspect of the pollination cycle doesn't usually lead to the extinction of other species. It turns out that plant-pollinator relationships are more adaptable to change than we thought. So really it is hard to know just how agriculture affects the pollination of plants.

Lecture4-Business Management (The Life Cycle of Innovation)

Narrator

Listen to part of a discussion in a business management class.

Professor

Last week we were talking about innovation in business. Remember the graph I showed you?

Student

The curve that looked sort of like the letter S?

Professor

Right. Cathy. Let's take another look. Do you recall? Cathy. How this S-curve represents the life cycle of innovation?

Student

Sure. Starting on the left, the new innovation, let's say it's a new product. Almost nobody's heard of it or at least nobody takes it seriously. Then its popularity increases, uh, slowly at first till sales really start accelerating quickly. They are where the line goes up steeply in the middle as more and more get excited about the product and they go out and buy it. But eventually, moving over to the right side there, interest begins to fade and the growth and sales levels off.

Professor

At which point the market has matured for that product. We can still sell it and even marginally improve it, but it's not new anymore. It no longer offers exciting growth opportunities. So a business leader might face a choice: either stick with this old, safe, proven idea or move on to the next big idea, a fresh innovation. But innovations are risky. They may succeed or they may not.

OK. A case study.

George. I have heard your Thursday night program on the campus radio station. You like Jazz, right?

Student

Huh?! Uh…yeah…sure! But…what?!

Professor

OK. Stay with me here. On your program last week, I heard an old Miles Davis album. Tell us about that.

Student

Uh…Miles Davis. Trumpet. I played a CD of a Jazz classic he recorded in the 1950s called Kind of Blue. It's my all-time favorite Jazz recording.

Professor

Mine too. Would you call that recording innovative for its time?

Student

Absolutely! Nothing at all like what he had recorded up till then. I mean, before that Miles Davis played things so complex that…well…nobody could touch him. But this was something totally new. Suddenly his playing sounded so amazingly simple.

Professor

And how did people react to this new sound of Miles Davis?
Student
Well…some were disappointed, even angry that he'd abandon his old style. But soon most of his fans came around and this new style appealed to a whole new group of jazz listeners.
Professor
I guess so. Kind of Blue became the most commercially successful album in the history of jazz! So is there a lesson here anyone? Think of that S-curve I showed you.
Student
Oh! So his old style of jazz was actually a kind of product, one that had been developed pretty thoroughly. And he'd taken it about as far as he could. So he decided to take a big risk and try something totally new.
Professor
Exactly! Something completely fresh and cool. And people couldn't get enough of it. It was a brand new beginning that left lots of room for further development artistically. And as a market analyst, you could say that with Kind of Blue, he was jumping to the beginning of a brand new S-curve! With all that potential for profitable development still ahead of him.
But let me ask you something else. This isn't just the music of a single performer, is it? George.
Student
Hardly. More like a group of all-stars. Along with Miles Davis on trumpet, there is Bill Evans on piano, John Coltrane on tenor saxophone…
Professor
Individually perhaps the best in the business. But thinking of Miles Davis as the leader of this group, how did he organize and manage all these incredible talent?
Student
Well, he'd lay out the general outline, the theme and then give each of these star performers, one by one, the creative freedom to really show what they could do with it on their own instrument, to improvise and add something new, but always within the same general theme.
Professor
So Miles Davis gets credit for recruiting the best jazz talent anywhere and getting them to collaborate on a fantastic musical product.
Everyone see the business parallels here?
And give each of these musicians credit for seizing this opportunity and creating great individual performances.
But good jazz is more than just individual performance, isn't it?
Student
Definitely. Jazz musicians need to listen to each other and go with the flow. Like, one time somebody goofed and came in a little early, but everyone else adjusted and went right along with it, as if nothing were wrong. And this mistake came out like just another unexpected creative interpretation.
Professor
Thanks. George. Great insights, ones that would certainly apply to what we are studying here.

纸质版 **TPO4**

纸质版 **TPO4 conversation1**

Narrator
Summarize the points made in the lecture, being sure to explain how they oppose the specific points made in the reading passage.
TRACK 63 TRANSCRIPT

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TPO 35

TPO 35-Conversion 1 (Part-Time Position)

Narrator:Listen to a conversation between a student and a counselor.
Student: Hi, I'm Tina Molly.Employee:Oh, Tina, yeah, good to meet you!You told me on the phone that you are looking for a part-time position?

Student:Yeah! My roommate works at the dining hall, and she heard a part-time job might be opening up there for this new semester. So I was hoping...

Employee:There was one, but that got filled a couple days ago.

Student:Oh, no! Really? The thing is I've got to do something to pay for expenses. And, well, I'm not afraid of hard work.

Employee:I guess not. You see, I always have to check the class schedules of potential applicants to make sure they are full time students in good standing. And your schedule this past semester, I mean, everything from computer science, to African history, to zoology and physics. How do you manage with such a heavy class load?

Student:Pretty well! Actually. If I do get a job, of course, I may have to cut back to a more normal schedule. But, you know, there're so many great subjects to learn about.

Employee: Ah, a generalist.

Student:Yeah! It's gonna be hard for me to pick just one thing to specialize in.

Employee:Say, that gives me an idea. You're pretty comfortable on a computer, right? With learning new software applications?

Student:Sure! I'm pretty good at that. Why?

Employee:Well, last week I got a call from the folks over at the visualization project. They wanna add a couple part-timers to their staff.

Student:Visualization project?

Employee:Yes, they help professors from all different departments turn information into something their students can see. You know, instead of just writing on a black board, more and more professors want to project information onto a screen. And how do I say this? Some professors are really good in their own subject areas, but when it comes to computers, well...

Student:I get the picture. So they use the visualization project to create what? Like graphs of different sorts?

Employee:Graphs of economic trends for instance or population growth. And sometimes dynamic maps, maps that change on screen to show for instance how trade ebbed and flowed over the centuries along various routes between China and the Mediterranean.

Student:Wow, that'd be interesting.

Employee:Yeah! And that's just what they do for classroom lectures. A project staffer might also be asked for to help professors pool together some of their research data and model that visually. They claim that putting their research in a map, for example, or a moving image helps them see connections, new relationships in data on, say, animal migration patterns that they might miss if they're just looking numbers on a piece of paper.

Student:That's terrific! What about working hours?

Employee:They are pretty flexible. Staffers can go in to work day or night. They just have to make sure it's all done by the time the professor needs it. So shall I give you the number to call to get in touch with these people?

Student:Oh, would you? To think I came in just hoping to get something in the dining hall.

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TPO 35-Lecture 1 (Animal Navigation System)

Narrator:Listen to part of a lecture in an animal behavior class.

Professor:Before we leave the topic of animal navigation, let's look at one more species and how it finds its way through its environment.

The species we'll look at is the blind mole rat.

Blind mole rats are interesting in terms of navigation because they live entirely in the dark-in elaborate underground tunnel systems. So how do blind mole rats find their way around in these complicated tunnels?

Well, for some time we've known that blind mole rats use some combination of two different navigation systems.

Um, one system relies on their sense of time and their ability to remember underground landmarks. For example, let's say a mole rat wants to find its way through its tunnel system back to its nest where it sleeps. Well, it goes along. Then it feels some hard stones or a tree root under its feet and it basically says to itself. 'Ok, here is where I took a left.' And then it might remember how long it took to get to the next turn and so forth. The mole rat goes straight or turns based on what it remembers having sensed along the way on previous trips and the time it took between turns.

Now, the other navigation system for the mole rat relies on Earth's magnetic field. Mole rats have the ability to sense the magnetic field and use it to orient themselves directionally. But until recently scientists weren't sure about the role of these two different systems.

Recently a team of researchers conducted an experiment to answer that question. Do these two navigation systems play different roles? What they did was they designed a special structure that very closely resembles a blind mole rat's tunnel system, which looks like a bicycle wheel, a central hub with multiple spokes radiating outward.

Now this turned out to be quite important. Earlier experiments have used a more generic habitat, basically a wide open circle, which was originally designed to test magnetic navigation in other animals. That design led to inconclusive results with mole rats.

Now, with their bicycle wheel tunnel system the researchers were able to vary the distance that the mole rats travel between their nest and their food source by creating long routes and short routes. In each trial, the mole rats started out in their nest, went to the food source and then had to find their way back home, back to the nest.

To determine which navigation system they were using, the researchers tested the animals under two different conditions.

First, the mole rats were tested under conditions of normal magnetism for both the trip to the food and the trip home. And under these normal conditions, they all followed their original route back home, regardless of the length of the trip to the food source.

Then in the second part of the experiment, the magnetic field was altered but only for the trip home, a specially constructed set of magnets was used to shift the magnetic field around the habitat 19 degrees eastward. The researchers wanted to see how the mole rats responded to this shift. Well, it turns out that the magnetic shift had no impact on the return route of the blind mole rats after a short trip. They returned to the point where they had started from.

But after a longer trip, they took a totally different route: one that led them nine degrees east of the nest. Essentially they got lost. This was strong evidence that blind mole rats use magnetic navigation only for longer trips.

So why two navigation systems: one for long trips and one for short trips?

Well, for now we can only speculate, but we think that when mole rats rely on the first system, using underground landmarks or their sense of time, well, they make small mistakes here and there. On a short trip, this doesn't matter much. The trip is short, so they can't make many mistakes.

But on a long trip, well, there are lots of opportunities to make small mistakes, and small mistakes can add up, leading the mole rat far from where it wants to be. So on a long trip, a magnetic navigation system is better, more useful, since earth's magnetic field is stable, a constant, a more reliable indicator of direction!

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TPO 35-Lecture 2 (Earliest Permanent Settlement)

Narrator:Listen to part of a lecture in an archaeology class.

Professor:One of the frustrating things about archaeology, especially for beginning students, is that theories are constantly evolving. A theory that's been accepted for many years may suddenly be called into question.

Student:But why would that happen?

Professor:There are probably a number of reasons. Earlier finds are always being reexamined in the context of new finds. Or it may just be that someone looks at the evidence in a different way, has a different idea of what it suggests.

Take the theory about the earliest permanent settlements. They were found in an area to the east of the Mediterranean Sea called the Levant. And the people who lived there were the Natufians.

For quite some time, it's been widely accepted that about 15,000 years ago, the Natufians developed a sedentary lifestyle. Can someone remind us what that means?

Student:It means that they stopped being nomadic, that they began staying in one area year round instead of moving around all the time.

Professor:Right. And we think there was an abundance of edible plants and animals in the area at that time that make this shift away from a nomadic lifestyle possible. Uh...keep in mind that the Natufians were hunter-gatherers. So in spite of other changes, they were always a pre- agricultural society.

Anyway, after being sedentary for around 2,000 years, something happened that forced the Natufians to change their lifestyle. The general consensus is that there was a period of climatic cooling, which had a negative effect on the availability of food. And this food shortage likely caused the Natufians to revert to a nomadic lifestyle. Then around 11,500 years ago, the climate warmed again. Food became more abundant and the people in that area became sedentary again.

Now, no one is contesting that these people, probably descendants of the Natufians, were indeed sedentary by 11,500 years ago. The evidence is quite strong. Archaeologists have uncovered numerous circular structures dating from that period that appear to have been used to store grain. We think this for a couple of reasons.

First, the remains of barley houses have been found inside them. Barley was the main type of grain that grew in this area.

And secondly, the floors on these structures were elevated. This design would have been consistent with the need to keep the barley dry and safe from rodents. So, that makes sense.

And there are lots of these structures in the settlements. In one settlement that was only partially excavated, archaeologists have already found four of these structures.

Student:So it's the earlier part, that the Natufians were sedentary 15,000 years ago, that's changed?

Professor:Well, there's evidence, but some archaeologists have questioned the criteria used to identify permanent settlements.

See, circular structures have also been found in early Natufian settlements, so archaeologists believe that these were also food storage structures based on their physical similarity to the structures in later settlements. And they would indicate that the Natufians were sedentary 15,000 years ago.

But now, there are doubts about the use of these earlier structures.

Researchers point to the lack of grain remnants in these earlier structures. In fact, things other than grains have been found in them. So at the very least, they say, these structures probably had multiple purposes.

And another problem they point to is that most early settlements have only one of these so-called storage structures. But do you think one structure would be enough to hold the surplus for an entire settlement?

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Student:Well, whatever these structures were used for, couldn't they just have built them at a place they came back to regularly? Maybe to store things for their next visit?

Professor:Exactly! So-called base camps, where the Natufians didn't stay all year round.

But artifacts that were found at a number of Natufian sites seem to present evidence of a sedentary way of life. Large heavy mortars, the sort of thing that would have been used for grinding grain. Such heavy equipment could indicate that the Natufians would have stayed permanently in one place since the work involved in moving an item like this around constantly would have been substantial.

But this evidence of sedentism has also been called into question because the materials used to make the stone mortars did originally come from quite a distance. And if the Natufians could move the materials over great distances...

TPO 35-Conversion 2 (Source Material Of The Paper)

Narrator: Listen to a conversation between a student and his European History Professor.

Professor: So I wanted to talk about your outline. I do like your topic: William, the conqueror, leading the Norman invasion of England. But I'm a little concerned about your source and the fact that you want to use it as the entire basis of your paper.

Student: Really? The Bayeux tapestry? I thought it was pretty creative to use something that was made to hang on a wall as a source. And as far as I know it's the most important documentation of the invasion, a first-hand account, right?

Professor: Well, you are right. It's considered a primary source. And at 70 meters long, the tapestry certainly is impressive. Imagine the time it took for those embroiderers to sew all those words and images to tell the story of the Norman forces sailing from France to England. So, yeah, it's an amazing artifact, but what's problematic is that the tapestry is a very controversial source. Were you aware of this?

Student: Well, I know some pieces of it were probably lost.

Professor: It is incomplete, but...

Student: But I also read that historians have relied on it to help interpret the events leading up to the invasion and the battle itself.

Professor: Well, it has great historical value, no doubt, but in my opinion, there's a problem because...well...do you know who commissioned the tapestry?

Student: It was a church official...um...the bishop of Bayeux, a city in France?

Professor: Yes. And the bishop was also William the Conqueror's half-brother.

Student: Oh! That I didn't know. But regardless of who commissioned it, isn't the fact that it was based on eye witness accounts the most important thing? I mean, it was made only 17 years after the battle. So plenty of eye witnesses were still alive.

Professor: Yes, that's true. But the real point of the controversy isn't the battle itself. It has to do with the reason for the battle: who was the rightful heir to the throne? Who would be the next king? And if William the Conqueror's brother is the one who's commissioned this tapestry...

Student: Then he would be the one to decide which words and images would go on the tapestry and what would be left out.

Professor:Exactly. So of course the tapestry shows why William should be the new king.

Student:I guess I see your point. Embroiderers are just gonna do what they are told to do.

Professor:You have to understand that the tapestry depicted an entire series of events as they were interpreted by the Normans, the victors of the battle. And that's a problem if you are trying to write objectively about the invasion, especially if you use it as your only source of information. After all, it's important for historians to examine an event from all sides.

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TPO 35-Lecture 3 (Frescos)

Narrator: Listen to part of a lecture in an art history class. The professor has been discussing the Italian Renaissance.

Professor: In our discussion of Italian Renaissance paintings from the 1400s and early 1500s, we've looked at some masterpieces on canvas and on wood, but our discussion will be grossly incomplete without talking about frescos.

Frescos are basically paintings done on the interiors of buildings, on walls and ceilings. They weren't invented during the Renaissance. If you remember we looked briefly at frescos paintings way back in our discussion of ancient Romans and ancient Roman art a few weeks ago. But, it was much later during the Renaissance that the term fresco was commonly used. It's an Italian word that means literally fresh. And, well, to explain that, we have to get specific about technique.

Back then, most buildings had stone and brick walls with highly irregular surfaces. They weren't smooth. Also, the walls weren't completely waterproof. Moisture could seep in. Buildings were often damp. There was no way to really control humidity inside buildings in those days. So, because frescos are done inside buildings on walls, well, the walls needed to be prepared before work could begin.

So for example, sometimes, thin reed mats were stuck onto the walls, so these thin reed mats would be like an additional layer between the original part of the wall and the frescos, the painted part of the walls that were done over them. The reed mats could smooth out the surface of a rough wall or could also provide that all- important protection from moisture or do both. So it was the wall, then the mats, then plaster on top of the mats, then the fresco painted onto the plaster.

Other times though, plaster was applied directly to the walls, a thick layer of plaster, to fill in spaces between the bricks, to smooth out the wall surface for painting the fresco. You see.

Plaster is a whitish kind of paste, a mixture of lime, water and sand. After you spread plaster on a surface, it'll harden, like cement does. But as I said, fresco means fresh. And that's because to create a fresco, the painting has to be applied very soon after the plaster has been spread over a surface, right on to the wet fresh plaster. By doing this, the painting actually becomes part of the plaster. Finishing a painting before the plaster dry was a real challenge for fresco painters.

The technique of creating frescos was developed overtime and eventually perfected during the Renaissance, a time when immense buildings were being erected as symbols of wealth and power, very large buildings, which people wanted decorated on the inside as well as the outside. The owners of these grand buildings wanted to decorate the walls to reflect their own affluence and prestige.

Now, few people would argue with the greatness of artists from that period, Michelangelo, Raphael. But there is this popular mental image people have of an artistic genius producing a masterpiece in total solitude. Well, that idea is fine for canvas painting or other small works, but a practical reality of fresco painting in the Renaissance was collaboration. The sheer dimensions of the surfaces involved, plus the physical properties of the plaster, meant it was inevitable that Renaissance artists would rely on assistants, apprentices they were called, to help create their masterpieces. Artists had to plan the work carefully, divide it into several days. Each day was a repetition of the same technical process. Apprentices mix paints, prepare the plaster, spread it on one section of the wall or ceiling, then finally paint on the wet plaster. This had to be done within a few hours before the plaster dried. So they go through that whole process in one day on one section. The next day they'd move on and do it again on an adjacent part. So any fresco commissioned to an artist was, for practical reasons, commissioned to a whole team.

Now, I am not saying a genius like Michelangelo lacked the skill to paint the enormous ceiling of The Sistine Chapel by himself, but he probably would have had to live until he was 200 years old to finish the ceiling's frescos like that without anyone's help. So although we aren't sure exactly how many people took an active role in actually painting the ceiling, we can see areas which are really inferior to Michelangelo's work that must have been painted by his apprentices.

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TPO 35-Lecture 4 (Permian Extinction)

Narrator:Listen to part of a lecture in an Earth science class.

Professor:Let's review something from last week. We talked about an event that happened 65 million years ago. Anyone?

Student:An asteroid hit Earth. Um...well, we think an asteroid hit Earth, near the Yucatan Peninsula, in Mexico, and that wiped out all the dinosaurs.

Professor:Right. I wouldn't say that we've got 100% proof, but there's very strong evidence that this is why that mass extincti on occurred.

Okay. But did you know there was an earlier extinction far greater than the one that killed off the dinosaurs? It was what we call the Permian Extinction.

Now, way back about 290 million years ago, at the beginning of the Permian Period, there was just one big continent, a super continent. And as the climate warmed up, plant and animal species began to diversify profusely. So life during the Permian Period was abundant and diverse. But about 250 million years ago, the Permian Period ended with a rapid mass extinction, something happened that wiped out 75% of the land animals and over 95% of ocean life.

So what was it? What could have caused this?

Well, with the all the evidence that it was an asteroid that led to the dinosaur extinction, we began asking ourselves: is it possible that another asteroid much earlier caused the Permian Extinction? And so researchers have been looking for an impact crater.

Student:I thought the Permian Extinction was caused by a decline in sea water oxygen levels. Isn't that what's in the textbook?

Professor:But don't forget the textbook makes it very clear that's only a theory.

Student:And it mentions something about volcanic eruptions too.

Professor:It does, but now this new theory has led to a search for evidence of an asteroid impact. And one place of interest is a region called Wilkes Land in eastern Antarctica.

A few years ago, a researcher reported a strange anomaly beneath the ice in Wilkes Land. Evidence of what may be a mascon. That's just short for mass concentration.

When an asteroid hits Earth, when it slams into Earth's crust, we think that causes molten rock from deep below the surfa ce to rise up into the impact area. Sort of like if you bump your head, you get a big lump under the skin. Fluid makes the area swell. Anyway, the material flowing up from below the crust is more dense than the crust itself. So that's how we get a mascon, a spot in the crust with newer crust material that's more dense than the material all around it.

There're lots of mascons on the moon too, where a mascon's density causes a small increase in the local gravity that can be m easured and mapped by orbiting spacecraft. And where do these mascons tend to be found? In the centers of impact craters on the moon's surface.

But back to Wilkes Land. We're not certain that the mascon there...what might be a mascon ...was actually caused by the impact of an asteroid, but there does seem to be evidence. Researchers notice a gravity anomaly similar to those on the moon. And the spot where the gravity readings are especially high...this is right in the middle of a 500-kilometer wide, circular ridge, what could be part of an old impact crater.

And if there was an asteroid impact there in Wilkes Land, the next question is: did it happen 250 million years ago? Because that would put it when in geologic history?

Student: At the end of the Permian Period? Right when those animals went extinct.

Professor:Exactly.

Student: But can't researchers figure that out by studying the rocks there in Wilkes Land...where this impact supposedly took place?

Professor: Well, to get to anything from that long ago, we would have to drill down to abo ut a mile, about 1.6 kilometers of solid ice that covers the area today. And that's not likely to happen.

But speaking of rocks, I should mention that Wilkes Land is not the only place of interest here. There's another called the Bedout High off the coast of Australia. And we have rock samples from the Bedout High. Some apparently have extraterrestrial origin. I mean, they show the effects of extreme temperatures and pressures, the level of extremes produced only by an impact. And as for their age, well, they do in fact, date back to about 250 million years ago.

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TPO 36

TPO 36-Conversion 1 (Change Of Academic Plan)

Narrator: Listen to a conversation between a student and her academic advisor.

Student: Hi. Professor Jones. Thanks for seeing me.

Professor: No problem, Laura. How was your summer break?

Student: It was great! But the fact is it's made me reconsider my academic plans.

Professor: Oh, really? Nothing too dramatic, I hope.

Student: No, no. At least I hope not.

Professor: What do you mean exactly?

Student: Well, I just spent the summer working on a Native American reservation, a Navajo reservation in Arizona. And I was fascinated, so now I want to study the Navajo language, uh, their history, religion. I want to go back next summer too. And maybe even spend a semester there, some kind of internship or independent study?

Professor: Wow! Sounds like you are really enthusiastic, but you were majoring in sociology, and I seem to recall that for your senior project, you were doing something with education?

Student: Right. I have done some research on the public schools in the northeastern states, how they've been affected by changes in population, uh, immigration trends, during the past fifty years. But now I really want to study the culture of the Navajo people.

Professor: Well, there are a couple of options depending on your priorities. Say, how did you end up on a reservation in Arizona anyway?

Student: Well, a friend of mine took a job there, in a summer school program. And they had another opening. Someone cancelled at the last minute. I thought it would be just a big adventure, but it turned out to be much more than that.

Professor: I see. Well, anyway...as I am saying, your options depend on what your priorities are and on exactly what you want to study.

Student: Uh, like I said...Navajo culture?

Professor: Well, let's see if we can be more specific. If you want to study the Navajo language, learn about their religion, their history, that's part of cultural anthropology.

Student: No. I really don't want to change majors at this point. I love sociology and I really want to graduate in four years.

Professor: Okay. Now I see what your priorities are. So from a sociological perspective, since you are interested in education, you can stay with that, change your research topic to the Native American experience with public education, the effect it had. And you could take sociology courses on religion or the role of minorities in society, again, focusing your research on the Navajo.

Student: Um...l hadn't thought about that angle. Sounds intriguing. And all the courses I have already taken would still count toward my degree?

Professor: I have to check. And remind me to plan carefully to make sure all your degree requirements are met, but I don't see any problems.

Student: Great! And then I can pick up the language and culture courses as electives.

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TPO 36-Lecture 1 (Potential Energy Source - Helium-3)

Narrator: Listen to part of a lecture in an environmental science class.

Professor: Now last week when we discussed the serious energy challenges we are going to face as the world's population continues to grow and we place more stress on our finite supply of fossil fuels, especially natural gas and oil, well, maybe it's not all doom and gloom. In a number of areas, scientists are thinking outside the box and trying to come up with unusual, novel solutions to the energy question. Not that a positive outcome is inevitable by any means, but well, let's take a look at one of these creative ideas involving a gas - helium-3.

Helium-3 is an isotope of helium that has tremendous potential for use in practical energy applications. Remember, an isotope is a form of a chemical element that has the same number of protons in its atomic nucleus but a different number of neutrons. The most common isotope of helium on Earth is helium-4, which does not have any known or potential uses as an energy source. Helium-3, in comparison, is extremely rare. There isn't very much of it on Earth. Plus, the, um, the main source of helium-3 in our solar system is solar wind, a stream of lethal radiation and particles pouring off of sun. And Earth's magnetic field fortunately prevents that wind from reaching us.

So why is helium-3 so exciting?

Well, it seems a sure bet that helium-3 is available in abundant quantities on the moon. Since the moon doesn't have a magnetic field, the solar wind must have been depositing helium-3 there for billions of years. In fact, Apollo astronauts have already discovered it in the moon's dust. Some estimates hold that there may be a million tons of helium-3 buried on the lunar surface. And one ton is more than enough energy for a city of ten million people for a whole year. So you can see this would certainly solve most of our energy problems. But how could this be possible?

Well, we think helium-3 would have to be used in nuclear fusion reactors. Keep in mind that a nuclear fusion reactor is completely different from our existing nuclear fission reactors. Basically a nuclear plant powered by nuclear fission derives its energy from the splitting of atoms. While a plant based on nuclear fusion utilizes the energy produced when atoms are fused together. Fusion is the same nuclear reaction that fuels stars, which as you know, produces unfathomable amounts of energy.

Researchers have identified two isotopes of hydrogen as the most promising fuel sources for fusion power plants. However, there is a real drawback. They both produce large amounts of radioactive material in the fusion reaction. But helium-3 fusion produces no radioactive material. In fact, one proponent stated you could safely build a helium-3 power plant in the middle of a city.

A clean, safe source of power almost sounds too good to be true, doesn't it? Well, of course, this is all very theoretical. And there are issues that have to be addressed.

For one thing, we still haven't created a single nuclear fusion plant despite decades of research and development. An often heard joke about fusion is that a nuclear fusion plant has been just decades away from being created for several decades now. Nuclear fusion research is still ongoing, as strong as ever, in fact, but we still don't have a full- scale fusion plant to point to.

And there's a rather big logistical problem as well. How to get the helium 3 off the moon? Digging the stuff up is challenging because the distribution of helium-3 is so diffused across the lunar surface. One estimate is you'd need to heat a million tons of lunar soil to about 800 degree Celsius to yield about 70 tons of helium-3 gas. It's kind of liking digging out a crater with a spoon to find the single nugget of gold. Kind of ridiculous, right? There's a camp that believes it'll take more energy to extract helium-3 gas than the gas itself would provide.

So there are concerns, but given the lure of the possibilities and the pressing nature of our energy difficulties, it’s possible that helium-3 could be a significant driver of future exploration of the moon. And it certainly could ease the pressure on the demand for fossil fuels if and when the numerous challenges, and not just the ones we've talked about, are solved.

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TPO 36-Lecture 2 (Vegetation Discoloration And Mayan Ruins)

Listen to part of a lecture in an archaeology class.

Professor: Sure. Sometimes we do just stumble onto an important find when doing field research, but usually we've got at least a vague idea of where to look. And with new technology...uh...Okay.

Here's a story that illustrates what I mean.

It's about the Mayans, who, as you remember, flourished in Central America and had a culture that was quite advanced in art, architecture, astronomy...We know that despite regular droughts and poor soil, their numbers grew into the millions over the centuries until about 1,200 years ago when their entire civilization just seemed to disappear, and we are not sure why.

Okay

So an archaeologist named William Saturno1 goes looking for ancient Mayan ruins in Guatemala near a town called San Bartolo. And after several days of extremely difficult hiking through the thick rainforest, Saturno stops to rest in the shade and finds himself sitting in what turns out to be an ancient Mayan temple, a pyramid 25 meters high. And inside, on the walls of this temple, Saturno finds some ancient writing and also this enormous mural with elegant figures depicting a Mayan myth of the creation of the world. And it's all painted on plaster that's over 2,000 years old, which makes it the oldest Mayan artwork ever found, at least in good condition, and in fact, one of the most perfectly preserved and extremely important find.

Student: Wow! Do you have a picture of it?

Professor: Now...hang on. I don't...there's a point I want to make here.

It happens that someone at NASA, the United States Space Agency, reads about Saturno's discovery and gets very excited 'cause the space agency has just produced some images of this area using a technique called remote sensing. That's when instruments on planes and satellites survey areas on the ground. And the newest twist on remote sensing, quite new, is infrared imaging. Instead of taking regular photographs, the satellite cameras take pictures using infrared light, which is invisible to the human eye, but computers can then process these images so our eyes can see them.

Using infrared imaging, the satellite-based remote sensing instruments revealed what turned out to be traces of water storage systems and canals, canals that the Mayans built to irrigate their parched soil, which helps explain how the Mayans could feed such a large population. The infrared images also revealed ancient roadways that had tied Mayan cities together. So people at the space agency figured Saturno would be interested and they sent him this infrared image of the area near San Bartolo where the pyramid temple was found.

Now, this is a false color image based on an infrared photo. So the greens of the jungle are shown mostly as blue and red, but notice also the spots of greenish yellow scattered here and there. These indicate significant discoloration in the vegetation, at least as it appears to infrared cameras. And Saturno notices that some of that discolorations located in exactly the spot where he found the pyramid temple. So he figures, hey, maybe some of those other yellow spots are worth investigating. Well, long story short, he checks out three different spots where the photo shows discoloration and finds an ancient Mayan site overgrown with vegetation at every single one. Further exploration shows a perfect correlation between yellow spots on the infrared image and Mayan ruins hidden in the jungle.

Student: So what caused those spots to look different?

Professor: Well, Saturno believes the limestone and lime plasters that the Mayans used to build their structures...Over time, uh, this limestone decayed and seeped into the soil and changed the soil's chemistry. Then calcium carbonate from the decaying lime plaster might have been taken out by the roots of the trees growing there, uh, up into their leaves, and made them give off infrared light much more brightly than the surrounding vegetation. And infrared sensing technology can detect this.

Student: So...like...is Guatemala the only place where archaeologists have used remote sensing?

Professor: No. This technique has been used in other parts of Central America too, and also in Brazil, Bolivia, Cambodia. It can be used anywhere the rainforest has obscured ancient ruins.

And the results can be amazing! Like another Mayan temple that Saturno found, thanks to remote sensing, he had walked right by it every day for five years and had no idea it was there, until he saw an infrared image of the area!

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TPO 36-Conversion 2 (Talk Show Application)

Narrator: Listen to a conversation between a student and the program manager of the university radio station.

Student: Hi I'm Jim, the guy who's trying to get a new show.

Manager: Right. Jim.

Student: My application got turned down and...um...l am not sure why. So I wonder if you could explain...

Manager: I'm glad you came in, Jim. I was actually quite impressed with your application.

Student: Okay.

Manager: But the thing is, we run a music station here, not a talk station. We've been a music station since the beginning, since the station's inception.

Student: This is where I get confused because of the article in last month's campus newspaper about the poll...

Manager: Yes. The survey...

Student: I mean, a majority of students said they felt the station was stale, that it needed a breath of fresh air. Well, um, how are we supposed to get fresh air if you keep all the windows closed? I was just trying to open some windows for people.

Manager: I can tell you have a lot of passion for this, but I'm really not convinced it's a good idea. Okay.

The first thing is, again, this is a music station. If we just have that one calling show, it just doesn't fit in with what we are doing. And studies have showed that mixed format stations just aren't as successful as...Look. We do want to innovate, but within the format. And with a live calling show, for one thing, you have no idea what the caller is going to say, no idea what you could end up broadcasting.

Student: I understand, but that seems like a small risk to take in exchange for giving students a chance to talk publicly, interactively about issues they care about. I really think they'd like to have a place where they can air their views about current events, about the university.

Manager: But the university already has that. There's a monthly meeting open to all students to discuss issues like the ones you mentioned in your application. And there are several student clubs on campus that discuss current events. But either way we have no plans to change the format.

Now, if you had an innovative idea for a new music program...

Student: Well...how about a music program that includes taking calls from listeners?

Manager: You really are determined to have a calling show, huh?

Student: Well, I'm a communications major, and I'm hoping to get an internship at a professional talk radio show in the city next year. I thought a little experience with the college station might help.

Manager: Tell you what, there's still some time before the application deadline. Why don't you submit a new application with the music show idea that you just proposed? Then we will see if we can work something out.

Student: Okay. Thanks!

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TPO 36-Lecture 3 (Suburb Housing Design)

Narrator: Listen to part of a lecture in an architecture class. The professor has been discussing housing designs.

Professor: Alright, in our last class we began our discussion of housing designs in the United States from the 1940's. You'll remember, for example, that we looked at some photos and discussed apartment complex in Chicago from that decade.

Now, today, let's talk about housing design in the suburbs. The demand for low-cost housing outside the cities increased in the late 1940's after World War II as a whole generation of young families needed affordable housing, and a firm called Levitt & Sons strove to meet this demand in some pretty innovative ways.

They designed buildings based on the demands of the public, not so much their own artistic vision, and created a residential community in the state of New York that became known as Levittown.

Levittown was the first suburb of its kind and it started out with 2,000 homes. They were called 'Cape Cod houses', the 'Cape Cod model', and they were designed to look like the historical cottages in the New England states in the northeastern United States.

The original floor plan was very simple. The living room was in the front of the house with windows looking out towards the street. You also had two bedrooms, um, a bathroom and a kitchen. Everything was on one floor. The bathroom was right next to the kitchen, which was a way of keeping building costs down since the two rooms could rely on just one plumbing system.

Another feature of this Cape Cod house is that it could be expanded as families grew and needed more space. You had the downstairs but up the stairs the house actually had unfinished attic space as well. Levitt & Sons promoted their houses saying this attic space could easily be converted into another bedroom or even two, and then there was always the possibility of building additional rooms onto the house later.

Each house was built the same way and with the same materials. All parts were standardized so houses could be built economically. This was important because it meant that they were affordable for young families who wanted to live outside of the city. As a result, what you had was a whole community of houses that, except for the color of their roof and walls, were identical. So eventually there's going to be a demand for some variety, right?

After a couple of years, Levitt & Sons came up with a second design. Well, they called it a second design because it had a slightly different roof. Plus, the exterior had a more modern look.

This model was called a ranch house.

Now, I'm guessing it wasn't too expensive or time-consuming for Levitt to come up with this idea, but it was certainly efficient and hugely popular with families. The Ranch is like the Cape Cod except that the living room is in the back of the house instead of the front, and on this Ranch model there is one more important feature that is not present in the Cape Cod. It has a large window in the living room called a 'picture window', which gives you a kind of 'framed view' of the outside. The way the Ranch is set up when you look out this picture window from the living room you're looking out from the back of the house instead of from the front. Parents could watch the children playing in the backyard, the grassy area behind the house rather than a view of the street. So here was a way for families to disconnect their home, their house, their private lives from the outside world, which was represented by the street that led to work and school, which really seems like the thing they had been looking for all along, but the floor plan was just like the Cape Cod only, you know, turned 90 degrees.

Levitt & Sons offered their ranch houses for sales at a low price. They could do that because they were using the simple and therefore cost-saving building methods. Another way they kept construction prices down was to train workers who went from house to house doing a specific task, sort of like an assembly line. For example, you might have a painter whose job was to paint the doors of each house and then it would be someone else's job to install the doors. This way houses went up quickly, saving time and money. And the Levitt's ideas caught on. In the early 1950's, their designs became a model for suburb construction throughout the country.

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TPO 36-Lecture 4 (Gause's Hypothesis)

Narrator: Listen to part of a lecture in a biology class.

Professor: OK. Back in the 1930's, a biologist named G.F. Gause first proposed what's known as 'Gause's hypothesis'.

Gause said that whenever you've got two similar species competing for the exact same limited resources, one of them will have some sort of advantage, however slight that'll eventually enable this species to dominate and ultimately exclude the other one, even cause it to become extinct. That's why Gause's hypothesis came to be called 'The competitive exclusion principle'.

Gause did some lab experiments like placing two Paramecium species in the same environment where they would have to compete for the same food. He found that, over time, one species was consistently able to drive out the other, to eliminate it from the habitat, just as his hypothesis predicted.

Now, one of the early criticisms of Gause's hypothesis was that: 'sure, it works in simple lab experiments where you have just two competing species in a controlled environment, but the hypothesis falls apart when applied to natural ecosystems where things are more complex'.

Now, it's true that in the real world there are lots of examples that seem to contradict the hypothesis. For example, in the forest of New England, in the northeastern United States, there are some small songbirds called wobblers and right in the same area you've got five species of wobbler, all about the same size and all having similar diets of insects, uh, insects that are found on and around trees. Yet, these five wobbler species all managed to coexist. There is no dominance, no exclusion of one species by another.

How is this possible?

Well, turns out that one wobbler species feeds in the uppermost branches, while others favor the middle branches and others feed toward the bottom of the tree. Also, each wobbler species breeds at a different time of year. This way the period of peak food requirement, um, when the birds are feeding their chicks, varies from one species to the next.

Yes, Mark?

Student: But does that really contradict Gause's hypothesis? Because, I mean, are those different wobbler species really competing for the same food? I don't think so. I think they're more like, you know, almost cooperating so that they don't have to compete.

Professor: Excellent! To the casual observer, the wobblers do seem to contradict Gause's hypothesis since they all live in the same place and eat the same types of insects.

But if you observe these birds more closely, the wobbler species are not really competing with one another for the exact same food at the exact same time, which brings us to a really important concept in ecology: the niche.

Mark, can you tell us what an ecological niche is?

Student: The place where the plant or animal lives, you know, its habitat.

Professor: For example?

Student: Like the polar bear living in the Arctic on the ice sheet. The Artie is its niche, the habitat it's adapted to survive in.

Professor: Okay. That's what most people think of.

But for biologists, the concept of a niche also includes the way an organism functions in its habitat, how it interacts with other plant and animal species, with the soil, the air, the water and so on.

Okay. Now let's put it all together.

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If you have two similar species competing in the same niche, what's going to happen? Susan?

Student: One will dominate the other and eventually eliminate it.

Professor: Okay.

So what could the weaker species do to improve its chances of survival?

Student: Maybe just move to some other area, you know, away from the competitor.

Professor: That's one possibility. But think of the scientific definition of a niche. Think about the wobblers.

Mark?

Student: Maybe it could find some new way of functioning in its habitat so that it wouldn't have to compete with the dominant species. Keep the same habitat but not the exact same niche.

Professor: Yes, and there are many ways to do that. The dominant species feeds in one part of the tree and you feed in another.

Student: If the dominant species needs a lot of water you develop the ability to survive on very little water.

Professor: You survive on what's left over: water, food, nesting or breeding sites, whatever.

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TPO 37

TPO 37-Conversion 1 (Ancient Peru Featherwork)

Narrator: Listen to a conversation between a student and his anthropology professor.

Professor: Well, Mathew. Good to see you. How can I help you?

Student: Did you happen to read last weekend's art section of the newspaper?

Professor: Yes, I did. Why?

Student: Well, you remember the article about an exhibition of ancient featherwork pieces from Peru? I'm thinking of doing my research paper on this topic, if it's okay with you, of course. I've done some additional reading about ancient Peruvian cultures, how they used brightly colored feathers to decorate clothes and ceremonial objects. From the pictures I'm seen, they are beautiful works of art.

Professor: They sure are. I saw the exhibition a few days ago. But is that how you'd approach Peruvian featherwork in your paper? As an art form?Remember you need to take an anthropological angle. Uh, look at this in a way that tells us something about the people who made this featherwork and the societies they lived in.

Student: Well, absolutely. I read that most of the really colorful feathers came from the rain forest and the societies who used them lived on the coast on the other side of the Andes Mountains, so the feathers had to be carried over the Andes. No wonder featherwork was symbol of high status in ancient Peruvian societies.

Professor: That's definitely a long, dangerous trip to make on foot. I do research down in Peru and I have made that trip, but the easy way. I've flown and driven.

Student: I didn't know you did research in Peru. Maybe...do you think you would be able to help me with this paper?

Professor: I'll be happy to help if I can, but Peruvian featherwork isn't my area of expertise. You know, every few pieces of featherwork survive because feathers decay so quickly. Not many people have had the chance to study them up close. There is a handful of experts out there who have, and I could try to contact some of them. But I think your best bet is to keep reading and finding more books and articles. And of course you can use the information you got at the exhibition as source material too. You've been to the exhibition, haven't you?

Student: Uh, actually...not yet.

Professor: Um...well, it would be a good idea if you went, don't you think?

It's good that you've done some background reading, but it will make more sense when you actually see the featherwork. There's a lot of information available there from book lists, tour guides. And you could even ask to meet with the curator and ask for her insights.

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TPO 37-Lecture 1 (Soil Formation)

Narrator:Listen to part of a lecture in the geology class.

Professor:So, we all know soil. It's important to plant growth, right? And we know that there're different types of soil in different places and that some soils are more fertile than others. But what is soil? And how's it formed? Well, we're going to go into this in some depth, but for now let's just lay down the basics.

Soil is composed of two kinds of material: inorganic material, basically small pieces of rock, and organic material, which is animal and plant matter.

OK. So, what do you think? If I mix bits of rock with composted vegetables, will I get soil? The answer is no, because the formation of soil is a dynamic process. It involves not only the initial inputs, the raw materials, but also the transformation of those materials, and the movement of some of the materials and the loss of others. So, the inputs are bits of rock and organic matter.

Now, the bits of rock, the inorganic input to soil, uh...they come from the breakdown of rocks on Earth's surface through a process called weathering.

Weathering can be either physical or chemical. Physical weathering, uh...that's when exposure to the elements over time causes a rock to break up and eventually disintegrate. Uh... of course, some rocks are more resistant to physical weathering than others. If you think of the sand particles in soil, those are the result of physical weathering, and they have the same chemical composition as the original rock.

Now, chemical weathering, uh... that's the chemical breakup of rocks. It differs from physical weathering in that the chemical properties of the minerals are actually changed. The clay minerals you find in soil are the result of chemical weathering. Clay minerals are called secondary minerals, because their composition has been altered.

Okay. So we have weathered rock, which needs to be combined with organic matter.

So what does the organic input consist of?

It's the remains of plants and animals, but mostly plants. Now, just as rocks are broken down by weathering, the animal and plant residues are broken down, too. They're reduced to simple chemicals by microorganisms in a process called mineralization. And just as some rocks are more resistant than others to weathering, the compounds found in the soil's organic input resist mineralization at different rates. The compound cellulose is the major constituent of most plant tissue. It mineralizes relatively quickly. But there are woody substances in certain plants that strengthen the cell walls. They are found in smaller concentrations and their mineralization can take several years.

Weathering and mineralization transform the inorganic and organic inputs in a number of ways. And it's partly from these transformations that soil gets its unique properties.

How does it work?

Uh... take the dark brown color of soil. After microorganisms have broken down the cellulose, we're left with two things: the microbe's waste and the more resistant plant material that microorganisms can't break down easily. These materials ultimately get transformed into a new material called humus. And when humus is combined with the clay minerals in soil, that's what gives soil its dark brown color. So now, if we've got clay and humus, these transformed materials, and we mix them together, we've got something very close to soil.

But soil isn't static, and there're still other processes that go into the formation of soil: the movement and loss of materials. The soil in any location isn't a uniform mixture.Its composition varies with depth. You see, mineral and organic materials move through soil vertically.Some materials move more easily than others. Water carries the more mobile materials from the upper level of soil to the lower levels.So the upper levels of the soil eventually get depleted of these materials, while the lower levels get enriched with them. And that creates distinct layers of soil as far down as the rock underlying the soil. And the materials that dissolve easily in water can get lost completely if the water carries them horizontally out of the soil and into rivers.

Now, of course, new mineral and organic material will be deposited at the surface and become incorporated into the soil, but you see how the processes of movement and loss contribute to the formation of soil.

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TPO 37-Lecture 2 (Cats' Domestication)

Narrator: Listen to part of a lecture in an archaeology class.

Professor: In our last class we began talking about animal domestication. And we said it's the process whereby a population of animals is bred in captivity and becomes accustomed to being provided for and controlled by humans. Question, Jim?

Student: Yeah. I was thinking...you said domesticated animals usually served some kind of purpose for humans, like horses could...uh...pull heavy loads, and dogs could hunt or herd sheep, but cats, why were they ever domesticated? I mean, mine can't do much of anything.

Professor: Interesting question. Cats don't seem likely candidates for domestication, do they? They actually lack an important characteristic that most animals that can be domesticated have. Domesticable animals tend to live in herds or packs, with clear dominance hierarchies. Humans could easily take advantage of this hierarchical structure. By supplanting the alpha individual, they could gain control of the whole group or of individuals as in the case of dogs. Cats in the wild, though, rarely have this structure. For the most part, they are solitary hunters. But as for their utility to humans, well, it's helpful to think about when and where cat domestication might have begun.Any ideas, Jim?

Student: Well, I guess ancient Egypt. I'm thinking of all those ancient Egyptian paintings of cats.

Professor: Good guess. Those paintings you mentioned do provide the oldest known depictions of full cat domestication, where cats are, without question, household companions. The paintings from about 3,600 years ago typically show cats in Egyptian homes poised under chairs, sometimes wearing collars, eating scraps of food out of bowls. But the Egyptians don't get credited for the early stages of cat domestication where cats are just beginning to interact with humans. There are signs of early domestication as far back as 9,500 years ago! Recently, two graves were discovered on the Island of Cyprus.

One was the grave of a human, buried with some tools, sea shells and other items, and nearby, a cat was buried in its own grave. Interestingly, the cat's body was oriented in the same westward direction as the human's body.

Another notable thing about the two bodies was that they were in an identical state of preservation, suggesting they had been buried at the same time. So we can assume that humans had at least some kind of relationship with cats as early as 9,500 years ago!

Student: So cat domestication began in Cyprus?

Professor: Well, except cats weren't native to Cyprus. They were undoubtedly brought over to the island by boat probably from the nearby coast of the Fertile Crescent in the Middle East. In fact, extensive DNA analysis has now confirmed what archaeologists have believed for quite some time.All modern domesticate cats arose from just one subspecies of wild cat from that single location: the Fertile Crescent, and not from any of the other four subspecies of wild cats located in other areas throughout the world. Pretty amazing, isn't it?

Which brings us back to Jim's question: Why did it happen and how? Well, for years, researchers have pondered this question of cat domestication, and the best I can do here is just a theory, but tell me it doesn't make sense.

In evolutionary terms, early settlements and agriculture in the Fertile Crescent around 10,000 years ago created a completely new environment for any wild animals that were flexible and curious enough to exploit it. Mice were attracted to these settlements, and cats, being obligate carnivores they must eat meat to thrive， They were almost certainly drawn to the settlements by the mice. Over time, only the cats that could adapt to living in human-dominated environments would have stayed and thrived. People probably encouraged them to stick around and controlled the mice in the field and the granaries, and eventually, their homes, and perhaps simply grew to like their company too.

Student: Hmm...so in a way, the difference with cats was that domestication was their idea instead of ours.

But why do you suppose only one of the five subspecies was domesticated? Were the others just not friendly enough towards humans?

Professor: Well, no. In fact, at least two of the other subspecies are known to be relatively friendly, but the Fertile Crescent subspecies had, well, a head start because of its proximity to the first human settlements. And as agriculture spread, the tamed ancestors of this subspecies spread with it.So they fill the niche of home companion in each region they entered and effectively shut out the local subspecies that were already there.

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TPO 37-Conversion 2 (Preparation Of A Shakespeare Play)

Narrator: Listen to a conversation between a student and a university theater manager.

Student: I'm sorry if my email wasn't clear. It's probably best that we are meeting now. I have a lot of questions.

Manager: So do I. But first let me say that I'm so glad that this tradition is continuing. I guess for the last twenty years now, every senior classes put on a Shakespeare Play.

Student: It won't be anything like the drama department's productions in the main theater, but we are really excited. We are doing 'As You Like It' this year.

Manager: Great! Let's start with the timing. You want the production to run on two consecutive nights, Thursday and Friday?

Student: Right. The end of April will be best. Maybe the last Thursday and Friday? We are flexible with the dates.

Manager: The only bookings at the small theater are some recitals in the beginning of the month, so I'll make sure to get it on the calendar. But you other questions...let's see. You want to use fire on stage?

Student: Well, our idea is to reproduce the conditions of an Elizabethan playhouse, make it as authentic as possible. And of course, they didn't have electric lights 500 years ago. So we thought if we had candles, a lot of candles actually...

Manager: To light the stage?

Student: Yeah.

Manager: Okay. Um...you'd need a special permit. You could get one from the city council. But for one thing, it's difficult and time-consuming to get permission and expensive. And it's not just a permit, you'll have to pay for an inspection and to have a fire marshal present at the shows.

Student: That does sound expensive. If we had a budget like the drama department...but it looks like we'll have to scale back a bit.

Manager: Are you charging admission?

Student: There will be a small admission fee. In Shakespeare's time, if you paid a little more, you got a more comfortable seat. I don't see how we could do that though. I mean, all the seats are the same, right?

Manager: Right. I guess you could charge more for the seats upfront, but it's a small theater.

Student: And there isn't much difference between the front and the back.

Manager: Anyway, for lighting, you could buy those electric lanterns that are made to look as if they had a natural flame.

Student: If that's the best we can do, not exactly authentic, though.

Manager: But safer and less expensive. And about the food...

Student: Selling food was also done in Shakespeare's time. It's related to the candles actually. When the candles burn down, they stops the play so they can bring out new ones, and that's when they sold snacks. That's how the custom of having an intermission started.

Manager: I always thought intermissions began as a way to change the scenery.

Student: Oh, speaking of scenery...do you have the exact dimensions of the stage?

Manager: Sure.

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TPO 37-Lecture 3 (Vasari's Biographies Of Famous Artists)

Narrator: Listen to part of a lecture in an art history class.

Professor: I'm sure you've all heard of the Mona Lisa, the famous painting by Leonardo Da Vinci. The Mona Lisa is a portrait of a woman and it's thought to be the portrait of Lisa Gherardini but that's not certain. In fact, many things about the Mona Lisa remain a mystery. For example, we don't know exactly who commissioned the painting or how long Da Vinci worked on it and there are actually many scholars who think the mystery makes the painting more interesting. I think it places unfortunate limits on our analyses, makes it hard to make strong arguments about the painting.

Anyway, getting to the point: most people today might have never heard of the Mona Lisa, or of many other now famous works of art for that matter, if it hadn't been for Giorgio Vasari.

Giorgio Vasari was an Italian painter, architect and scholar. In the mid fifteen hundreds, he wrote a book called Lives of the Most Eminent Painters, Sculptors and Architects in which he describes, among many other things, the features of the Mona Lisa, including her famous smile. This book drew a lot of attention to Da Vinci and significantly increased the Mona Lisa's fame.

As the title suggests, Lives of the Most Eminent Painters, Sculptors and Architects includes biographies not only of Da Vinci but also of many other now famous Italian renaissance artists. This was the first time that a European author had made the personal lives of the artists a central component of an art history book and many a later author followed the example. The more important the artist in Vasari's view, the longer their biography in the book.

And by far, the longest of the biographies, is that of Michelangelo, the painter of the Sistine Chapel ceiling and sculptor of the famous statue of David, whose work Vasari adopted as his benchmark, his reference point for evaluating everyone else's artwork.

Many of the biographies are extremely detailed with all the basic facts about where the artists were born, where they'd worked, who their teachers were and so on.

But I read Vasari's book cover to cover almost every summer. I find it a great way to unwind during the summer break and what keeps me coming back to it are the anecdotes, fascinating anecdotes, that give you glimpses in the artist's private lives, their dreams, their fears, their virtues, their vices.

In his book, Vasari also tackled, quite successfully I might add, the enormous task of sorting out which works had been done by which artists, which works belong in the same stylistic categories, which works belong in similar categories in terms of quality and so on, stuff you take for granted today. But again, Vasari was the first European author to do that.

A word of caution though: Vasari was not at all averse to, how should I put it, modifying the facts. For example, in his book, he has a touching description of Da Vinci's death, in which Da Vinci dies in the arms of his last patron: The king of France, Francis the First.

Now, Da Vinci did spend the last years of his life working in the court of Francis the First. Vasari seemed to have overlooked a minor detail, however, the well documented fact that the king was far away when Da Vinci breathed his last breath. But why let the fact stand in the way of a great story, right? Since Vasari's tales are, as I've said, so compelling and because they have been repeated by so many subsequent authors, they're still often taken at face value. Even today. No questions asked.

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TPO 37-Lecture 4 (Endotherms And Ectotherms)

Narrator: Listen to part of a lecture in a biology class.

Professor: So, to review, who remembers how animals are classified in terms of body temperature? Mike?

Student: Um, endotherms and ectotherms?

Professor: Right! All animals are considered either endotherms or ectotherms. Therm-that means heat, and the main thing that distinguishes endotherms from ectotherms is the source of body heat.

So an endotherm, endo- meaning internal, an endotherm's body heat mainly comes from inside its body. It can generate its own heat internally with its metabolism. And an ectotherm, ecto- meaning external, an ectotherm gets its body heat mainly from outside its own body, meaning from its environment, mostly from the sun's radiation. So we've got endotherms. Mammals and birds are the classes that fall under this category. And ectotherms, that's pretty much everything else, including reptiles, amphibians, insects.

Now, body temperature is important. And if an animal's environment gets very hot or very cold, something needs to happen in order for the animal to maintain its body temperature within its normal range. In endotherms, this is mostly physiological. The body changes its rate of heat production.

Okay, well, humans are endotherms. What does your body automatically do when it gets really cold?

Student: Shiver?

Professor: Right, shivering. In fact, any muscle movement increases metabolism, the process that produces heat and keeps your body temperature up when your surroundings get cold.

And then there's what's known as brown fat, like other kinds of fat, it stores triiodothyronine, but brown fat is unique beca use it chemically produces lots of heat even without muscle movement. That's especially beneficial for small mammals in colder climates. And when an animal gets too hot, well, have you ever seen a dog cooling off by taking short, quick breaths? And humans, we sweat, of course, perspire, which also gets rid of body heat. These are automatic, physiological responses too. Yes, Sally?

Student: So, in endotherms it's really not about behavior, about doing things.

Professor: Well, a human, you know, might put on a winter coat or jump in a swimming pool, or elephants, elephants might spla sh themselves with cold water when it's warm out, but for the most part, no. It's not what we endotherms do that keeps our temperatures within range, unlike ectotherms.

Student: Well, what about ectotherms, like frogs? They must have metabolism too.

Professor: Sure they do.

It's just that metabolism in ectotherms is so much lower. I mean, the metabolic rate of an endotherm, say, a mouse, is at least six or seven times that of an ectotherm of a similar size like a frog or a lizard. An ectotherm doesn't generate nearly as much heat internally. So its body temperature will tend to equalize with the temperature of its surroundings. And that's where behavior comes in. Imagine a lizard, okay, living in the desert.

Now, a desert gets very cold at night and very hot during the day. So what does the lizard do to maintain its body temperature? Well, on a cold morning, it can warm itself by going to a sunny spot and lying in the sun, and later if it gets too hot, it can seek out a cool place in the shade. It's by means of such behavior that an ectotherm like this lizard regulates its temperature. But you put that same lizard in a temperature controlled chamber and gradually drop the temperature, say, 20 degrees, and here of course, the lizard can't go off to lie in the sun. So what happens?

Student: Well, the lizard's body temperature drops too.

Professor: Right, and this really slows down its metabolism, which depends on temperature. Even that 20 degrees drop in body temperature though, the lizard can survive that no problem, and come out just fine when it warms up again. Ectotherms can do that.

Student: But an ectotherm probably wouldn't survive in a place where the temperatures got too low, right?

Professor: Ever heard a frog being chased by a polar bear?

Student: No.

Professor: Well, there you are. Now a mouse in the same situation, in the same temperature chamber, is just the opposite of the lizard. When the temperature goes down, the mouse's metabolism goes up. Like any endotherm, it starts producing more heat to keep its body temperature stable, same as it would do outside in a field.

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TPO 38

TPO 38-Conversion 1 (Campus Housing For Summer)

Narrator: Listen to a conversation between a student and an employee in the university housing office.

Employee: Hi. Can I help you?

Student: I hope so. I am taking a class this summer and I need to see about getting campus housing.

Employee: Oh, sorry. I am afraid the deadline to apply for summer housing in the dormitories has already passed. I could help you look for something off campus.

Student: Well, see, I only found out yesterday I need to take this course. It wasn't really my idea. I mean I was gonna take it in the fall. It is a course I need for my major in cognitive science, Professor Wilson was supposed to teach it but now...

Employee: Oh, right. I heard he is taking a last-minute leave of absence next year. I hope everything is okay.

Student: Oh yeah. He'll be in Botswana helping develop the new cognitive science program at our sister university there. Anyway I have to take the course this summer if I want to graduate on time. I've got a note from the dean approving the whole situation.

Employee: Oh, well, in that case I guess we'd better make an exception for you. Only problem is most of the bedrooms are gone already. Was there any particular dorm you were interested in?

Student: Well, I'm in Randolph Hall right now, but my roommate's graduating in May so I have signed up for a single in Murphy for the fall, room 206. I was hoping I might be able to just move in there now.

Employee: Well, let's see what the computer says. Sorry, that room's scheduled for repainting and maintenance over the summer. So I can't give it to you.

Student: I don't really care if it's repainted. I'll be covering most of the walls with posters anyway. Couldn't I just take it as is?

Employee: Sorry, no. It is actually a city ordinance. All rental rooms including dorm rooms have to be painted at least once every five years.

Student: Oh, well, how about if I stay where I'm for the summer? I'm pretty sure they just painted it a couple years ago.

Employee: Hang on, let me check. You said Randolph, right?

Student: Room 122.

Employee: Oops. Afraid not. The entire floor is taken.

Student: Oh, well. Guess I'll just have to move twice.

Employee: One sec. I have got one more idea. Here we go. There is a room open in Murphy just down the hall from your new one. That way come fall, you'd only have to carry your things a few doors down.

Student: Okay, works for me.

Employee: Now, that room is a double. Right now you have got it to yourself but there's a chance someone else might sign up at the last minute, not likely. But you could end up with a roommate for the summer. Would that be okay?

Student: Oh, sure. I can get along with anyone for a couple of months.

Employee: Okay, then, I will get the forms printed up. They should be ready for you by tomorrow afternoon. You can stop by and sign them then.

Student: Excellent, thanks.

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TPO 38-Lecture 1 (Tulip-breaking Virus)

Narrator: Listen to part of a lecture in a botany class.

Professor: Okay. Let's move on, to bacteria and viruses that can infect plants. And let's start out with a virus that's rather common in various plants but first became known in connection with tulips. This virus can cause a change in pigmentation that dramatically affects the color of the plant's leaves or flower petals. But since not all cells of the plant tissue are infected, the result tends to be color variation. With color intensified in one part of the flower petal and faded in another, this is called color breaking. And the virus that causes this in tulip is called the tulip-breaking virus.

The tulip-breaking virus is now known to have detrimental effects on plants. They're weaker and sometimes reduced in size.

But for centuries people didn't have a clue about this virus. Not until the early 1900s was it known what caused the color breaking in tulips, what made the tulip plant produce flower petals so radically different in color or in pattern from what you would have expected.

Tulip flowers with stripes or streaks or feather or flame patterns on their petals, there is no doubt in my mind that these symptoms of this breaking virus affected human behavior too indirectly, that they set off the famous tulip craze in the Netherlands.Let me explain.

In the 17th century, the Netherlands was among the most important trading centers in all of Europe with lots of rich merchants who wanted to showcase their wealth, for example, by displaying exotic tulips in their private gardens.

Now, tulips are not native to the Netherlands. They originated in the mountains of Central Asia and spread from Persia, present-day Iran, to the Turkish Ottoman Empire and from there eventually reached Europe.

There's an explanation for the origin of the name 'tulip' that kind of reflects this. Apparently, it came from a Persian word for 'turban', you know, a cloth wound round the head. Um, a style of headgear worn by men in that part of the world.

Well, the Ottomans used a similar name for tulips after they acquired them from Persia. And then, in the late 16th century, a variation on that name found its way from what is now Turkey to the Netherlands along with the plant itself.

Okay.

A tulip, of course, is typically grown from an underground bulb. And although as it flowers the old bulb shrivels to almost nothing, the plant produces another large bulb and maybe two, three, four smaller ones to take its place, and while tulips take up to seven years to bloom if you start from seeds. A large bulb can produce a flower the very next year. With the smaller bulbs it takes maybe a couple of years. And since these bulbs remain viable for quite a long time, even out of the ground, they can be stored or transported long distances without much of a problem, which helps explain the spread of tulip cultivation.

At first, tulips were rare in the Netherlands and only for the wealthy. But in the early 17th century, as more bulbs were produced there, you'd think the prices would come down. In fact, though, the popularity of some tulips increased tremendously. So demands soon far exceeded supply and their prices skyrocketed. And the tulips most prized for their uniqueness and beauty were apparently the ones inflected by this mysterious virus. At that time, nobody was really able to breed tulips like these. Color breaking happened in just two or three out of a hundred bulbs and seemingly just by chance.

And since you didn't really know when you bought a bulb if the colors would break, well, Dutch speculators invested hand over fist and drove prices sky high. Some bulbs, even while still in the ground, were sold for as much as you would pay for a house at the time. But the huge speculative bubble created by this tulip craze eventually collapsed. And when the prices fell, that wiped out a lot of fortunes almost overnight.

Later on, tulip breeders learned to duplicate color breaking in healthy, uninfected plants, so the spectacular-looking tulips so common today are the result not of chance viral infections, but of carefully controlled breeding.

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TPO 38-Lecture 2 (Congruent and Incongruent Media)

Narrator: Listen to part of a lecture in a business class.

Professor: Last time we talked about the design and production of advertisements. Today we'll be discussing how advertisers decide where to display their ads. This is critical to a successful marketing campaign because it builds up the consumer's brand awareness, their knowledge of a product made by a particular manufacturer. And studies show that the more you are aware of a product, there's a greater chance you'll buy it.

Now, most ads we see in the media, like in newspapers, television, or magazines, are placed where the product is matched with a medium of a similar theme.

Let's take...uh...the medium of magazines as an example. If you were to flip through, say, an automotive magazine, what kind of ads would you expect to find? Jack?

Student: Ads for cars, car parts, tires, stuff like that.

Professor: Good. When you have an ad for a certain product in media with a similar theme, we call that congruent media. Congruent simply means it fits. It's what you would expect. Congruent media placement is the most logical choice for marketing a product.

First, it's obvious that people reading a car magazine are interested in cars. So if you place a car ad there, you know you are reaching the right audience. Also, research shows that when people read an ad in a congruent medium, afterwards, they have pretty good recall of what was advertised.

Now, there's another approach, that's placing ads in incongruent media. Incongruent media are the magazines, newspapers, TV spots, where the theme doesn't match the theme of the product. Even though it seems counterintuitive, research shows that this also is an effective marketing strategy. One study tested this by placing car advertisements in a magazine that had an incongruent theme and it found that this contributed to consumers' positive attitudes toward the ad and the car being advertised.

Student: What kind of magazine was it?

Professor: A cooking magazine.

Student: Wow! That worked? I'd have imagined it would be a distraction to see something like that, you know, out of place.

Professor: Well, keep in mind that potential car buyers don't read only car magazines. Most have other interests. Many of them probably subscribe to other magazines, a news weekly, a financial publication, something related to a special interest or hobby. So what marketers have to do then is carefully research potential customers and look for overlapping interests, which magazine overlaps most with the interests of the car buyer. Then when they do choose to place ads in incongruent media, they know they'll be effective.

Student: Okay.

Professor: Now this study suggests that because the people reading a cooking magazine didn't expect to see a car ad, they actually paid more attention. And so for example, when people who like reading about cars see a car ad in a car magazine, they might pass over it quickly, while here...

Student: They actually took more time to read the ad.

Professor: Right! People paid more attention. They processed the information more carefully when it appears in a medium with a different theme.This ultimately results in stronger brand awareness, which leads to a more favorable impression of that product overall. Jenny?

Student: So according to the study, basically when I see an ad in an unexpected place, it'll make me want to buy the product?

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Professor: Well, yes and no. The research shows you'll probably remember that ad and you are more likely to feel positive about that product. Now, whether you'll go out to buy it is a different story.

Of course, there are other factors at work here. You remember those criteria we discussed last week? Anyway, this explains why most marketers today rely on a mix of congruent and incongruent media.

But there are limits to how incongruent the media should be. You don't want a totally mismatch. So in a magazine aimed at new parents, you often see car advertisements since parents buy and drive cars. But there are different types of cars, right? For example, placing an ad here for a big roomie van, which is popular with big families would make sense, but a snappy sports car with only two seats? Well, that would clearly be too much of a mismatch.

TPO 38-Conversion 2 (Domestic Exchange Program)

Narrator: Listen to a conversation between a student and his ecology professor.

Professor: How is it going? Tom.

Student: Great! I was, oh. I wanted to tell you. You know the guest speaker you brought into class last week from the wildlife conservation center.

Professor: Susan Brown. Yes. She is an old friend from graduate school.

Student: Her talk on wildlife population modeling, well, it was very theoretical.

Professor: It was certainly a change of pace from what we usually do.

Student: Yeah, but I think I pretty much followed along. Plus, I like to see people get so passionate about ecology.

Professor: Oh, right. Ecology is your major field of study, isn't it? Yes, Susan Brown's certainly a lively speaker. What a shame she didn't go into teaching.

Student: Uh, anyway, what I, well, a while ago, I saw this blurb in the school paper about an exchange program that's part of the study abroad office. And today there was booth set up in the student center with a couple of students answering questions about the university's programs in foreign countries. Seeing the booth reminded me about the article in the paper and...

Professor: Thinking about going abroad in the coming year?

Student: Actually I just spent last summer studying in Tokyo. I think that satisfied my urge to travel.

Professor: It must've been quite an experience.

Student: Definitely. Taking all those language courses was really challenging. But what I wanted to find out at the booth was: it's...um...a domestic exchange program, not studying abroad, but studying for a year somewhere else here in the United States.

Professor: I don't think I have heard of that.

Student: Well, neither had the guys in the booth. They didn't know what I was talking about. But when I talked to the supervisor in the study abroad office, it turns out we are part of a... a group of universities throughout the US that does a domestic exchange program.

Professor: Huh! So you spent...what...a year at another university and your classes count toward your degree here?

Student: Yeah, and I paid the same fees, tuition, room and board, that I pay here. So it doesn't really cost any extra.

Professor: Interesting.

Student: And you know I've lived here in southern Florida my whole life. And I've always been interested in Montana. The university in Montana, where I want to go, has classes that deal specifically with the ecology

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there. Like I am interested in the greater yellow stone ecosystem. It is such an important ecosystem being the source of three major rivers, and I want to learn more about it.

Professor: Wow! This is a unique idea. The climate, the plants and wildlife, it's really different from here, probably the culture too in a way, and don't forget about all the outdoor activities you could do there, hiking, skiing, and the national parks.

Student: That's true. Anyway I'll have to get my application together in the next month or so, and I'll need two letters of recommendation, one from a professor in my major department.

Professor: Consider it done.

Student: Thanks.

TPO 38-Lecture 3 (Found Sound)

Narrator: Listen to part of a lecture in a music history class.

Professor: So let's continue our discussion of twentieth century music. By the early twentieth century, some composers in Europe and the United States, composers of what's considered classical music, were already moving away from traditional forms and were experimenting with different ways of composing. In many cases, moving away from traditional western scales and tonalities.

But as the century progressed, some composers, composers of what was called avant-garde music, went further. Their experiments with musical composition were not always well accepted. Quite the contrary, you see, many people felt avant-garde music was too radical and wasn't even legitimate art.

A case in point is the composer John Cage.

Cage was probably the most famous composer of twentieth-century avant-garde music. He didn't begin his music radical, but as time went on, his musical experiments led him there.

What caused the change?

Two experiences in particular entirely changed how he thought about music. First was his 1951 meeting with the avant-garde painter Robert Rauschenberg.

Now, avant-garde is a term that applies many different artistic genres. Rauschenberg had created a series of famous paintings that consisted simply of white paint of different textures on canvas. That's all they were: white.

But the concept of these paintings actually wasn't so simple.

Rauschenberg was asking, in effect, how much could you leave out of an artwork and still have something? Because in fact, even on a purely white canvas, there's still plenty to see, shadows, dust, reflections.

For Cage, Rauschenberg's white paintings opened up a whole new way of understanding what art could be.

The second key experience in Cage's development came when he stepped in an anechoic chamber. An anechoic chamber is a room with special walls that absorb sound. Anechoic means without echoes. So an anechoic chamber was a room where, in theory, you can experience total silence. But Cage entered this room and he heard two sounds, one high and one low. The high sound, he was told, was his nervous system operating, and the low sound was his blood circulating.

Cage was profoundly affected. He realized that music doesn't need to be created intentionally. We find it all around us. This idea came to be called found sound. It's the sounds that are already there, traffic outside your window, or whatever. For Cage, they were just as musical as sounds made by musical instruments.

These experiences led Cage to create a composition that would convey the idea of found sound. That is, it would provide an opportunity for the audience to identify random sounds of the environment as music. So he composed a piece called 4 minutes 33 seconds, commonly known as the silent composition. And this composition was completely silent, literally. When it was performed the first time, a pianist sat on stage at the piano and the only

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thing he did was raise and lower the lid of the keyboard to indicate the beginning or ending of a movement. 4 minutes 33 seconds had three movements, but not a note was played in any of them.

Well, the audience was outraged. Music critics called the piece ridiculous. But Cage saw no reason for the outrage. The fact that the audience was scandalized showed that they missed the whole point of his composition, which was that there's no such thing as silence, no such thing as a complete absence of sound, and whilst in fact during that first performance, the sound of wind and rain and people muttering.

Cage had a different understanding of silence. He defined silence as the absence of intended sounds. So to perceive 4 minutes 33 seconds as music, the audience needed to tune in to the sounds around them.

This was quite revolutionary. So we should probably be sympathetic to their reactions at the time. I mean, it's confounding people even today! Cage's silent composition is still performed all over the world, but I'm afraid to say, it's often misinterpreted. It's been choreographed, in dance performances for instance, in which case the sound was the beat of the dancers' feet against the stage floor. And it's been performed by people who made noises on purpose to call attention to the piece's silence. Can you see why we can consider these performances to be misinterpretations?

TPO 38-Lecture 4 (The Formation Of Gas Planets)

Narrator: Listen to part of a lecture in an astronomy class.

Professor: Last week we discussed the formation of Earth and the other rocky planets, of planets in the inner solar system. Uh, so, what about the gas giants? Jupiter, Saturn, Uranus, and Neptune.

Well, there's two theories. But first, let's recap. We believe our solar system began as a huge spinning cloud of dust and gas, which flattened and eventually collapsed in on itself. The matter it's centered condensed into a ball of hot gas and dust, eventually becoming our sun. And what happened to the remaining cloud?

To the disk encircling the sun when it was a young star?

Student: The rocky planets were born. Um, dust, little grains of rock and metal within the disk collided with each other and stuck together, and this process sort of snowballed over millions of years until the chunks grew into mini-planets, proto-planets.

Professor: Yeah. This process is called accretion. And we call the disk an accretion disk.

Now, think of it as two parts: an inner accretion disk, and an outer accretion disk. In the inner part, once an object gets large enough, that object's gravitational field gets stronger, which speeds up the accretion process. You know, larger objects attract smaller ones and sort of gobble them up.And eventually, you get a full-sized planet in its own orbit.

Okay. That's how the inner rocky planets probably formed by accretion.

But what about those gas planets in the outer solar system, in the outer accretion disk?

Well, the first theory says the accretion process was similar to the one that formed the rocky planets, with some key differences.

Remember, the gas giants are farther from the sun, where temperatures are much colder. So, in the outer accretion disk, compounds like water and ammonia exist in frozen form. Closer to the sun, they're more likely to be vaporized by solar radiation. What this means is that in addition to rocky and metallic particles there would be other solids like frozen water and frozen ammonia.

Student: So more solid substances are available to clump into protoplanets, right?

Professor: Precisely! So the solid cores of the gas giants could conceivably have formed by accretion. And once their mass reaches a certain point, around about 5 to 10 Earths, what would happen?

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Student: 5 to 10 Earths...uh, with a mass that big, I guess gravity would start to pull in more and more material faster, right?

Professor: Material, meaning gas. It would rapidly pull in more and more gas from the accretion disk, so you end up with a solid core of rock, metal and ice surrounded by massive amounts of gas. That's the core accretion theory. Now, the other theory is called the disk instability theory.

The disk instability theory holds that gas begins the planet-making process, without a solid core. You see, most of the outer accretion disk would have been gas. We believe solid particles probably made up just one percent of the outer accretion disk.

So this theory suggests that large planets, the gas giants, uh, they develop from large clumps of mostly gas and some dust in an accretion disk. Outer regions of an accretion disk can be unstable, gravitationally unstable, which is what causes these clumps to form, and in some cases, grow in to proto- planets.

Over time, dust particles within a gas clump coalesce, bond together, and eventually fall toward the center, creating a core. Once this happens, the gas clump grows relatively quickly as its gravity pulls in more and more gas and dust particles. And this whole process can theoretically happen within one hundred thousand years.

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TPO 39

TPO 39-Conversion 1 (Grotowski's Idea About Theater)

Narrator: Listen to a conversation between a student and a theater professor.

Student: Hi, Professor Johns.

Professor: Hey, didn't I see you at the performance of Crimes of the Heart last night?

Student: Yeah. Actually my roommate had a small part in it.

Professor: Really? I was impressed with the performance. There sure are some talented people here. What did you think?

Student: You know, Beth Henley is an okay playwright. She has written some decent stuff, but it was a little too traditional, a little too ordinary, especially considering the research I'm doing.

Professor: Oh, what's that?

Student: On the Polish theater director Jerzy Grotowski.

Professor: Grotowski. Yeah, that's a little out of the mainstream. Pretty experimental.

Student: That's what I wanted to talk to you about. I had a question about our essay and presentation.

Professor: Okay.

Student: Yeah. Some of these ideas, uh, Grotowski's ideas are really hard to understand. They are very abstract, philosophical. And, well, I thought the class would get more out of it if I acted out some of it to demonstrate.

Professor: Interesting idea. And what happens to the essay?

Student: Well, I will do the best I can with that, but supplement it with a performance. You know, bring it to life.

Professor: Alright. But what exactly are we talking about here? Grotowski, as I'm sure you know, had several phases in his career.

Student: I'm mainly interested in his idea from the late 1960's: poor theater. You know, a reaction against a lot of props, light, fancy costumes, and all that. So it would be good for the classroom. I wouldn't need anything special.

Professor: Yes. I'm sure a lot of your classmates are unfamiliar with Grotowski. This would be good for them.

Student: Right. And this leads...I think there's overlap between his poor theater phase and another phase of his, when he was concerned with the relationship between performers and the audience. I also want to read more and write about that.

Professor: You know, I saw a performance several years ago. It really threw me for a loop. You know, you are used to just watching a play, sitting back, but this performance, borrowing Grotowski's principles, was really confrontational, a little uncomfortable. The actors looked right in our eyes, even moved us around, involved us in the action.

Student: Yeah. I hope I can do the same when I perform for the class. I'm a bit worried since the acting is so physical. That there's so much physical preparation involved.

Professor: Well, some actors spend their whole lives working on this, so don't expect to get very far in a few weeks, but I'm sure you can bring a couple of points across. And if you need some extra class time, let me know.

Student: No. I think I can fit it into the regular time for the presentation.

Professor: Okay. I think this will provide for some good discussion about these ideas and other aspects of the audience and their relationship to theatrical productions.

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TPO 39-Lecture 1 (Mineral Evolution)

Narrator: Listen to part of the lecture in a geology class.

Professor: Since Earth formed some four and a half billion years ago, the number of minerals here has increased dramatically, from a few dozen relatively simple minerals early on to over 4,300 kinds of minerals we can identify today, many of them wonderfully complex. A basic question of geology is how all these new minerals came into being. Well, recent studies have turned to biology to try to explain how this happens.

Now, much of biology is studied through the lens of evolution. And the theory of evolution suggests that as environments change, and inevitably they do, some organisms will have characteristics that allow them to adapt to those changes successfully, characteristics that help these organisms develop and survive, and reproduce. And when environments become more complex, as tends to happen over time, those earlier adaptations, those variations, become the basis of yet other combinations and variations, and lead to ever more diverse and complex forms of life. So from fewer, simpler and relatively similar forms of life billions of years ago, life on Earth has now become a dazzling array of diversity and complexity.

Well, some geologists now want to apply this concept to explain mineral diversity too. The conditions that minerals are under are not constant, conditions like temperature, or pressure, or chemical surroundings. These change, often in cycles, increasing and decreasing slowly over time. And as conditions change, minerals sometimes break down. And their atoms recombine into totally new compounds as part of a process some called mineral evolution.

Now, minerals are not alive of course, so this is not evolution in quite the same sense you'd have in living organisms, but there do appear to be some parallels. Living organisms not only adapt to their environment, but also affect it, change the environment within which other organisms may then develop. Likewise each new mineral also enriches the chemical environment from which lots of other even more complex new minerals may be formed in the future.

Beyond these similarities though, what's really fascinating about mineral evolution is the way minerals apparently coevolve with living organisms.Uh, what do I mean by that?

Well, it's maybe a billion years after Earth's formation that we first see evidence of life. Of course early life forms were primitive, just tiny, single-celled microbes, but overtime, they had a profound effect. Huge numbers of these microbes began producing food by photosynthesis, which of course also freed up enormous amounts of oxygen and lots of that oxygen interacted with the atoms of existing minerals, creating rust out of iron for instance, reacting with a whole range of different metals to create lots of new minerals.

Now, living organisms rely on minerals, but they not only take in some minerals as nutrients, they also excrete others as waste products, including what we call bio minerals, minerals that form with the help of biological life. We can see geologic evidence of bio mineral production in what are called stromatolites.

Stromatolites look like wavy layers of sedimentary rock, but they are really fossils, fossils of the waste from microbial masts. Microbial masts are vast colonies of one-celled organisms that were once the most prevalent form of life on Earth. And the study of stromatolites indicates that these ancient microbial masts interacted with minerals in the environment and left behind new compounds as waste products. Bio minerals like carbonates, phosphates, and silica. In fact, we've grown microbial masts in the laboratory. And over time, they too have produced some of the same sorts of minerals found in stromatolites. Uh, you don't need to know the details of the process right now. We are still figuring out just how it works ourselves.

But you might be interested to know that this concept of mineral evolution is being used in the search for evidence of life on other planets. The thinking is that if certain minerals occur here on Earth, as a result of a biological process, and if we also find those same minerals on another planet, this would suggest that life may have once existed there!

But just because a particular mineral is found on, say Mars or Venus, we really shouldn't assume that whatever caused it to turn up there, must be the same process that formed that mineral here on Earth.

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TPO 39-Lecture 2 (Community-determined Film)

Narrator: Listen to part of a lecture in an anthropology class. The professor is discussing ethnography.

Professor: Since ethnography is all about the descriptive study of an individual culture, film has proved to have great value as a tool for anthropologists in their research. Let's look at a particularly effective approach to ethnographic film-making, which was developed in the 1970s. This particular style of ethnographic filmmaking is called the community-determined approach.

The intent of the community-determined approach is to achieve a kind of, uh... shared authorship. See... in this approach, the goals of the project and how the information will be used are discussed ahead of time, and so a culture, uh... community is not just the focus of the film. They are actually equal participants in the whole ethnographic process. In this way the film revolves around the actual values and concerns of the individuals in the community, and it honors an individual's ethical right to control how he or she is presented in the media. Several of these films were made in Alaskan communities in the 1970's.

Student: So how does it work, you know, the community-determined part?

Professor: Well, it takes a lot of preparation.

First, way before filming begins, the filmmakers visit the community and meet with the village council who are the decision-makers of the community. A film if available is shown to the village council so that they get an idea of the experience of another community. After the meeting, the filmmakers leave and the village council is given all the time they need to think about what was discussed. Later, if the village council members are interested, they send a letter or call.

Student: There's no follow-up meeting?

Professor: Not unless they want one. See, this helps remove any pressure to say yes. The social pressure from the filmmakers' presence.

Student: So, if they agree, then what?

Professor: Then the filmmakers start living in the community. See, another major point in the community-determined approach... it's very important that the filmmakers plan to stay in the community for an extended period of time, not weeks, but months.

And really, there are several reasons for this. Any ideas?

Student: The filmmakers could get a more realistic sense of the pace of life in that community? Uh, its daily rhythm?

Professor: Correct, and it allows the filmmakers to shed some of their assumptions so that they better interpret what they see.

Student: I bet it also takes the mystery out of the filmmaking process. You know, everyone has time to get used to the filmmakers and their equipment.

Professor: Exactly, trust is established and relationships are built first.

Student: Wow, this seems like a long process. It must cost a fortune.

Professor: It does. Even with a small film crew any project as involved as this is bound to.

Student: OK, so who decides what goes into the film?

Professor: Well, such decisions are made by general consensus within the community. So, for instance, the community, not the filmmakers, decide who is to be interviewed for the films. Control of the interview is in the interviewee's hands. If the person being interviewed says to stop at any time, the recording stops. He or she states where they wish to be filmed and when and what topic they wish to speak about. The community members review the footage both midway and at the end of the filming. And if they want any scene deleted, it gets removed. That's the level of respect and regard for the interviewee's preferences and those of the community in general.

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Student: So then what language is everything filmed in?

Professor: Excellent question!

Language is culture, isn't it? So the native language, rather than a dubbed voiceover in the filmmakers language, is the primary language of the film. This way a speaker's emotions and manner of expression really come through, even if we don't know their language. Subtitles are placed in a secondary position at the bottom of the screen.

Student: And the subtitles probably give only the gist of what's actually being said.

Professor: Yeah, a word for word translation could become too complicated or it'd go by too fast on the screen.

TPO 39-Conversion 2 (Career Fair)

Narrator: Listen to a conversation between a student and an employee in the university career services center.

Employee: Hi. Can I help you?

Student: One of my sociology professors suggested that I come to the career services center and talk to you. She thought there was going to be a career fair soon where I could talk to different companies about a possible summer job.

Employee: Well, these are classroom-to-cooperation career fair. That's our largest fair every year. We get representatives from over 100 companies and they actually conduct interviews right here on campus.

Student: Great! What kinds of companies?

Employee: This year we'll have representatives from all the major technology companies in the area.

Student: Oh. Then I don't know how helpful that will be. I'm a sociology major.

Employee: Well, that's fine. Sociology students often get jobs in marketing, administration, human resources. Tech companies have openings in those areas.

Student: Well, I'm mainly interested in working with people, in human services.

Employee: Well, in that case, we do have a smaller fair coming up, with smaller companies and some public service organizations. This one might be a better fit for you.

Student: Yeah. I think that was the one my professor was talking about.

Employee: Most likely. Now, have you been to a fair like this before?

Student: Not really, but I just show up and talk to different companies, right? I don't have to register or anything, do I?

Employee: No, you don't have to register, but I highly recommend that you come prepared.

Student: Prepared?

Employee: You should dress professionally and have copies of your resume with you.

Student: Copies of my resume? Do I really need that?

Employee: Well, it's not a requirement, but a lot of students come to our career fairs. Plus, we've opened up these fairs to the public, to people in the neighboring communities. So anything you can do to make yourself look more...well...look more professional. That's gonna set you apart from the other job applicants.

Student: Um..I don't even have a resume. I've never written one before.

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Employee: Oh, that's not a problem at all. Have you been to our new website? It has all sorts of information about how to write a resume. And once you've written it, you can make an appointment to bring it in to us at the career services center and have someone look at it with you.

Student: Okay. So I really need to have a resume just to get a summer job?

Employee: That depends on the company, but it's a good idea to have one.

Student: Okay. I guess I'll need to have one sooner or later anyway.

Employee: Oh, and we'll be adding other information to our website eventually. Like we'll have a list of the companies that are going to be at the career fair by the end of the week. You should check it out and then maybe do some research on the companies. That should help you when you talk to them too.

TPO 39-Lecture 3 (Thoreau's Ideas About Train)

Narrator: Listen to part of the lecture in a literature class. The professor is discussing Henry David Thoreau.

Professor: Nowadays, trains are pretty much taken for granted, but in the United States in the first part of the nineteenth century, when Thoreau lived, the railroad was a big deal, a technological revolution. It was kind of earth-shattering to ride in a mechanical conveyance at fifty kilometers an hour in the 1830's.

The train, or 'iron horse' as people called it, unlocked all sort of new experiences of time and space. Thoreau himself praised trains for changing the way people experience their own bodies, for stirring the imagination in new ways. So, in Thoreau's famous book, Walden, as you know, Walden is one of the central literary texts of the United States from that time period, and in it, Thoreau offers both praise and criticisms of trains.

Um. . .Thoreau is sometimes seen as being anti-modern, but he's not. He uses poetic language, descriptive metaphors to inspire, to awe his readers, to communicate the fact that the railroad was a feat of human ingenuity.

Thoreau also associates trains with commerce and trade. Though his attitudes toward commerce are complicated, he credits trains for delivering goods that feed and clothe society, things that improve human life.

But Thoreau also critiques trains on what we could call philosophical grounds. He points out that riding on trains distorts people's experiences of the natural world. Trees, wild life, landscapes just zip right past you and this is a real problem for him. Thoreau also worries that trains had become an institution regulating the whole country.

He worries about people doing things in 'railroad fashion', conforming to the train's timetable, letting their lives be governed by this mechanical device that is making its way into the fabric of society. And he extends this critique to other inventions of the day, like the penny press, this very fast steam-driven press. He talks about popular literary genres, like penny newspapers and dime novels, which were being published in mass quantities.

He worries about people no longer thinking for themselves and uncritically accepting all this cheap popular literature and the trivial details of the news. So Thoreau is offering here a critique of technology that might be relevant for our own times, and I think it's important to take it seriously. When there is a new invention, a new computer or a mobile phone technology, some new gadget, there is a tendency to think that we need to have that thing, just as people were doing in the nineteenth century with respect to railroads. Accepting them as a necessity without considering the possible negative consequences or trade-offs that can flow from them. Okay. Can anybody offer an example of what I'm talking about? Deborah?

Student: Yeah, there was this new computer game that my brother just had to have, so he saved his money and bought it, which was good, I guess that he saved his money and all, but now he spends like all his spare time playing that game instead of riding bikes with his friends or reading books like he used to do, and it's causing some friction between him and our parents.

Professor: Perfect example! Deborah. So this is one way to think about Thoreau's text, not just as an important book in its time, for what it tells us about the nineteenth century, but also as a text that can teach us certain things about ourselves in contemporary society.

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TPO 39-Lecture 4 (Potential Alternative Source of Energy-cellulose)

Narrator: Listen to part of a lecture in a biology class.

Professor: Your reading for today's class was about potential alternative sources of energy. So one thing I want to do today is consider one of those potential energy sources: cellulose.

Who can tell us what cellulose is? Alan?

Student: Cellulose. Yeah. It's a tough organic molecule made of simple sugars. It's found in the walls of all plant cells, in grass, trees, all plants. And well, there's more cellulose than any other organic molecule on Earth.

Professor: Good. It's also a potential tremendous source of energy in part because there's so much of it.

Now, many organisms live on the energy they derive from consuming cellulose, like many species of bacteria or cows and goats. Cows and goats have evolved highly specialized digestive systems that allow them to metabolize cellulose.

Student: But it's hard for most species to process cellulose?

Professor: Yes. And it's been very hard to develop a controlled way to process cellulose in a lab so that we can use the energy that's stored in it. It needs to be converted into ethanol.

Let me explain. Ethanol is a liquid, a kind of alcohol that's derived from processing sugars from plants, often corn. And it can be used as fuel. Many researchers believe it is the key to ending the reliance on gasoline.

The problem is that the amount of energy we get from corn-based ethanol isn't much more than the amount of energy that gets put into making it. So it's not really worth it. Tina?

Student: But ethanol made from cellulose is different?

Professor: Yes. It's possible to get a vastly better energy yield on cellulose-based or cellulosic ethanol.

Student: Okay. So why don't we just use cellulosic ethanol?

Professor: Well, the problem is that the current method for processing cellulose into ethanol is very expensive and can't be done on a large scale.

See? Currently there are two key steps in the process.

The first is breaking the cellulose down into sugars. This is done with an enzyme, a specific type of protein. And second, after the enzyme has broken down the cellulose, yeast and other microorganisms, microbes are added to ferment those sugars into cellulosic ethanol.

Thing is, though, we are not too good at producing the enzymes that break down cellulose. Those proteins are very difficult to make, to just assemble in a lab. So usually we extract enzymes from microorganisms that produce them naturally. Unfortunately, this is slow, expensive, and just not very efficient.

Student: So are they trying to develop a better way to make enzymes?

Professor: Actually there's a company that thinks they can do better than that. It'd be more efficient and therefore cheaper to combine the two steps I mentioned into one. That is, have a single organism that breaks down cellulose and then produces ethanol. So what this company is doing is searching around the world and gathering naturally occurring microorganisms that do both things.

I mean, the best key to unlocking the power of cellulose may well lie in a rare species of bacteria or yeast in a jungle somewhere.

So researchers at this company have discovered some microorganisms that process cellulose and produce ethanol. Now they are working on enhancing, improving certain natural characteristics of these microorganisms, manipulating them with sophisticated technology to make them work even more efficiently. The goal, which seems to definitely be within reach, is to design an engineer, a superbug, a specific kind of microbe, that makes cheap, commercial production of cellulosic ethanol a really possibility.

TPO40

Conversation1

Listen to a conversation between a student and a business professor.

第二段

1 .Thanks for seeing me. Professor Jackson.

第三段

1 .Sure, Tom. What can I do for you?

第四段

1 .I'm gonna do my term project on service design.
2 .What you see as a customer, the physical layout of the building, the parking lot.
3 .And I thought I'd focus on various kinds of eateries: Restaurants, coffee shops, cafeterias
4 .So I'd also analyze where you order your food, where you eat, and so on.

第五段

1 .Wait. I thought you were gonna come up with a hypothetical business plan for an amusement park.
2 .Isn't that what you e-mailed me last week?
3 .I could've sworn...
4 .Oh, I'm thinking of a Tom from another class. Tom Benson. Sorry. Sorry.

第六段

1 .No problem. I did e-mail you my idea too though.

第七段

1 .That's right. I remember now. Restaurants, Yeah.

第八段

1 .So here's my question.
2 .I read something about service standard that kind of confused me.
3 .What's the difference between service design and service standard?

第九段

1 .Service standard refers to what a company...
2 .employees are ideally supposed to do in order for everything to operate smoothly.
3 .The protocols to be followed.

第十段

1 .Oh, okay.

第十一段

1 .So backing up.
2 .Service design is...uh, think of the cafeteria here on campus.
3 .There are several food counters, right?
4 .All with big, clear signs to help you find what you're looking for: soups, salads, desserts.
5 .So you know exactly where to go to get what you need.
6 .And when you are finished picking up your food, where do you go?

第十二段

1 .To the cash registers.

第十三段

1 .And where are they?

第十四段

1 .Right before you get to the seating area.

第十五段

1 .Exactly. A place that you would logically move to next.

第十六段

1 .You know, not every place is like that.
2 .This past weekend was my friend's birthday, and I went to a bakery in town to pick up a cake for her party.
3 .And the layout of the place was weird.
4 .People were all in each other's way, standing in the wrong lines to pay, to place orders.
5 .Oh, and another thing, I heard this bakery makes really good apple pie, so I wanted to buy a slice of it too.

第十七段

1 .OK.

第十八段

1 .There was a little label that said apple pie where it's supposed to be but there wasn't any left.

第一十九段

1 .That's what's called a service gap, maybe there wasn't enough training for the employees or maybe they just ran out pie that day.
2 .But something is wrong with the process, and the service standard wasn't being met.

第二十段

1 .OK. I think I get it.
2 .Anyway, since part of the requirements for the term project is to visit an actual place of business.
3 .Do you think I could use our cafeteria?
4 .They seem to have a lot of the things I'm looking for.

第二十一段

1 .Well, campus businesses like the cafeteria or bookstore don't quite follow the kinds of service models we're studying in class.
2 .You should go to some other local establishment I'd say.

第二十二段

1 .I see.

第二十三段

1 .But just call the manager ahead of time so they aren't surprised.

Lecture1

Listen to part of a lecture in an art history class.

第二段

1 .Last class I passed out your assignment for your first paper and today I want to spend some time going over it.
2 .Most people never take any art history until they get to college,
3 .so many of you have probably never written an art history paper before.

第三段

1 .I gave you a list of appropriate works of art for you to write about.
2 .So your next step in this process needs to be to go look at the work you've selected as your topic and bring a pencil and a notepad with you.
3 .Because I don't mean you should just drop by at the museum and glance at it, so you can say you've seen it in real life,
4 .you need to go and sit in front of the work and really look at it carefully and slowly, and keep careful notes about what you see.
5 .You'll need them for the kind of art history paper you are going to be writing.
6 .It's what we call a formal analysis.

第四段

1 .A formal analysis of a work of art, any kind of art,

2 .is based on its formal qualities, which means qualities related to the form.
3 .Things like color, texture, line, shapes, proportion and composition.

第五段

1 .Now, probably the closest thing to a formal analysis you might have written is for an English class.
2 .If, you've, say, written an analysis of a poem, you've used the same skills.
3 .You've given an analysis of the poem by describing and analyzing its form and meter.
4 .A formal analysis paper in art history is very similar.

第六段

1 .Now, before you begin writing your formal analysis,
2 .you'll want to start with a summary of the overall appearance of the work,
3 .a brief description of what you see: either figures, people,
4 .what are they doing, or is it a landscape,
5 .or an abstract representation of something.
6 .Tell what the subject is and what aspects are emphasized in the painting.
7 .This will give your reader an overview of what the work looks like before you analyze it.

第七段

1 .The next part of your paper, the actual formal analysis,
2 .would be the longest and most important section of your paper,
3 .where you describe and analyze individual design elements.
4 .For this portion of the paper,
5 .you are going to rely on the notes you took at the museum because you should be able to describe in detail the design elements the artist uses and how they are used.
6 .For example, does the artist use harsh lines or soft lines?
7 .Are the colors bright or muted? Focus on the design elements that you feel are most strongly represented in that particular work of art.
8 .And if you don't know where to begin, take note of where your eye goes first.

9 .Then describe things in the order in which your eye moves around the work.
10 .This will help you understand how one part relates to another,
11 .the interaction between the different parts of the work.
12 .Ok? This kind of analysis should occur throughout the main portion of the paper.

第八段

1 .In the last section of your paper,
2 .and this goes beyond formal analysis,
3 .you comment on the significance of what you've seen,
4 .what details of the work convey meaning.
5 .Some significant details will not be apparent to you right away.
6 .But if you look long enough, you realize how important they are for your interpretation of the work.

第九段

1 .Many years ago, I was writing a formal analysis of a painting of a little boy.
2 .In the painting, a little boy was standing in his nursery and he was holding a toy bird in his hand.
3 .And there were more toys around him in the background of the painting.
4 .Because of the bird he was holding, I assumed at first that the painting was about the innocence of children.
5 .But as I looked at the painting longer, I realized that the boy's eyes look sad even though there was no discernable expression on his face.
6 .And then it dawned on me that even though he was surrounded by toys, he was all alone in his nursery.
7 .The boy's eyes were a significant detail in the painting that I didn't notice at first.

Lecture2

Listen to part of a lecture in an Environmental Conservation class.

第二段

1 .Next I want to talk about the collapse of the North American Cod population.
2 .Let's look at Cape Cod in the northeastern United States.

3 .he area was named Cape Cod because there was so many Cod fish in the waters just off its shores,
4 .so many that the first Europeans who fished there in the 17th century reported it was better than in New Finland, Canada.
5 .At that time, New Finland's Cod fishery was so rich that people said it was possible just to lower a bucket in the water,
6 .pull it out and it would be full of cod,
7 .but Cape Cod was even better,
8 .so the fishing industry there did great until after the 1940s. Uh, there were simply too many fishing vessels,
9 .sophisticated vessels, competing for fewer and fewer fish.
10 .In the 1940s there were still about four hundred million pounds of fish caught at Cape Cod every year.
11 .Just 50 years later though, by the 1990s,
12 .commercial cod fishing there had become unprofitable.
13 .The annual catch had gone down about 5% of its 1940s' level.

第三段

1 .And here's what's so fascinating:
2 .as more and more fishing vessels with better and better fishing technology were competing for cod,
3 .this competition was causing changes to the biology of the fish and these changes were making it more and more difficult for the cod population to sustain itself.

第四段

1 .Changes to the biology of the fish?

第五段

1 .Well, if a cod fish could reproduce earlier than usual,
2 .it'd have a better chance of passing on its genes to the next generation before being caught, right?
3 .And sure enough, biologists noticed that around Cape Cod,
4 .the cod were beginning to mature at an earlier age than normal.

第六段

1 .Prior to the population collapse, cod usually took about 8 to 10 years to fully mature, to start to reproduce,
2 .and they lived around 40 years total.
3 .So cod had about 30 years of active reproductive life.

第七段

1 .But now, cod were beginning to reproduce at a younger age, at 3 to 4 years old,
2 .and they were living shorter lives because they were being caught,
3 .so they had fewer years within which to reproduce.

第八段

1 .Additionally, even though some fish in the population were maturing at an earlier age,
2 .none was actually growing faster.
3 .No cod has a way of speeding up its rate of growth.
4 .So the younger reproductive age actually meant that smaller fish were reproducing.
5 .And when you're a small cod reproducing,
6 .you produce fewer eggs than a large cod.
7 .The smaller cods simply don't have the body mass to reproduce as many eggs.
8 .The overfishing pressure on the cod population was pushing the cod into an evolutionary corner.
9 .They were having a harder and harder time surviving.

第九段

1 .But what can be done to prevent other scenarios like this?
2 .I mean obviously we need a better way to manage environmental resources.

第十段

1 .Well, what do you guys suggest? Carol?

第十一段

1 .Hmm, uh, maybe privatize the resource?
2 .A private owner would want to manage the resource efficiently in a sustainable way.

第十二段

1 .Ok, but the problem is privatization doesn't necessarily result in better management of an environmental resource.
2 .Any ideas why it wouldn't?

第十三段

1 .Well, an individual owner might not properly assess the limits of the resource.

2 .So they could be just as prone to overexploiting that resource as a group where lots of people have access to it.

第十四段

1 .Yes. Well, like in the 1970s,
2 .when it was already clear the North American cod population was declining dramatically,
3 .the US and Canada declared a 200-mile exclusive economic zone in the waters around Cape Cod.
4 .By declaring an exclusive economic zone, you see,
5 .these two countries were trying to extend their territorial waters.
6 .Basically it was as if they were saying: 'we're the private owners. We own these waters. So we own the rights to the fish in them too.
7 .Essentially the two countries told fishing vessels, trollers from all other nations, to get out of the cod fishing area.

第十五段

1 .You'd think that would be good news for the cod because there'd be less fishing.
2 .However, The US and Canada wanted to expel foreign trollers only in order to increase the number of their own fishing fleets.
3 .The total number of fishing trollers actually increased.

第十六段

1 .Another possible solution, pass laws that regulate use of the resource.
2 .But for regulation to be effective, penalties for breaking the law have to be large enough to deter violators.

Conversation2

Listen to a conversation between a student and a university librarian.

第二段

1 .Mr. Reese. I am Jennifer Lee.
2 .I worked on the photography exhibition last year, the one that was commemorating the university's 100th anniversary.
3 .I helped select and display photos for the exhibit.
4 .I helped set it all up, remember?

第三段

1 .Oh, sure! You're the photography student that Professor Ryan sent to us.

2 .How have you been?

第四段

1 .Good. Thanks.
2 .And I...uh...well, I was hoping I could talk to you about a job actually.

第五段

1 .Oh, the job here in our library archive? Ha, that was fast! We just posted it yesterday.

第六段

1 .Oh, no. Actually, it's for a photography job in the portrait studio at the mall.

第七段

1 .Taking portrait photos?
2 .Sounds like a great job for a photography student.
3 .But how can I help?

第八段

1 .Well, I went for an interview, but I still need to give them professional references from people I've worked for.
2 .And well, I don't have a lot of work experience.
3 .But you know, you've...you've seen how...
4 .how I helped plan and carry a project through and showed up on time and everything.
5 .So, I was kind of hoping I... you know, I could give them your name as someone they could talk to.

第九段

1 .Of course, we all thought you did a great job.
2 .I remember saying that to Professor Ryan and he thought so too.
3 .I suppose you've already asked him for a recommendation?

第十段

1 .I have. He's actually the one who convinced me to apply for it.
2 .I wasn't sure I should. I mean, having real photography experience would be great for my resume, but...well...I am little concerned about the hours.
3 .It's ten hours a week, which is fine, but they're all during the daytime.
4 .I would have to schedule several classes for the late afternoon and evening.
5 .I am not sure I will be able to do that.

第十一段

1 .Yeah, I see how that could be a problem.
2 .Well, maybe you should consider the job I mentioned.
3 .We just got a grant to hire a part-time library assistant for our photography archives.
4 .It doesn't involve taking pictures, but it does involve working with pictures, filling requests for specific photos from students and professors.
5 .And it's in the evenings from 6 to 9, three days a week.

第十二段

1 .Hmm, well, the hours are definitely better, but I really do want to find out about that job at the studio first.
2 .I am sure you will understand.

Lecture3

Listen to part of the lecture in an environmental science class.

第二段

1 .Now, over the next few weeks, we're gonna focus on carbon and its role in what's known as the "greenhouse effect."
2 .Everyone knows what that is, right?
3 .But let's make sure anyway.
4 .Yes, Karlie?

第三段

1 .The greenhouse effect is when gases in Earth's atmosphere act like the glass in a greenhouse or a hothouse.
2 .They trap in heat which warms up the earth.

第四段

1 .Gases Gases.

第五段

1 .Um, water vapor? Carbon dioxide?

第六段

1 .Right. Carbon dioxide.
2 .We hear a lot about carbon these days, no?
3 .Carbon emissions, carbon burning, leaving a carbon footprint.
4 .So it'd be easy to assume that any form of carbon burning is necessarily a bad thing.
5 .But the fact is: it's not quite that simple.

6 .So we're gonna focus today on the difference between good, bad, and well, the, not so bad, the potentially okay carbon burning.

第七段

1 .OK. Good carbon burning.
2 .Well, we all have a personal stake in this because burning carbon is the basis of life.
3 .We wouldn't be here if we ourselves weren't burning carbon.
4 .Basically, all living things burn carbon to survive.
5 .Usually this happens at the cellular level and what's burned is carbon in the form of sugars, glucose.

第八段

1 .Oxygen gets chemically combined with sugars in our cells and the energy produced from that reaction is then used to power the cells.
2 .So just by breathing you could say we are all guilty of carbon emission and contribute to the amount of carbon in the atmosphere.

第九段

1 .Um, another thing about atmospheric carbon: it keeps us from freezing.
2 .Because without carbon and other greenhouse gases, our planet would be the same temperature as outer space,
3 .around four degrees above absolute zero.
4 .And there's nothing going on at that temperature.
5 .No possibility of life of any sort.
6 .So without atmospheric carbon, life couldn't exist on Earth.

第十段

1 .Now, another thing to remember is that carbon is always being removed from the atmosphere.
2 .It gets used up.
3 .Largely it is consumed by plant life through photosynthesis.
4 .Also, it dissolves in the oceans or gets stored deep in the ocean.
5 .You have shellfish that use the CO_2 dissolved in the water to make carbonate shells and when they die, they fall to the ocean floor and the carbon gets sequestered down there.

第十一段

1 .So with all this carbon constantly being depleted from the atmosphere, we really need to keep carbon output up to a certain point.

第十二段

1 .So why all the bad press for burning carbon?

第十三段

1 .Well, turns out it's the source of the carbon being burned that's the key.
2 .It's in fact the burning of what we call "fossil carbon" that creates the imbalance: fossil fuels, coal, oil, natural gas.

第十四段

1 .These substances are all mined.
2 .We have to dig them up or drill a well to release them.
3 .And this is carbon that was in the atmosphere millions of years ago.

第十五段

1 .So what happens is: when we burn this carbon,
2 .ok, it doesn't really release a whole lot compared to the amount that's already there in the atmosphere,
3 .but it adds to the pool.
4 .And over years it accumulates.

第十六段

1 .Think of the atmosphere as a big bathtub.
2 .It's basically already filled to the brim with carbon.
3 .When we start adding fossil carbon into the mix, it starts to spill over.
4 .That being said, there's actually a category that's in-between: what we call biomass fuels, probably the most common one is wood.

第十七段

1 .Another example, um, on the North American plains, the Native Americans used to collect buffalo droppings to burn.
2 .Uh, in Ireland, they cut up peat from bogs and they burn that.

第十八段

1 .So what's the big distinction between this and fossil carbon?

第一十九段

1 .Biomass carbon is what we might call current carbon.
2 .It's always going in and out of the atmosphere.
3 .So if we burn one of these fuels, we're putting its carbon into atmosphere. Right?
4 .But in a balanced system, somewhere else in the world the same amount of carbon is going back.
5 .It gets taken in by growing vegetation.
6 .So burning biomass fuel produces sort of not-so-bad carbon.

7 .In fact, it can become good carbon if we endeavor as a society, as humanity,
8 .to allow forests to recover this carbon,
9 .if we don't, say, pave over all the surfaces to prevent things from growing.
10 .So whenever we cut down a tree and burn its wood, we have to allow another tree to grow to keep things in balance.
11 .That way, you're...you're carbon neutral.

Lecture4

Listen to part of a lecture in a United States Government class.

第二段

1 .We've been talking about the basic services and facilities that an economy needs to function,
2 .roads, bridges, rail systems, water supplies, power grids, and so forth.
3 .What we call infrastructure.

第三段

1 .Now, traditionally much of a society's infrastructure, particularly the transportation infrastructure,
2 .has been owned and operated by states, by governments.
3 .But lately, local and state governments have started to consider and sometimes actually enter into various deals to privatize parts of their infrastructure, particularly in the transportation sector.

第四段

1 .And why is this privatization happening?

第五段

1 .Well, as you may know, in the 1950s and 60s there was a tremendous highway building boom.
2 .Governments created a huge interlocking network of highways with associated bridges and tunnels.
3 .But these facilities are getting old now and they're becoming more and more expensive to maintain,
4 .very expensive actually.
5 .Tolls and tax revenues don't often cover all the needed repairs.

第六段

1 .So why don't the governments just raise tolls and taxes?

第七段

1 .Well, that's not so simple.
2 .Government officials are elected by voters and voters get upset when their taxes go up.
3 .And as for highways tolls,
4 .commuters especially don't like paying higher tolls,
5 .merely proposing increases can damage political careers.

第八段

1 .So there's tremendous pressure on governments to find other ways to maintain infrastructure assets.
2 .One solution is to sell or lease a part of the infrastructure,
3 .a toll bridge, a tunnel, something like that to a private company,
4 .usually a company that specializes in this sort of thing.
5 .The idea is that the company that buys or leases a bridge or a highway or whatever will find it easier to keep it in good repair.

第九段

1 .That will make commuters happy.

第十段

1 .Right, there could be better service.
2 .Since they are not government entities,
3 .private companies face less political resistance, say to raising tolls in order to provide that better service.
4 .But besides that, there's another reason governments like these deals.
5 .States often have trouble paying their bills and they can use money they get from selling or leasing a piece of infrastructure to balance their budgets.

第十一段

1 .That all sounds good to me.

第十二段

1 .It does sound good,
2 .but a lot of people are very wary of privatizing pieces of infrastructure and rightly so.
3 .For instance, in almost every case thus far,
4 .the first thing private companies do is drastically raise user fees because they say,

5 ."Oh, we must do critical maintenance that's gone undone for years and years.
6 .And because we're a private company,
7 .we can't use tax money to do it.
8 .Our only option is raising tolls.

第十三段

1 .But what's the impact on people who use a toll road to get to work?
2 .What if a private owner doubles or triples the toll overnight?

第十四段

1 .Uh, users would have to spend a higher percentage of their income on commuting.

第十五段

1 .And depending on their income, that percentage could be significant.

第十六段

1 .But if tolls went up, me, I'd just avoid the toll road and take smaller back roads where there aren't any tolls.

第十七段

1 .That's a good point.
2 .Secondary roads would become attractive to lots of other people too,
3 .and private companies know this.
4 .They also know that dramatic reductions in traffic would hurt their bottom line.
5 .So market forces do play a role in keeping private companies from raising their tolls too much.
6 .But the mere prospect of astronomical toll hikes is still alarming to governments when they think about selling or leasing parts of an infrastructure.

第十八段

1 .Now, from a business standpoint,
2 .infrastructure purchases can be great investments!
3 .If a company buys or gets a long-term lease on a toll bridge from the government,
4 .it's got an almost guaranteed steady source of revenue for years and years,
5 .which means that if the company decides it wants to sell the bridge to another company, say ten years from now,

6 .it'll have no problem finding a buyer.

第一十九段

1 .But what if that buyer, this new owner, ontinues to charge a high toll but doesn't do the same amount of maintenance because they want to squeeze more money out of the asset!

第二十段

1 .In that case, could the governments buy the asset back?
2 .Well, to do that, it would have to raise money either by raising taxes or by selling bonds, both of which are politically sensitive.

第二十一段

1 .So it's unclear in a practical sense whether these deals are truly reversible.

TPO41

Conversation1

Listen to a conversation between a student and his professor.

第二段

1 .I have some good news for you.
2 .One of the students who was signed up for the summer term at the field station next year won't be attending after all. Your name's first on the waiting list.
3 .So if you still want to do it, the space is available.

第三段

1 .Oh, that's terrific!

第四段

1 .You were also interested in doing an independent research project next summer, right?

第五段

1 .Yeah, on salt marsh restoration, but that was before, when I thought I wasn't going to get into the field station.

第六段

1 .Well, you can still do it if you want.
2 .I looked over your application for the independent research project, and it looks strong. I approved it.
3 .And you'd have even more resources there at the field station, so...

第七段

1 .The field station and an independent study, but the summer term is a few weeks shorter than a regular term.

第八段

1 .Well, it's up to you.
2 .You'd have to work hard but I think you can do very well.
3 .Professor Garfield, one of the professors over at the field station...

第九段

1 .Yeah, I've heard of him.

第十段

1 .Yes, well. Professor Garfield has been doing research on salt marshes for years, assessing human impact and methods of salt marsh restoration.
2 .He is willing to oversee your project.

第十一段

1 .Wow!
2 .That's too good an opportunity to pass up.

第十二段

1 .I thought you'd say that.
2 .When I spoke with Dr. Garfield, he suggested you take a particular course he'll be teaching here in the spring.
3 .It's called advanced topics in salt marsh management.
4 .The course looks at salt marsh ecology in depth and it also focuses on factors that stress salt marsh systems and how to assess and monitor the level of stress.

第十三段

1 .And that background information will fit right into my project on salt marsh restoration. This is so great!

第十四段

1 .Oh, one more thing. Do you know John Arnold?

第十五段

1 .Not really, but he lives in my dorm. Why?

第十六段

1 .John's another ecology student who will be the Field Station next summer.
2 .I approved an independent research project for him, too. Initially, he had the same concern as you.

第十七段

1 .But anyway, his topic will be similar to yours.
2 .He'll be researching how bridges and culverts1 that have been installed to allow tidal waters to move underneath roads between the sea and the salt marshes.
3 .Well, they are often too small.

第十八段

1 .I guess that would result in not enough tidal water flowing into the marshes to maintain the natural vegetation, right?

第一十九段

1 .Exactly, and he'll be looking at how to determine the right size.
2 .So I was thinking he might be a good choice for a summer roommate for you.

Lecture1

Listen to part of a lecture in a botany class.

第二段

1 .Many organisms have developed the ability to survive in harsh environmental conditions: extreme heat or cold, or very dry conditions.
2 .Like plants in the desert.
3 .Your textbook doesn't have much about the specifics on desert plants, but I think that desert plants are great examples of specialized adaptations to extreme environmental conditions.

第三段

1 .So, with desert plants, there are basically three different adaptive strategies.
2 .And I should point out that these strategies are not specific to any particular species.
3 .Many different species have developed each of the adaptations.

第四段

1 .So, first off, there are succulent plants.

第五段

1 .There are many different species of succulent plants, but they all can absorb and store a lot of water.
2 .Obviously, opportunities to get water in the desert are few and far-between.

3 .Generally rains are light and short.
4 .So the rain doesn't seep too far down into the soil.
5 .And there's a limited window of time for any plant to get the water before it evaporates.

第六段

1 .But succulent plants have a spread-out and shallow root system that can quickly pull in water from the top inches of soil, though the soil has to be saturated since succulents aren't good at absorbing water from soil that's only a little moist.

第七段

1 .Succulent plants also are well suited to retaining water, important in an environment where rainy days are rare.
2 .Succulent plants can store water in their leaves, in their stems, or in their roots.

第八段

1 .And to keep that moisture from evaporating in the hot, desert Sun, most succulent plants have a waxy outer layer that makes them almost waterproof when their stomates are closed.

第九段

1 .They also preserve water by minimizing their surface area.
2 .The more of the plant that's out in the Sun, the more potential there is to lose stored-up water.
3 .And that means that most succulent plants have few, if any, leaves.

第十段

1 .Now, besides succulent plants, there're also drought-tolerant plants.
2 .Drought-tolerant plants are like bears in a way.
3 .You know how bears mostly sleep through the winter.
4 .They can survive without eating because their metabolism slows down.
5 .Well, drought-tolerant plants also go into a dormant state when resources, in their case, water, run short.
6 .A drought-tolerant plant can actually dry out without dying.

第十一段

1 .I said before that most desert rains are light and brief, but occasionally there is a heavy one.
2 .Drought-tolerant plants revive after one of these significant rainfalls.And they are able to absorb a good bit of the rainfall due to their deep roots.

3 .Actually the root system for drought-tolerant plants is more extensive than the root systems of many plants that live in wetter climates.
4 .Droughttolerant plants can even absorb water from relatively dry soil because of their deep roots in contrast to succulent plants.

第十二段

1 .The third adaptive strategy is to avoid the drought conditions altogether.
2 .Yes! There ARE plants that do this: Annual plants!

第十三段

1 .An annual plant will mature and produce seeds in a single season that will become the next generation of annual plants.
2 .In desert conditions, annual plants grow in the fall or spring to avoid the heat of summer and the cold of winter.
3 .Of course, these plants could face a serious problem if a particular fall or spring happened to be very dry.
4 .They would have difficulty growing and could die before producing seeds.

第十四段

1 .But they have a mechanism to prevent one year of low rainfall from wiping them out.
2 .Not all seeds an annual plant puts out will grow the following year.
3 .Some seeds remain dormant in the ground for several years.
4 .It's a type of insurance that protects the annual plants from a season of poor growing conditions, of unfavorable weather.

Lecture2

Listen to part of a lecture in an American History class.

第二段

1 .It's interesting how much we can learn about culture in the United States by looking at how Christopher Columbus has been portrayed throughout United States' history.
2 .So let's start at the beginning.

第三段

1 .Columbus' ships first landed in a... landed in the Caribbean.
2 .There's some debate about which island.
3 .He landed in 1492, but it wasn't until 300 years later in 1792 that his landing was first commemorated.

4 .And this was the brainchild of John Pintard.

第四段

1 .Pintard was a wealthy New Yorker, the founder of the New York Historical Society.
2 .And he decided to use his influence and wealth to find a great hero, a patron for the young country.
3 .And he chose Columbus.

第五段

1 .And in New York, in 1792, the anniversary of Columbus's landing was commemorated for the first time.Now, other cities, uh, Philadelphia and Baltimore followed. And...

第六段

1 .But why Columbus?
2 .And why there?

第七段

1 .Well, to Pintard it was a way to build patriotism in the young, politically fractured country.
2 .Remember, the United States had only declared its independence from Britain 16 years earlier, and had yet to form a national identity.

第八段

1 .Pintard also had a hand in helping to create Independence Day, you know, July 4th; as a national holiday.
2 .So you see that he was very involved in creating sort of a national story for Americans.
3 .And Columbus, he felt Columbus could become a story that Americans could tell each other about their national origins that was outside of the British colonial context.
4 .The United States was in search of a national identity.
5 .And its people wanted heroes.

第九段

1 .But why not some of the leaders of the revolution?
2 .You know, like George Washington.

第十段

1 .The leaders of the revolution were the natural candidates to be heroes, but many were still alive and didn't want the job.

2 .To them, being raised to hero status was undemocratic.So Columbus became the hero.
3 .And the link between Columbus and the United States took hold.

第十一段

1 .And so what was that link?

第十二段

1 .Well, Columbus was portrayed as entrepreneurial, someone who took chances, who took risks, and he was cast as somebody who was opposed to the rule of kings and queens.
2 .Perhaps most of all, Columbus was portrayed as someone who was destined to accomplish things, just as America in those early years was coming to see itself as having a great destiny.

第十三段

1 .But Columbus was supported by the king and queen of Spain. He wasn't against them.

第十四段

1 .True.
2 .To be historically accurate, the way Pintard thought about Columbus doesn't match up with the facts of his life at all.
3 .And I really have to stress this: the fact that Columbus became the hero of a young country had little to do with Columbus, anything he did, and a lot to do with what was happening in the United States 300 years later.

第十五段

1 .Columbus was extraordinarily adaptable to the purposes of America's nation builders, people like John Pintard in the early part of the 19th century.
2 .And since not a lot of facts were known about Columbus, because writings weren't available in North America until...until 1816.
3 .That might have actually helped the process of adapting him to American purposes.

第十六段

1 .Since no one knew much about the real Columbus, it was easy to invent a mythical one?

第十七段

1 .Exactly.

2 .And this mythical Columbus, it became a reflection of the society which chose him.

第十八段

1 .So in the early history of the United States, Columbus represented an escape from the political institutions of Europe.
2 .He was the solitary individual who challenged the unknown.
3 .And now there was this new democracy, this new country in a world without Kings.
4 .Columbus became sort of the mythical founder of the country.

第一十九段

1 .So as historians, we wouldn't want to study these myths about Columbus and mistake them for facts about Columbus.
2 .But if we are trying to understand American culture, then we can learn much by studying how America adapts Columbus for its own purposes.

第二十段

1 .Evaluations of Columbus then will reflect what Americans think of themselves.
2 .Oh, there is a quote, something like, ¡°societies reconstruct their past rather than faithfully record it ."
3 .And how that reconstruction takes place and what it tells us, that's something we are going to be paying a lot of attention to.

Conversation2

Listen to part of a conversation between a student and a university employee.

第二段

1 .Hi, can I help you?

第三段

1 .Yes, I'd like to get help with the, you know, payment for my classes, some sort of financial aid.
2 .The problem is I don't know much about it, so I don't really know where to begin.
3 .I saw this poster about work-study programs.
4 .Can you tell me something about that?

第四段

1 .Well, I think you're talking about the government sponsored work-study program.It works like this: you work on campus and get paid an hourly wage just like a regular job.
2 .However, instead of getting a paycheck, the money goes directly to your bill for your courses, but almost all work-study jobs pay minimum wage, which is usually pretty low.
3 .The truth is: you might do better getting a job off campus since you can do whatever you want with the money, like paying your rent or...or buying textbooks.

第五段

1 .Thanks!
2 .That's very useful.
3 .So how do I find out what's out there?

第六段

1 .Let me show you our catalogue of various programs as well as scholarships offered here.
2 .That's your best bet1 really, if you can find a good scholarship, because you don't have to pay the money back.
3 .You might qualify if your grades are good enough or if you have the right background.

第七段

1 .Yeah, that sounds like something I should try for.

第八段

1 .Now, this is my desk-copy of the catalogue, but I can give you your own copy if you want. Oh yeah, be sure to visit the university library, too.
2 .There's a whole section on financial aid including application forms.

第九段

1 .Why isn't all the information listed in the catalogue? It'd be so much easier.

第十段

1 .Oh, if we did that, the catalogue would be too heavy to pick up.
2 .City clubs, foundations, organizations from all over the country offer scholarships or other financial assistance to college students, and all kinds of companies have programs to help their employees' children go to college.

3 .If either of your parents works for a large corporation, have them check to see if their companies do that.

第十一段

1 .Okay. Good idea.
2 .Hey, my dad works for a big accounting firm and he's a member of a professional accounting organization.
3 .Do you think they'd offer financial aid?

第十二段

1 .Yes, that's fairly common, especially if you are planning to go into accounting.
2 .What are you studying?
3 .What do you plan to do after you graduate?

第十三段

1 .I want to become a dentist.
2 .I'm enrolled in a pre-med program for dentistry.

第十四段

1 .Okay. So Td suggest looking in the library for information on organizations that have to do with dentistry.
2 .Any number of them might offer scholarships to students planning to join their profession.

第十五段

1 .I'll definitely investigate that one.

第十六段

1 .Great! But be sure to talk to one of our librarians, too.
2 .They get the same questions over and over, so they can save you a great deal of time.

Lecture3

Listen to part of a lecture in an art history class.

第二段

1 .OK. As art historians, one of our fundamental tasks is to assign authorship to works of art, right?
2 .We're presented with a work of art, and we have to figure out who made it.
3 .But this task becomes particularly difficult when we're dealing with works produced in Italy during the Renaissance, the 16th, 17th centuries.

第三段

1 .Now, why is this the case?
2 .Anyone? Emily.

第四段

1 .Um...is it 'cause artists didn't sign their work?
2 .I mean, didn't the whole concept of the artist as an individual developed later? In like the 19th century?

第五段

1 .Well, you are sort of on the right track.
2 .The concept of the individual artist, especially the concept of the artist as an artistic genius struggling alone with a vision as opposed to...say...a mere artisan...well, the idea of the artist as a lone genius didn't develop until later.

第六段

1 .But artists, individual artists, did sign their work during the Renaissance.
2 .In fact, you could say that's part of the problem.
3 .Paintings were signed by the artist and that used to be understood to be a mark of Renaissance's individualism.
4 .If a piece had Raphael's signature on it, we assume it was done by the great artist himself Raphael, in the singular.

第七段

1 .But you see, art in Renaissance Italy was very much a collaborative business.
2 .Painters and sculptors worked in a workshop.
3 .It was almost like a small business run by a master artist.

第八段

1 .You see, to deal with a wide variety of commissions they received, orders basically, for specific types of art, specific projects, to handle these, master artists often employed assistants as apprentices.
2 .And this was especially so if they worked on a large scale, huge paintings or sculptures, or if they were much in demand, like Raphael, for instance.

第九段

1 .He worked on some large paintings.
2 .He painted frescos for the Vatican1.
3 .He also received a great many commissions.

4 .There's no way he could have completed every part of every project all by himself.

第十段

1 .Now, these assistants might work for the master artist on a temporary or a permanent basis.
2 .And they might also specialize.
3 .For example, in Raphael's workshop, which might be called Raphael incorporated, one of the assistants specialized in animals.
4 .He actually painted a good number of the animals in Raphael's art.
5 .It maybe that a master signing a work was simply making a declaration that the work met the standards of the shop.

第十一段

1 .And it wasn't just painters.
2 .Sculptors also worked together.
3 .In fact, assistants were even more necessary if you were a master sculptor because statues take longer to make than paintings.
4 .And the master had to arrange for marble to be quarried, things like that.

第十二段

1 .Perhaps the most collaborative of all was architecture.
2 .There we see a real division of labor, but with carpenters, masons, unskilled labor just to carry materials to and fro, and so on.Plus, of course, your skilled artisans who carried out the master architect's design.
3 .Think of it, like, um, a ballet, you know.
4 .All the dancers work together.
5 .There's a division of labor. People have different roles.
6 .And in order for the thing to come together, everyone needs to be aware of what others are doing and coordinate their work and have good timing.

第十三段

1 .So for architecture, it's almost impossible to know who was responsible for any given detail.
2 .Was it the master architect?
3 .The mason? An assistant mason?
4 .Maybe it was even the patron, the client who was paying for the art.

第十四段

1 .Remember, it wasn't yet customary for architects to give their assistants measured drawings to work from.

2 .Instructions were given orally, not in writing. So we don't have those documents to tell us what exactly the master architect's plans were.
3 .The only time we have written records is when the architect wasn't actually there.
4 .Perhaps the architect was away on business and had to write out instructions and send them to the shop.

第十五段

1 .And another thing to think about: What effect do you suppose this approach would have had on innovation?

第十六段

1 .I mean, since the hired artisans had been trained by other artisans, they tended to be trained to use traditional styles and techniques.
2 .So if you're a master architect, uh, you've developed your own style.
3 .Say you're calling for certain detail in the building you're designing, right?
4 .And say this detail is different, purposely different, from the established tradition, the established style.

第十七段

1 .Well, most likely when the hired artisans would execute the design, rather than follow the intended design, they would stick with the more traditional style that they were familiar with.
2 .Workers would have to be supervised very closely to prevent this from happening.
3 .Otherwise, as it often happened, there goes the designer's style and creativity.

Lecture4

Listen to part of a lecture in an astronomy class.

第二段

1 .OK. We've been discussing the planets in our solar system and how some of the ones farthest from the sun were discovered.
2 .Well, today I'd like to turn to what are called exoplanets and how researchers detect them. Maria?

第三段

1 .Exoplanets are planets that orbit around a star other than our Sun, right?
2 .They are not in our solar system.

第四段

1 .Right.
2 .They have different...what are called "host stars".
3 .And the study of exoplanets has been getting more and more exciting. Hundreds of them have been discovered so far.
4 .This is quite remarkable in view of the fact that the discovery of the first exoplanets was confirmed only in the mid-1990s.
5 .Now we're finding new ones every few weeks or so.

第五段

1 .So, uh, exactly why are we interested in these exoplanets anyway?
2 .Is it to see if there's life on them?
3 .Cuz it seem to me like the only exoplanets we ever hear about are gas giants like Jupiter and Saturn that couldn't possibly support carbon-based life.

第六段

1 .OK. Well, let's talk about that.

第七段

1 .First, as for discovering life.
2 .Well, I think that sort of discovery is pretty far in the future, but it is an eventual goal.

第八段

1 .For now, the focus is on locating planets within a host star's so called "habitable zone", a zone that's a certain distance from its star because only planets within this zone could conceivably support carbon-based life.

第九段

1 .So, what would such a planet need?

第十段

1 .Water?

第十一段

1 .Yes, it need to be the right temperature to sustain liquid water.

第十二段

1 .And it would need to be a rocky planet, I mean, as opposed to a gas giant.

第十三段

1 .OK, good. An Earth-like planet.

第十四段

1 .Now, as to that, there are some recently detected exoplanets that might actually be Earth-like.

第十五段

1 .For example, there's a red dwarf star, that's what most stars are, um... that's called Gliese 581.

第十六段

1 .Gliese 581 is... well, it's a lot more interesting than that name makes it seem.
2 .This host star is considered a near neighbor of our solar system because it's only about 20 light years away.
3 .It's pretty close by astronomical standards.
4 .And being a red dwarf star, it's small and relatively cool, at least compared with the Sun.

第十七段

1 .And researchers have discovered planets orbiting Gliese 581.
2 .These exoplanets have been named, ready? Gliese 581 b, c, d, e, in alphabetical order of their discovery.

第十八段

1 .Gliese 581 d and e are the planets I wanna focus on now.
2 .See, in 2009, a group of researchers made an announcement.
3 .These two exoplanets: Gliese 581 d and e do have some Earth-like qualities.
4 .Gliese 581 d had actually been discovered a couple of years earlier.
5 .And when its orbit was originally calculated it was thought to be too far away from its host star to be warm enough to support a liquid ocean, let alone carbon-based life.
6 .But then its orbit was recalculated and now we see that Gliese 581 d is within its host's habitable zone.

第一十九段

1 .So it might have an ocean?

第二十段

1 .Well, conceivably.

第二十一段

1 .See, Gliese 581 d weighs 7 times what Earth weighs and it's unlikely that it's made entirely of rocks because it's so massive.

2 .The researchers studying it said that it could have a rocky core, an ice layer, a large deep ocean and an atmosphere.

第二十二段

1 .OK, and there was another announcement along with the recalculated orbit of Gliese 581 d.
2 .That was the discovery of another planet in the system, Gliese 581 e.
3 .Compared with other exoplanets, its mass is quite small, only about twice that of Earth.

第二十三段

1 .So 7 is Gliese 581 e a more Earth-like planet?

第二十四段

1 .Well, we have to consider its orbit.
2 .Gliese 581 e orbits its host star in a much shorter period of time than the other planets in the system, meaning it's very close to the star, and therefore too hot for water, for an ocean.

第二十五段

1 .However, the fact that it's relatively close to the size of Earth, small, in astronomical terms, that was pretty exciting.
2 .It's impressive that we have the technology to detect it and it bodes well for future research.
3 .Who knows what we'll find the more we search.

TPO42

Conversation1

Listen to a conversation between a student and an art history professor.

第二段

1 .Hi. Tm Melisa.
2 .I was just a few doors down getting some help in the computer lab.My electronic files won't open.
3 .The technician says it's probably a computer virus. She's working on it now.

第三段

1 .Yes, from what Tve heard lots of campus computers have been affected.
2 .What a first week! Huh?

第四段

1 .I know, anyhow, I noticed your name on the door as I was walking down the hallway, thought I'd stop in and find out if you happen to have any additional copies of the class syllabus.
2 .The one I received in class the other day is missing a page.

第五段

1 .Oh, sorry about that.
2 .I probably have a few extra printouts on hand.

第六段

1 .Great! Oh, and I noticed on the syllabus we'll be learning about and eventually writing a paper on "The Bauhaus1 style of art"?
2 .Sounds interesting. Tm looking forward to it.

第七段

1 .Right, but technically it doesn't say Bauhaus style of art.It only says the Bauhaus.

第八段

1 .Oh, what's the difference?

第九段

1 .Well, the Bauhaus is not really an artistic style like cubism.
2 .It was the name of an art and design school in Germany in the early 20th century.
3 .The Bauhaus was started as an experiment in education, and one ground-breaking technique used in its teaching was that students actively participated in workshops instead of just sitting in classes.

第十段

1 .Interesting! I don't have much background in order or anything.
2 .I'm an economics major and Tm taking this class as an elective, decided I wanted to broaden my awareness, try something new!

第十一段

1 .Excellent! Tm really glad to hear that.

第十二段

1 .So, was the focus of the Bauhaus architecture, I mean, I studied German and Bauhaus translates into "house for building"...

第十三段

1 .Well, the founding director was an architect.However, he aimed to combine an incredibly broad variety of fine arts and crafts under one artistic roof.

2 .As a matter of fact, when the Bauhaus first opened, it was without an architecture department for several years.
3 .But later, it became very influential in architecture.

第十四段

1 .So I wasn't all wrong.

第十五段

1 .You'll see on the syllabus that you are required to visit the Rutherford Museum exhibit.
2 .The exhibit will help you see that there is no single Bauhaus style.

第十六段

1 .I think it;s refreshing that this particular exhibit departs from the standard ways in which art from the Bauhaus is often presented.

第十七段

1 .Which are?

第十八段

1 .Well, for example, by a specific artist.
2 .I think it's a mistake to focus on a single Bauhaus artist and that person's individual specialty.I mean, the different artists from the school created different things: fabric, sculpture, furniture, graphic design, paintings, even theatrical performances.
3 .The exhibit in the Rutherford Museum units all these specialties through connecting themes such as motion or the body.

第一十九段

1 .Sounds fascinating!
2 .Say, I've heard of something about discount nights at that museum?

第二十段

1 .Weekends are full price.
2 .It's typically best to go Thursday nights.
3 .That's student discount night, 50% off However, next Wednesday is open to the public for free.
4 .It's a special promotion.
5 .So I know what I would do.

Lecture1

Listen to part of a lecture in an art history class.

第二段

1 .I am sure you've all been to museum, where you've seen beautiful white marble statues sculpted by the Greeks and Romans, or at least that you've seen photos of such statues, right?
2 .We've come to expect these classical Greek and Roman statues to be monochrome, just one color, white skin, white hair, white eyes, white everything, the natural color of the marble they're carved from.

第三段

1 .Now, the ideal of plain white sculpture goes back to 15th century Europe when Renaissance artists rediscovered ancient Greek and Roman culture.
2 .They were inspired by sculptures that appeared monochrome so they created white marble statues.
3 .The impact of these Renaissance statues, such as Michelangelo's David, gave rise to new standards for sculpture, standards that emphasized form rather than color.

第四段

1 .But what if many of those ancient statues were originally polychrome, colored from head to toe?

第五段

1 .Early in the 19th century, archeologists found traces of paint on ancient sculptures and since then, classical art historians have begun to realize that Greek and Roman marble sculptures were originally colored.

第六段

1 .Even if an ancient marble statue doesn't have any visible traces of paint, that does not mean it was originally monochrome.

第七段

1 .In many cases, the pigment would've simply deteriorated.
2 .Ancient artists used mineral-based paints with organic binding media that would've disintegrated on its own overtime.

第八段

1 .In other cases, the pigment may have been weathered away while exposed to the elements or someone may have rigorously cleaned the statues and unknowingly removed the last traces of pigment.

第九段

1 .So, the fact is, we do have evidence of polychrome sculptures from Greece and Rome from the 7th century B.C.E. all the way through at least the third or fourth century C.E.

2 .It's now generally accepted that most, maybe even all marble sculptures from that time period, receive some kind of surface treatment, like the application of pigments, colored stones or metals that would've modified their color.

第十段

1 .So do we interpret the statue differently if we had known it had originally been polychrome?

第十一段

1 .I feel strongly when it comes to this.
2 .A marble sculpture that had been colored has another layer of meaning that was meant to affect the viewer.
3 .As art historians, we must try to interpret the intentions of the artists.
4 .What were the artists trying to achieve?

第十二段

1 .Certain features of the sculpture were highlighted through color, were made to stand out.
2 .In other words, they caused the viewer to focus on certain features.
3 .And certain colors represented certain things to the ancient artists and cultures.
4 .A color might symbolize heroism, divinity or youth.

第十三段

1 .One example to consider is the statue of Roman emperor Augustus.
2 .This particular statue of Augustus that I am referring to was discovered just outside of Rome in 1863 and was in terrific condition.
3 .It's about 2 meters tall, just larger than life size.
4 .It was made from an expensive high quality type of marble and was obviously carved by an expert.

第十四段

1 .Now, it still had visible traces of color on the hair, eyes and its clothing and armor.
2 .The paints have been very carefully studied.
3 .And it turns out that the colors weren't just from any pigments.
4 .They were from expensive pigments.
5 .The use of these pigments showed the importance of Augustus and that he should be honored.

第十五段

1 .And let's consider the extensive traces of a red pigment that were found on the statue's cloak.
2 .The cloak is a special garment that was traditionally worn by an emperor on the battlefield.
3 .And in real life it was a red color, which to the Romans, signified the emperor's authority, military and political authority.

第十六段

1 .Ok, I won't point out any further details about the colors on the Augustus statue, because you can already begin to see that there was cultural importance associated with the colors, symbolism, which should help us understand the status better.

第十七段

1 .There are many, many more sculptures that have traces of pigments left on them and we have the technology these days to be able to carry out effective studies of these pigments.
2 .There is a lot of work to be done, but it needs to be done fast.
3 .Like I said before, these pigments deteriorate rapidly so we really need to do the research before the traces are gone so that we can increase our understanding of ancient polychrome sculptures and the cultures which created them.

Lecture2

Listen to part of a lecture in an astronomy class.

第二段

1 .Before we continue talking about the properties of individual galaxies, it's worth talking about the distribution of galaxies in space.
2 .Efforts at mapping or surveying the universe, making a sort of atlas of galaxies, have been going on for more than 50 years.
3 .And the creators of the first major map of the universe were the astronomers Harlow Shapley* 1 and Adelaide Ames2.

第三段

1 .In 1932, Shapley and Ames3 catalogued the positions of 1250 galaxies by photographing what they saw through their telescopes.

第四段

1 .And they made an important discovery.

2 .Their survey was the first to indicate that galaxies were not distributed uniformly in space.
3 .Some areas had a lot of galaxies, and other areas had just a few. Another way of putting this is to say that galaxies are clustered.
4 .They're not spread evenly throughout the universe.
5 .So we have stars grouped together in galaxies and galaxies grouped together in clusters. Okay?

第五段

1 .Now, after their survey, other astronomers completed surveys that added to the number of clusters catalogued.

第六段

1 .One of the most important was done by the astronomer George Abell4
2 .Abell completed his survey in 1958.
3 .It added considerably to the map made by Shapley and Ames.
4 .In fact, his map had over 2700 clusters of galaxies.
5 .That is 2700 clusters of galaxies! Not just galaxies.

第七段

1 .But there's another aspect of Abell's work that makes this map so valuable to astronomers.
2 .He introduced a classification scheme for the galaxy clusters5
3 .Now, surveys completed since Abell's have catalogued additional galaxies and surveyed more outer space, but no one has improved upon Abell's classification scheme.
4 .In fact, the Abell catalogue is used as a starting point for astronomers who study these objects.

第八段

1 .One of the reasons his scheme has been so widely accepted is because of his sample size.
2 .With all the clusters in his sample, he could determine the different characteristics of clusters.
3 .And these characteristics form the basis of his classification scheme.

第九段

1 .Now, two of the characteristics crucial to his classification were richness and symmetry.
2 .So what did he mean by "richness"?

第十段

1 .Well, basically it refers to the number of galaxies there are within a cluster.

第十一段

1 .Is that the same as density?

第十二段

1 .That's right. Both richness and density refer to the number per area.
2 .Rich clusters, or dense clusters, contain a relatively high number of galaxies.

第十三段

1 .And symmetry just refers to its shape?

第十四段

1 .Roughly speaking, yes.
2 .Whether the shape of the cluster was the same on the left side as on the right side.

第十五段

1 .So Abell use categories like that to classify clusters on a scale: from regular to irregular.

第十六段

1 .A regular cluster is sphere shaped, symmetrical, and most dense in the middle.
2 .The greatest number of galaxies concentrated in the middle of the cluster.

第十七段

1 .An irregular cluster might appear to be lopsided, asymmetrical, with a little concentration of galaxies in the center.

第十八段

1 .You are talking about the shape of the cluster though, not the shape of the galaxies within the cluster.

第一十九段

1 .Right.
2 .For example, let's consider the Coma Cluster6.
3 .It's a symmetrical cluster basically spherical in shape, but the individual galaxies within it are elliptical. They're not spherical or spiral shaped, but the cluster itself shows spherical symmetry.

第二十段

1 .The Virgo Cluster, on the other hand, is considered irregular.

2 .There's no symmetry to its overall shape, no central concentration of galaxies, but it happens to have both elliptical and spiral galaxies within it.

第二十一段

1 .Another question. You were saying how some clusters have more galaxies than others.
2 .How many galaxies does a cluster have to have in order to even be a cluster?

第二十二段

1 .Good question!

第二十三段

1 .Abell's definition of a cluster is this:

第二十四段

1 .First, there have to be more than 50 galaxies within a specific amount of space.
2 .He said basically that clusters have a radius of roughly 2 megaparsecs.
3 .And it was just an assumption that all clusters would be about the same size.
4 .It's remarkable that it proved to be correct.
5 .And this standard cluster radius is known today as "The Abell Radius".

第二十五段

1 .And second, those 50 plus galaxies have to be a certain brightness.
2 .Of course it was a rough estimate, but looking at galaxies' brightness was a good way to distinguish between clusters that were nearby and those that were more distant.

Conversation2

Listen to a conversation between a student and a university activities coordinator.

第二段

1 .I understand your problem, but the upper level of the Student Center isn't available for the time being.

第三段

1 .But my dance group has a performance coming up.

第四段

1 .I've been talking with people all day long who are in the exact same situation.

2 .There are at least a dozen dance and drama groups on campus, and they are all scrambling for rehearsal space right now.

第五段

1 .But I made this reservation last June, before leaving for the summer.
2 .No one said anything about construction.

第六段

1 .That's because no one knew that the remodeling was gonna run over into the beginning of the school year.
2 .The builders are just way behind schedule.
3 .For a while, we weren't even sure that the dining hall on the lower level would be ready for the start of the semester.
4 .So, it could've been a lot worse.

第七段

1 .So when will...?

第八段

1 .The whole upper level will be ready in six weeks.
2 .The rehearsal rooms, the game room, the computer center.

第九段

1 .Six weeks!
2 .That's not gonna help me.
3 .Our performance is in five weeks.

第十段

1 .Are you part of the program they plan for parents' weekend?

第十一段

1 .Yeah, the thing is we are a tap dancing group, and we need to practice on hard floors, preferably wood.
2 .We can practice on carpet at first, but it's important for us to be able to hear our feet hit the floor.

第十二段

1 .Interesting, uh, because of the rhythm, huh?

第十三段

1 .Yeah, because the taping becomes part of the music.

第十四段

1 .So the floors are very important.

第十五段

1 .Exactly, and just about everywhere on campus has carpeting.

第十六段

1 .Well, there's always the stage at the student theatre.
2 .Though it's a long shot, we can look at the schedule.There might be some odd hours free.

第十七段

1 .What about in town? Do you think the university could help us rent a rehearsal space in a commercial dance studio in town, given the situation?

第十八段

1 .That's not really my call.
2 .I can reserve rehearsal and performance spaces on campus for you, but off campus...

第一十九段

1 .So who would I talk to?
2 .The dance department?

第二十段

1 .Look, let's check the theatre schedule first.

Lecture3

Listen to part of the lecture in an environmental science class.

第二段

1 .When you try to imagine a fungus, you'd probably picture a mushroom popping up out of the ground.
2 .And think that's it.
3 .But a fungus like that...most of it actually lives underground.

第三段

1 .And fungi in general are often an important active component of the soil.
2 .A fungus secrets enzymes into the soil, enzymes that break down, decompose organic material in the soil.
3 .So the fungus can absorb this material and get nutrition.

第四段

1 .But to me, what's most interesting about this process is how it may enable fungi to help clean up environmental pollution in the soil.
2 .And that's thanks in part to a substance in their cell walls called Chitin.

第五段

1 .Now a lot of people think fungi are related to plants, but they are not. Believe it or not, the only other place chitin is found in abundance is in the exoskeletons of insects, crabs and such.
2 .So in this sense, fungi are more associated with insects than with any plant. Strange, huh?

第六段

1 .And the chitin in the cell walls of a filamentous fungus...a filament, of course, is a long thread-like structure, cells joined end to end.
2 .Filamentous fungi grow in soil and in decaying vegetation.
3 .And as their name implies they exist as filaments.
4 .And although regarded as microorganisms, filaments from a single fungus can fan out to occupy many square meters or even several square kilometers of forest floor.
5 .Their vast surface area allows them to break down and take in huge amounts of nutrients, but beyond that, the filaments also pull out of the soil a great deal of the pollution that might be in there, especially heavy metals.

第七段

1 .And here is where chitin comes in, like some other substances in fungal cell walls, chitin forms strong chemical bonds to heavy metals in the environment, in a process we call adsorption.

第八段

1 .Now, don't confuse this with absorption, where a substance is absorbed into a cell, into the interior of a cell.
2 .I mean, that is happening here too.
3 .But adsorption means binding to the outer surface of the cell.
4 .And a filamentous fungus can adsorb toxic heavy metals, bind them to the surface of its enormous network of filaments, and thereby detoxify a large soil ecosystem.
5 .The heavy metals are still there, but instead of leaching into the water system and contaminating the water underground, large amounts of these metals may remain bound to the chitin, to the cell walls of filamentous fungi in the soil, and thus remain chemically inactive for as long as 30 years, perhaps longer.

第九段

1 .In fact, we can actually use the cell walls of filamentous fungi as a filter, even after the fungi are dead.

第十段

1 .For example, the pharmaceutical Industry grows filamentous fungi in large quantities in the lab, like to produce the antibiotic penicillin, the drug company grows the fungus penicillium, and after the penicillin is extracted, these dead penicillium filaments, we can use the chitin in their cell walls to make industrial filters to adsorb heavy metals.
2 .We can put these filters into waste pipes from industrial processes, and use the filters to trap heavy metals, like mercury and zinc.
3 .Later, we can chemically extract the heavy metals and reuse the filter over and over.

第十一段

1 .Now going back to the absorption of toxic metals into the body of the fungus, let's turn our attention to mushrooms.

第十二段

1 .Like other fungi, mushrooms can absorb large quantities of heavy metals.
2 .In fact, they may contain up to two and a half times the concentration of toxic metals found in the soil they grow in. So mushrooms, at least what we see above ground...we can potentially harvest them and then once for all safely dispose of the pollutants contained within them.
3 .In fact, to clean up, especially the groundwater system, permanently, harvesting mushrooms is probably the best way to go.
4 .For some reason, this hasn't happened yet as far as I know, but I can easily envision cultivating mushrooms for the sole purpose of detoxifying a large underground ecosystem.

Lecture4

Listen to part of a lecture in a marketing class.

第二段

1 .And that wraps up our discussion of how the retail sector, uh, ways in which retail managers deal with customer complaints.

第三段

1 .So let's shift now to the service sector, which markets not goods but services, intangibles like transportation, food service, career counseling...
2 .Oh, there are literally hundreds of examples.

第四段

1 .Service providers must, of course, constantly strive to meet customers' needs.
2 .But as in retail, there are instances of service failure in which the customer is dissatisfied, uh, perhaps to the point of not doing business with you anymore.

第五段

1 .Some service failures are beyond an organization's control, like, uh, computer malfunction that leads to missed deadlines.
2 .Other failures stem from process problems, like inadequate training for newly-hired employees.

第六段

1 .Then there's human error.
2 .Okay, imagine you manage a car rental agency.
3 .A customer calls in a reservation, but your employee marks down the wrong date.
4 .So your customer arrives and guess what, the size car he reserved isn't available.
5 .But your customer is less concerned about the source of the failure than the solution: what you do about it; what sort of compensation; what service recovery you give.

第七段

1 .So if you are in the service industry, as a marketer, you always need some kind of service recovery plan.
2 .Your plan must be in place before a failure occurs and it must also be communicated promptly to everyone in your organization who deals with customers so they'll know what to do.

第八段

1 .Service recovery encompasses all the actions taken to get a disappointed customer back to, uh, well, back to a state of satisfaction.
2 .So if your car rental agency couldn't provide the size car your customer wanted, but your policy is to provide a roomier car for the same price.
3 .Your customer would probably be happy, might even restore his faith in your company.
4 .Research has in fact identified service recovery as a significant determinant of customer loyalty.

第九段

1 .I see what you mean.
2 .Every year£, my family goes on vacation together.
3 .And a few summers ago, when we were in Chicago, it was really really hot. And guess what, the hotel's air conditioning broke and everyone was complaining.
4 .What the hotel did...they actually didn't charge anybody for that weekend.
5 .But the funny thing is that even though we had that horrible experience at that hotel, because they were so quick to appease us, we usually stay at that same hotel every time we go to Chicago.

第十段

1 .Great example!
2 .So in this case that hotel chain might consider itself the beneficiary of the so-called service recovery paradox.

第十一段

1 .Um, the paradox basically implies that customers who experience a service failure, well, they could potentially be made more loyal than customers who were satisfied in the first place if an equitable recovery occurred after the failure.

第十二段

1 .Yes, Ben?

第十三段

1 .Wait a minute.
2 .If a good service recovery creates more loyalty than, um, if things went smoothly from the get-go1 , why don't companies like make mistakes on purpose so?

第十四段

1 .So you could implement a recovery plan that leave your customers delighted as opposed to merely satisfied?
2 .Look, it;s always better to do things right the first time 'cause how how can you know that the paradox will hold true in every situation?

第十五段

1 .Plus, it's hard to predict if a good service recovery will overcome the negative effect of a service failure, and what about all those failures that never come to your attention?

2 .Because statistically about 50 percent of the customers don't complain about service failures, at least not to the service provider. But negative word of mouth, now, that got worse implications for your business.

第十六段

1 .Also, you'd have to pay your employees to execute the service a second time.
2 .Typically, a service recovery is gonna involve some kind of compensation, right?
3 .So it is gonna cost your company some money that you are going have to account for in your budget.

第十七段

1 .I've actually been researching some of these issues myself 'cause what we need is a deeper understanding of customers' thought processes and their reactions to service recoveries.
2 .How do consumers form expectations?
3 .How do they react to different service recovery tactics?
4 .Can we predict how any given customer will react to a given service failure?

第十八段

1 .People's expectations, their priorities vary.
2 .Like uh, if I am in a hurry, and the French fries I ordered at a fast food restauran aren't piping hot2,1 might not complain 'cause I got them fast.
3 .But If I am not in a hurry, I might return the fries even if I had to wait for a fresh batch.

TPO43

Conversation1

Listen to a conversation between a student and a computer lab administrator.

第二段

1 .Excuse me. Do you know that all the printers over in the student center have stopped working?

第三段

1 .There are eight printers connected to the computers there.
2 .You are saying they are all broken?

第四段

1 .Yes, I just came from there.
2 .There's a lot of frustrated students.

第五段

1 .So many classes have papers due this afternoon that everyone is trying to print out their stuff at the same time.

第六段

1 .Those printers got overworked and now they all have paper jams or some other problem.
2 .Can you fix them?

第七段

1 .Well, not really. I'm just an administrator. Most of our actual technicians are students who take the job on the side.

第八段

1 .Where are they?

第九段

1 .Well, most of the students who work at the computer labs study at the engineering school, and unfortunately they all took the day off.
2 .I think they have some big exams tomorrow.

第十段

1 .How can there be no technicians working on the biggest deadline day of the semester?

第十一段

1 .Well, there is one technician working at the computer lab in the arts building.
2 .Actually, he just sent me an email message saying there was a huge crowd there, and he could not figure out why.

第十二段

1 .Because people need to print their papers.
2 .There must be something you can do.
3 .People need those printers working.

第十三段

1 .Well, we just ordered new printers and next month we are replacing the old printers over the student center with a brand new set of printers.

第十四段

1 .But the deadline for submitting papers is just two hours away.

第十五段

1 .I'm afraid there's nothing I can do. Your best bet is to probably head to the arts building and get in line there.

第十六段

1 .But how did this happen again?
2 .Last semester when the all printers broke down, the president of the college got involved.
3 .He sent out an email message to all the students saying that he was going to personally do something to make sure that the situation was resolved.

第十七段

1 .That's right.
2 .When we had our budget meeting at the beginning of the semester, the president was there.
3 .That's not something he usually does, but he wanted to make sure we ordered the new printers.

第十八段

1 .The new printers that are coming next month?

第一十九段

1 .Yeah, I ordered them as soon as the budget was approved.
2 .It's a shame. But the purchasing process being what it is...

第二十段

1 .You know what? It's possible some of the printers are malfunctioning because they ran out of ink.
2 .Tm not a technician, but if that's what's wrong I could fix it.
3 .I guess I'll grab some ink cartridges and go over to the student center and check.
4 .No guarantees, sorry, but it might fix the problem.

Lecture1

Listen to part of a lecture in a botany class.

第二段

1 .It's autumn and as you know in most parts of the United States, the leaves on the trees are changing color from green to yellow, orange and lots of other colors.
2 .So this will be a great time to talk about how and why some of these leaves turn one color in particular and that's bright red.

第三段

1 .Well, before we discuss why leaves turn red, first, let's, um, look, I know this is very old material, but just to play it safe, let's first go over why leaves are usually green.

第四段

1 .It's chlorophyll, right?

第五段

1 .Leaves get their green color from chlorophyll, the chemical that's responsible for photosynthesis.
2 .The chlorophyll in the leaves collects energy from the Sun in the form of sunlight and it converts this energy into sugar which is food for the plant.
3 .It's chlorophyll that makes leaves green most of the time.

第六段

1 .Now, the classic explanation for why leaves change color is this.

第七段

1 .In autumn, the leaves start preparing for the winter and stop synthesizing new chlorophyll.
2 .Since chlorophyll is sensitive to sunlight and to cold temperatures both of which you get in autumn.
3 .The existing chlorophyll in the leaves breaks down and since it's not been replaced by the new chlorophyll.
4 .The green color of the leaves gradually fades away.
5 .As this happens, the other pigments present in the leaf become visible. According to the classic theory, this is true for the red pigment as well.
6 .It was there in the leaf all along but it was hidden by the green chlorophyll.

第八段

1 .OK, so that's the classic explanation and it's partially right.

第九段

1 .Why do I say partially?

第十段

1 .Well, it's probably true for pigments like yellow or orange, but it doesn't seem to hold for the red pigment.

第十一段

1 .Let's back up a bit.
2 .Just what produces this red color in leaves?

3 .It's a red pigment called anthocyanin.

第十二段

1 .Here is where the classic explanation doesn't seem to apply to red.
2 .What's interesting is that during the summer there was very little if any anthocyanin in the leaves.
3 .But in the weeks before a tree is about to drop its leaves, the production of anthocyanins increases significantly.
4 .In other words, unlike those other pigments, anthocyanins are not just unmasked by the breakdown of chlorophyll in autumn.
5 .They are actually created at this time.

第十三段

1 .So that raises a question, why would a tree produce more anthocyanin just before dropping its leaves?
2 .Why does the tree spend so much of its resources doing this just before the leaves fall off?

第十四段

1 .On the surface, that doesn't make sense.
2 .It'd be likes spending money to...I don't know...to have your old car repainted when you know the car's not going to last more than a couple of months.
3 .All this extra anthocyanin in the autumn seems like a waste.

第十五段

1 .But remember nature is very economical with its resources.
2 .So that means anthocyanin must be serving some function that's important for the tree.

第十六段

1 .Today, there are some theories about what that function might be.

第十七段

1 .One of them involves predatory insects; another involves fungi.
2 .You know, the more I read about these theories and the related research, it always created more questions for me than answers.
3 .So I was really glad to learn about a totally different theory, a new one. It seems to come with research and data that give a full explanation.
4 .So here it is.

第十八段

1 .Remember I said the chlorophyll breaks down?

2 .Well, in autumn, a whole lot of other chemical constituents of the leaf break down as well.
3 .I don't mean they are totally destroyed 'cause actually they break down into other different chemicals that the tree can reabsorb from the leaves and reuse later.

第一十九段

1 .Now, this reabsorption process is very important for the tree and here is the key.
2 .It's sensitive to light, meaning that too much exposure to sunlight can interfere with this process.

第二十段

1 .So where does anthocyanin fit in here?

第二十一段

1 .Well, anthocyanin is more stable than chlorophyll.
2 .It's not harmed as easily by the Sun or the cold.
3 .So it's still working long after the chlorophyll breaks down.

第二十二段

1 .But what does it do?

第二十三段

1 .The theory is that anthocyanin protects the reabsorption process from the sunlight.
2 .For example, if you look closely at a red leaf on a tree, you'll notice that most of the red pigment is on the upper side of the leaf, the side facing the sun.
3 .This new theory suggests that what the anthocyanin is doing there on top is shielding the rest of the leaf from the sunlight, and more importantly, allowing those important chemicals to be reabsorbed by the tree.

Lecture2

Listen to part of a lecture in a psychology class.

第二段

1 .For some time now, psychologists have been aware of an ability we all share.
2 .It's the ability to sort of judge or estimate the numbers or relative quantities of things.
3 .It's called the Approximate Number Sense, or ANS.

第三段

1 .ANS is a very basic, innate ability.
2 .It's what enables you to decide at a glance whether there're more apples than oranges on a shelf.
3 .And studies have shown that even six-month-old infants are able to use this sense to some extent.
4 .And if you think about it, you'll realize that it's an ability that some animals have as well.

第四段

1 .Animals have number...uh...approximate...?

第五段

1 .Approximate Number Sense. Sure.
2 .Just think: would a bird choose to feed in a bush filled with berries or in a bush with half as many berries?

第六段

1 .Well, the bush filled with berries I guess.

第七段

1 .And the bird certainly doesn't count the berries.
2 .The bird uses ANS: Approximate Number Sense.

第八段

1 .And that ability is innate, it's inborn.
2 .Now I'm not saying that old people have an equal skill or that the skill can't be improved, but it's present...uh...as I saicL.
3 .It's present in six-month-old babies.
4 .It isn't learned.

第九段

1 .On the other hand, the ability to do symbolic or formal mathematics is not really what you would call universal.
2 .You need training in the symbols and in the manipulation of those symbols to work out mathematical problems.
3 .Even something as basic as counting has to be taught.
4 .Formal mathematics is not something that little children can do naturally.
5 .And it wasn't even part of human culture until a few thousand years ago.

第十段

1 .Well, it might be interesting to ask the question:

2 .Are these two abilities linked somehow? Are people who are good at approximating numbers also proficient in formal mathematics?

第十一段

1 .So to find out, researchers created an experiment designed to test ANS in 14-year-olds.
2 .They had these teenagers sit in front of a computer screen.
3 .They then flash a series of slides in front of them.

第十二段

1 .Now, these slides had varying numbers of yellow and blue dots on them.
2 .One slide might have more blue dots than yellow dots, let's say...six yellow dots and nine blue dots.
3 .The next slide might have more yellow dots than blue dots.
4 .The slide would flash just for a fraction of a second.
5 .So you know, there was no time to count the dots.
6 .And then the subjects would press a button to indicate whether they thought there were more blue dots or yellow dots.

第十三段

1 .So the first thing that jumped out at the researchers when they looked at the result of the experiment was that between individuals, there were big differences in ANS proficiency.
2 .Some subjects were consistently able to identify which group of dots was larger even if there was a small ratio, if the numbers were almost equal, like ten to nine.
3 .Others had problems even when differences were relatively large, like twelve to eight.

第十四段

1 .Now, maybe you are asking whether some fourteen-year-olds are just faster, faster in general, not just in math.
2 .It turns out: tha's not so.
3 .We know this because the fourteen-year-olds had previously been tested in a few different areas.

第十五段

1 .For example, as eight-year-olds, they had been given a test of rapid color naming.
2 .That's a test to see how fast they could identify different colors.
3 .But the result didn't show a relationship with the results of the ANS test.

4 .The ones who were great at rapidly naming colors when they were eight years old weren't necessarily good at the ANS test when they were fourteen.
5 .And there was no relationship between ANS ability and skills like reading and word knowledge.

第十六段

1 .But among all the abilities tested over those years, there was one that correlated with the ANS results: math, symbolic math achievement.
2 .And this answered the researchers' question.
3 .They were able to correlate learned mathematical ability with ANS.

第十七段

1 .But it doesn't really tell us which came first.

第十八段

1 .Go on, Laura.

第一十九段

1 .I mean, if someone's born with good approximate number sense, um, does that cause them to be good at math?
2 .Or the other way around:
3 .If a person develops math ability, you know, and really studies formal mathematics, does ANS somehow improve?

第二十段

1 .Those are very good questions, and I don't think they were answered in these experiments.

第二十一段

1 .But...wait. ANS can improve?
2 .Oh, that's right, you said that before.
3 .Even though it's innate, it can improve.
4 .So wouldn't it be important for teachers in grade schools to...

第二十二段

1 .Teach ANS?
2 .But shouldn't the questions Laura just posed be answered first?
3 .Before we make teaching decisions based on the idea that having a good approximate number sense helps you learn formal mathematics.

Conversation2

Listen to part of a conversation between a student and his theater professor.

第二段

1 .Hi. Professor Davis. Sorry I missed the class yesterday. I was just getting over a cold.

第三段

1 .That's alright, Andrew. Feeling better now?

第四段

1 .Oh, yeah, fine. Um, I had a question though.
2 .For the mid-term, how much do we need to know like about the different acting styles?
3 .Since the last few chapters have been on writing our own material, scripts and stuff...well...will the exam be about that? Or about stuff in the earlier chapters? Like."um."

第五段

1 .Oh, Andrew. Before I forget, I will get to your question, but, now, don't leave without taking the tickets for tomorrow's field trip.
2 .I have a last-minute meeting so I can't make it after all. But since you helped organize the trip, I'll let you hand out the tickets. I've got everything you need right here.

第六段

1 .Sure, no problem.

第七段

1 .And you don't need directions to the theater. You've been there before, right?

第八段

1 .Yup.

第九段

1 .Good. Oh, oh, also, please remind everyone about the reception afterward.
2 .It'll be an opportunity to ask Alan Altman about his acting in the play, which we can discuss in class next week.

第十段

1 .Ok, HI tell them. It's really something! I mean, I know our acting professors must in plays all the time, but it isn't every day you get to see one right here in town.

第十一段

1 .Oh, you might be surprised.
2 .There's a calendar on the main bulletin board listing all the local productions that faculty are involved in.

第十二段

1 .Well, it seems like Professor Altman is a really popular actor. I just read his bio in the local paper.
2 .I know the critics always praise him, but I had no idea he was such a commercial success, too.
3 .And it said he just won an award last year for...uh...playwriting, wasn't it?

第十三段

1 .Well, there is a general playwriting category, but actually, his award was for script adaptation.
2 .He adapted a novel into a play.

第十四段

1 .Script adaptation?

第十五段

1 .Oh, it's a very specialized skill.
2 .Writing a play based on some other written work, novels, short stories.
3 .Now we've been studying original plays, which are pretty much based on the writer's imagination.
4 .But think about adapting a script...

第十六段

1 .Yeah, seems like it might be easier, like to start with something that's already written.

第十七段

1 .Well, actually think about it, transferring that material to a whole different genre, from narration to live dialogue.
2 .Imagination is a part of it, sure, but it also requires a lot of technical knowledge of about theater production, acting and so on.
3 .So Professor Altman, for example, he took a novel and made it into a play, dealing with all the different conventions that plays have.
4 .You know, like limitations of scene changes and...uh...well, it'd be a good thing to ask him about it at the reception tomorrow.

第十八段

1 .Yeah, sounds like an interesting topic.

第一十九段

1 .Oh, and before I forget, the packet with the tickets has a list of the students' addresses.
2 .Since Ivan is picking you up first, you can direct the driver to the other students' dorms.

第二十段

1 .Sure. That was the plan.

第二十一段

1 .Okay, good. Now, about the mid-term.

Lecture3

Listen to part of the lecture in a children's literature class.

第二段

1 .Today we'll start looking at the most important children's book authors of the twentieth century.
2 .And I'd like to start with an author illustrator whom some of you probably grew up reading:Dr. Seuss.

第三段

1 .His actual name was Theodor Seuss Geisel.
2 .Geisel's work was hugely popular among beginning readers and their parents, but it wasn't always considered literature or subjected to serious academic inquiry until relatively recently.
3 .In fact, not only weren't his books considered literature, but they weren't always considered good school books.

第四段

1 .In the late 1950s and even through the 60s, US teachers resisted Seuss's books because they perceived them as having a comic book style...fine, maybe, but not...not appropriate for the classroom.

第五段

1 .None of Geisel's books individually won him a Pulitzer Prize.
2 .And he didn't receive any top children's literary awards either.
3 .Although the Pulitzer Prize committee did give him a citation in 1984 for his...uh..."special contribution over nearly half a century to the education and enjoyment of America's children and their parents."
4 .But again, that wasn't until 1984.

第六段

1 .Perhaps one reason his books weren't taken seriously is that even though they often rhyme, you wouldn't call him a great poet.
2 .Geisel's rhyme schemes are very simple.
3 .And often, to make things rhyme, he used silly names for his imaginary creatures, like the Grinch and Sneetches.
4 .In fact, one book features 34 pairs of rhymed words, but only eight of those pairs consist entirely of real words.
5 .The rest are made-up words.

第七段

1 .Geisel also illustrated his own books and created a lot of highly memorable characters from a visual standpoint.
2 .Yet as far as his artistic talent, no one's ever called him a great artist or a great illustrator.

第八段

1 .For his human characters, he pretty much drew the same face over and over.
2 .Except for minor accessories, all the people in his books look the same.
3 .Not exactly something you'd be encouraged to do in art school. And the way he drew even nonhuman characters was dismissed by many critics as being overly simplistic.
4 .His landscapes, on the other hand, they are simple but they are also extremely clever.
5 .He had this uncanny knack for creating the illusion of great distance with some very simple shapes and lines.

第九段

1 .But what about from a pedagogical standpoint?

第十段

1 .Well, let's consider Geisel's most famous book: The Cat in the Hat.
2 .Now, in a way, this book, The Cat in the Hat, captures the essence of Geisel's particular genius as a children's author.
3 .Geisel actually wrote it in response to an article written in 1954 by an acclaimed novelist named John Hersey.
4 .In this article, Hersey criticized the textbooks being used in elementary schools to teach children to read.
5 .He called the books 'boring, contrived, and utterly humorless'.

第十一段

1 .After seeing Hersey's article, Geisel must have wondered what made the books so dull.
2 .And one thing he found was they use only words from the Dolch List.
3 .The Dolch List contained a few hundred common sight words, words like, well, cat and hat.
4 .At the time, the Dolch List was widely adhered to by publishers of textbooks for beginning readers.

第十二段

1 .Well, using only words from the Dolch List, Geisel tapped into his fertile imagination.
2 .And the result was an incredibly funny and engaging storyline about a talking cat that convinces a brother and sister to let him make a huge mess in their house while their mother is away.
3 .Another character, a talking fish, tries to warn the children that they'll be blamed for the cat's crazy antics.
4 .You can really feel the tension building up in those kids as the cat makes the house messier and messier.
5 .Ultimately the house gets straightened up in the nick of time.
6 .And the kids are left speechless when their mom shows up and casually asks if anything interesting happened in her absence.
7 .The kids, and presumably, Geisel's readers are left thinking: Should they tell the truth? And that's where the book ends.

第十三段

1 .Brilliant! There aren't too many authors who can set up a moral dilemma like this and then get children to think about it for themselves.

Lecture4

Listen to part of a lecture in a physics class.
2 .The professor has been discussing electromagnetic waves.

第二段

1 .So are there any questions before we continue our discussion of different types of electromagnetic waves?
2 .Um, today, we'll focus on radio waves, and specifically, very low frequency radio waves. Yes, Tim.

第三段

1 .Are you going to talk at all about the difference between radio waves and sound waves?

第四段

1 .Uh, Ok. That might be a good place to start actually.
2 .Sound waves are mechanical in nature, right? They can only originate and spread in places where there's some dense physical medium, like atmosphere or water.
3 .They result from changes in pressure in that medium, like changes in air pressure.
4 .So they can't travel through a vacuum, where there is no dense physical medium, which is why they can't travel through interplanetary space.

第五段

1 .Radio waves, on the other hand, are fundamentally different from sound waves.
2 .They are electromagnetic.
3 .They result from oscillations of the electromagnetic field and don't need a physical medium, so they, like other types of electromagnetic wave, can travel basically anywhere, through a vacuum, or through atmosphere or water.

第六段

1 .Now, radio waves can be detected.
2 .For example, very low frequency radio waves can be detected with a special type of radio receiver called a very low frequency radio or VLF radio, which can pick up radio waves with very low frequencies, from 3 to 30 kilohertz, which aren't really picked up by a regular household or car radio.
3 .So VLF radios pick up VLF radio waves and convert them to sounds we can hear.

第七段

1 .Um, on Earth the main source of naturally occurring VLF emissions is lightning, which generates a pulse of radio waves every time it flashes.
2 .Yes, Laura.

第八段

1 .Since you almost always get lightning with thunderstorms. We can pick up VLF waves pretty often, right?
2 .You just have to wait until there is a thunderstorm.

第九段

1 .Ah, do you? Have to wait? VLF receivers are very sensitive and VLF waves travel very far.

2 .So we can pick up emissions from lightning that's far away. So actually, you can pretty much listen to them all the time because lightning strikes Earth constantly, about a hundred times per second.

3 .Even if there is no lightning where you are, with a VLF radio, you can hear the crackling from storms that are thousands of kilometers away.

第十段

1 .However, some times of day are better than others for picking up VLF waves.

2 .Daytime isn't as good as night time, for example.

3 .And what's more, my colleague Denis Gallagher says, and in my opinion, he's right.

4 .He says the best time to listen for them is around sunset or sunrise.

5 .That's when there're natural waveguides in the local atmosphere.

第十一段

1 .Did you say waveguide?

第十二段

1 .Yes, a waveguide.

2 .Usually it refers to a device, like a metal conductor that's used to guide and direct waves.

3 .But waveguides also occur naturally.

4 .They make a path for radio waves to follow in our atmosphere.

5 .These natural waveguides occur when the Sun is rising or setting, which makes sunrise and sunset good times to pick up VLF emissions.

第十三段

1 .Now, there are a few different sounds that you can hear on a VLF receiver, because when lightning strikes the radio waves travel different distances and in different ways before they reach the receiver.

第十四段

1 .Some really interesting ones are called whistlers. Whistlers come from lightning-generated radio waves that leave earth's atmosphere and travel into earth's magnetosphere before bouncing back down.

2 .Not all radio waves do this and the sound they make, well, we call them whistlers because they sound like slowly descending tones.

3 .And no two whistlers are alike.
4 .To me, they're the most intriguing.

第十五段

1 .Another interesting sound is the tweek.
2 .Tweeks are the result of VLF waves that have travelled a long distance through the waveguides.
3 .They produce a chirpy sound because the higher frequency parts of the wave reach the radio receiver before the lower frequency parts.
4 .The entire wave is still considered very low frequency.
5 .It's just that some parts of the wave have lower frequencies than others, OK?

TPO44

Conversation1

Listen to a conversation between a student and her sociology professor.

第二段

1 .I'm glad you got my message and were able to make it.
2 .Where are the other members of your group? Tom and Jane?

第三段

1 .They are actually at the library.
2 .They have a biology lab assignment that's due later this afternoon. So I'm here to represent the whole group.

第四段

1 .But...um...when we got your e-mail message about being worried about our research project, we were a little confused, we thought you were excited about our idea for the project.

第五段

1 .Well, I think it's a great research topic, but when I looked closely at your plan for accomplishing the research, I realized that your group was probably asking for some trouble.

第六段

1 .What do you mean? I thought that, you know, by monitoring students studying in the library we could really get a good understanding of people's study habits and stuff.

第七段

1 .The thing is, I think you might have a problem because of the Hawthorne Effect.

第八段

1 .The Hawthorne Effect?

第九段

1 .The Hawthorne effect is a technical term for when researchers...uh...more or less forget about a specific variable, the variable of the researchers themselves.

第十段

1 .Now, the students in the library, they are going to know that you are observing them, right? So you have to consider the effect your very presence will have on the people you are observing.

第十一段

1 .But...so you think... I mean it's not like our observations would be a secret. The students would know exactly what we would be doing.
2 .I mean, we'd put up a sign right outside the library.

第十二段

1 .Yes, but that's just it.
2 .When people know they are being watched, they act differently.
3 .Let me explain how the Hawthorne effect got its name and...well...you,ll get the idea.

第十三段

1 .See, there was a manufacturing facility called the Hawthorne plant.
2 .And researchers conducted some experiments there to see what conditions make workers the most productive.

第十四段

1 .What sort of conditions?

第十五段

1 .Well, one thing they experimented with was the lights. Were workers more productive with bright lights or dim lights? Well, here is the thing, whatever the researchers did, the workers' productivity increased.
2 .When the lighting was improved , productivity went up.
3 .When the lighting was dimmed , productivity went up again.

第十六段

1 .That doesn't make a lot of sense.

第十七段

1 .Exactly! So initially the experiment was considered a failure.
2 .But then the researchers realized that their own presence had affected the workers' productivity.
3 .The workers knew that the researchers were watching them , and with so much attention on them the workers felt compelled to work harder.

第十八段

1 .Oh, I guess that really could bean issue with my group's research.

第一十九段

1 .Yes, but I don't want to send you all back to square one.
2 .So how about you set up a meeting with your group members and discuss this. Then we can meet again and go over your ideas.
3 .And I think that we should be able to figure out a way to get a round the problem.

Lecture1

Listen to part of a lecture in a materials science class.

第二段

1 .Ok. Last time we finished going over some of the fundamental concepts of nanotechnology, the multi-disciplinary science of manipulating or controlling extremely small units of matter on the scale of molecules or even atoms.

第三段

1 .So, I want to talk about how nanotechnology is being used today.
2 .And just to give you an idea, we'll look at one particular application.

第四段

1 .A team of material scientists in Massachusetts has been working on a new ultra-thin coating, a nano coating that might be applied to objects like bathroom mirrors, car windows, and eye glasses to prevent fogging.
2 .And the coating has the potential to be a permanent solution, unlike the kinds of anti-fogging spray-on liquids that are on the market today.

第五段

1 .Now, fogging often occurs when a cold surface comes into contact with warm moist air, such as when a glass shower door or mirror fogs up during a warm shower.

第六段

1 .Now, what's actually happening is, what the fog is, is thousands of tiny spherical water droplets condensing on the surface of the glass.
2 .Light hits the water droplets and is scattered in random directions, causing the fogging effect.

第七段

1 .Now, the kind of spray-on treatments I mentioned.
2 .Well, they wear off.
3 .What happens is they cause the tiny water droplets to flatten when they condense on the surface of the shower door or bathroom mirror or whatever object it is, it's been applied to.

第八段

1 .Because the droplets are flattened, when light hits them, the light doesn't scatter.
2 .But, as I said, those kinds of treatments don't last very long.

第九段

1 .The new coating has two important components.
2 .One, negatively charged silicon nano particles, these are basically tiny particles of glass.
3 .And two, a positively charged polymer, which you already know, a polymer is a chemical compound.
4 .They're layered over each other.
5 .The polymer, then the silicon nano particles, the polymer, then the silicon nano particles, you see.
6 .They're layered in such a way that the silicon nano particles don't pack together tightly.
7 .In other words, the structure has pores, or holes, little tiny pockets throughout it.

第十段

1 .The coating prevents fog from developing, because it loves water.
2 .It attracts the water droplets, sucking them into the tiny pores.
3 .And that alters the shape of the droplets.
4 .The droplets are forced to flatten and to join together into a single sheet of water, rather than remaining as single droplets, each of which is a sphere that scatters light in different directions.

第十一段

1 .Ok, so, instead of being scattered, the light passes through the thin sheet of water.
2 .So, there's no fogging effect.

第十二段

1 .The ultra-thin coating can be made more durable by heating it, and of course the object it's applied to, to an extremely hot temperature, 500 degree Celsius.
2 .What that does, is burn the polymer away, and fuse the silicon nano particles together, while maintaining the structure of pores.

第十三段

1 .But that's possible only on materials that can withstand high heat.
2 .Glass? Yes. Plastics? No.
3 .But they're working on solving that problem, trying to come up with a way to coat plastics and other materials, durably and effectively.

第十四段

1 .Interestingly, it was a plant, the lotus plant that inspired this work.
2 .I guess you could say inspired it in an indirect sort of way.
3 .The leaves of this plant are what we call superhydrophobic.
4 .Lotus leaves, being superhydrophobic, don't attract water.
5 .They repel it, in a big way.
6 .When raindrops fall on lotus leaves, they remain spherical. They roll right off.

第十五段

1 .So for a long time, the Massachusetts scientists tried to create a coating that acted like these lotus leaves, a coating that was superhydrophobic.
2 .But then they began to think about the opposite extreme.
3 .Could they accomplish their goal by making a coating that, instead of repelling water, actually, attracted water?

第十六段

1 .Well, they seem to have gotten quite far with this approach.
2 .It's really strong work, with a range of interesting consumer applications.
3 .It's not costly to manufacture the coating.
4 .Some carmakersare interested in applying it to their wind shields.
5 .Looks like we'll probably see it on the markets in everyday products in the next few years.

Lecture2

Listen to part of a lecture in an introduction to drama class.

第二段

1 .Now, throughout the history of drama, there has been a, well, a relationship between the structure of a play, and the structure of the space where the play was performed.

2 .And this goes all the way back to the ancient Greeks.

第三段

1 .The Greeks built the first theaters in the fifth century B.C.E.

2 .These were outdoor theaters.

3 .The architects looked for sites where you had a natural bowl-like formation on the side of a hill, and that's where they set the theater.

4 .All Greek theaters were pretty much the same.

5 .There was some natural variation to accommodate the size and shape of the site, but as far as the basic elements went, those remained constant.

第四段

1 .Have a look at this diagram.

2 .Let's start with the area where the actors performed, like, what we call the stage today.

3 .The Greeks referred to this space as the skene.

4 .Uh, there's some confusion about the use of the word 'skene' by different scholars.

5 .Some authors use it to refer only to the structure behind the stage, while others use it to refer to the structure and the stage together, and that's how I'll use the term, to refer to both the stage and the building.

第五段

1 .Um, so, anyway, the skene started as a simple wooden platform, but eventually became much more elaborate.

2 .The front wall of the building was decorated like a palace, or a temple, and served as background scenery for the play.

3 .The building was also a storage place for costumes, props, things like that.

第六段

1 .Yes, Robert?

第七段

1 .So, did they decorate the skene for each play or, um, change the scenery during the play, like we do today?
2 .Or, did the whole story take place in one setting?

第八段

1 .Well, everything the audience saw happened in that one setting usually in front of either a temple or a palace, but the audience didn't witness all events in the story.
2 .Some events couldn't be presented convincingly, so the playwrights had them take place somewhere off stage, where the audience couldn't see them.
3 .And then news of the event would be reported by one of the characters. Diane?

第九段

1 .Last summer, I saw... Hippolytus.

第十段

1 .Excellent! I hope you enjoyed it.

第十一段

1 .Definitely. So, at one point, you see Hippolytus being sent off by his father, then a little later, a messenger arrives and describes how Hippolytus was riding in his chariot when a giant bull appeared out of the ocean, and caused the chariot to crash, and then, after we hear what happened to Hippolytus, he's carried back on stage where he dies.

第十二段

1 .Exactly. I mean, can you imagine trying to show all that action, a giant animal rising out of the sea?

第十三段

1 .Um; Okay. The next area was the space the ancient Greeks called the Orchestra.
2 .The orchestra was either round, as you see here, or a semi-circle.
3 .Um; in ancient Greek, the word orchestra actually meant the dancing place, because this is where the chorus danced and sang.

第十四段

1 .But to understand Greek plays, you need to understand an additional function of the chorus.

2 .Yes, the ancient Greek chorus did most definitely sing and dance like choruses do today, but the chorus's most important role was commenting on what the characters on stage were doing and thinking.
3 .In fact, Aristotle, the Greek philosopher, thought the chorus should be considered as acting out a role in the play.

第十五段

1 .Yeah, I read that a chorus could have a distinct personality, just like a person.

第十六段

1 .Absolutely. In fact, you'll see an excellent example of that in the first play we'll be studying.

第十七段

1 .Okay, the last space was the seating area for the audience.
2 .This was called the theatron.
3 .In ancient Greek, theatron means seeing, that's S-E-E-I-N-G, seeing place.The theatron was shaped in a semi-circle with rows of seating rising up the sides of the bowl.
4 .It was designed to take advantage of the natural acoustic benefits of the setting.
5 .The shape of the bowl captured sound and funneled it upwards so that even in the top rows, spectators were able to hear the performers very clearly.

第十八段

1 .Actually, that the name theatron means seeing place is kind of ironic.
2 .Some theaters had fifty or more rows of seats accommodating up to 14,000 spectators, ascending way up the hillside, and this was long before theater binoculars were invented.

Conversation2

Listen to a conversation between a student and an art professor.

第二段

1 .Hi. Dr. Morten. I'm Karen Stern. I met you briefly about a year ago when I was applying to the university.
2 .You were on a panel of professors and you were talking about the art department.

第三段

1 .Ah...and you are now a student here.
2 .I guess I said the right thing.

第四段

1 .Yeah. Right now I am doing the intro-courses in the art department, but I am really interested in painting.

第五段

1 .Well, I did several of the painting courses so I hope to see you in the future.

第六段

1 .Actually I was wondering: you are in charge of student art exhibitions at the university gallery, right?

第七段

1 .Right!

第八段

1 .So I know all the exhibitors are students, but I was wondering how you choose the works you exhibit every month. Is there like a submission process or something?
2 .Now, there is a submission process, yes.
3 .We a have gallery review committee, but we already have our exhibitions planned for the rest of the schoolyear.
4 .Generally our exhibitors are third- and fourth-year students, well into their coursework.

第九段

1 .Oh; Well, I guess that will be something to look forward to then.
2 .Tell me, do you show all kinds of paintings?

第十段

1 .Well, actually we started doing something different with the gallery this year.
2 .We are featuring a specific technique each month.
3 .Next month's exhibition, for instance, will feature drip paintings.

第十一段

1 .Really? Like Jackson Pollock?

第十二段

1 .Ah....so you are familiar with Pollock's work.

第十三段

1 .Well, sort of, though I've only seen photographs of it.

2 .I know he dripped paint onto the canvas instead of using a brush.
3 .I read he stretched out his canvases on the floor of a studio and then he climbed up on a ladder to pour paint, ordinary house paint, from a can onto the canvas.

第十四段

1 .That's right. That was characteristic of Pollock in the late forties, in what we call his drip period.
2 .And the object was to produce a constant stream of paint to create continuous lines, because as you know when you use a brush directly on a canvas you get broken lines.
3 .So, you like Pollock.

第十五段

1 .Yeah, I do. I like abstract works in general.
2 .There's a class on abstract art, right?

第十六段

1 .Actually I teach that class and drip painting was one of our themes last year.
2 .Some students from last year's class have continued experimenting with it and created some incredible pieces using everything from squeezed bottles to computer controlled sprayers.

第十七段

1 .Do they look a lot like Pollock's work?

第十八段

1 .Well, our goal wasn't to imitate Jackson Pollock.
2 .The object was to get students to look at different ways of applying paint to a canvas.
3 .But you don't have to enroll in a specific course to be invited to exhibit your work.
4 .It just has to fit the theme for one of our exhibitions.

Lecture3

Listen to part of a lecture in an anthropology class.

第二段

1 .So, we've been talking about early civilizations, how they developed, and early agriculture.

2 .And it's believed that agriculture arose independently in a few areas of the world about ten thousand years ago, and then spread from those areas to the rest of the world.
3 .Those cradles of agriculture include the Middle East, China and Southeast Asia, and parts of the Americas.

第三段

1 .Now, for many years archaeologists have speculated that agriculture also arose independently in another center, too-New Guinea, which is just north of Australia, in the South Pacific Ocean.
2 .You can see it on this map.

第四段

1 .So, it had been assumed for a long time that New Guinea,
2 .that domesticated plants and animals,
3 .the practice of agriculture, generally,
4 .had been introduced from Southeast Asia about 3500 years ago,
5 .had come south essentially.

第五段

1 .Then in the 1960s and 70s, research was conducted at sites in New Guinea to explore the possibility of independent agricultural development.

第六段

1 .But unfortunately, the evidence gathered at that time was inconclusive.

第七段

1 .For instance, although evidence was found of deforestation,
2 .you know, cutting down trees, from at least 7,000 years ago,
3 .that is long before we;d thought previously.
4 .It was unclear whether the forest had been cleared by farmers to plant fields,
5 .or by hunter-gatherers, so they could hunt more easily.
6 .And many plant remains like seeds and fruits don't preserve well in swampy soils, in humid environments like you often find in New Guinea.
7 .So really, the proof was limited.

第八段

1 .But, recent research has turned up some pretty convincing support.
2 .A group of archaeologists returned to a site that had been previously examined,

3 .Kuk Swamp, which is in a mountain valley in the highlands of what is now Papua, New Guinea.

第九段

1 .Based on their findings, they identified a succession of phases of agricultural development in the wetlands there,
2 .with several of these phases predating the earliest known agricultural influence from Southeast Asia.

第十段

1 .At the site in Kuk, they used an array of modern archaeological methods to analyze sediment samples from the soil.
2 .From the oldest soil layer dating back 10,000 years, they found evidence of pits, stake holes and ditches.
3 .Now, these all indicate that crops were being planted.
4 .Plants are tied to stakes, and ditches are for... for drainage,
5 .a proof of a very early, first phase of agricultural development.

第十一段

1 .The second phase, which they identify from a higher layer of soil, featured regularly distributed mounds.
2 .Mounds were constructed to plant crops that can't tolerate very wet soil,
3 .such as bananas, because remember Kuk is a swampy wetland, and bananas wouldn't ordinarily grow well there.

第十二段

1 .And in the layers from Kuk's third phase, they found evidence of an extensive network of ditches and drainage channels,
2 .indicating a further refinement of wetland cultivation.
3 .Because they had more advanced techniques than were available to earlier researchers,
4 .the archaeologists also were able to identify actual plant remains - micro-fossils in the soil from banana plants,
5 .and...and also grains of starch from taro, on the edges of stone tools that date from about 10,000 years ago.

第十三段

1 .Finding the taro remains were very important,
2 .because it meant that it must have been planted there, brought from the lowlands,
3 .because taro doesn't grow naturally in the highlands.

第十四段

1 .And as for the bananas, researchers also found a high percentage of fossils from banana plants in sediment samples dating from about 7,000 years ago,
2 .proof the bananas were deliberately planted,
3 .because where bananas grow naturally the concentration of the plant fossils is lower.
4 .Bananas don't naturally grow so densely.
5 .As a matter of fact, recent genetic research,
6 .genetic comparisons of banana species,
7 .suggests that the type of banana grown in New Guinea was domesticated there and then brought to Southeast Asia.

第十五段

1 .So, not sure where I'm going with this?

第十六段

1 .Well, usually, we expect to see that certain social changes are brought about by the development of agriculture,
2 .structural changes in the society like rapid population growth, social classes.
3 .But New Guinea, it's largely unchanged.
4 .It's remained an egalitarian and rural society, so what does that tell us about the usual assumption?

Lecture4

Listen to part of a lecture in an environmental science class.

第二段

1 .Now, there is growing interest these days in generating electricity from renewable energy sources, right? From developing wind farms to tapping into an underground source of geothermal energy.
2 .And when you're considering a new project, it's important to look at the costs as well as benefits of developing that energy source.
3 .Let me give you an example of the kind of thing I am talking about.

第三段

1 .There is currently a lot of interest in harnessing the power of the oceans,
2 .of the ocean tides, that is,

3 .the movement of huge amounts of water which causes the water level of oceans to rise and fall.
4 .The idea is that if we can harness that tidal energy,
5 .it'd be a great clean enewable energy source.

第四段

1 .One place where this tidal energy can be harnessed is at a shallow body of water, such as an estuary.

第五段

1 .Now, can anyone tell us what an estuary is? Yes, Ted.

第六段

1 .An estuary is where a river enters the ocean.
2 .The fresh water meets the ocean water.
3 .Sometimes it is covered in water. Sometimes it is not.

第七段

1 .Some parts of the estuary, as the tides go in and out, but other parts are always submerged.

第八段

1 .Now, estuaries are an ideal place to try to capture energy from changes in tides because,
2 .well, there is an exceptionally large difference between the water level at high tide and at low tide.
3 .All that movement of water generates a lot of energy.
4 .And one way to harness that energy is by building a structure called a barrage there.

第九段

1 .A barrage is basically a large low dam that's built across an estuary.
2 .When the tides go in and out, the moving water flows through tunnels in the barrage.
3 .So you have huge amounts of water trying to flow through these relatively small tunnels and that turns turbines that generate electricity.

第十段

1 .Now, these estuaries are important because of their high level of biological productivity.
2 .They are home to lots of birds, fish and other marine life.
3 .So when you propose to construct a barrage, you have lots of issues to consider.

第十一段

1 .For example, it would change the existing water levels in the estuary.
2 .Since a lot of water is getting held up by the barrage, the incoming tides won¡¯t go as high,
3 .but they wouldn't be as low during low tide, either.
4 .This might help prevent flooding. But it would also affect the mudflats, those areas of mud that normally are exposed when the tide recedes.

第十二段

1 .But don't lots of birds rely on exposed mudflats for food?

第十三段

1 .I mean, don't they eat tiny animals that live in the mud?
2 .And what about those tiny animals?
3 .What would happen to them if the mudflats were endangered?

第十四段

1 .So you are seeing some of the potential problems with the barrage.
2 .But consider this, right now, the water in an estuary is very cloudy.
3 .The tidal currents are constantly churning up the sediments that rivers deposit in the estuary.
4 .But a barrage would reduce the tidal currents. So a lot of that sediment would settle to the floor of the estuary.
5 .It wouldn't get stirred up so much.
6 .The water would be clearer,
7 .allowing more sunlight to reach deeper into the water,
8 .which might lead to more food for birds and other animals,
9 .attracting new wildlife to the area.
10 .So it;s a complicated environmental picture.

第十五段

1 .Have they tried this anywhere? Built a barrage?

第十六段

1 .Yes, there are several in operation. There is one in France.

第十七段

1 .Now, they have to be careful there about how they turn on the turbines because they create currents and waves that can affect boats.

第十八段

1 .But I haven't read about any major ecological problems.
2 .In fact, the fishing is supposed to have improved.

3 .Plus there is even more bird life.

第一十九段

1 .But some of the barrages we're considering now would be much larger than that one.
2 .There has been one proposed for the estuary of Great Britain's Severn River, one of the largest estuaries in the world.
3 .It would be 16 kilometers long.
4 .Just to give you an idea, the barrage in France is less than a kilometer.

第二十段

1 .Outside of environmental concerns, such a project would be hugely expensive and that's another argument against barrages,
2 .well, such large ones anyway.
3 .Critics say that it would better to use that money for something else,
4 .such as improving the energy efficiency of buildings.
5 .You could make a lot of buildings more efficient with all that money and that would reduce the need for electricity.

TPO45

Conversation1

Sorry you had to wait. It's a busy time of year.
2 .Lots of people mailing packages home.

第二段

1 .I bet. I'll have to come next week to do that.Im moving out of my dorm and Tm sending some papers home.

第三段

1 .Ok. Well be here. What can I do for you today?

第四段

1 .Well, my roommate asked me to pick something up for her. I told her I was coming down here. She got this notice saying that there's a package to pick up. I guess it was too big to fit into our mailbox.

第五段

1 .I am sorry. But I can only give packages to the person who they're addressed to. It's university policy.

第六段

1 .Really? Could you make an exception? She is my roommate.

第七段

1 .I wish I could, but she'll have to come and get it herself.
2 .And be sure to tell her to have her student ID card on her.
3 .We will need to see identification.
4 .Oh, and she'll need that package notification too.

第八段

1 .Ok. HI let her know. Also since I'm moving, I'll be able to receive my mail at my new apartment, so I don't really need my campus mailbox.

第九段

1 .Oh, Ok. Although I should tell you that we do recommend that students use the campus mailbox service even if they are moving off campus.

第十段

1 .Really? Why?

第十一段

1 .Well, if any of your professors want to notify you of changes to class schedules or get in touch with you for any reason...

第十二段

1 .My professors have my email address.

第十三段

1 .Yes, that's true. But remember things like university newsletters, flyers from university clubs, notices about special events, they're only distributed to campus mailboxes.
2 .None of that is mailed off campus.

第十四段

1 .Well, I worked at the college newspaper£, so I should be able to keep on top of what's going on.
2 .Plus there's a bulletin board outside the dining hall.

第十五段

1 .True. But you know if it's the campus mailbox fee, I might be able to offer you a less expensive rate for next year.
2 .We can do that in special circumstances.

第十六段

1 .Thanks.But I mean I can afford the mailbox fee. It's just that between my off-campus address, my email account and the school newspaper, I don't think there will be a problem.

第十七段

1 .Ok. In that case, stop by the main desk on your way out of the building and pick up the form you'll need.
2 .And don't forget to include a forwarding mail address for anything that's addressed to your box from outside the university.

Lecture1

Listen to part of a lecture in an Art History class.

第二段

1 .As I was saying, the Renaissance period, which started in the 1400s in Europe, the Renaissance was still a pretty religious period, and that's reflected in the artwork of that time.

第三段

1 .But artists were starting to experiment with a more secular point of view as well, a tendency to also use the natural world as the subject matter for their art.

第四段

1 .And there were different ways that these natural themes were explored.
2 .For instance, many artists would paint portraits, while others, although this was more common in Northern Europe, would make landscapes the subject of their works.

第五段

1 .But today i like to consider an influential Italian Renaissance artist, Leon Battista Alberti, who took a slightly different approach.

第六段

1 .Leon Battista Alberti was a painter, sculptor, architect, musician, poet, very wide-ranging interests, like Da Vinci or Michelangelo, the sort of guy for whom the term "Renaissance Man was in fact created.

第七段

1 .created.Alberti believed that the most important approach for a painter was to capture a story or narrative.
2 .Now, as Tve indicated, this narrative could be the religious or secular, depending on what the work of art was for.
3 .If the work was to be placed in a church, then obviously, it'd have a religious theme, whereas, if it was for someone's home, then it could deal with a different subject matter.

4 .The exact narrative didn't really matter, so long as it was one that captivated the audience, that held the viewers' attention.

第八段

1 .So, what is actually needed to tell a story?

第九段

1 .Well, Alberti needed characters, right?
2 .Human figures. And he wanted to represent them as realistically as possible, to capture the viewers' attention.
3 .One way he achieved this was to make use of what's known as "the contrapposto pose".

第十段

1 .A contrapposto pose basically entails showing a slight twist in the body.
2 .The shoulders and hips are usually bent in different directions.
3 .In other words, if the left shoulder is bent, so that it's slightly higher than the right shoulder, then the hips will be bent, so that the left side will be slightly lower than the right side.
4 .Similarly, in sculptures, most of the weight seems to be on one foot, which also results in this slanted position, making it seem like the figure is about to walk or move. This adds to the realistic aspect of the figure.

第十一段

1 .But there are actually a lot of things that could go wrong in the attempt to create such a pose.
2 .You could make a figure's arms bigger than its legs, or the head too small for the body.
3 .Messing up the proportions can leave a figure looking cartoon-like and unnatural.
4 .But Alberti had a solution.
5 .He encouraged artists to visualize a figures' bones and structure.
6 .This would give the artist an idea of the proportions of the figure.
7 .From there, Alberti suggested that the artists imagine attaching the tendons and muscles, then covering those with flesh and skin.

第十二段

1 .Now, although this method may seem complicated, artists since antiquity have used anatomical observations to try to get the proportions of the human figure as accurate as possible, though obviously not to the degree that Alberti was recommending.

第十三段

1 .Now, in addition to characters, the setting is extremely important, especially when attempting to tell a story realistically.
2 .Renaissance artists essentially needed to create a threedimensional scene on a two-dimensional surface.
3 .They accomplished this by the use of perspective, a relatively new idea for artists at the time.
4 .In particular, the type of perspective that Alberti advocated was called Linear "One-point Perspective".

第十四段

1 .In fact, Alberti was one of the artists who developed the geometry behind linear one-point perspective.
2 .Linear perspective basically consists of drawing straight lines that extend from the forefront of the painting into the background, lines that seem to be paralleled to each other, but which actually converge on a single point in the horizon, called the vanishing point.
3 .By drawing figures and objects smaller and smaller, as the lines get closer together, the artist is able to create depth
4 .in a painting. This gives the illusion of a third dimension, and makes the work of art more realistic.

Lecture2

Listen to part of the lecture in a biology class.

第二段

1 .So that's the overview of the human immune system.
2 .But we have a few minutes left.
3 .Any questions? George?

第三段

1 .Yes. You talked about T-cells, naive T-cells.
2 .Can you go over that part again? And also why do we call them that anyway?

第四段

1 .All right. They're...they're known as T-cells because they develop in the thymus.

第五段

1 .The what?

第六段

1 .Thymus.
2 .That's T-H-Y-M-U-S.
3 .It's a small organ in the body.
4 .Anyway, that's why we call them that. They come from the thymus.
5 .And T-cells are a part of body's immune system.
6 .They can recognize and eliminate cells from outside the body that might cause disease.

第七段

1 .But why naive?
2 .I mean, we might call people naive if they don't have enough experience to know about the dangers of the world.
3 .But how can you call a cell naive?

第八段

1 .Well...when this type of immune cell encounters a cell from outside the body, like maybe a bacterium.
2 .It interacts with that bacterium and learns to recognize it.
3 .So whenever the immune cell runs into that kind of bacterium in the future, it'll attack and kill it.
4 .At that point we call it a memory T-cell because it's learned to recognize a protein marker that identifies this particular kind of bacterium.
5 .But before it's learned to recognize any particular protein from outside the body, we call it naive. Okay?

第九段

1 .Yeah, I get it.

第十段

1 .There is a lot of biochemistry involved that we'll get into in the next lecture.
2 .But your question reminds me about a study that some of my colleagues are doing.
3 .It relates to caloric restriction.

第十一段

1 .Caloric? Like calories in the food we eat.

第十二段

1 .Exactly! We are talking about the sugars, carbohydrates, fats that our bodies burn to get energy which we measure in calories.

第十三段

1 .Okay, let's back up a little.

第十四段

1 .Back in the 1930s, a nutritionist at Cornell University put mice on a severely restricted diet.
2 .He gave each mouse in one group thirty percent less food, or more precisely, thirty percent fewer calories than the mice in the other group which ate a normal amount.
3 .And the result, the underfed mice lived much longer than the normally fed ones.

第十五段

1 .Wow! Does that just go for mice?

第十六段

1 .Apparently not.
2 .Similar results have come from experiments on other animals from roundworms to most recently Rhesus monkeys.

第十七段

1 .These monkeys, two groups of them, were given all the vitamins and minerals and other nutrients they needed, except that one group got thirty percent fewer calories.
2 .And now after thirty years or so, about an average lifetime for a monkey, it's clear that the monkeys that have been on the calorie restricted diet are doing a lot better than the ones on that we consider a normal healthful diet.
3 .Like in terms of blood pressure and lots of other measures, the calorie restricted monkeys are much healthier and they just look and act younger than the monkeys in the normal diet group.
4 .And as a group, they are living longer.

第十八段

1 .Interesting. But what's the connection?

第一十九段

1 .Oh, with the immune system?
2 .Well, it is been shown that the immune system becomes much less effective as animals age.
3 .That's true in humans too.
4 .We think those naive T-cells just get used up.
5 .I mean it is not like the body's always making lots of new ones.

6 .And over the course of a lifetime, as T-cells encounter more and more strange bacteria or whatever, the naive T-cells get turned into memory T-cells.
7 .So later on in life, there are fewer and fewer of these naive T-cells left to deal with any new diseasecausing organisms that might attack, which means less immunity, and the animal or person is more likely to get sick.

第二十段

1 .But caloric restriction, it kind of shocks the system, and one result is, well, those monkeys on the calorie-restricted diet had lots more naive T-cells left than you'd expect in monkeys that old.
2 .The expected drop in naive T-cells, apparently the shock of getting thirty percent fewer calories really slows that down.
3 .And after many years, with so many more naive T-cells still in reserve, these monkeys are a lot better at fighting off new infections than normally fed monkeys of the same advanced age.

第二十一段

1 .And that's why they live longer?

第二十二段

1 .Well, it's got be one reason.
2 .This is all pretty complex though with lots of details yet to be worked out.

第二十三段

1 .But are results the same for humans?

第二十四段

1 .Hard to say.
2 .A good study would take decades. And it's not easy finding people who'd want to take part, would you?

第二十五段

1 .And eat thirty percent less.
2 .That would be tough.

第二十六段

1 .You bet it would.

Conversation2

Listen to a conversation between a student and her economics professor.

第二段

1 .Excellent presentation you made at the end of class yesterday.

第三段

1 .Oh, thanks.

第四段

1 .Im so glad you volunteered to present first.Starting out by outlining what you were going to say, then at the end summarizing the key points. It was a very effective way of getting your points across.

第五段

1 .Im glad you think so. I was afraid it might come across as too formal.
2 .Not at all. In fact£, I think it's a great approach in general for these presentations.
3 .So I hope the others were taking note, and the economic model you discussed: build operate transfer. I think everyone was quite interested.
4 .I think everyone was quite interested.

第六段

1 .Yeah. It makes so much sense.
2 .If governments allow private companies to build public works like a power plant and then operate it for a decade or two before transferring ownership to the government, everyone benefits.

第七段

1 .Yes, the private companies make a profit.
2 .The public gets immediate infrastructure.

第八段

1 .And all without the government having to spend any money upfront, which is amazing.

第九段

1 .Right.

第十段

1 .Anyway as I said in my presentation, this model is being used in Turkey right now and you said when you handed out that brochure in class last week, about the university's global enrichment initiative.
2 .You said one of the countries involves in that is Turkey.

第十一段

1 .Yes, that's right.

第十二段

1 .So I wanted to see if there's a chance the university sends fifteen students overseas to study?

第十三段

1 .Fifteen students per country, fifteen for Turkey, fifteen for Brazil, fifteen for Russia.

2 .We've got a total of six countries participating next summer.

第十四段

1 .Oh!

第十五段

1 .Yeah.

2 .And you spend six weeks in whichever country you are selected for. The classroom component consists of seminars on that country's culture, politics and economy.

3 .Most sessions are taught in English by local professors.

4 .But two of our faculty accompany each group and also give seminars.

5 .I'll be going to Brazil to teach a seminar on coffee next summer.

第十六段

1 .But you're an economist.

第十七段

1 .Coffee's played a central role in Brazil's economic development for over 200 years.

2 .About a third of the coffee consumed worldwide is produced in Brazil.

第十八段

1 .Oh I had no idea.

2 .Hmm...So if I applied, I mean, can students pick the country they want to go to 'cause if I could go to Turkey...

第一十九段

1 .Well, the primary goal of the Global Enrichment Initiative is simply cultural exchange.

2 .So students who've never been overseas before can broaden their perspective.

3 .This is why on the application you are asked to indicate your first, second and third choice countries.

第二十段

1 .I'm only interested in Turkey, though. I'm studying both Turkish and Turkish history this term.

第二十一段

1 .I see.

第二十二段

1 .And maybe I could learn more about how they're implementing the build operate transfer model there.

2 .Plus, I wouldn't want to take a spot away from someone who really wanted to go to one of the other countries.

第二十三段

1 .Well. I guess you could leave the second and third choices blank.

Lecture3

Listen to part of the lecture in a chemistry class.

第二段

1 .So just to sum up, matter is anything that has mass and volume, right?

2 .Anything that takes up space. And this includes solids, liquids and gases.

3 .And if we combine two portions of matter, we get a mixture.

第三段

1 .Now, there are two main kinds of mixtures: homogeneous and heterogeneous.

2 .Maybe I should put this on the board.

3 .Whether a mixture is homogeneous or heterogeneous...

4 .well... this relates to the notion of phase.

5 .Remember we defined the word 'phase' as being one physical state, whether solid, liquid or gas, that...

6 .well... that has distinct boundaries and uniform properties.

第四段

1 .So homogeneous mixtures... What are they?

第五段

1 .Okay. The prefix 'homo-' means 'same'.So a homogeneous mixture is the same throughout.

2 .It contains only one phase.

3 .So if you put alcohol in water, the two liquids combine.

4 .They disperse into each other.

5 .And you can't perceive any boundary between the two any longer.

6 .So the mixture contains only one phase. Even though two phases went into it, it now contains one phase and we can't detect any boundary between the water and the alcohol once they're mixed together.

7 .The two portions combined form a single phase.

第六段

1 .Now, if homogeneous mixtures are ones that are the same throughout, then what do you suppose heterogeneous mixtures are?
2 .Right. Mixtures that are different throughout.

第七段

1 .If you mix oil and water together, the mixture contains two liquid phases because the oil will float on top of the water because of the oil's lower density.
2 .They are not going to mix together like alcohol and water do.
3 .You can see the boundary between them and in fact, they are mechanically separable.

第八段

1 .The same is true for soil, which is a mixture of solid materials.
2 .So if you look closely at a sample of soil, you are going to see bits of sand, some black matter, maybe even pieces of vegetation.
3 .Since you can see all the different components, detect distinct boundaries, we've got multiple phases.
4 .And in fact, you can pick out the components. The various portions can be mechanically separated.

第九段

1 .Now, with some heterogeneous mixtures, you can see the different phases with the naked eye.

第十段

1 .But that's not so for all of them, like smoke.
2 .Actually, that's a good example because to the naked eye it looks uniform, like it's a single phase.
3 .But if you magnify it, you can see that there are tiny solid and liquid particles suspended in the air.
4 .So actually what you got in smoke are three phases: solid, liquid and gas, which you can separate by a process of filtration.

第十一段

1 .Another example, uh, dirty water. Okay?

第十二段

1 .That can be filtered too.

2 .Pass it through a filter and the dirt and whatever else is in there will stay behind in the filter paper.
3 .And the clean water will pass through it.
4 .Again, depending on the size of the particles in the water, you might need magnification to see them.
5 .But even so, they can be detected. The boundaries are detectable. So multiple phases, okay?

第十三段

1 .Homogeneous mixtures, on the other hand, well, no amount of magnification could reveal a detectable boundary between the components.
2 .Their mixing extends all the way to the fundamental particle level.
3 .And we use the term ,solution, to refer to the single phase, homogeneous mixtures.

第十四段

1 .When salts dissolve in water, no amount of magnification is going to show you separate pieces of salt.
2 .There are no detectable boundaries between salt and water.
3 .So it's a solution.

第十五段

1 .Even so, what you can do with solutions is separate the parts by a process called distillation.
2 .If you distill salt water, water gets boiled away from the solution and only the salt remains behind.
3 .And in your next lab actually, we'll be using these processes, distillation and filtration, to show how we can separate the different parts of some mixtures.

第十六段

1 .Now, there are other ways we can describe mixtures.
2 .And one of these is by properties, uh, variable properties.

第十七段

1 .A real simple example of this is the taste and color of a cup of coffee.
2 .The more coffee that's dissolved in the water, the stronger the taste of the coffee, and the darker the color, the darker the solution.
3 .So, color and taste, these are two variable properties.

4 .And these variable properties, they vary of course, because of the relative amounts of the components, and the melting or freezing points of liquids too.
5 .A solution of salt water, for example, will have a different freezing point depending on how much salt is dissolved in the water.

Lecture4
Listen to part of a lecture in an anthropology class.

第二段

1 .OK, today we are go to be moving on and we're going to be talking about early pottery.
2 .But rather than me just giving you a broad overview of how pots or ceramic vessels were developed and used in different regions of the world, we're gonna consider a specific example, a case study. And we're going to focus on ceramic cooking vessels from just one part of the world.

第三段

1 .So the question I want to look at today concerns the use of ceramic cooking vessels, clay pots, in the Arctic during ancient times.
2 .Why were they developed and used there?

第四段

1 .So, to begin with, we don't know for sure when human beings first started creating pottery, but we have evidence of it from over 15,000 years ago.
2 .And in the Arctic, ceramic cooking pots didn't appear there until some 2,500 years ago.

第五段

1 .Now, it's not surprising that they appeared relatively late there.
2 .In fact, what's been something of a mystery is why they were used at all, in the Arctic, I mean.
3 .Ken?

第六段

1 .Why wouldn't they use pottery?

第七段

1 .Good question. What would some of the drawbacks of ceramic containers be for ancient people groups in the Arctic?
2 .Ancient Arctic societies were nomadic, right?

第八段

1 .I get it! Clay pots are fragile.

2 .So if people were moving around all the time, well, the pots would probably keep breaking.

第九段

1 .Precisely. Ceramic cooking vessels can't be transported easily.

2 .That's one thing.

第十段

1 .And think of how ceramics are produced.

2 .You need water and clay of course.

3 .You need to make the pot, allow it to dry for a long time.

4 .Warm, dry locations work best for this of course.

5 .And then you need to fire it, bake it. So you can see the role that climate would play in whether or not ancient people created and used ceramic cooking pots.

6 .And that's why manufacturing pottery would have been a challenge, actually quite difficult for people in the Arctic.

第十一段

1 .But you're saying they did make ceramic cooking pots.

第十二段

1 .Yes. So the question is, given all these clear disadvantages, why would Arctic people choose to make and use ceramic cooking vessels? Sue?

第十三段

1 .well, they made food easier to digest, something about making the nutritional components of foods more accessible?

第十四段

1 .That's definitely true as far as many nutrients are concerned, but some nutrients, like vitamin C, are destroyed by cooking.

2 .But the ancient Arctic people ate a diet that consisted almost entirely of raw or only minimally cooked meat and fish or shellfish.

第十五段

1 .I saw something on television once, a documentary that talked about how healthy the diet was, how it provided all of the nutrients they needed.

2 .I guess that would include vitamin C as well, but then what I don't understand is: why would they have cooked their food at all?

第十六段

1 .Ah, here's where we need to look beyond obvious factors and consider things like culinary preferences.
2 .Although the diet of ancient Arctic people mainly consisted of raw and minimally cooked food, it was carefully prepared.
3 .It was based on an interplay of contrasts, um, different temperatures, or hard and soft textures.
4 .Sometimes meat was only partially defrosted.

第十七段

1 .For example, one way of preparing meat was to boil it briefly, leaving the center frozen.
2 .So cooked food, or partially cooked food, for ancient Arctic people, was a matter of social preference.

第十八段

1 .So again, the question is - why did they use ceramic pots to cook their food?
2 .That's not the only way to cook food. And we've already looked at some disadvantages of ceramic pots.
3 .So why use them?
4 .Well, first of all, wood for cooking fires was in short supply.
5 .And because of the extreme climate, food had to be prepared inside, indoors most of the year.
6 .Therefore, fires had to be small, and cooking methods had to be efficient.
7 .So in regions of the Arctic where wood was scarce, and where the houses could not withstand large fires and did not have good ventilation, we do find advantages associated with ceramic pots.

TPO46

Conversation1

Listen to a conversation between a student and an employee in the student housing office.

第二段

1 .Hi.I'm a first-year student here. I, I live in the dorms, and I, well, I like where I'm living now. It's convenient and quiet, but I'm starting to think about where I wanna live next year.

第三段

1 .Good idea.As a second-year, you have more freedom to choose a place that suits your needs.

第四段

1 .Yeah!And I want to make sure that, well, that I apply in time to get what I want.
2 .And, um, a friend was telling me about these common-interest houses on campus.

第五段

1 .Yes. We have a language house, a life science house, a music house...

第六段

1 .Yeah, the music house.
2 .That's the one I'm interested in, but, um, I' m not a music major.
3 .I do play an instrument, but I'm a history major.

第七段

1 .Oh, that's not an issue.
2 .You see, that house isn't just for music majors. It's for anyone who's interested in music.

第八段

1 .But isn't that everyone?

第九段

1 .Well, maybe. But the house has a performance area and practice rooms.
2 .So people who choose to live there need to be open to the possibility that there's always gonna be someone playing something,
3 .an instrument, the radio, even at odd times. You're pretty much always gonna hear music there.
4 .That might bother some people.

第十段

1 .Doesn't bother me. And I'd love to have a place to practice my saxophone without worrying about disturbing people.

第十一段

1 .Well, it does sound like it might be a good fit for you.
2 .And the house also functions as a social club.

第十二段

1 .I know they do activities, but I don't know much beyond that.

第十三段

1 .Well, for example, every month, I think it is, there's an informal concert.

2 .Any house resident can perform.And remember that big jazz festival at University Park last month?

第十四段

1 .Of course. It was amazing.
2 .The music was great. Um, I, I didn't connect it to the music house.

第十五段

1 .Not many people do.
2 .Anyway, they put on a whole range of other activities as well.
3 .Someone at the house could give you more information about those.

第十六段

1 .So, how do I...um, what's the process for getting a room there?

第十七段

1 .You need to fill out an application form and send it to the house director
2 .The form's on the housing department's website. But, don't get your hopes up too high.
3 .They can only accept about 30% of students who apply.

第十八段

1 .Oh, wow, I had no idea.

第一十九段

1 .So, for your application, it needs to include a personal statement,
2 .you know, why you're interested in living in the house, how you might contribute to the group. There are guidelines on the form.
3 .That statement's really important, because it's basically how they decide who to accept into the house.

Lecture1
Listen to part of a lecture in a biology class.

第二段

1 .I'd like to continue our discussion of animal behavior, and start off today's class by focusing on a concept we haven't yet touched upon: swarm intelligence.

第三段

1 .Swarm intelligence is a collective behavior that emerges from a group of animals like a colony of termites, a school of fish, or a flock of birds.

第四段

1 .Let's first consider the principles behind swarm intelligence and we'll use the ant as our model.

第五段

1 .Now, an ant on its own is not that smart. When you have a group of ants, however, there you have efficiency in action.
2 .You see, there is no leader running an ant colony. Each individual, each individual ant operates by instinctively following a simple set of rules when foraging for food.

第六段

1 .Rule number one: deposit a chemical marker called a pheromone.
2 .And rule two: follow the strongest pheromone path.
3 .The strongest pheromone path is advantageous to ants seeking food.

第七段

1 .So for example, when ants leave the nest, they deposit a pheromone trail along the route they take.
2 .If they find food, they return to the nest on the same path,
3 .and the pheromone trail gets stronger.
4 .It's doubled in strength.
5 .Because an ant that took a shorter path returns first, its pheromone trail is stronger and other ants will follow it according to rule two.
6 .And as more ants travel that path the pheromone trail gets even stronger.

第八段

1 .So what's happening here?

第九段

1 .Each ant follows two very basic rules.
2 .And each ant acts on information it finds in its immediate local environment.
3 .And it's i mportant to note, even though none of the individual ants is aware of the bigger plan,
4 .they collectively choose the shortest path between the nest and the food source,
5 .because it's the most reinforced path.

第十段

1 .By the way, a few you have asked me about the relevance of what we are studying to everyday life.

2 .And swarm intelligence offers several good examples of how concepts in biology can be applied to other fields.

第十一段

1 .Well, businesses have been able to use this approach of following simple rules when designing complex systems.
2 .For instance, in telephone networks,
3 .when a call is placed from one city to another,
4 .it has to connect through a number of nodes along the way.
5 .At each point, a decision has to be made:which direction does the call go from here?

第十二段

1 .Well, a computer program was developed to answer this question based on rules that are similar to the ones that ants use to find food. Remember, individual ants deposit pheromones and they follow the path that is most reinforced.

第十三段

1 .Now, in the phone network,
2 .a computer monitors the connection speed of each path and identifies the paths that are currently the fastest, the least crowded parts of the network.
3 .And this information, converted into a numeric code, is deposited at the network nodes.
4 .This reinforces the paths that are least crowded at the moment.
5 .The rule the telephone network follows is to always select the path that is most reinforced. So similar to the ant's behavior,
6 .at each intermediate node, the call follows the path that is most reinforced.
7 .This leads to an outcome which is beneficial to the network as a whole and calls get through faster.

第十四段

1 .But getting back to animal behavior,
2 .another example of swarm intelligence is the way flocks of birds are able to fly together so cohesively.
3 .How do they coordinate their movements and know where they're supposed to be?

第十五段

1 .Well, it basically boils down to three rules that each bird seems to follow.

第十六段

1 .Rule one:stay close to nearby birds.

第十七段

1 .Rule two:avoid collision with nearby birds.

第十八段

1 .And rule three:move in the average speed and direction of nearby birds.

第一十九段

1 .Oh, and by the way, if you're wondering how this approach can be of practical use for humans,
2 .the movie industry's been trying create computer-generated flocks of birds in movie scenes.

第二十段

1 .The question was:how to do it easily on a large scale?
2 .A researcher used these three rules in a computer graphics program, and it worked.
3 .There have also been attempts to create computer-generated crowds of people using this bird flocking model of swarm intelligence.

第二十一段

1 .However, I'm not surprised that more research is needed.
2 .The three rules I mentioned might be great for bird simulations, but they don't take into account the complexity and unpredictability of human behavior.
3 .So, if you want to create crowds of people in a realistic way,
4 .that computer model might be too limited.

Lecture2

Listen to part of a lecture in an art history class.

第二段

1 .As you know, portrait artists often position their subjects so that their head is turned a little to one side,
2 .thereby presenting the artist with a semi-side view, a semi-profile view.

第三段

1 .And for some reason, western European artists have historically tended to show the left h side of the subject's face, more than the right.

第四段

1 .A while back, some researchers examine about 1,500 portraits painted from the 16th to the 20th century in Western Europe.
2 .And in the majority of them is the left h side of the face that's most prominently displayed.Why is that?

第五段

1 .And interestingly enough, this tendency to show the left side has diminished over time,
2 .especially in the 20th century.
3 .In fact, the lefth right ratio is now about 1:1.50% left 50% right.

第六段

1 .Why is that?

第七段

1 .We do know that for many artists, the choice of left side, right side was very important.
2 .There is an image by the Dutch painter Vincent Van Gogh called the Potato Eaters that shows the profiles of a group of farmers.
3 .It's a lithograph, which is a print made from i mages drawn on a stone.
4 .When you print something that way, what you get is a mirror image of the original picture.
5 .The exact same image, except that left and right are reversed,
6 .and Van Gogh was so dissatisfied with the print that he wrote to his brother,
7 .quote "the figures, I'm sorry to say, are now turned the wrong way." end quote.

第八段

1 .Anyway, why do you think so many painters in the past chose to depict the left side of their subjects' face? Nancy.

第九段

1 .Could it have to do with whether the artists were left-handed or right-handed,
2 .like maybe most of them were right-handed, and maybe for some reason they feel more comfortable painting the left side?

第十段

1 .Ok, many right-handed artists do find it easier to paint left profiles, and many art historians think that's the reason for the directional bias.

2 .But if that hypothesis, let's call it the right-handed hypothesis, was correct,
3 .you'd expect that left-handed artists would find it easier to paint right profiles.
4 .But the research suggests that left-handed artists find it just as easy to paint left profiles as right.
5 .So any other ideas?

第十一段

1 .Well, another theory is what's known as the parental imprinting hypothesis,
2 .which proposes that people are more used to seeing left profiles because supposedly right-handed parents are more likely to hold their babies in their left arm.

第十二段

1 .Well, my sister just had a baby and she keeps talking about how her left arm is getting so much stronger than her right.

第十三段

1 .Ok, so there's some anecdotal evidence.

第十四段

1 .So, then when the baby looks up at their parent, what they see is the left profile.

第十五段

1 .Right. And so the theory goes:the left side of the face becomes imprinted in our memories.

第十六段

1 .But the parental imprinting hypothesis doesn't explain why left profiles have decreased over time.
2 .I mean, parents are still carrying their babies in their left arm, right?

第十七段

1 .Exactly! All right, what about the way the artists' studio is organized, specifically the light source.

第十八段

1 .Remember that the light source determines where the shadows are.
2 .So, if you're a right-handed artists, you'd want to the light coming from your left because you don't want your painting hand to cast a shadow across your canvas, right?

3 .And if the light's coming from your left,
4 .ou'd want your subject to turn to their right into the light. If they do that, what do you see?

第一十九段

1 .The left side of their face.

第二十段

1 .Exactly, and well into the 20th century,
2 .many an artist's primary light source would be the sun.
3 .And they set up their studio to take maximum advantage of it.
4 .But then what happens as other high-quality, portable, artificial light sources become available?

第二十一段

1 .Well, you could position your subject in a lot more different ways and still have good lighting on your subject and on your canvas.

第二十二段

1 .So...?

第二十三段

1 .You'd expect to see a more balanced ratio of left- and right-side portraits.

Conversation2

Listen to part of a conversation between a student and her history professor.

第二段

1 .So I definitely want to write my term paper on American journalism in the eighteenth century.
2 .That old copy of the New York Daily Gazette you showed us,
3 .the one printed from the library's microfilm.
4 .Just seeing a newspaper that was published in 1789...that was really cool!

第三段

1 .Yes, reading old newspapers can be a powerful experience,
2 .especially to a budding historian like yourself.
3 .As a resource for scholars and researchers, I don't think any form of publication really captures the day-to-day life of a community better than a local newspaper.

第四段

1 .Yeah, I mean, I knew that the number of newspapers exploded in the 18th century,

2 .but I figured they all deteriorated before the technology was invented to preserve them, or you know, make copies.

第五段

1 .Well, actually, before the mid-1800s, newspapers were printed on fairly sturdy paper made from cotton fibers.

2 .Those that survived are in surprisingly good shape.

第六段

1 .Are there many more copies of the Gazette on microfilm?

第七段

1 .Yeah, we've got a great microfilm library on campus.

2 .You'll find it invaluable, I'm sure, as you research your paper.

3 .Um, but also talk to the librarians because they are creating an online archive of their microfilm collection.

4 .I'm not sure of the project's status,

5 .but if it's done, it'll probably save you time.

第八段

1 .So, um, 18th h century journalism, you must realize that that topic is too broad for this assignment.

第九段

1 .I do. So one idea I had was like looking at an important world event like maybe the French revolution of 1789, since we just finished a unit on it.

2 .The readings you've given us were incredibly vivid.I loved them, but they were translations of French writers, historians.

3 .So I thought it'd be interesting to pick the Gazette and one other American newspaper to see how each covered the revolution,

4 .how the journalists reported it from America's perspective.

第十段

1 .Hmm, interesting approach.But remember, I'll be grading your paper based on the details you include.

2 .And at some point in your paper,

3 .you'll want to focus on a particular event of the revolution like maybe the storming of the Bastille prison.

第十一段

1 .How about the formation of the French national constituent assembly?

第十二段

1 .Sure! That would work.

第十三段

1 .And since I'm gonna look at newspapers from two cities,
2 .I could read the editorials, the opinion pieces,
3 .to find out what each community thought about the national assembly.

第十四段

1 .Ok, but, you know, I once attended a history conference where a professor presented a paper on the American press in the French Revolution.
2 .She was discussing the development of democratic ideals here and in France at that time.
3 .But she also pointed out that using old newspapers as primary sources... to be aware that they reflected the values of only a segment of society,
4 .and should not be used to draw conclusions about a Americans.
5 .I don't think I held on to her paper, but it was subsequently published,
6 .so you'll have no trouble tracking it down on the Internet.
7 .Let me give you her name.

Lecture3

Listen to part ofthe lecture in an art historv Class.

第二段

1 .Okay. So, When We Were discussing GainSborough's painting, the Blue Boy,
2 .Which he painted in 1770, I mentioned the story that the painting might have been an experiment.
3 .The result of a Challenge.
4 .It was believed that blue couldn't be an important color in a painting because...Well...it tends to recede into the background.
5 .Not good for your main subject, right?

第三段

1 .So to show otherwise, Gainsborough created the Blue Boy,
2 .with the boy featured large in his famous blue clothes...and...well...I guess he proved his point.

第四段

1 .But there was another challenge to blue.
2 .It was very very expensive back then.
3 .Now of course, because of modern chemistry, any color is available in tubes at any art supply store.
4 .But in the 18th century and before, it wasn't so easy.

第五段

1 .And blue...well...the color ultramarine, the most desired shade of blue,
2 .was made from the precious stone, Lapis Lazuli, which had to be imported all the way from Afghanistan.

第六段

1 .And the second most favorite shade of blue,
2 .after ultramarine made from Lapis Lazuli, was a shade a blue that came from another precious stone, Azurite.

第七段

1 .But Azurite was...well...harder to work with.
2 .There's evidence that artists would try to get around these difficulties.
3 .For example, use pigment from lapis lazuli or azurite very sparingly,
4 .and also use something cheaper, like smalt, which was made of ground glass.
5 .Thing is, smalt became discolored over time.
6 .So many artists probably avoided blues altogether rather than use something cheap and impermanent.

第八段

1 .So, blue, and especially ultramarine pigment,
2 .was a luxury, a status symbol, worth even more than gold at times.
3 .And you even have the wealthy ordering paintings with ultramarine to show others that they could afford something made from this precious pigment,
4 .much in the same way they would order gold leaf.

第九段

1 .Actually, the ancient Egyptians did manage to make an artificial blue,
2 .the first synthetic pigment in fact, if you can believe that.
3 .They passed the formula on to the Greeks and Romans, but then it was lost.

第十段

1 .Anyway, not only was lapis lazuli hard to get, it was also hard to process.
2 .The recipe was difficult.
3 .The stone had to be ground finely, not easy to do with a rock,
4 .then mixed with melted wax, resins and oils, wrapped in a cloth and knitted like bread dough.
5 .The fine particles of ultramarine were then separated from the rest.
6 .The process was time-consuming, which also contributed to the high cost of producing ultramarine,
7 .and it didn't even yield much usable pigment.

第十一段

1 .As a result, the French government sponsored a competition in 1824 to find a cheaper way to make ultramarine pigment.
2 .And soon after a process was demonstrated where a combination of coal,
3 .sulfur and other cheap, commonplace substances were heated, creating a suitable synthetic substitute for lapis lazuli.

第十二段

1 .So there's no doubt that 19th-century artists,
2 .after good synthetic versions were available, used more ultramarine.
3 .Think of the impressionists, for example.
4 .They had a lot more choices or at least, less expensive choices, than painters not that long before them.

Lecture4

Listen to part of a lecture in a materials science class.

第二段

1 .So what's the first thing that comes to mind when we talk about uses for copper? Tammy?

第三段

1 .The penny. It's made of copper.

第四段

1 .Okay, good one. But what's a one cent coin worth these days?
2 .You might get back change.
3 .Like if you go to the store and give the cashier 5 dollars for something that costs 4 dollars 98 cents,

4 .you'll get 2 cents back, but 2 cents does not buy much.
5 .The value of the penny in terms of what it'll buy has gotten so low that there's actually a move afoot to eliminate the coin from US currency.
6 .But there's more to it.

第五段

1 .As Tammy implied, the penny looks like it's solid copper.
2 .It is reddish orange with a bright metallic luster when it's new, but that's just the copper plating.
3 .The penny's not solid copper.
4 .In actuality, it is almost 98 percent zinc.

第六段

1 .But given the rising value of both these metals, each penny now costs about 1.7 cents to produce.
2 .So it generates what is called negative Seigniorage.

第七段

1 .Negative seigniorage is when the cost of minting a coin is more than the coin's face value.
2 .Even though the penny generates quite a bit of negative seigniorage,
3 .there is concern that if it's eliminated,
4 .we'll need more nickels, because more merchants might start setting prices in five-cent increments, 4 dollars 95 cents and so on.
5 .So we need a trusty five-cent piece that can be minted economically.
6 .But the nickel's negative seigniorage is even worse than the pennies.
7 .Each nickel costs the US mint 10 cents to produce.

第八段

1 .Also, some of us are pretty attached to pennies for whatever reason, nostalgia, and then those collectors.
2 .And people, if they see a penny on the sidewalk, they'll pick it up and think: it is my lucky day!

第九段

1 .Another scenario is that, without pennies, merchants, instead of charging 5.98,
2 .might round up the price to an even five dollars.
3 .So consumer goods would become slightly more expensive.
4 .But on the other hand, some cash transactions would be more convenient for consumers.

5 .And as I said, the government would save money if pennies were eliminated.

第十段

1 .But wouldn't the copper industry suffer financially if the US government stopped buying copper to make pennies?

第十一段

1 .But how much copper do pennies actually contain?

第十二段

1 .How much...Oh, got it, right.

第十三段

1 .So what else comes to mind when you think about copper?
2 .What else is copper used for?

第十四段

1 .I know that copper can be shaped into all sorts of things:
2 .sheets, tubing, and my cousin's house has a copper roof.

第十五段

1 .Yes, like gold and silver, copper is extremely malleable,
2 .but it's not a precious metal, it's far less expensive than gold or silver.
3 .It's also a superb conductor of electricity so you can stretch it into wires which go into appliances and even car motors.

第十六段

1 .Copper also has superior alloying properties, it's...you know, when it's combined with other metals.

第十七段

1 .For instance, how many of you play a brass instrument, like a trumpet or a trombone?

第十八段

1 .Well, brass is an alloy of copper and zinc.
2 .If your trombone was made of pure copper or pure zinc, it wouldn't sound nearly as beautiful as a brass trombone.

第一十九段

1 .Another alloy, a combination of copper and nickel, resists corrosion.
2 .It does not rust, even with prolonged exposure to water.

第二十段

1 .But what about the Statue of Liberty in New York Harbor?
2 .It's made of pure copper, but it turned green.

3 .Isn't that a sign of corrosion?

第二十一段

1 .Indirectly. If copper's exposed to damp air, its color changes from reddish orange to reddish brown.

第二十二段

1 .But in time, a green film, called a patina, forms and the patina actually serves to halt any further corrosion.
2 .It is one reason that ship hulls are made of copper-nickel alloys.
3 .These alloys are also hard for the barnacles to stick to.
4 .If these little shellfish adhere to the hull of a ship, it produces drag, slowing the vessel down.

第二十三段

1 .Copper's also a key material used in solar heating units and in water desalination plants,
2 .which will play increasingly important roles in society.

第二十四段

1 .Bottom line: if you are a copper miner, you won't lose any sleep should the penny get...
2 .if you'll excuse the expression, pinched out of existence.

TPO47

Conversation1

Listen to a conversation between a student and a music director.

第二段

1 .Miss Harper?

第三段

1 .Yes, can I help you?

第四段

1 .Hi, my name's Eric Paterson. I'm a journalism student.
2 .I wanted to ask you about the orchestra.

第五段

1 .I' m sorry, Eric. But the orchestra is only open to music majors.

第六段

1 .Really? Well, see...

第七段

1 .But the policy is changing next year.

2 .After that, if you've taken three music courses, you will be able to audition.

第八段

1 .Well, I have taken some music courses and I do play the double bass. So, maybe that's something to think about.
2 .But, actually, I was here about something else.

第九段

1 .Oh, sorry. It's I... I get that question all the time. So...

第十段

1 .That's okay. The thing is I work for Magna - the school paper and I am reporting on last week's concert.
2 .Now I went to it and I really enjoyed it, but now I'm looking for some background knowledge.

第十一段

1 .Well, I can refer you to some of the students in the orchestra if you'd like a young musician's point of view.

第十二段

1 .Uh...I guess that might be helpful. But...um...I am really looking for a little bit of scholarly prospective.
2 .Some history of the music that was performed that evening, where it originated, how it's developed over time.

第十三段

1 .Well, some of our musicians kind of specialize in Appalachian music.
2 .In fact, that's part of the reason we performed it.
3 .So you really should talk to them, too.
4 .Okay, so we were playing Appalachian music from communities in the Appalachian Mountain regions of the United States.

第十四段

1 .All right.

第十五段

1 .Uh...Do you really think you can keep these all in your head?

第十六段

1 .Oh, don't worry.
2 .All I need are a few key facts. I'm sure I can keep them straight until I get back to my dorm.

第十七段

1 .So the music is generally based on folk ballads and instrumental dance tunes. It started with Scottish and Irish immigrants who brought over their styles of music.
2 .It's called Anglo-Celtic.

第十八段

1 .So, people brought their musical traditions with them.

第一十九段

1 .Well, this Anglo-Celtic music was considered an important link to the past for these people, which you can see in the way that Appalachian singers sing ballads.
2 .They have sort of a nasal quality to them, like in Celtic ballads.
3 .In their new land, some of the lyrics were updated,
4 .you know, to refer the new locations and the occupations that settlers had in America.
5 .But at the same time, lots of ballads were still about castles and royalty,lords and ladies, stuff like that, which is what they were about originally.

第二十段

1 .Okay. And was that some sort of banjo I saw on stage during the performance?

第二十一段

1 .Yes, we are lucky that one of our students, Stewart Telford, has a nineteenth-century banjo, a real antique.
2 .He's able to play in most of the traditional styles.

第二十二段

1 .Did you know that banjos are of African-American origin and that settlers in Appalachia adopted banjos for their folk music?
2 .They became very common in traditional Appalachian music along with guitars and violins, of course.
3 .But if you want to learn about that banjo, talk to Stewart.

第二十三段

1 .That's great, Miss Harper. Thanks a lot.
2 .Now, can you recommend any sources where I could look up more about this?
3 .Sure, I have a great book.
4 .A student has it today, but you can borrow it tomorrow if you'd like.

Lecture1

Listen to part of the lecture in a literature class.

第二段

1 .So, urn, in France, you have the French Academy, which was created to uphold standards of literary taste.
2 .It was a very conservative organization.
3 .It tried to keep things a certain way...uh...resist change.

第三段

1 .It dictated that French plays should neoclassical in form, you know, have five acts, sophisticated language, etc.
2 .But try as it might, it couldn't stop change.
3 .French drama was changing, though the transition from neoclassical drama to Romantic drama was itself pretty dramatic.

第四段

1 .Let's look at a play by Victor Hugo called Hernani, or as the French would say, Hernani.
2 .Although Hugo was a truly brilliant writer of essays, poems, novels, and plays, uh, his play, Hernani, isn't a great play in and of itself.
3 .It's got a really confusing, convoluted storyline.
4 .Critics back then were unimpressed by it,
5 .though it's likely that their own feelings about how plays should be,
6 .neoclassical or romantic, affected their opinions about it.

第五段

1 .But its premiere in Paris, in 1830, was anything but ordinary.
2 .Hernani's opening night was probably one of the most important literary events in 19th century France!

第六段

1 .What happened was...OK. Hugo was a Romanticist, right?
2 .He was part of a growing movement of young authors and artists who were rebelling against neoclassicism,
3 .against the conventions of neoclassicism.
4 .And what this meant is that Hugo opposed the neoclassical unities that French theater had inherited from Greek drama.
5 .These unities were basically the unity of time, space and action,
6 .meaning that the entire play consisted of just one main event that was unfolding in just one specific place,

7 .usually in the course of one day.

第七段

1 .And Hugo found this to be too constraining.
2 .He looked for inspiration in...well...OK.
3 .Hugo is from the 19th century, but he looked to Shakespeare,
4 .several centuries in the past, long before neoclassicism.

第八段

1 .For example, in Shakespeare's play, A Midsummer Night's Dream,
2 .the play moves from indoors to outdoors, from the city to the forest, and back again.
3 .So there was a kind of mobility in...in the use of space. And...well...in A Midsummer Night's Dream,
4 .of course the action in that play takes place on a single summer's night,
5 .but in Shakespeare's other plays, in Hamlet, for example, ti me elapses.
6 .People travel; they go to other destinations.
7 .And the action is not limited to one plot.

第九段

1 .Hugo also opposed the neoclassical insistence on the separation of genres.
2 .For a neoclassicist, a play could only be dramatic and high art, or comic, well, light-hearted.
3 .And in either case, there was still a sense of decorum.
4 .Characters might make jokes and get into silly situations, but they're still regular people, like not in disguise or anything.
5 .There's still a certain amount of restraint in a neoclassical comedy.

第十段

1 .Again, earlier works by Shakespeare provided very different models that Hugo found more appealing.
2 .Many of Shakespeare's plays, even the tragedies, contain scenes with ridiculous, outlandish characters like clowns, so that many of the plays have both qualities: a serious dramatic side and comedic scenes with the clowns that break the drama.

第十一段

1 .And Hugo, like other Romantics, was also opposed to the artistic rules that the neoclassicists had inherited from the Enlightenment.

2 .The Romantics wanted a more passionate kind of theater and it was more rooted in the individual and the individual sensibility.

第十二段

1 .Romanticism was political as well, claiming that individuals, people, could govern themselves,
2 .without the need for kings and queens.
3 .There was an ideological struggle between a lot of young people, artists, people who wanted change, and people who didn't.
4 .So of course Romanticism was controversial.

第十三段

1 .Now, Hernani was a play that incorporated these Romantic conventions.
2 .Hugo suspected that neoclassical audiences would be hostile to this new form and the ideas it represented.
3 .So to protect himself, he rounded up his friends for opening night.
4 .And hundreds of them came to the theater that night.

第十四段

1 .And Hugo writes about this arrival of the Romantics,
2 .these wild and bizarre characters and their outlandish customs,
3 .which stupefied and infuriated the more conventional theater-goers.
4 .So the play that night took forever to finish because it was interrupted many times and there were these debates in the audience,
5 .between Hugo's friends and supporters, the Romantics, and the Neoclassicists, the supporters of the old school.
6 .Lots of interruptions!

第十五段

1 .And afterward, what had been a debate inside the theater spilled out onto the street and there were fist fights.
2 .It was a complete free-for-all. And this went on for the next forty-five nights.
3 .Every night that the play was performed,
4 .there was this excitement and controversy that was,
5 .was really an expression of the kinds of passions that...uh...differences of aesthetics and political opinions and taste could give rise to.

Lecture2

Listen to part of a lecture in a biology class.

第二段

1 .Now usually when we talk about birds flying long distances, we're discussing seasonal migration.

2 .But there's some species that fly long distances not as part of a migration but as part of their regular foraging for food.

3 .A great example is the albatross.

第三段

1 .Albatross are seabirds that nest on islands and forage for food out in the open sea.

2 .And you have one species that forages an average of a thousand miles from its nest.

3 .And I read in another study where one albatross left a chick in its nest and went out in search of food.

4 .And by the time it got back to the nest, it has flown nine thousand miles. Yes, Bob?

第四段

1 .But why don't they just build their nest closer to their food supply?

2 .I mean, for one thing, they must burn up a lot of energy flying back and forth and also the parents are gonna have to be away from the nest that much.

3 .Aren't the chicks gonna be pretty hungry most of the time?

第五段

1 .Ok, good question.

2 .The chicks are capable of going for long periods of time without food,

3 .which works out nicely since as you point out, they may not get to eat that often.

第六段

1 .As far as the parents go, well, first, they typically can't get enough food in a single location.

2 .So they have to visit several places on the same foraging trip.

3 .And the locations of good foraging grounds tend to be very far apart.

第七段

1 .And second, they can't always nest on an island that's closest to the best feeding ground because some of those islands have too many predators on them.

2 .Predators that would just love some little chicks to snack on.

3 .So I don't think they have much choice.

第八段

1 .But it still works out because albatross fly using a technique called dynamic soaring,
2 .which enables them to cover very long distances while expending very little energy.
3 .If it weren't for that, you'd be right. They would probably burn up all their energy just flying back and forth.

第九段

1 .Another factor is albatross lay only one egg at a time.
2 .So when the parent returns with the food that one chick doesn't have to share it with a lot of other chicks.
3 .Yes, Nancy?

第十段

1 .So you're saying that they might easily fly a thousand miles over the open ocean when they're looking for food?

第十一段

1 .That's right.

第十二段

1 .Then how do they know how to get to the food?
2 .I mean, which direction to take to get to the food and how do they find their way back home?

第十三段

1 .Good point.
2 .And the truth is we are not sure.
3 .It's very difficult to keep seabirds in captivity where you can study them.
4 .And it's very difficult to study them in the wild, you know.

第十四段

1 .But we think that a lot of what we've learnt about songbirds probably applies to seabirds as well.
2 .So we're thinking that albatross could make use of two different kinds of compasses if you will, a magnetic compass and a celestial compass.

第十五段

1 .The magnetic compass somehow makes use of Earth's magnetic field,
2 .much the way a standard compass does.

3 .But to prove this, we would have to find some kind of magnetic sensory organ in birds.
4 .And we are not sure that we have.
5 .We have found in birds a mineral called magnetite,
6 .which we think might be somehow related to this, because magnetite is a natural magnet.
7 .But the problem is that we've also found magnetite in non-migratory birds,
8 .which suggests that it may in fact serve a completely different function, not related to navigation at all.

第十六段

1 .Um, and the other compass, the celestial compass makes use of the stars, more or less the same way humans have historically used the stars to navigate in the open sea.
2 .So that's the way we think albatross navigate.

第十七段

1 .So anyway, you know, think about it,
2 .how about if you had to go a thousand miles every time you wanted to get a bite to eat?

第十八段

1 .Yeah, and we complain about having to walk all the way across campus to get to the cafeteria.

第一十九段

1 .Yeah.

Conversation2

Listen to a conversation between a student and his professor.

第二段

1 .This is not what I had in mind when I assigned a film review.

第三段

1 .It isn't?

第四段

1 .No. What you wrote is a synopsis, a detailed summary of the movie, but it's not a review.

第五段

1 .It's not? I guess I'm a little confused cuz...isn't that what a film review does?
2 .You know, describe the film?

第六段

1 .Sure. In part. But a good review has to do more.
2 .But this is probably not your fault.
3 .I'm starting to think that I should have explained the assignment better because...well...I got a lot of summaries and very few reviews.

第七段

1 .So it wasn't only me.

第八段

1 .Hardly. I just assumed that everyone would know what to do.

第九段

1 .So...um...what else is a review supposed to do?

第十段

1 .Well, it should also analyze the film, discuss its strengths and weaknesses,
2 .maybe compare it to other movies,
3 .even mention why the reviewer did or didn't like it.

第十一段

1 .You mean it should have been more personal?

第十二段

1 .For starters, or maybe subjective is a better word than personal.
2 .Yes. It should have been more subjective.

第十三段

1 .Maybe I could rewrite it?
2 .Well, I don't know about rewriting it.
3 .Too many people seemed to have missed the point.
4 .I think I may have to forgo evaluating this one.
5 .Instead maybe we'll just devote a class to discussing what it takes to write a good film review.
6 .Or maybe...hmm...you know, I have a colleague who writes film reviews for the local paper.
7 .Maybe I could ask her to come to class and describe what she does and then have everyone rewrite their reviews.

第十四段

1 .So, she would talk about what a film review should be like, so we'd know what to do.

第十五段

1 .Well, more than that.
2 .A professional film reviewer gets to see movies sometimes before they are even released.
3 .They get advance copies —— usually a video or DVD —— to watch at home or they go to a movie as soon as it opens in the theaters.

第十六段

1 .Um...seeing it on the big screen in a theater, doesn't that affect the experience?

第十七段

1 .Of course! Having other people there can...can affect the review, too.

第十八段

1 .So, for the next assignment, I might ask everyone to review one of the films the film club shows every weekend at the theater on campus.
2 .There is no admission charge.
3 .They are free to students and the movies are shown on Friday and Saturday nights, plus Sunday afternoon.
4 .So, everyone should be able to see one.
5 .Yeah, that should work.

第一十九段

1 .But for this time, will we have to rewrite our reviews?

第二十段

1 .Well, let's take it one thing at a time.
2 .Let me talk to my colleague.

Lecture3

Listen to part of a lecture in a sports management class.

第二段

1 .So, I want to end today with a topic that many of you have questions about when you come to see me during my office hours.
2 .A lot of you have told me you are specifically interested in careers as coaches.

第三段

1 .Now, it doesn't matter what sport you are interested in coaching, volleyball, basketball, swimming...
2 .There are some considerations for all new coaches to think about as they plan their careers.

第四段

1 .A recent study, a survey of high school head coaches,
2 .helped identify some obstacles,
3 .some things that head coaches felt they were not prepared for as they began their careers.
4 .They were surveyed to determine what things they would do differently if they were starting their careers over again.
5 .Based on their responses, several themes emerged.

第五段

1 .The largest number of responses was in the area of relationships.
2 .79% of the coaches indicated that if they had to do it all over again,
3 .they would do things differently in this area.
4 .They said they'd deal differently with assistant coaches, parents, student athletes, school administration, and, and pay more attention to those relationships.

第六段

1 .The second most critical area for these coaches was organization and administration.
2 .To them, this meant things like better managing their budgets,
3 .and delegating responsibilities, making sure that even minor things were taken care of,
4 .like pre-game meals, those sort of things.

第七段

1 .Excuse me, professor,
2 .I know good nutrition is important, but organizing pre-game meals isn't really something you consider when you are thinking about going into coaching as a career.

第八段

1 .No, I guess not, Kenny,
2 .but it's more an example of paying attention to the details, being organized.

第九段

1 .I do want to emphasize that the profession of coaching is about more than just wins and losses.
2 .In fact, winning is probably stressed too much.
3 .At its best, I'd say coaching, especially in high school and college,
4 .is about teaching life skills through game strategy.
5 .Of course, coaching requires a specialized body of knowledge.
6 .If you coach tennis, you need to know the rules of tennis.
7 .If you are a football coach, you need to know all about football strategies.
8 .And those are the sorts of things that you'll get in your classes here at the university.
9 .But if coaches spend too much of their time on game strategy,
10 .well, you see, maybe that's secondary too, to the knowledge and skills,
11 .you'll need for the other roles you'll undertake as a coach,
12 .especially, as that survey emphasized,
13 .skills in dealing with people, and, and administration.

第十段

1 .But, how do you...
2 .how do you improve in those areas, I mean, I'm gonna be an assistant coach at a high school beginning next month, and ...

第十一段

1 .Really? Nice going, Kenny!

第十二段

1 .Yes, that's wonderful!

第十三段

1 .Thanks. I'm excited.

第十四段

1 .So, congratulations!
2 .Ok, well, to get better organized, one thing is take courses in business management and not just the sports management courses in the physical education department,
3 .other business and finance courses.
4 .Oh, oh, but wait a minute.
5 .You said you are starting next month?
6 .What sport will you be coaching?

第十五段

1 .Uh, gymnastics, mainly.

第十六段

1 .Okay, in my career, I've learned, well, as part of building and maintaining strong relationships and working on administrative skills,
2 .you've got to consider the other needs of your team beyond the sport itself.
3 .Remember, the team members are athletes and students,
4 .and remember, if you are enthusiastic about what you are doing,
5 .well, enthusiasm is...is catching, right?
6 .You want team members to enjoy participating.

第十七段

1 .Right, but what about setting rules for your team, and, is it better to be strict or not so strict?

第十八段

1 .Actually, I don't believe in having a lot of rules.
2 .And coaches often do have too many.
3 .I think that can get in the way of leadership and box you in.
4 .I think people sometimes set rules just to make things easier for themselves.
5 .That way maybe later they just can refer to the rule and avoid making a choice.
6 .You know that kind of person I'm talking about, right?

第一十九段

1 .But that's not to say the team shouldn't have any rules at all.
2 .Of course they need some.
3 .So early in a season, or when you first take a new job,
4 .establish a few basic ground rules for what is acceptable and non-acceptable behavior.

第二十段

1 .So, what are some good ones?

第二十一段

1 .Well, a...a couple rules a coach should have are:
2 .insist that players be on time, and insist that they practice hard, and give their best effort.
3 .And when you do establish a rule, stick to it.

Lecture4
Listen to part of the lecture in a meteorology class.

第二段

1 .Now, Earth's atmosphere is sort of like a giant weather machine, right?
2 .Uh...with air and water being its key components.
3 .A machine powered by energy from the Sun.
4 .So we need to consider the role that air, or more specifically, wind, plays in this machine.
5 .So wind is really nothing more than moving air, right?

第三段

1 .Now, as air is heated and becomes warmer, it expands, it becomes less dense.
2 .When air in a particular area is heated,
3 .you get a concentration of warm air in an area of low pressure.
4 .Likewise, when you get a concentration of cold air,
5 .that air's gonna be very dense, so it's gonna create an area of high pressure.
6 .If you have an area of high pressure next to an area of low pressure,
7 .the colder, high pressure air will start moving toward the area of low pressure.
8 .Right? And the warmer air will move away, rising above the cooler air. Okay?

第四段

1 .Uh...yes. Linda?

第五段

1 .So wind is actually generated by the Sun?

第六段

1 .Well, Earth's rotation plays a role.
2 .And there are other factors and we'll come back to all that.
3 .But, principally, yes. The Sun creates the temperature differential that creates the areas of high pressure and low pressure that create wind.

第七段

1 .Um...I don't get what...how it causes a temperature differential.

第八段

1 .Right. Good. This will take us to the role of wind in the climate.

2 .The key is that the Sun warms up different parts of Earth at different rates and to different degrees.
3 .For example, at sunrise, the land heats up faster than the ocean.
4 .That's why you get morning sea breezes.
5 .The air over the water heats more slowly than air overland,
6 .so during the early morning, it's cooler and denser than air overland,
7 .so it moves in toward land.
8 .A sea breeze.

第九段

1 .What else?

第十段

1 .The Sun's energy is more intense near the equator than it is near the poles,
2 .so you've got masses of warmer air over the equatorial regions,
3 .and masses of cooler air over Polar Regions.
4 .And these masses are constantly interacting with each other, which is critically important for Earth's climate.

第十一段

1 .One result of these interactions is that equatorial air masses move away from the equator and in the process those equatorial winds actually take heat away from the equator and transfer it to some cooler part of Earth.
2 .And by redistributing this energy, the Sun's energy really,
3 .winds play a critical role in maintaining a temperature balance from the poles to the equator.

第十二段

1 .Now, winds also help Earth maintain its balance in another way:
2 .by transporting water from one part of Earth to another.
3 .Water's contained in the air in the form of vapor,
4 .mostly through evaporation, mostly from the oceans.
5 .So when the air moves, it carries the vapor with it to some other parts of Earth,
6 .where it can deposit it as rain or snow, or some other form of precipitation.

第十三段

1 .Now, actually, the transfer of heat and water by way of the wind are very closely related,

2 .because a primary way that heat energy is transferred by wind is mediated by the process of evaporation.
3 .What happens is that a certain amount of heat energy is required to convert liquid water into vapor.
4 .So when water evaporates from the ocean, it takes energy to convert that water into a gaseous form, into water vapor.
5 .But that heat energy, that conversion energy, doesn't raise the temperature of the water vapor or the air, it's just stored in the water vapor.
6 .Then later when the water vapor converts back to liquid water, that energy is released.

第十四段

1 .So when water evaporates, energy is taken from the ocean, and it's stored in the water vapor, in the air.
2 .Then the air, the wind, transports the water vapor to some other part of Earth.
3 .Then the water vapor converts back into liquid water.
4 .It rains, in other words.
5 .And the heat energy that was stored in the water vapor is released into the new environment.
6 .Okay? So the transfer of heat and the transfer of water are very closely related.
7 .And what's the primary vehicle for this transfer?
8 .The wind! So wind is a very critical element in the redistribution of both the Sun's energy and Earth's water.

TPO48

Conversation1

Listen to a conversation between a student and a university employee at the campus employment office.

第二段

1 .Hi, can I help you?

第三段

1 .I hope so. My name's Mark Wickman. I'm...

第四段

1 .Don't I remember you from last year?
2 .You worked in, uh, where was it? The art library?

第五段

1 .Yeah, you're good. That was me, and I really enjoyed the work.

第六段

1 .Right, yeah. Your supervisor gave us some really great feedback at the end of the year.

2 .Oh, "he's so organized, always on time, helpful..."

第七段

1 .Really, well.. I'm glad. It was a good job.

第八段

1 .Well, we usually try to match student's jobs with their academic interests.

第九段

1 .Yeah, urn, I'm not exactly sure what career I'm headed for. But librarian is a possibility.

2 .It was a great experience to learn how it works and meet some people working in the field. But for this year, well, that's what I wanted to ask about.

第十段

1 .Oh, how come you waited so long to come in?

2 .You know how fast campus jobs fill up. If you'd come in earlier, you could probably have gotten the library job again.

3 .I mean, since you have the experience from last year, you don't need the training and all.

4 .But it's been filled now.

第十一段

1 .Yeah, I know.

2 .But I plan to get a job working at a restaurant off campus this year.

3 .I really need to make more money than I did last year, and working as a waiter, there's always the tips.

4 .But I've tried a ton of places and I haven't found anything.

5 .I know it's really late, but, well, um, I was wondering if maybe there was some job that hadn't been taken or maybe someone started a job,and you know, had to drop it or something.

第十二段

1 .Well, I doubt you'll find anything.

第十三段

1 .Well, could you, could you possibly check?

2 .I know it's a long shot, but my friend Susanne, she takes photography classes in Harrison Hall and...um...she sort of thought there might be an opening in the janitorial staff.

第十四段

1 .Urn, why does your friend, the photography student, think she has information about a janitorial staff opening?
2 .I'm pretty sure those jobs are filled. In fact, I remember taking lots of applications for them, but let me double check it online.

第十五段

1 .She said the whole studio arts building and especially the photo lab have been kind of, uh, sort of messy lately,
2 .I mean, she says there's...uh...chemicals and stuff left out, and you know, it's like no one's been cleaning up.
3 .Oh, but that could just be, you know, students using the lab after hours or something, like after it's been cleaned.

第十六段

1 .Hmm, hang on.
2 .There's a...There's...um...an asterisk gap next to one of the job numbers here.
3 .There's a note.
4 .Let's see... Ha, your friend's right.
5 .Seems like one of the student janitors quit a couple of weeks ago for some reason.
6 .Well, whatever, it looks like this is your lucky day.

第十七段

1 .Wow! That is so great.
2 .So who's the contact person?

第十八段

1 .Check with the janitorial office.

第一十九段

1 .Fine. Thanks so much.

Lecture1

Listen to part of a talk in an art history class.

第二段

1 .So today we are going to continue our discussion of 20th century photography in the United States.
2 .Last time we were talking about Alfred Stieglitz and we saw that one of his goals was to introduce Americans to European Art.
3 .Today, we are going to look at another photographer from the early 20th century.

第三段

1 .Yes, Jennifer?

第四段

1 .Before we get to that, I had a question about Stieglitz.

第五段

1 .Sure.

第六段

1 .Well, Stieglitz was married to Georgia O'Keeffe. Right?

第七段

1 .That's right. Stieglitz was married to her, promoted her work and actually, took some amazing portraits of her when they were married.

第八段

1 .For anyone who's not familiar with this,
2 .we are talking about the American painter: Georgia O'Keeffe.

第九段

1 .Ok. Well, I was wondering...Georgia O'Keeffe.
2 .You know I've heard her name so many times and I've seen some of her work. But she's not mentioned in any of our reading about photographers from that time.

第十段

1 .Oh. Well, O'Keeffe was really more of a painter.

第十一段

1 .I thought she was a photographer, too.
2 .I mean, I just saw one of her photographs in a museum the other day.
3 .I think it was called "Red Leaves on White" or something like that.

第十二段

1 .Oh, right! Yes. "Large Dark Reaves on White" is the complete title.
2 .It's a fairly well-known painting by O'Keeffe.

第十三段

1 .Oh, oh, okay. What was I thinking?

2 .I guess I should have had a closer look.

第十四段

1 .No, no. That's a really good observation.
2 .I mean chronologically that would be impossible.
3 .When she did that painting, color film hadn't even been invented yet.
4 .Neither had the right technology to blow pictures up that big to show that much detail.

第十五段

1 .But that painting and some of her other paintings do reveal the...
2 .the influence of photography, like, uh, she would crop her images.
3 .She would make a frame around part of an image,
4 .say, just the very center and then cut off certain parts, the parts outside that frame,
5 .to create the effect she wanted, the way a photographer does.
6 .And those paintings are close-ups,
7 .like you might see today, of a person or a flower in a photograph.

第十六段

1 .Now, those techniques were certainly around and being used by photographers then.
2 .But just in photographs, which were smaller not as big as what O'Keeffe was painting.

第十七段

1 .Also, O'Keeffe studied under an artist named Arthur Wesley Dow.
2 .That's DOW, D-O-W, who advocated focusing on simple basic forms, like the lines of a flower and its petals and he wanted forms to be isolated from their original settings.

第十八段

1 .He believed that, by doing that, an artist could reveal an object's, its essence.
2 .He'd do things like...like...have students take a simple ordinary form, like a leaf,
3 .and explore various ways of fitting all of it into a square,
4 .maybe bending it around to make the whole thing fit into the frame. Pierre?

第一十九段

1 .It sounds like maybe O'Keeffe borrowed most of her ideas. The stuff we might think of as being hers, she got them from other people.
2 .She didn't really have a style of her own.

第二十段

1 .Well, virtually, all artists are influenced by other artists,
2 .by their predecessors, by their contemporaries, their teachers...

第二十一段

1 .Artists build on what other artists have done.
2 .But if they are talented, they take it in some unique direction to develop their own distinctive style.

第二十二段

1 .O'Keeffe liked to create abstract interpretations of real objects.
2 .In the painting Jennifer mentioned,
3 .Large Dark Red Leaves on White, in addition to exaggerating the size of the leaf,
4 .O'Keeffe juxtaposes it against a silver or whitish background.
5 .So that's more of an abstract setting for it, and so on.

第二十三段

1 .Now, O'Keeffe wasn't the first artist to create an abstract interpretation of a real object but she used that approach to express her experience of the object she was painting.
2 .So she presented a vision that people hadn't seen before.
3 .It's unique.
4 .It's compelling.
5 .She didn't expect other people to experience the object the way she did.
6 .She knew they'd look at her painting and hang their own associations on it, which is true for artwork in general, I think.
7 .That's just the way the human brain works. But at least they'd be taking a careful look at something they'd never really paid much attention to.

Lecture2

Listen to part of the lecture in an Earth Science class.
2 .The class has been discussing volcanoes.

第二段

1 .Okay. We know the Earth's surface, the crust, is made up of tectonic plates, and these huge slabs of rocky crust are slowly sliding over or under or past each other,
2 .and we said that most of the world's volcanoes occur at the boundaries of these tectonic plates where you have hot molten rock squeezing up through gaps between the plates.

第三段

1 .But some volcanoes occur not at the edges, but in the middle of a continental or oceanic plate.
2 .The Hawaiian Islands, for example,
3 .are thousands of kilometers away from any plate boundary, and yet you have vast amounts of magma,
4 .molten rock or lava, flowing up through the earth's crust, which means, of course,
5 .that volcanic activity there can't be explained simply by plate tectonics.

第四段

1 .So, how do we explain these volcanic anomalies, these exceptions to the general rule?

第五段

1 .Well, back in 1963, a geophysicist by the name of Wilson came up with a hot-spot theory to explain how this particular type of volcanic activity can occur,
2 .and can go on for maybe tens or even hundreds of millions of years.
3 .Wilson's theory was that: hot spots exist below tectonic plates,
4 .and they're the cause of these volcanoes.

第六段

1 .But what causes the hot spots?

第七段

1 .Hmm, well, the most popular theory that's been proposed is the plume hypothesis.

第八段

1 .According to this hypothesis, plumes, uh, basically columns of extremely hot magma.
2 .These plumes well up from deep inside the planet's interior,
3 .maybe even as deep as its core,
4 .and rise all the way up to melt through the Earth's crust.

第九段

1 .Imagine a burning candle, and imagine moving a sheet of heavy paper slowly over the flame of the candle.
2 .You're gonna get a series of burned spots in the paper,
3 .well, that's just like what's happening with the Hawaiian Islands, but instead of a sheet of paper,
4 .you've got a tectonic plate,
5 .and it's moving over this plume of intensely hot magma,
6 .and rather than a series of burned spots in the paper.
7 .You're getting a chain of volcanic islands where the hot plume melts through the crust under the Pacific Ocean at one point after another with active volcanoes on the younger islands that are now just above the plume,
8 .and the other islands, well, the farther away from the plume they are now, the older they are, and the longer ago their volcanoes went dormant or extinct.

第十段

1 .Incidentally, volcanic islands may seem small,
2 .but the island known as the Big Island Hawaii is one of the tallest topographic features on the planet, more than five kilometers from the sea floor to the ocean surface,
3 .and almost that much again, up to its highest peak.
4 .That's nearly ten kilometers from ocean floor to the highest point on the island,
5 .which makes it taller even than Mount Everest.

第十一段

1 .So, you can imagine the huge amounts of magma, or lava, that've flowed up to form even just this one island,
2 .much less the whole chain of islands.

第十二段

1 .Now, the Plume Hypothesis provides a pretty elegant explanation for a volcanic anomaly, like the Hawaiian Islands.
2 .But, while it's hypothetically attractive,
3 .there's very little direct evidence to support the theory, because so far,
4 .no one's been able to actually observe what's happening that far beneath the Earth's crust.

第十三段

1 .Some studies have been done, seismographic, geochemical,
2 .where the data's consistent with the model, but they aren't definitive proof.
3 .Even the model supporters are uncomfortable claiming that it explains every volcanic anomaly.

第十四段

1 .And like any popular theory, I suppose, it has some determined critics.
2 .These critics have put forth a number of alternative theories, all unproven so far.
3 .But one well-regarded theory is the crack hypothesis,
4 .which assumes that hot spots are created when a piece of the crust gets stretched thinner and thinner and the resulting stress causes small cracks to open up at weak spots in the crust,
5 .and it's through these cracks that magma pushes up to form volcanoes.

第十五段

1 .Proponents of the crack hypothesis consider this a widespread phenomenon and believe that magma's not coming up from deep within the Earth's interior,
2 .but rather from just beneath the surface crust.

第十六段

1 .This hypothesis is attractive, because it fits with what we already know about plate tectonics and it fits what we know about some secondary smaller hot spots, but how well does it explain the Hawaiian Islands?
2 .Could a series of random cracks produce that same particular string of Islands that's sequenced so neatly from old to young?
3 .You know, it worries me when a theory depends on coincidence to produce results.

Conversation2

Listen to a conversation between a student and a professor.

第二段

1 .Hi professor, I was hoping to ask you a few questions about the class you're teaching next semester,
2 .the course on Polish drama I was thinking of taking it.

第三段

1 .Well, that's an upper division course. You don't look familiar to me.
2 .Are you a student in this department?

第五段

1 .Ok, have you had other classes in the Slavic languages department, here or somewhere else?

第六段

1 .No, that's the thing. I was just wondering how good my Polish would have to be whether the class is taught Polish or not.

第七段

1 .Well, you'd have to have some knowledge of it.
2 .By that level a lot of students are quite fluent, plus there're some native speakers in the department.
3 .And we don't plan for it to happen,
4 .but it's pretty common for the discussions to kind of move in and out of English and Polish and it can be difficult to follow.
5 .So, how well do you speak Polish?

第八段

1 .Hmm, not so great.
2 .It's just that my father's from there.
3 .So I'm interested in learning about...
4 .You know, Polish history, Polish culture, plus I'm studying drama.
5 .I'll probably major in it.
6 .I love plays. So I thought your course might be perfect.

第九段

1 .Hmm, to be honest with you, you have to realize that we'll be watching videos of performances.
2 .And maybe if we can swing it, even watch a live performance and those won't necessarily be in translation.
3 .Also, texts, texts are sometimes available in translation. But even then some references will be to the original.
4 .I'd hope you'd be fairly confident in reading.

第十一段

1 .You know what? I believe they'll be offering a survey course on Polish literature.
2 .Let me check here.

3 .Yes, I thought it was being offered this time, Professor Jowaski's teaching it.
4 .Let's see. It covers the major works,
5 .you know, epic romantic portray, the novels, and it does cover one or two plays.

第十二段

1 .And this is in English?

第十三段

1 .Yes, you'll be reading mostly English translations and the discussions will be in English.

第十四段

1 .Hmm, novels and poetry.

第十五段

1 .They'll provide you with a great historical context for the plays.
2 .So when you do get to them, you're gonna really have a feel for the times they lived in, so to speak.
3 .Plus this course might also give you the impetus to learn more Polish, you know, get it to the level where you'd be ready for the other class.

第十六段

1 .Hmm.

Lecture3

Listen to part of the lecture in a biology class.

第二段

1 .Ok, today I'd like to spend some time going into more detail about symbiosis.
2 .Symbiosis, what is it? Anyone?

第三段

1 .Urn, I thought it's when two organisms are in a relationship that they both benefit from.
2 .Well, at least that's what I thought it was until I did the reading last night.
3 .Now, I am kind of confused about it, because the book used that definition to describe mutualism.
4 .Could you explain the difference?

第四段

1 .Good. I was hoping that someone would bring that up.

2 .Sometimes scientists working in different fields use the term symbiosis to mean slightly different things.
3 .And it can get confusing.
4 .Uh, for example, when symbiosis is used as a synonym for mutualism.
5 .But there are quite a few of us out there who think there should be a clearer distinction made between the two.

第五段

1 .Ok, where to begin...
2 .Um, the original definition of symbiosis is pretty simple.
3 .It simply means living together.
4 .So, any close relationship between two organisms of different species would be considered a symbiotic relationship,
5 .including positive and negative relationships.

第六段

1 .Mutualism then is a kind of symbiosis,
2 .a specific type of symbiotic relationship where both organisms benefit somehow.
3 .So, your book is correct.

第七段

1 .Now, I want to make it clear that, um, the positive result from being in a mutualistic relationship doesn't have to be equal for both organisms.
2 .It's not a one-to-one ratio here.

第八段

1 .Is everyone with me so far?
2 .Symbiosis, general term;
3 .mutualism, a narrower or more specific kind of symbiosis. Okay.

第九段

1 .Now, let's take a closer look at mutualistic relationships.
2 .Um, I'll start off by describing a case of mutualism that involves a certain butterfly species found in South Africa and Australia.
3 .It's a good example of how dependence on a mutualistic relationship can vary.

第十段

1 .Ok, there's this butterfly family and I'll spare you the fancy Latin name because it is not important for our purposes here.

2 .Uh, I'll call them Coppers and Blues, well, because most members of this family have blue or copper colored wings.
3 .I think this is one of the most interesting cases of mutualism.
4 .These butterflies require the presence of ants to complete their life cycle.
5 .Their interaction with ants is obligatory.

第十一段

1 .So, this is what happens.
2 .A female butterfly of these Coppers and Blues will lay eggs only on vegetation where there are ants of a particular species.
3 .The butterflies can smell,
4 .well, ants leave behind pheromones, a special chemical signal.
5 .The butterfly recognizes the ants' pheromones on the plant and then the newly hatched butterflies, the caterpillars will feed on this plant after they hatch from the eggs.
6 .As the caterpillar gets a little older and find shelter under nearby rocks or stones to protect itself from predators.
7 .It's always attended or escorted by ants.
8 .And it always makes its way back to the host plant to feed,
9 .guided by the ants,
10 .the ant escort service, so to speak.

第十二段

1 .Now, why would the ants go through all this trouble?
2 .What's their benefit? Mary?

第十三段

1 .It's probably related to food?

第十四段

1 .Uh-huh? You are onto something.

第十五段

1 .Ok, ants feed on sweet stuff, right?
2 .So the caterpillar must have some kind of special access to honey or sugars, or something like that.
3 .Maybe caterpillars produce honey somehow.
4 .On second thought, um, I'm probably way off.

第十六段

1 .You are pretty close actually.

2 .The caterpillars have a honey gland, an organ that secretes an amino acid and carbohydrate liquid.
3 .The caterpillar secretes the liquid from the honey gland, rather large quantities, enough to feed several ants.

第十七段

1 .But what makes this relationship obligatory for the caterpillar?

第十八段

1 .Well, if the ants don't feed regularly on the liquid from the caterpillar's honey gland, the gland overloads and gets infected.
2 .The infection will kill the caterpillar and it will never reach its final stage of development, becoming a butterfly.

第一十九段

1 .John?

第二十段

1 .Ok, I just want to make sure I'm following here.
2 .The caterpillar needs the ants or it won't make it to the stage where it can become a butterfly.
3 .And the ants do this because they get an easy meal out of it, right?
4 .But the ants don't absolutely need the caterpillar for survival, 'cause they can get food from other places right?
5 .So it's still called mutualism even though it seems like the caterpillar's getting way more out of it.
6 .Oh, wait, you said they don't have to equally benefit. Never mind, sorry.

第二十一段

1 .Yes. But there is a type of mutualism where the relationship is necessary for both organisms to survive.
2 .It's called obligatory mutualism.
3 .And we'll talk about that in the next class.

Lecture4

Listen to part of a lecture in an American History class.

第二段

1 .We have been talking about the transformation¡ªthe industrialization of United States economy in 19th century.
2 .As the country shifted from an agricultural to an industrial base, political power shifted too.

3 .Businesses became... a lot of power went...went...went...went from the government into the hands of business leaders.

第三段

1 .So, why did this happen?
2 .How did an elite group, a few business giants,
3 .how did they end up dominating, controlling a number of important national industries in the last quarter of the 19th century?
4 .How did they get to be so dominant?
5 .How did they figure out?
6 .How did they take advantage of the new industrialization of American society?

第四段

1 .Well, consider the example of Andrew Carnegie and the steel industry.

第五段

1 .We have already discussed the development of a national network...a national system of railroads.
2 .Well, this growth created a tremendous demand for steel.
3 .A national railroad system needs a lot of railroad tracks, right?
4 .And Carnegie seized the opportunity.
5 .He built the world's most modern steel mill.
6 .And he came up with a system of business organization called Vertical Integration.

第六段

1 .Vertical Integration just means that...all...every single activity of a particular industry's processing is performed by a single company.
2 .In the case of the steel industry, this means the mining of iron ore, the transportation used to get ore from the mine to the mill, turning the ore into the steel,
3 .the manufacturing process and sales. Carnegie controlled all of these.
4 .He practiced Vertical Integration on such a large scale that he practically owned the whole steel industry.
5 .This, of course, gave him a lot of political clout.
6 .Just a quick sketch, but you get the idea, right?

第七段

1 .Here is another example: John D. Rockefeller. Rockefeller owned an oil refinery, but he wanted to expand his business.

2 .Since there was lots of competition in the industry,
3 .he thought the smart way to go about it would be to buy his competitors' businesses.
4 .But at the time it was illegal for one corporation to control another.
5 .So what he did was: he created an organizational structure called a trust.
6 .A trust is... well I don't have to go into that now.

第八段

1 .What matters is that a trust created a single, central management team.
2 .And that team directed the activities of what otherwise still appeared to be independent companies.
3 .This new...uh...legal entity worked so well that at one point Rockefeller controlled 90% of the country's oil refineries,
4 .which again gave him lots of political power.

第九段

1 .So you've got two different approaches to expanding a business, and both were quite effective.
2 .Of course, these weren't the only two examples.
3 .A number of big businesses run by powerful individuals developed across a wide range of industries, like railroads, food processing, electricity.
4 .But what they all had in common was: the government let them operate pretty much how they wanted to.

第十段

1 .So why did they do that?
2 .Why did the government keep such a low profile and allow individuals to gain so much control of the industries?
3 .Well, obviously, they had the wealth and the power to influence political leaders.

第十一段

1 .But also, the truth is that these industry leaders made a significant contribution.
2 .Their investments in technologies led to the development of many new production techniques, which strengthened the economy.
3 .And many of them gave lots of money to charity.
4 .Andrew Carnegie was particularly admired for his generosity.

第十二段

1 .But there was one thing in particular that gave them power.
2 .And that's they were beneficiaries,
3 .probably the biggest beneficiaries of a theory,
4 .a dominant political theory in the 19th century, something called laissez-faire doctrine.

第十三段

1 .Laissez-faire roughly means "let it alone".
2 .And that pretty much summarized the theory's philosophy.
3 .The idea was that government should leave business alone, allow it to operate unregulated.
4 .Legislators weren't supposed to pass a lot of laws, or worry about regulating business practices.
5 .When people did challenge a company's business conduct,
6 .I mean, I mean, in court cases, well, the few laws that did exist were usually interpreted in favor of business interests.

第十四段

1 .But over time, it started becoming increasingly obvious and troubling to the public that some of these big companies simply had too much control.
2 .There were criticisms that owners had too much opportunity to exploit workers,
3 .workers and consumers, because they could control prices and wages.
4 .And small business owners and small farmers couldn't compete.

第十五段

1 .So there was bad press, bad publicity, enough that the government eventually felt it had to do something.
2 .So it passed two key pieces of legislation.
3 .One law was designed to regulate the prices set by the railroads;
4 .another made it illegal for trusts to be used to limit competition.
5 .Both were aimed squarely at reducing the exclusive control that existed in some industries.

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TPO 49

TPO 49-Conversion 1 (Restricted Access)

Listen to a conversation between a student and a librarian.

Student: Hi, I need to get into special collections, in particular the British Literature.I was working with some of the William Blake books.

Librarian: Well, then you must know that access is restricted.

Student: Um, I was in a seminar with Professor Gray and she authorized access for us.

Librarian: Oh, if that's the case, let me check.Right. Yeah. But it looks like that expired at the end of last semester

Student: But I really need to get back in there.See...I didn't quite finish my project.

Librarian: Aha! The plot thickens.Well, it's easy enough.Have Professor Gray authorize you again.You see, these editions are rare and shouldn't be handled more than necessary.Can you work from later editions or microfilm?

Student: Not really. Actually my project...Well, it involves some annotations in the particular edition here.They haven't been reproduced because they are really not part of the text.You know, they generally clean them up.They are quite hard to see.

Librarian: Well, often the characteristics of the manuscripts have been recorded.These types of extraneous markings might also be noted.

Student: I don't think they are.They are very faint, and, well, I think I have a new angle on them.There was a study once a long time ago about these notes that everybody else has taken for granted without checking for themselves.I think there might have been a mistake in the past, that they were misread.

Librarian: So get Professor Gray...

Student: Uh...she's away this semester I had to beg her to give me extra time on this project.I haven't even received a grade in the class yet.And this class is a prerequisite for other classes in my major.I really need to see those books so I can finish this project and get back on course to graduate on time.

Librarian: Everybody has special circumstances.

Student: Two hours? One hour?I promise to be careful.I just need to look at a few pages with a strong magnifying glass.

Librarian: Well, I can’t let you in without authorization from your professor.Can you get in touch with her somehow?

Student: Maybe she'd be checking her email.I really thought I would be able to straighten this out without her.You know, she did me a huge favor by giving me the extra time.I feel like I'm skating on thin ice with her.

Librarian: You know, you were lucky to have had permission to look at the books last semester.If we don't maintain our policies, they'll disintegrate.

Student: I know. Would an email from her or a phone call be good enough?

Librarian: Of course.

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TPO 49-Lecture 1 (Alaska)

Listen to part of a lecture in a geology class.

Professor: Alaska is fascinating to geologists because of its incredible landscapes.Permafrost has a lot to do with this.That is the areas where the ground, the soil, is always frozen, except for the very top layer, what we call the active layer of permafrost, which melts in the summer and refreezes again in the winter.

The northern part of Alaska is covered in lakes, thousands of them.And most of these are what we call thaw lakes, T-H-A-W, thaw lakes.I'm going to show you a few sketches of them in a minute, so you'll have a good idea of what I'm talking about.So how these thaw lakes are formed has to do with...OK, it starts with ice wedges.The top part of the ice wedge melts.Should I back up?

Ice wedges form when water runs into cracks in the ground, the permafrost, then freezes.You ever see mud after it dries?Dried mud has cracks because when it dries it contracts, it shrinks.

Well, in winter permafrost behaves similarly.It shrinks in winter because it freezes even more thoroughly then.And as it shrinks, it forms deep, deep cracks.Then in the summer, when the active layer, the top layer of the permafrost, melts, the melt water runs into those cracks in the permafrost, then freezes again, because that ground, the ground beneath the active layer is still below freezing.So you have wedges of ice in the permafrost.

Now, the ice wedges widen the original cracks in the permafrost because water expands when it freezes.All right, OK.Then in the autumn, the active layer on top freezes again.Then in winter the permafrost starts contracting again and the cracks open up even wider.So the next summer when the active layer melts again and flows into the widened cracks and freezes, it makes the cracks even wider.So it's sort of a cycle through which the cracks and the wedges grow wider and wider.

So when the ice wedge reaches a certain size, its top part in the active layer turns into a little pond when it melts in the summer.And that's the beginning of your thaw lake.There are thousands of them in Northern Alaska.One of the most fascinating things about these lakes and this is important, is that they mostly have the same shape like an elongated oval or egg shape, and what's more, all the ovals are oriented in the same way.Here is an idea of what they look like, what the landscape looks like from an aerial view with the lakes side by side.

There's been considerable research done to try to figure out what causes them to be shaped and oriented this way.We know that the shape and orientation are caused by the way the lakes grow once they are formed.But the question is what makes them grow this way?

One theory sees winds as the cause.This region of Alaska has strong winds that blow perpendicular to the lakes.What happens is wind blows straight into the longer side of the lakes.

Now, wouldn't that erode the lake bank in that direction?Same direction as the wind?Well, no.Actually, what happens is that the waves caused by the winds build a sort of protective layer of sediment.It's called a protective shelf, along the bank of the lake directly in front of them.So that bank is shielded from erosion and the waves are diverted to the sides, to the left and to the right.And that's why the left and the right banks start eroding.

Get it? The bank straight ahead is protected. But the lake currents, the waves erode the banks to the sides. That's the current model, the wind erosion model, which is generally accepted.

But there is a new theory that says that thaw slumping, not wind, is what shapes the thaw lakes.

Thaw slumping... Ok. Sometimes in the summer the temperature rises pretty quickly. So the active layer of permafrost thaws faster than the water can drain from the soil. So the sides of the thaw lakes get like mushy and slump or slide into the lake. Then the lake water spreads out more and the lake gets bigger. OK?

Also in that part of Alaska, the terrain is gently sloped, so the lakes are all on an incline. Here, now, this is an exaggeration of the angle. The hill is not this steep. But see how with the lake's banks, the side that is farther downhill, it's smaller, lower. This short bank thaws faster than the tall one does, so it falls into the lake, it slumps much more and much faster than the other bank. When short banks of many lakes slump, they move farther downhill and the lakes grow all in the same downhill direction.

This is a new theory, so it hasn't been tested much yet. In field studies, when we've looked at the banks of these thaw lakes, there is not much evidence of slumping. We’d expect to see cliff-like formation there from the slumping. But we haven’t really found any of those.

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TPO 49-Lecture 2 (Montessori Method)

Listen to part of a lecture in an education class.The professor is discussing the Italian educator Maria Montessori.

Professor: Ok, if you did your reading for today, then you were introduced to a very influential alternative to traditional education.This educational philosophy and methodology was pioneered in Italy in the early 1900s by Doctor Maria Montessori.It's called the Montessori Method.But what made the Montessori Method for young children so different?What made it so different, so special?

Male Student: It's based on very different ideas about how kids learn best, right?

Professor: Um-hmm...It was groundbreaking.To begin with, unlike the traditional classrooms at the time, the Montessori classroom environment was more suited to the child.The furniture was child-sized.Well, it's that way in almost all schools now, but that wasn't always the case.

We can thank Montessori for this.You won't see any long benches with children in rows or heavy desks that separate children.Children are free to interact with each other.And in Montessori classrooms, the furniture is lightweight, so children can move it around easily, and having furniture and materials made to fit them, makes kids feel more competent.This fits in with Montessori's notion of liberty and autonomy.Children are free to move around the room and they learn to do things for themselves.

Male Student: I'm not sure I get that part.It sounds like potential chaos.

Professor: Oh, no, no, no.Let's not confuse this liberty of activity with lack of discipline.In fact, teachers have to maintain this specific environment carefully through a number of rules, which are generally about respect and what's right.It's just that the child needs freedom of choice to develop independence and self-direction.

Also, unlike what happens in most conventional classrooms, children choose their own activities.They may be guided by the teacher, but it's ultimately up to each child to select tasks, which brings us to the manipulative equipment you find in a Montessori classroom, like little boards that have rough or smooth surfaces, or blocks that can be stacked into a tower.Now this equipment was designed by Montessori over time with much experimentation, designed...well, designed to help children teach themselves through playing.

Female Student: Well, what do the teachers do?I mean if the kids are teaching themselves.

Professor: Ah, well, that's a good question.To start, a child may not work with an activity until the teacher has demonstrated its proper use.Then the Montessori teacher's job is to observe the child's play, because when the children play, they are acquiring the bases for later concepts.So the teacher helps motivate and focus each child and monitors the child's progress, but does not interfere with the child's observations and deductions.That was and still is a novel idea, and for many teachers not the easiest thing to do.In facts, for some, it's very difficult.Montessori herself called the teacher a director.Remember, the independence of the learner lies at the heart of the Montessori methodology.

Female Student: Ok, yeah, it does seem like that the teacher need a lot of training and patience.

Professor: True.As I said, it is not easy for a lot of teachers to step back like that, but getting back to the equipment.Basic Montessori equipment can be divided into a number of major subject areas such as practical life, mathematics and what is called sensorial.

With a sensorial equipment, the children can explore things like sounds and textures.At the same time, they develop motor skills.But this apparent play is laying the groundwork for the later math and language work.

Now let's take a look at the materials called brown stairs.For a young child playing with this graduated blocks, these brown stairs, they are not just a sensorial lesson.By manipulating them, the child develops fine motor skills and by sorting and classifying them by size, by weight, the child learns some basic mathematics.Similarly, with practical-life equipment, the child can learn how to button a shirt, cut up an apple for a snack and other real-world tasks.

Male Student: Without this integration in real-world learning, is there any room for creativity?

Professor: Is creativity encouraged?Well, lots of Montessori teachers wouldn't praise a child for using a violin as a baseball bat or for putting their head like a hat.But actually, creativity comes through learning to play the violin, using the object for the purpose that was intended and practical life exercises stress that.

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TPO 49-Conversion 2 (Extension For Paper)

Listen to a conversation between a student and a professor.

Professor: Oh, hi, Melanie, how are you doing?

Student: I'm good. Thanks. I just have some questions about this paper for your class. Do you have a second to talk about it now?

Professor: Oh, yes. No problem. I have about twenty minutes before my next class. Will that be enough time?

Student: Yeah. I think so. Okay. So the thing is, you know, okay, I'm writing my paper on the history of jazz in New York City.

Professor: All right. Well, that's a pretty broad subject.

Student: Well, actually I'm focusing on a specific decade, the 50s and on...and I'm only doing it on a few specific artists.

Professor: Oh, okay, because I was going to say that seemed a bit, uh, too ambitious for a ten-page paper.

Student: Yeah, no, it's not the subject I'm having trouble with.Actually the paper is practically writing itself.I mean, I have got a lot to say and it's going pretty well.The thing is, I have this idea that might make it better and I was wondering if there's any way I could get an extension.I mean, I know it's due next week. Right?

Professor: That's right, on Monday. But I don't understand.It sounds like you are doing so well. Why do you need more time?

Student: Yeah. Well, I could write the paper as it is and turn it in on time and it would be fine.

Professor: But?

Student: But I was just talking to one of my friends whose family has lived in New York forever!And it turns out that her grandfather was actually there, in the period of jazz I'm writing about.I mean, he was a jazz musician and he actually, like personally, knew the artists I'm writing about.

Professor: You are kidding!That's a coincidence.

Student: Yeah, I know, it's cool, right?So anyway, that's why I was wondering if I could get an extension because I thought it would be really great if I could like interview him for my paper.

Professor: Ah...

Student: But I don't think I can meet with him until early next week. So...

Professor: Ah, I see.Well. It would certainly add a new dimension to your paper, wouldn't it?Have you talked to this gentleman yet?

Student: Uh, no, but I talked to my friend, just, you know, ran the idea past her and she said he would probably love to do it.But you know, he is busy until next week.

Professor: Okay. Well, yeah, I think that in this case we can definitely extend your deadline until, that's say, Friday next week?

Student: Okay. That would be great!

Professor: But just to be fair, why don't you turn in an outline of your paper on the due date?

Student: The outline? Oh, that's no problem.It's basically done except for the parts about the interview.

Professor: Oh, yeah. The interview.Could you have the questions ready then too? The ones you are planning on asking.

Student: Sure! Yeah, I can do that too.

Professor: And then I'll expect the final draft next Friday.

Student: Okay. Great. Thanks!

Professor: Sure. I'm looking forward to reading it.

)

TPO 49-Lecture 3 (Extension For Paper)

Listen to a conversation between a student and a professor.

Professor: Oh, hi, Melanie, how are you doing?

Student: I'm good. Thanks. I just have some questions about this paper for your class. Do you have a second to talk about it now?

Professor: Oh, yes. No problem. I have about twenty minutes before my next class. Will that be enough time?

Student: Yeah. I think so. Okay. So the thing is, you know, okay, I'm writing my paper on the history of jazz in New York City.

Professor: All right. Well, that's a pretty broad subject.

Student: Well, actually I'm focusing on a specific decade, the 50s and on...and I'm only doing it on a few specific artists.

Professor: Oh, okay, because I was going to say that seemed a bit, uh, too ambitious for a ten-page paper.

Student: Yeah, no, it's not the subject I'm having trouble with.Actually the paper is practically writing itself.I mean, I have got a lot to say and it's going pretty well.The thing is, I have this idea that might make it better and I was wondering if there's any way I could get an extension.I mean, I know it's due next week. Right?

Professor: That's right, on Monday. But I don't understand.It sounds like you are doing so well. Why do you need more time?

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Professor: But?

Student: But I was just talking to one of my friends whose family has lived in New York forever!And it turns out that her grandfather was actually there, in the period of jazz I'm writing about.I mean, he was a jazz musician and he actually, like personally, knew the artists I'm writing about.

Professor: You are kidding!That's a coincidence.

Student: Yeah, I know, it's cool, right?So anyway, that's why I was wondering if I could get an extension because I thought it would be really great if I could like interview him for my paper.

Professor: Ah...

Student: But I don't think I can meet with him until early next week. So...

Professor: Ah, I see.Well. It would certainly add a new dimension to your paper, wouldn't it?Have you talked to this gentleman yet?

Student: Uh, no, but I talked to my friend, just, you know, ran the idea past her and she said he would probably love to do it.But you know, he is busy until next week.

Professor: Okay. Well, yeah, I think that in this case we can definitely extend your deadline until, that's say, Friday next week?

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Professor: But just to be fair, why don't you turn in an outline of your paper on the due date?

Student: The outline? Oh, that's no problem.It's basically done except for the parts about the interview.

Professor: Oh, yeah. The interview.Could you have the questions ready then too? The ones you are planning on asking.

Student: Sure! Yeah, I can do that too.

Professor: And then I'll expect the final draft next Friday.

Student: Okay. Great. Thanks!

Professor: Sure. I'm looking forward to reading it.

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TPO 49-Lecture 4 (Pottery)

Listen to part of a lecture in an archaeology class.

Professor: So if I ask you what most archaeologists do with all those pieces of broken pottery they find at the excavation sites, you'd probably say that they help establish the time period of the site. Pretty obvious. Huh? Pottery helps us order things in time to assign relative dates.Basically, when we date pottery, we look at its frequency at a given site.

As you can probably surmise, styles of pottery vary over time, in terms of how they're made, what they're made of and what they were used for.So as archaeologists, we built up a picture, a sequence of how pottery changed over time as well as how its popularity varied over time which we can tell by the frequency of a style at a site, how many occurrences we find at a given site.But pottery can provide evidence about a lot of things, not just dating evidence, not just evidence of the time period that pottery was created.So there is also another type of evidence that we call distributional evidence.OK, pottery is evidence of distribution.It, pottery, provides evidence that trade took place.Pots were traded for themselves or given as gifts, but even more often they changed hands cause they were used as containers for food or wine.

To fully understand how pottery's used as distributional evidence, we have to know its origin, where it was made.So how do we figure this out? Well, by studying what the pottery's made of, you look at the material that...that a pot's made of, to know where it was made and its distribution.

OK. A third kind of evidence is evidence of function, the function of the site where the pottery was found and sometimes about the lives of the people who lived there.Now this evidence is a bit tougher to interpret than the other two.And there are several reasons for this.

First of all, pottery is usually not found in primary contexts, that is, it's often not found in the place where it was used.Think about you average town dump, you know the place where everyone's unwanted stuff ends up, can you imagine archaeologists a thousand years from now digging up a town dump and then using the items found there to get meaningful information about how the objects found there were used? Probably not.

A second reason why function is harder to identify is that not all objects found in one spot can be assumed to have identical functions even if they look similar.If you come across a collection of pots at a site, you need to work at the level of the group rather than the individual pots because you can't assume that they all have the same function just because they were found in the same place.So this is where pottery's form comes into play.

The form of a pot can give us some ideas about its function, the suitability of the pottery to serve a specific function.However, we have to be careful when it comes to skeuomorphs.These objects are copies of the designs of other objects, but in another material.And this can be problematic, because sometimes the new or different material is not well suited to the design.

A good example of this comes from a fifteen-century Dutch ceramics, a bronze cauldron was copied in ceramic, including the sort of big angled handles, and while it worked well in bronze, it didn’t work in the ceramic skeuomorph. Well, because the ceramic handles couldn’t support the weight of the pot when it’s full, it just couldn’t function as it was intended to.

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TPO 50

TPO 50-Conversion 1 (Straw Poll)

Listen to a conversation between a student and a political science professor.

Student:I'm not sure if you know but I would like to go to the student government this year.

Teacher: Oh, congratulations! I was in student government myself as an undergraduate. It taught me a lot about the political process. In fact, the experience solved my problem of what to do with my life. It really cemented my interest in becoming a political scientist.

Student: Cool! Anyway, the reason I came by is we are getting ready to conduct a straw poll on campus, you know, hold an informal ballot since the general election is just a couple of months away. We want to get a field from the students' bodies political leanings, like who students are planning to vote for, which political party people identify with, that sort of thing.

Teacher: I'm sure. I help students run the straw poll once years ago, uh, it was a lot of work. Mostly because we use paper ballots, and stayed up all night counting them. But if you use computers……

Student: Yeah, we are creating a website for our students to be able to vote online. Em, we are looking for a faculty advisor to help, actually. I was hoping you might be interested.

Teacher: Oh, I'm flattered, John. But my schedule is so jammed. I'm teaching two seminars, your intro-course, finishing up my research. But, what about Professor Clan? She is new in our department. Plus, she is a wiz with computers.

Student: Ok, I will ask her.

Teacher: So, have you decided on the topic for your term paper yet?

Student: Not really.

Teacher: Why not write about your straw poll? Since the paper is not due till after the election, you could include your results. Maybe compare them with the real election results.

Student: But would that be enough? I mean, just comparing numbers?

Teacher: Well, no, you need to provide some analysis, too. But I was thinking, there is a couple of local ballot questions this year. You know, referenda, the voters can either support or not support?

Student: Right. There is one on whether to ban smoking in restaurants, and another one……I think is whether to spend tax dollars for a new sports arena in the city.

Teacher: Ah, Ok. Here is an idea. In regular elections, the vast majority of voters ignore referenda. They vote for their favorite candidates but avoid ballot questions. We believe it's because voters aren't familiar with the questions or don't understand them. But actively educating people on ballot questions right before they vote can improve referendum participation rates.

Student: In that case, maybe we could have our straw poll website providing information on the ballot questions, like how each proposal would affect students.

Teacher: Exactly. And when you write your paper, you could compare the students' referendum voting rate to the general publics. And include you own analysis of the results. Plus, there is plenty of publish research on referendum voting behavior.

Student: Thanks, Professor Miller. I have no idea the straw poll can actually help me in my course work.

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TPO 50-Lecture 1 (Ancient Egyptian Glass)

Listen to part of a lecture in an ancient history class.

Professor: Ok, last time we were discussing trade and commerce during the Bronze Age. And I said a little over three thousand years ago, there was quite a lively trade among the countries along the Mediterranean Sea. People are making objects out of bronzes and they were using bronze tools to make other goods. And they develop trade networks to trade these goods with other countries around the Mediterranean. One of the things they traded was glass. And recently there was an archeological excavation in Egypt, on the Nile River around where enters the Mediterranean Sea where they discovered an ancient glass factory. Robert?

Robert: I thought our textbook said the Egyptians imported their glass from other countries.

Professor: Well, until now that's what the evidence seemed to suggest. I mean, we have some evidence that suggested that the Egyptians were making glass objects, but not glass.

Robert: Ok. Am……Am I missing something? They are making glass but they are not making glass?

Professor: I said they were making glass objects, right? You see, it was previously thought that they weren't actually making the raw glass itself that they were importing unfinished glass from Mesopotamia, which today is a region consisting of Iraq and parts of Syria and Turkey and Iran, and simply reworking it. Most archeologists believed that the glass factories were in Mesopotamia because that's where the oldest known glass remains come from. You see, there was two stages of glass making. The primary production stage where they made disks of raw glass. And there was the secondary stage where they melted the raw glass, the glass disks, and created decorative objects, so, or whatever. And from this new Egyptians' site, we learned that the primary production stage had several steps. First they took quartz, a colorless transparent mineral and crushed it. Then they took that crushed quartz and mixed it with plant ash. A plant ash is just what it sounds like, the ashes left after you burnt plant material. They slowly heated this mixture at a relatively low temperature in small vessels, containers like jars made out of clay. And that yielded a kind of glassy material. They took this glassy material and grounded it up into a powder and then they used metallic dye to color it. After that, they poured the colored powder out into disk-shaped molds and heated it up to very high temperatures. So that it melted. After cooled, they break the molds, and inside there were the glass disks. These disks were shipped out to other sites within Egypt and places around the Mediterranean. Then in the secondary phase, the disks were reheated, and shaped into decorative objects. Susan?

Susan: So what kind of objects were people making back then?

Professor: Well, the most common objects we found, mostly in Egypt and Mesopotamia, the most common objects were beads. One thing the Egyptian were very very good at was imitating precious stones. They created some beads that look so much like emeralds and pearls that was very difficult to distinguish them from the real thing. Em, and……and also beautiful vessels, ah, with narrow necks. They were probably really valuable so they wouldn't have been used to hold cooking oil or common food items. They were most likely used for expensive liquids, like perfume. Now the glass made at this factory was mostly red, to get this red color they used copper, in a sophisticated process. Of course, any kind of glass was very valuable so these red bottles would only have been owned by wealthy people. In fact, because it was so difficult to make, and sort of mysterious and complicated, it was probably a product produced for the royal family. And they probably used glass to show their power. Also, beautiful expensive objects made great gifts if you are looking to establish or strength the political alliances. And it is quite possible that the ancient Egyptians were actually exporting glass, not just making it or importing it. The trade with Mesopotamia was probably a friendly mutual trade because a Mesopotamia glass was usually white or yellow. So Mesopotamians might accept something like, we will give you two white disks for two red disks. There is no proof of that, at least not yet.

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TPO 50-Lecture 2 (The Classification of Creatures)

Listen to part of a lecture in a biology class.

Processor: Ok. There are two major types of classifiers in the world, people we call lumpers and people we call splitters. A lumper is someone who tries to put as many things as possible in one category. Splitters like to work for the differences and put things in as many different categories as possible.

Both lumpers and splitters work in the business of defining biological classifications. The great philosopher Aristotle is generally considered the first person to systematically categorize things. He divided all living things into two groups. They were either animal or vegetable. And these categories are what biologists came to call “kingdoms”. So if it ran around, it was an animal, a member of the animal kingdom. And if it stood still, and grew in the soil, it was a plant, a member of the plant kingdom. This system, organizing all life into these two kingdoms, worked very well for quite a while, even into the age of the microscope.

With the invention of the microscope, in the late 1500s, we discovered the first microorganisms. We thought that some wiggled and moved around and others were green and just sat there. So the ones that moved like animals were classified as animals, and the more plant-like ones as plants.Oh, before I go on I must mention Carolus Linnaeus. A hundred years or so after the invention of the microscope, Carolus Linnaeus devised a simple and practical system for classifying living things, according to the ranks of categorization still in use today——class, order, family and so on.

And by further best aspect of the Linnaeus system, is the general use of binomial nomenclature, having just two names to describe any living organism. This replaced the use of long descriptive names, as well as common names which vary from place to place and language to language.Binomial nomenclature gives every species a unique and stable two-word name, agreed upon by biologists worldwide.

But not everything about this system remained unchanged. Take for example the mushroom, a fungus. It grew up from the ground and looked like a plant. So it was classified as a plant. But using the microscope we discovered that a fungus contains these microscopic thread-like cells that run all over the place. And so it’s actually not that plant-like. So in this case, the splitters eventually won, and got a third kingdom just for the fungus.

And as microscopes improved, we discovered some microorganisms that were incredibly small. I’m talking about bacteria. And we could see that they didn’t have what we call a nucleus. So they got their own kingdom, a kingdom of very tiny things without nucleoli. So then we had several kingdoms for plants and for animals, and the different kinds of fungus like mushrooms, and for these tiny bacteria. But we also had some other microorganisms that didn’t fit anywhere. So biologist gave them their own kingdom. And this fifth kingdom was sort of anything that doesn’t fit in the first four kingdom, which upset some people.

And then there was a question of viruses. Viruses have some characteristics of life but don’t reproduce on their own or use energy. So we still don’t know what to do with them. The lumpers want to keep viruses in the current system. Some of the splitters say to give them a separate kingdom.And the extreme splitters say that viruses have nothing at all to do with living things and keep them out of my department.

Recent research though has moved to see yet another direction. Nowadays when we want to determine the characteristics of something, we look at its biochemistry and its genetic material.[4:00.22] And what we’ve discovered is that some bacteria are not like the others. Many of these are called extremophiles. They live in very strange places, in polar ice or in a boiling water of hot springs or in water so salty (that) other organisms couldn’t live there. Extremophiles tend to have a different chemistry from other bacteria, a chemistry that in some case is actually more related to plants and animals than to previously known bacteria. So what to do with this strange bacteria?

Well, one thing we’ve done is creating a new set of categories, the domains, overarching the different kingdoms. Biologists now recognize three domains. But even as we talk about these new domains, well, come back in a few years and it might all be different.

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TPO 50-Conversion 2 (Disturbance from Library Maintenance)

Listen to a conversation between a student and the head of building maintenance.

Teacher: Can I help you?

Student: Yeah, I um……I'm taking summer classes right now and they put me in Robert's Dormitory, offered by the library.

Teacher: Ok.

Student: And I guess they are painting the library or doing something to the outside of the building?

Teacher: Ah……yes, they are. They are replacing the bricks on the outside walls.

Student: Well, whatever it is, it's like……really disturbing, for those of us with windows facing the library. They are working on the wall right opposite us. I mean, dust is everywhere coming in the windows, and, the noise, cos we are like…… what, ten feet away. And……well, it is just not a pretty picture.

Teacher: Right, well, that's why we waited until now to start work on it. I mean, most students have already left campus for summer vacation.

Student: Yeah, but Robert's Hall has been used by all the summer students.

Teacher: Really? The housing didn't notify us of that.

Student: Yeah. It's pretty full. I mean, I can't sleep at night, because of the smell and the dust and……You know, I'd love to just like close the windows but you know (it's) being summer now.

Teacher: Yes, I know. There is no air-conditioning in that building.

Student: Right! So I mean, we got five more weeks of classes left, and we were really wondering how much longer they are going to be working on that particular wall. Because maybe it's going to be a while.Do you think they could maybe work on a different side of the building for now, one that's not facing people's dorm rooms, and wait until the students are gone? To come back and finish this side? I mean, that way the dust and noise won't be coming directly into our windows while we are here.

Teacher: You know, I wish it weren't being done this way and it doesn't make sense. But……this particular decision was made by a special committee and their plan was finalized several months ago. They just didn't realize there would be students in Robert's Hall now.

Student: Yeah.

Teacher: Plus, well, the equipment is all set up, you know, the scaffolding is up on that side of the building and……oh it just won't be practical to have the construction workers move everything to another side and leave a whole side of the library all torn out like that.

Student: I guess not. Isn't there another dorm open anywhere?

Teacher: Not that I know. Oh, wait. I overheard someone saying today that Manchester Hall isn't being used by the city's summer camp after all. You know, most years they house their participants in that dorm all summer.

Student: Well, there is an idea.

Teacher: Now it's a smaller dorm and it's a little out of the way but……well, I bet……I bet they could move the affected student from Robert's Hall.

Student: Wow, I think a lot of people would definitely appreciate that.

Teacher: Ok, well, let me call the housing people and I will get back to you. Leave your name and number, ok? And I will let you know what I find out.

Student: Great. Thanks.

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TPO 50-Lecture 3 (American Realism)

Listen to part of a lecture in the United States' Literature class. The professor is discussing Realism.

Professor: Ok, everyone. In our last class, we finished up Romanticism, right? So now let's look at something completely different. Realism as a literary technic was most popular in U.S. literature from around 1860 till 1890. So it started pretty much around the time of the civil war. And I think you'll see right away how it is different from Romanticism or any other kind of literature. There is a very specific point that makes it unique. And that is that it shows people as they are and get you to look at them and also you know the things that need to be changed in the society. And it doesn't without being sentimental, not in that sort of over-emotional way, the way that romantic literature can. Realism tells it like it is.

Let's look society as a whole. In the late 1800s, people were interested in the scientific method as well as rational philosophy, which says that people can discover the truth by using reason and factual analysis. So reason and facts, ok. And at the same time that realism was becoming popular, there were a lot of political and socioeconomic changes happening in the country. There was increased literacy, plus the growth of industrialism and urbanization, growth in population from immigration, and a rise in middle class affluence.

All these factors combined with the importance of reason and facts, meant readers were interested in really having a good understanding of all these changes, the changes going on in society. A scourer named Amy Chaplin says, and I'm just paraphrasing here, that Realism is a way to understand and deal with social change, which makes a lot of sense I think.

So then, let's take a closer look at the trips of the trend, and how realist writers did their work. For one thing as we said, they focus on, express reality, and in great detail.They inferred verisimilitude. Shall I write down on board?

Students: Um-hum.

Professor: Ok. Verisimilitude means basically the same true or real, like say, a photograph rather than a painting in a way. In fact, that's a good analogy. You see writers try to capture a moment in time and all its basic facts but without exaggeration, just like a camera does.

Anyway, the events, the things that happen in realistic literature are usually pretty much plausible. I mean, you figure that they can probably happen to anyone. And the characters are believable, too. And actually, they are usually even more important than the plot. There're also……they talked the way the real people talk, authentic speaking styles from different regions, different parts of the country were captured in the text. Does that make sense? Ok.

So, besides verisimilitude, another important characteristic of realism is the narrator's objectivity. Characters in the events were described without the narrator passing much judgment on them or anything or being too dramatic. Basically, you are reading a story without too much extra comment from the narrator.

Ok, now we have an idea of what realism was. So, who were the players? Well, two important realist novelists were Rebecca Harding Davis and Mark Twain. We'll talk more about other realists tomorrow. But for today, let's just start by looking briefly at these two.

Rebecca Harding Davis was an author and journalist who, like other realists, was concerned about all those social changes going on. She wrote mainly about some marginalized groups of the time, like women, native Americans, ah, immigrants. Now her best known book is a novella called The Life in the Iron Mills. It's really a key text, because it's one of the original realist works. Her works overall have been pretty much ignored for a long time. But some critics and scourers are starting to revisit them and study them more seriously. Probably more from the historical aspects of the works and……but I think that's great.

But if we are talking about great literature, literature that's read and enjoyed today as something more than just a way of looking at that era, the era when that was written. Well, a favorite of mine is Mark Twain. I'm sure you have read or heard of his most famous book, The Adventures of Huckleberry Finn. And Twain's style, he goes back to what I said earlier, verisimilitude, the realistic way characters act and talk. You should realize too that this was quite a contrast to earlier writers in the U.S., who try to emulate the British writers, try to be very elegant, at the expense of Realism. You know, a lot of critics will tell you that American literature began with that book, The Adventures of Huckleberry Finn.

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TPO 50-Lecture 4 (Petroleum)

Listen to part of a lecture in a geology class.

Professor: Hi, class, let's get started. Um, last time we finished up the section of coal, so we have just two fossil fuels left to talk about. Those are petroleum and natural gas. Today I will concentrate on petroleum and we will get into natural gas tomorrow. Like coal and natural gas, petroleum has been formed over millions of years, from remains of prehistoric plants and animals.

And like coal and natural gas, it's found in the rocks of Earth's crusts. In fact, the word "petroleum" literally means "rock oil". And in its' original state, the way we find it in Earth's crust, it is called crude oil, sometime people will short it up, and just refer to it as crude.

Um, petroleum also contains natural gas, so usually the petroleum industry is naturally searching for and utilizing deposits of both crude oil and natural gas at the same time. In other words, companies might as well gather, use and sell both the oil and the gas when they find it, since both are valuable. And……

Student: But what kind of organic materials, I mean, specifically what kind of dead plant and animals make up petroleum exactly? Do you mean like trees and dinosaurs?

Professor: Well, apparently petroleum is usually made from simple, one-celled marine animals and plants, algae, for example. Um, what happens is this accumulated plant and animal material that originally came from the ocean gets covered by sediment. And then is…um, eventually exposed to earth internal heat and pressure, for millions of years. And over those millions of years, the heat cooks and the pressure molds that material, turning it into a thick, sticky liquid. And since petroleum is made from these ocean organisms, you can guess where it was found, it makes sense that we usually find it under the ocean or near shore, right? Yes, Ann?

Ann: I've heard people talk of……ah……live and dead oils?

Professor: Well, um, when crude oil has a lot of natural gas mixed up with it, it's called live oil. But if the gas escapes from the mixture, then oil is said to be dead. And it's heavy and more difficult to pump. Does anyone know how the gas separates from the oil? Sam, go ahead.

Sam: Doesn't it happen when the oil shoots up to the surface?

Professor: Yes, that's right. When oil reaches the surface of the Earth, there is less pressure on it. And with less pressure, the oil and gas were able to separate. The other way the crude oil was able to come up to the surface is by people pumping it up out of the ground. And, um, it's the same thing that happens at the surface, there is less pressure, and, so the oil and gas separate. But when we talked about how would actually exists inside earth's crust, most people think that there are huge, pools of oil sitting around in caverns somewhere under there. That's really rare. The majority of petroleum is just filling in the tiny pores and cracks in rocks.

Now, um, a little more on the petroleum industry. As far as the extraction process the petroleum industry digs deep wells to reach underground oil fields where crude oil has accumulated over a large area and extract between layers of rocks. Then it pumps the crude oil out. Then its refineries have two main tasks, convert less valuable crude oil into a more valuable form and create usable products from refined oil. Basically, the refiner will do this by boiling the oil. When the oil cools off, the stuff that is left is turned into a variety of products, like gasoline, diesel fuel for cars and trucks, asphalt for roads, um, paints, plastics, even soaps. And check what you're wearing, if you are wearing something with synthetic fibers, what that really means is that it is made of the petroleum. So you can see petroleum is essential to today's industrial society.

Now, next week we will be joined the graduate students from the department of petroleum engineering to examine the comprehensive field study they're working on in our local oil fields. And I'd like you to read over the pack of information I'm about to hand out to you before we go. It should familiarize you with the history of the oil field we will be touring as well as the details of their project.

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TPO 51

TPO 51-Conversion 1 (Biology Experiment Reproduction)

Listen to part of a conversation between a student and her biology professor.

Professor : So, the assignment is to reproduce one of the animal camouflage experiments we read about in our textbook. Which experiment did you pick?

Student:Well, I was wondering if I can try to reproduce an experiment that's……kind of the opposite of what was discussed in the textbook?

Professor:So instead of how and why an animal might hide itself, you want to do something about why an animal might want to be seen? Em? Tell me more.

Student:Well, I got the idea from one of the journals you said we should look at. It's an experiment about ah……they called them eyes bugs in the article?

Professor:Eyes bugs, sure. The patterns on the wings of moths and butterflies that are generally believed to scare off predators because they look like big eyes?

Student:Yeah. Except the article was about the experiment that disputes that theory.

Professor:Well, we know that the markings do scare the birds but the idea that the spots looked like eyes is……well, that is just a commonly held belief.

Student:So, that's not even based on research?

Professor:Well, this whole idea of moths and butterfly markings being scary because they looked like eyes, rest on how we imagine the predators, like birds, perceive the markings. And we can never really know that. All we can do is observe bird behavior. But tell me more about the experiment.

Student: Ok. It said the experiment looked at the shapes of the markings on moths' wings. The researchers wanted to know if the markings that were round and eye-shaped were more effective in deterring predators than square and rectangular markings.

Professor: OK.

Student:Yeah. So they attached food to paper models of moths with different shaped marks drawn on the wings to see how birds reacted. And what's interesting is they realized the round marks were not more effective in scaring bird than other shapes.

Professor:Were they less effective?

Student:No, they were about the same. But what researchers did determine is that larger markings were more effective than smaller markings in scaring off prey. They call this phenomenon "visual aliveness".

Professor:Visual aliveness. Um. Well, I guess that it is not all that shocking if you think about it.

Student:So anyway, is it ok? Can I repeat this experiment and write about it?

Professor:Yes, I think that'll work. The problem I proceed is……well……where? This is an urban campus, you'll have a hard time finding a good place to set up the experiment.

Student:Oh, I wasn't planning on doing it on campus. I'm going home for spring break and my family lives in the country, far from the near city. I can set it up in the backyard.

Professor:Good idea. Except one week is not a lot of time, so you will need to make some adjustments to have enough data. I'd set up the experiment near bird feeder and get in as much observation time as you can.

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TPO 51-Lecture 1 (Maize and Teosinte)

Listen to part of a lecture in a botany class.

Professor:So, continuing with crop domestication and corn, or, um, maize as is often called, obviously it's one of the world's most important crops today. It's such a big part of the diet in so many countries and it's got so many different uses that it's hard to imagine a world without it. But because it doesn't grow naturally, without human cultivation, and because there's no obvious wild relative of maize, um, well, for the longest time researchers weren't able to find any clear link between maize and other living plants. And that's made it hard for them to trace the history of maize.

Now, scientific theories about the origins of maize first started coming out in the 1930s, one involved a plant called teosinte.Teosinte is a tall grass that grows wild in certain parts of Mexico and Guatemala. When researchers first started looking at wild teosinte plants, they thought there was a chance that the two plants, um, maize and teosinte, were related. The young wild teosinte plant looks a lot like the corn plant. And the plants continue to resemble each other, at least superficially, even when they're developed.

But when the scientists examined the fruits of the two plants, it was a different story. When you look at right corn, you see roll upon roll of juicy kernels, um, all those tiny little yellow squares that people eat. Fully-grown teosinte, on the other hand, has a skinny stock that holds only a dozen or so kernels behind a hard, um, almost a stone-like casing. In fact, based on the appearance of its fruit, teosinte was initially considered to be a closer relative to rice than to maize.

But there was one geneticist, named George Beadle, who didn't give up so easily on the idea that teosinte might be, well, the parent of corn. While still a student in the 1930s, Beadle actually found that the two plants have very similar chromosomes, very similar genetic information. In fact, he was even able to make fertile hybrids between the two plants. In hybridization you remember, the genes of two species of plants are mixed to produce a new third plant, a hybrid. And if this offspring, this hybrid, is fertile, then that suggests that the two species are closely related genetically. This new hybrid plant looked like an intermediate, right between maize and teosinte. So Beadle concluded that maize must have been developed over many years, ah, that is a domesticated form of teosinte.

Many experts in the scientific community, however, remained unconvinced by his conclusions. They believed that with so many apparent differences between the two plants, it would have been unlikely that ancient, the pre-historic peoples could have domesticated maize from teosinte. I mean, when you think about it, these people lived in small groups, and they had to be on the move constantly as the seasons changed. So for them to selectively breed, to have the patience to be able to pick out just the right plants and gradually over generations, separate out the durable nutritious maize plant from the Beadle teosinte that easily broke apart, it's a pretty impressive feat.

And you can easily see why so many experts would have been skeptical. But as it turns out, Beadle found even more evidence for his theory when he continued his experiments, producing new hybrids, to investigate the genetic relationship between teosinte and maize. Through these successful experiments, he calculated that only about 5 specific genes were responsible for the main differences between teosinte and maize. The plants were otherwise surprisingly similar, genetically.

And more recently, botanists have used modern DNA testing to scan plant samples collected from throughout the western hemisphere. This has allowed them to pinpoint where the domestication of maize most likely took place. And their research took them to a particular river valley in southern Mexico. They've also been able to estimate that the domestication of maize most likely occurred about 9000 years ago. And subsequent archaeological digs have confirmed this estimate. In one site, archaeologists uncovered a set of tools that were nearly 9000 years old. And these tools were covered with a dusty residue, a residue of maize as it turns out. Thus making them the oldest physical evidence of maize that we found so far.

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TPO 51-Lecture 2 (The Transmission of A Number System)

Listen to part of a lecture in a world history class.

Professor:So one of the more common topics that comes up in world history because it's had a pretty dramatic effect on how different societies evolved over long periods of time is cultural diffusion. Now, cultural diffusion is generally defined as the transmission of culture from one society to another. And by culture, we mean anything from artistic styles to……um……you know, technology, science. So we use culture very broadly. A common means of this process taking place is trade, travelling merchants or trading hubs, places where people from various areas all come together and ideas get exchanged.

Let's start with the example of the transmission of a number system, a system that used the number Zero, from South Asia into Western Europe.

Ok, so before this cultural diffusion happened, the dominant number system in Western Europe was the Roman Numeral System. The Roman Numeral System developed primarily as a means of record-keeping, as a way to keep track of commercial transactions, um, taxes, censors' records, things of that sort. As a consequence, this system started with the number One.

Student:With One? Not with Zero?

Professor:Right. See in Roman Numerals, Zero isn't really a value in and out itself. It wasn't used independently as a number on its own. If your primary concerns just basic types of record-keeping……

Student:Oh, yeah. I guess you wouldn't need a Zero to count livestock.

Professor:Or to keep track of green production or do a census. And it wasn't an impediment as far as sort of basic engineering was concerned either, um, to their ability to construct buildings, roads, stuff like that.

But other number systems developed in Asia, systems that do incorporate Zero. The mathematics these societies developed included things like negative numbers. So you start to get more sophisticated levels of mathematics.

So one of the earliest written text sub mathematics, that has Zero, negative numbers, even some sort of basic algebra, is written in South Asia in the early 7th century. This text makes its way into the Middle East, to Baghdad. And it's eventually translated into Arabic by a Persian astronomer and mathematician. Once he began his translation, he quickly realizes the advantage of this system, the types of math that can be done. Soon, the text begins to be more widely circulated through the Middle East. And other mathematicians start to advocate using this number system.

So by the 10th century, it's the dominant system in the Middle East. And as a consequence, algebra and other more sophisticated forms of mathematics start to flourish. Meanwhile, in Western Europe, the Roman Numeral System, a system without Zero, was still in place.

In the late 12th century, an Italian Mathematician named Fibonacci was travelling in North Africa along with his father, a merchant. And while he's there, Fibonacci discovers this Arabic text. He translates the text into Latin, and returns to Europe. And he promotes the adoption of this number system because of the advantages in recording commercial transactions, calculating interests, things of that nature. Within the next century and the half, that becomes the accepted dominant number system in Western Europe.

Any questions? Robert?

Robert:Um, this Fibonacci, is he the same guy who invented that……um…….that series of numbers?

Professor:Ah……yes. The famous Fibonacci sequence. Although he didn't actually invent it, it was just an example that had been used in your original text. I mean, can you imagine? Introducing the concept of Zero to Western Europe? And this is what you go down in history for?

Carol?

Carol:So, do we see like an actual change in everyday life in Europe after the Zero comes in? Or they really just……

Professor:Well, well, the change takes place is in the development of sciences.

Carol:Oh.

Professor:Even in basic engineering. It isn't a radical change. Um, but as you start to get into, again, the theoretical sciences, ah, higher forms of mathematics, calculus, Zero had a much bigger influence in their development.Ok, now note that as cultural diffusion goes, this was a relatively slow instance. Some things tend to spread much quicker, um, for example, artistic, or architectural styles, such as domes used in architecture. We see evidence of that being diffused relatively quickly from Rome to the Middle East to South Asia…

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TPO 51-Conversion 2 (Trip to the New York City)

Listen to a conversation between a student and the director of the Student Activity Center.

Director:Hello, Jack. Is everything set for the trip this Saturday?

Student:Everything's ready. Ah, fifteen people have signed up. Our train gets into New York City at noon which leaves plenty of time to get downtown to the art gallery for the reception.

Director:It's great. You could organize this. What an honor having a painting by one of our students in that exhibit!

Student:Yeah. My roommate's so modest. If we weren't such good friends, I'd never realize that his work was being exhibited. So, since I was going anyway for the opening and all, I figure that might as well make a student event out of it. Working here at the Student Activity Centers made me realize how popular our activities are. I figure they'll be interested in it.

Director:Well you've done a super job organizing everything. This poster was great. And they were up in no time.

Student:Thanks. And I'm glad you could approve the funding for us.

Director:My pleasure. By the way, how are you getting to the gallery from the train's station?

Student:Well, there are buses that run downtown.

Director:Right. You grew up in New York City, didn't you?

Student:Yeah. But, the bus, well, that's kind of what I want to talk to you about.

Director:Yes.

Student:I realized that at the last minute, but, well, the weather for Saturday is supposed to be really nice, sunny, warm. It'll be a great opportunity to walk the High Line.

Director:The……what?

Student:Haven't you?......Oh, I guess not everyone has heard of it. It's this amazing……it's like this park in the sky.

Director:A park in the sky?

Student:Yeah. Well, see there was this old train line. You know one of those elevated lines, the kind that run high above the streets?

Director:OK.

Student:Well, this one was used for freight, not passengers.

Director:Aha.

Student:But when it got cheaper to move freight by trucks, they stop using it. It was abandoned for a long time. And then, a few years back, the city agreed to turn the tracks and the surrounding area into a park. It's not very wide but it's over a mile long. And it goes from the train station all the way downtown near the gallery.I've walked before, it's really cool.There was grass and flowers everywhere, and since you're high up, you get these great views of the city.

Director:Sounds wonderful. But have you considered not everybody might be interested in walking that far? They might prefer the bus.

Student:Couldn't we just split up?You know how some of us walk and the others take the bus?

Director:But remember, Jack, the poster advertises you as the tour leader, not everybody sees the adventure about getting around the city.You need to find someone to accompany people on the bus, then you take the walkers.

Student:Yeah. But who? Um, the trip's in two days.

Director:Well, I did my graduate work in New York, of course it was a while ago, but I still know how to get around the city.

Student:Yeah……

Director:And I'd love to see that exhibit.

Student:You'd go? Ah, that'll be great!

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TPO 51-Lecture 3 (Audubon the Famous Illustrator)

Listen to part of a lecture in an art history class. The professor has been discussing illustrated books.

Professor:I want to take a look one particular book to give you an idea about what was involved in publishing illustrated books in the 1800s.The book's called The Birds of the America and the illustrator was John James Audubon.

So,The Birds of the America, four volumes which contained illustrations of nearly every bird in the United States, over 400 birds, all hand-colored, all painted life-sized, the largest birds painted on the largest printing paper available at that time.This required a lot of dedication. And Audubon is best remembered as an incredibly meticulous accurate artist, a very accomplished illustrator of the natural world.

And while there were other artists working on the similar project at the same time, Audubon's book remains the most well-known and successful of its kind. But, let's talk a bit about Audubon himself first.

First of all, Audubon was not a traditional painter.And by this I mean that he didn't work in oils. He preferred to use water color and pastel crayons.And he worked on paper instead of on canvas.The thing is, Audubon considered the illustrations in his book, not the original water colors, to be his finished product.His water colors were merely preparatory studies, most of which were painted while he was observing birds in the wild.These water colors were then sent to his printer who created the final prints for the book. And Audubon was so concerned with accuracy that he often scribbled notes to the printer around the edges of these original water colors.

In fact, you might question whether producing a work of art was even Audubon's goal. Now, when I look at Audubon's illustrations, I see a work of art. But, it may make more sense to consider Audubon, first and foremost, as a naturalist, as a scientist. See, the early 19th century when Audubon was painting was a time of major scientific inquiry. And an essential way of spreading scientific knowledge was through those illustrated books.

Student:So what did Audubon consider himself? An artist or a scientist?

Professor:I'm not sure the distinction between the two was all that clear in the 1800s. I think we can accurately state that the driving force in his art was getting the science right. And this was perhaps a point that critics of his art work at that time just didn't appreciate.

Audubon also study birds in ways that didn't directly inform his art. Ah, you know what bird banding is right? A bird has a band attached to its foot so we can learn about things like migration patterns. Well, the first recorded instance of anyone doing that, it was Audubon. Another example, a common belief of that time was that vultures used their sense of smell to find food. Audubon didn't believe that. So, he tested it. He put a large painting of a dead sheep in a field, and sure enough, vultures found it and started pecking at it.

Now, Audubon's work was very accurate, and we know this because we can compare his illustrations to the birds around us. But sometimes it's not possible to check. There are actually several birds in his book that no one's ever seen. These are sometimes called Audubon's mystery birds, because even though he drew them, there is no evidence that they exist in the wild.

For someone who's respected as a naturalist, isn't it strange to think that he drew some birds that don't appear to be real? For example, there is an illustration that appears to be a type of warbler, a small bird. It has a white ring around its eyes and white bars on its wings. No one's ever seen a warbler like this, so some people wonder if Audubon maybe forgot certain details about this bird when he painted it, or that he copied another artist's work. But considering that Audubon was such a meticulous artist, well, that might be a better answer.

Hybridization is something that's well-known in birds. And it definitely explains the rather unique-looking duck Audubon painted. He himself suggested that maybe it wasn't an unknown species but a hybrid, born from two different species. Since then, this particular crossing species has actually been recorded, both in the wild and in captivity. So it turns out that Audubon was right. And this duck actually was a hybrid.

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TPO 51-Lecture 4 (Heliocentric Theory)

Listen to part of a discussion in a history of science class. The class is discussing the heliocentric theory.

Male Student:What I found really difficult to understand is why the heliocentric theory, um, why wasn't like believed by everybody right away?

Professor:Well, one thing that's hard to do is to sort of see things from the perspective of someone who's hearing that theory for the first time. I mean today we tend to assume that the moment the heliocentric theory was laid out, the idea that the Sun, not the Earth, was the center of the solar system, that you know, you'd have to be in denial, not to accept it. But it really wasn't that easy.

Male Student:But the idea that the earth wasn't the center of the universe……that has been tossed around for like centuries, right? I mean, lots of people would have the idea.

Professor:Yes, that's true, going all the way back to the Ancient Greeks. But in Europe, when Galileo championed it in the 17th century, during part of his discoveries using a telescope, there still was some major resistance to it.

Male Student:But I still don't understand why, I mean, isn't it obvious?

Professor:Well, despite Galileo's ingenious arguments in support of the heliocentric theory, there was still a lot of reasons why people of that period couldn't buy into it. Remember, we are talking about four hundred years ago, so ah, let's think about a few of those reasons, Ok?

So, first of all, they could work out that if the Earth was going around the Sun, then it had to be traveling at many thousands of kilometers per hour. And that was just beyond anything anyone could understand. You know, they could understand riding a horse or walking, maybe they could get up to 30, 32 kilometers per hour. But tens of thousands of kilometers per hour? That was just crazy. So, to many people, whatever is going on, it couldn't be that.

Female Student:Um… So people didn't believe the heliocentric theory because it was so hard to believe?

Professor:Exactly. But, there were more scientific kinds of reactions as well. Because, look, if you have ever been on a carousel or you are on a ride at an amusement park and you are on something that is going round round and round, two things, alright?One, you know you are moving, there is no doubt.And the other thing is, you know that unless you hold on tight, you are gonna go flying out because of centrifugal force, right?

Female Student:So, if I understand you for the average person 400 hundred years ago there was no evidence that we are moving at higher speed, right?Since everything was securely on the ground and no one was flying off into space?

Professor:Yes. And in particular. And this was one specific difficulty for people in the period, even if they thought that there was some sort of force that maybe kept you and me and buildings and things on the surface of the Earth. Their theory about the nature of the atmosphere was that nothing was holding it down. So if, if you can understand that way of thinking, then clearly, if the Earth, was moving at a great speed, we should've lost all our atmosphere a long time ago. You know, it would be like, trailing away behind us. And so, I want to try a little sort of experiment, because, I, I think that what we will find is that some of us have ideas about motion that actually fit with anti-heliocentrism.

Male Student:Anti-heliocentrism? No way. It's the 21st century.

Professor:Well, then let's see. So, picture the following. You are at the equator, moving at 1600 kilometers per hour. Ok? And you drop something, small and light, like a matchstick for example. Where is it going to land?

Male Student:That's easy. It will be long gone. The matchstick is so light that it will fly right out of my hand and end up away behind me somewhere.

Professor:Ah, actually, that matchstick you dropped, it'll land right at your feet.

Male Student:What?

Professor:Well, let's think about it. If I got to consider that the Earth's rotating at 1600 kilometer per hour at the equator, and you, me, the air, and that matchstick will all moving together at the same speed, even though it doesn't seem or look or feel like we are moving. So class, clearly, even today, we actually have some inclination to think that if the Earth were moving around at a great speed, we all would see signs of it. Perhaps now you are less inclined to dismiss those who once found heliocentrism so hard to believe. Ok, let's move on.

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TPO 52

TPO 52-Conversion 1 (Explication of Pablo Neruda's Poem)

Listen to a conversation between a student and his creative writing professor.

Professor: John, listen. I can clearly see that you put a lot of time into your response paper.

John: I did! It took me forever. I rewrote it a dozen times.

Professor: And your hard work shows. Unfortunately, it's a week late.

John: I know. Sorry. I just got a little behind, you know, sports and homework. But I'm on top of things now.

Professor: Glad to hear it! Now, as for our meeting today, I'd like to talk to all of my creative writing students one on one at least once during the term and see how they're doing.

John: I think I'm doing OK. Busy, you know, but other than that…

Professor: Well, I found through the years that some of my assignments can be pretty tough for first year students like yourself, like the response paper you just did, the explication of a Pablo Neruda poem. Emm…by the way, why did you choose "The Lemon"? It's an unusual choice.

John: It was my favorite in the book of Neruda's poems. All the poems are about everyday objects and, you know, simple pleasures.

Professor: Right, Elemental Odes, one of my favorites.

John: I like how Neruda took things like fruit and vegetables and socks, and use metaphors and similes to describe them as these wonderful mysterious things, like in"The Lemon". He describes a lemon falling to Earth from the stars, and he compares a slice of lemon to a stained glass window. It's so original!

Professor: Beautiful images, aren't they? Neruda didn't win the Nobel Prize for literature by accident.

John: No, he didn't.

Professor: Now, as you know, the paper was only the first half of the assignment, and I'm concerned about your ability to complete the second part on time, considering how much time the first part took you.

John: Actually, I finished it just before I came here.

Professor: Excellent!

John: It was tricky, too. You know, having to write a poem inspired by "The Lemon", but in a completely different style.

Professor: Right!

John: In order to do that, I really had to study Neruda's style and read a lot of his stuff, which was great, but "The Lemon" is free verse. So to do the assignment, I decided to use a strict meter - iambic pentameter, to be as different as possible.

Professor: So each line of your poem has ten syllables and every other syllable is stressed. Interesting choice! Iambic pentameter is certainly different from free verse.

John: It was hard for me though, because usually when I write a poem, I choose my own topic, and I just write. I don't worry about counting syllables or anything. So, I'm kind of hoping we won't have more assignments like this?

Professor: Sorry to disappoint you, but these assignments are designed to get you out of your comfort zone, to get you reading and writing a wide variety of poetic styles.

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TPO 52-Lecture 1 (Still-life Painting)

Listen to part of a lecture in an art class.

Professor:This week you are going to be studying something new, a painting in still-life. First I want to give you a little background that might be helpful when you start working. We spend a lot of time on portrays in this class and moving from painting people to painting objects, might feel like a big shift. But I think it’s important for you to understand that you could pack just as much life and vibrancy and excitement into a painting of a bowl of fruit as you can into something more dynamic.

And, you know, still-lives don’t just need to be straightforward representations. A lot of still-life painters really use the simplicity of the style to send a message or tell a story, even portrays sometimes include elements of still-life paintings. For example, in a portray, there might be a map, hanging on the wall. Or there might be some books on the table next to the subject. These objects tell you something about the subject like maybe that person was well-educated.

A big part of still-life painting is the use of those kinds of symbols. The objects you include can provide more contacts than help convey your message. I’d also like to show everyone an example of still-life that we can talk about a little and use to get some inspiration.

This is by James Peale, one of the true masters of the art of still-life.This piece is called Still-life, bowls, some apples and vegetables. And it’s a really, really great example of what I’m going to be looking forward in your painting.

Now, Peale did his work in the early 19th century. And painters of that period approached still-life painting from a scientific perspective. Let’s look at this painting to help you understand what I mean. See the red tomatoes in the foreground and how vibrate that color is? And if you look at the large heads of cabbage farther back, every detail, every crinkle in each leaf, all the fruits, are so precise. They are almost like a sketch you’d see in a field guide. Peale and other painters of this era used still-life painting as a way of exploring the natural world and satisfying their curiosity about nature.

So now we can take some time to discuss a little more of… more about the… the actual process of still-life painting. Now, before you paint a single stroke, you’ve got to plan the composition of your painting. You know, the arrangement of the objects to make sure everything is set up the way you wanted. I remember a still-life piece I painted when I was in university. It was vegetables I think and I had created scratches of the setting. But then I realized the arrangement of the vegetables in a basket just, just didn’t look right. So I had to start over. So I can say from experiment it’s really important to make sure your arrangement is just right before you even start painting.

Now, what are some ways to make sure the composition of your painting is the way you want it to be? Well, it’s important in the still-life to make sure you’re not overdoing the amount of positive space, the amount of stuff in your piece. The still-life really is not just about the subject matter. If you make a really cluttered composition with too much going on, it can throw off your painting. That’s something you notice in the James Peale painting. Notice how it really… you know it makes great use of negative space, you can see how he sort of embraces those little empty spots on the table. And that adds a really nice sense of balance.

Also, try to make your still-life look natural. If it looks contrived and if it’s obvious a person deliberately arranged everything, it takes away from the simplicity and the natural feel of the work. Basically the best still-life paintings are the ones where the objects don’t look arranged for the painting at all, but that those tomatoes are near that cabbage on a table by accident.

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TPO 52-Lecture 2 (Interactions within an Ecosystem)

Listen to part of a lecture in an environmental science class.

Professor:Today we are going to begin discussing ecosystems. One important point I want to emphasize in the reading is that there are many interactions that take place within an ecosystem, interactions between animals, interactions between living and non-living things and so on. Now these interactions can be fairly simple and straightforward.

Ah, there are certain species of ants and rodents sharing a desert ecosystem in Arizona. And they compete for the same plants to eat. And the competition influence is not only the size of the ant and rodent populations, but also the number of eventual plants. Now, this interaction is easy to see, right? However, there are many other interactions within ecosystems that are not so apparent and require closer examination. And the example from your reading was the forest ecosystem along the Pacific coast of North America. Um, specifically the role of salmon.

Ok, as you probably know, salmon are born in fresh water streams, they might ran to oceans where they spent most of their lives. And then they return to the same streams where they were born to reproduce, or spawn. In order to spawn, salmon need cold, clear streams to ensure the survival of their eggs. And trees in the surrounding forest play an important role here. Their leaves provide shade from the Sun. When logging removes the trees, the streams are open to the Sun and the water becomes warmer. When the water warms up, the concentration of dissolved oxygen in the water decreases. And this reduces the chance that the salmon eggs will survive.

And the trees also help keep the soil on the banks of the stream in place. Salmon cannot spawn in streambeds clogged with sediment, dirt, from the surrounding area. They need a clean, graveled streambed.

Bred?

Bred:I read that salmon also help keep stream healthy.

Professor:Right. Salmon contribute important nutrients like carbon and phosphorus. And these nutrients promote diversity in the stream environment. Ok, um, so salmon need trees to successfully reproduce, but surprisingly trees also need salmon. And bears play an important intermediary role. So in the autumn, bears are busy putting on extra-weight as they prepare to hibernate. Each bear catches an estimated 700 fish during the 45 days that the salmon are spawning.

The bears catch the salmon in the streams and then they carry them back into the forest to eat. Sometimes as much as 800 meters from the streams. And since the bears only eat about half of each fish they catch, other animals like eagles, crows and insects feed on the leftovers.

Maria?

Maria:Why did the bears bring the salmon so far into the forest? Why not just eat the fish near the streams?

Professor:Well, imagine several hungry bears looking for salmon. When one bear catches a fish, it’s not uncommon for another bear to try stealing it. These confrontations can be pretty intense. So it’s safer to bring it back into the forest, to a place where the bear can eat undisturbed.

Bred:Um, you said that the bears only eat half of each fish they catch? I mean if I were a bear preparing to hibernate, I probably eat everything I can catch.

Professor:Well, certain parts of a salmon are more nourishing, fattier than others. It’s actually more efficient for a bear to only eat some parts of the fish and then try catching another one, instead of eating the whole fish.

Ok. So after the scavengers have eaten the leftovers, only the fish’s skeleton remains. Now, salmon contain nitrogen. So their decomposing bodies as skeletons provide a lot of nitrogen to the surrounding forest. Plants absorb this nitrogen which they need to grow. So the transfer of this nitrogen to the forest is important. Forest near streams with salmon actually reach maturity faster than other forests.

Ok, so, why’s all these important? Well, salmon are in trouble. Some of their populations have gone extinct. And most of the remaining populations have been significantly reduced by overfishing and environmental challenges. Now, conservationists can try to prevent overfishing but, well, I mean you can see the interconnections within this ecosystem. We’ve already talked about the importance of trees to salmon and the negative effect that something like logging can have. So you can see that protecting this ecosystem is going to take a broad effort.

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TPO 52-Lecture 3 (Snowflakes and Ozone)

Listen to part of a lecture in a chemistry class.

Professor: Ok, so, today we're going to talk about the Arctic, ozone depletion and snowflakes. And it's all related. Let's start with snowflakes.

Now, I find snowflakes fascinating. To even begin to understand them, you need to understand physics, chemistry, and mathematics.Even though there's been a lot of research, there're still actually a lot about snowflakes that we don't understand yet. Hard to believe, I know.

Anyway, snowflakes have a particular form, there's a six-sided center with six branches or arms that radiate out from it. But how did they get that way? Well, you start with water vapor. You need a pretty humid atmosphere. And that water vapor condenses directly into ice, into an ice crystal. At this point it looks kind of like a thin dinner plate that rather than being circular, is hexagonal with six flat edges.

It's at this point in the process were we begin to see why each snowflake is unique. Imagine this dinner plate is floating around in the wind, right? And when it encounters water vapor, molecules from that vapor attached to each of the six sides. You begin this development with six arms or branches radiating out from the center plate. Each time the snowflake encounters water vapor, more molecules attached to it, leading to more and more complex structures. And of course, each snowflake takes unique route through the clouds on its way down. And so the quantity of water vapor that it goes through is going to be unique for each one.

Now one important characteristic of snowflakes is that they have something called a quasi-liquid layer, the QLL. Our snowflake is an ice crystal, right? Well, we find a quasi-liquid layer on the surface of ice is basically a thin layer of water that's not completely frozen. And the existed temperature is well below freezing, though thickness varies at different temperatures. Now this quasi-liquid layer, it plays an important role on what we are going to talk about next.

Ah, yes, Mary?

Mary:How can liquid exist below freezing? Why doesn't it freeze?

Professor:Well, when water becomes ice, the molecules bond together and it gets sort of…locked in the place. They can't move around as much anymore. So each molecule is surrounded by other molecules, and they are all locked together. But what about the exterior of the ice? There is a layer of water molecules on the surface, they attached molecules only on one side. So, they are a bit freer. They can move around a bit more. Think of a… think of a brick wall. The bricks in the wall, they have other bricks above and below them, and they are all locked against each other. But that top layer, it only has a layer below it. Now this can only be taken so far because of course bricks don't move at all. They are not liquid. But the bricks of water molecules, well, this top layer would be the quasi-liquid layer. And it wouldn't be completely frozen. Does that make sense?

So, finally we get to the connection between snowflakes and ozone. Ozone is a gas found in the atmosphere of Earth. Now there is the ozone found in the stratosphere which is the layer of the atmosphere from 6 to 30 miles above the Earth. This is considered good ozone, which occurs naturally and helps block harmful radiation from the Sun.

But there is also ground-level ozone. It's exactly the same gas but it's found closer to the surface of the Earth. This ground-level ozone results from human activities, at high concentrations it can be a pollutant. Now snowflake's quasi-liquid layer plays an important role in some complex chemical reactions. We're going to be looking at these in detail later today. But basically, these reactions cause certain chemicals to be released. And these chemicals reduce the amount of ground-level ozone. So the more branches you have in an ice crystal, the more quasi-liquid layer there is. The more quasi-liquid layer, the more reactions and the more chemicals that reduce ground-level ozone. So you can see why this is such an important system to study and understand.

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TPO 52-Lecture 4 (Maya Civilization)

Listen to part of a lecture in an archeology class. The professor has been discussing ancient Mayan civilization.

Professor: Now, as you remember from your reading, the Maya were an ancient civilization which occupied in area corresponding to parts of modern-day Mexico and Central America. Early Mayan settlements date back over 3,000 years and say from about 600 to 900 C.E. The civilization was in what's considered a golden age of cultural achievement, what we call the Classic period.

The period after this, after the Classic Period, is called the Postclassic period. Now it's long been thought that during the PostClassic period, Mayan civilization was in decline. But we're continuing to find new evidence that in certain areas Mayan civilization flourished right up to the end of the Postclassic period, what we refer to as the late Postclassic period. The late Postclassic corresponds to the period from the 1200s to 1500s, right until the arrival of the Spanish in the mid-1500s. A good example of a site which continued to flourish through the late Postclassic is the inland Mayan community of Lamanai, located in what is today the country of Belize in Central America. Now, Lamanai is one of the largest and most prominent archeological sites in Belize. It was occupied for over 3000 years. That makes it the longest continually-occupied site by the ancient Maya. Large-scale excavation at Lamanai began back in 1974 under the leadership of a Canadian archeologist. The first excavation there was on a building that dated back to the late Postclassic period. When the excavation began, we didn't know much about Mayan life during that time. As I said, most people considered the Postclassic period as a time of decline that came after the so-called golden era. But during the first few years of excavation, the archeological team realized that Lamanai had continued to be an important center of classic Mayan culture, almost right up until the 1500s.

Student: So basically, what you are saying is while other Mayan cities were collapsing or had already collapsed, Lamanai was one of those places that was flourishing?

Professor: Uh huh…exactly! In fact, the evidence shows that one of the greatest periods of construction in the city occurred during the Postclassic.That's definitely not what was happening at neighboring sites during that time. And consider this, archeologists found ceramic artifacts from Lamanai's late Postclassic period at a recently-discovered site on an island off the coast of Belize. And in Lamanai they found objects that had been imported from parts of the region which correspond to modern-day Mexico during the late Postclassic. What did those finds tell us?

Female student: eh…the trade was still going on? So you probably still find the same Mayan social structure and economic practices, right?

Professor: Yes. Now, these researchers and subsequent research teams have been helping us see a bigger picture. We now know that there was still a widespread trading network up and down a long portion of the coast of what is modern-day Mexico and Central America for more than two centuries after the golden era ended. Those finds are telling.

Female student: How big is Lamanai overall?

Professor: Well, in all, 700 stone structures have been documented. It takes several life times and lots of funding to uncover all of them. Ok, if that's not a helpful mental picture…all right here's another detail that might help. There was once a population between 35 and 55 thousand there. The southernmost end of Lamanai had become the city center by the Postclassic period. It was there at the southern end that people continued to develop technological capabilities, especially in ceramics and eventually in metal work. The center of Lamanai society had previously been in the northern part of the city. We're not yet sure why the focus of life shifted southward only that it did.

Female student: Was the former center, the one in the north smaller than the new one in the south? Like maybe the population grew so they needed more room and moved?

Professor: Actually, the new city center was smaller. It's possible that's because the population had decreased by that point so they actually needed less room. In any case, the restructured community thrived.

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TPO 53

TPO 53-Conversion 1 (Questions about a Drama Class)

Listen to a conversation between a student and his drama professor.

Professor: Hi Robert. So how's your paper going?

Robert: Pretty well. It's a lot of work, but I'm getting into it, so I don't mind. I'll probably have some questions for you in the next week or so.

Professor: Okay. Glad to hear you're progressing so well.

Robert: Um… There was something you said at the end of the lecture on Tuesday, something about there not really being any original plays.

Professor: There's no such thing as an original play. Yes. That's the direct quote from Charles Mee.

Robert: Mee… that's with two "e"s, right?

Professor: Yep. M-E-E. You'll probably be hearing a lot about him. He's becoming a pretty famous playwright.

Robert: Yeah, well, I've been thinking about his quote. I mean there must be some original plays out there.

Professor: I'll grant that he's overstating things somewhat. But the theater does have a long tradition of borrowing. Take Shakespeare. Like most writers of his day, he borrowed plots from other sources unabashedly. And the ancient Greeks, all the plays they wrote were based on earlier plays, poems and myths.

Robert: And borrowing applies to plays being written nowadays, too?

Professor: To some extent, yes. Mee, for example, he's made a career out of remaking plays, one of which we'll be studying soon. It's called Full Circle and Mee based it on an earlier play by a German playwright.

Robert: Oh Full Circle… Wasn't that based on the Caucasian Chalk Circle?

Professor: That's right.

Robert: I remember hearing about that play from my acting coach.

Professor: Okay. Well, the Caucasian Chalk Circle was based on a play by yet another German playwright, someone who was fascinated by the ancient literatures of China, India and Persia, and many of his works were adapted from those literatures, including his version of the Chalk Circle which was based on an early Chinese play.

Robert: So this Full Circle play, by Charles Mee, the one we're going to study, it's like the third or fourth remake. Wow… And we complain that Hollywood keeps making the same movies over and over again.

Professor: Well, part of what Mee's trying to do is drive home the point that: One, theater's always a collaborative effort.

Robert: Well, yeah, the playwright, the director, the actors, people have to work together to produce a play.

Professor: Yes, of course. But Mee means historically. The dramatic literature of early periods is hugely influential in shaping later dramatic works.

Robert: So it's like when the playwright bases a play on a previous playwright's theme or message.It's like they're talking to each other, collaborating. Uh, just not at the same time right?

Professor: Exactly. And the second point Mee's trying to make, I think, is that it's legitimate to retell an old story in a new way, in a way that's, uh… more in line with contemporary concerns. So when playwrights reinvent or update an earlier play, it shouldn't be construed as a lack of imagination or an artistic failure.

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TPO 53-Lecture 1 (Sounds in the Film)

Listen to part of a lecture in a film studies class.

Professor: Nowadays we take sound in films for granted. I mean you still might see black and white films occasionally. But you'll hardly ever see silent films anymore.

So it's interesting to note that the use of recorded sound was originally controversial. And some directors, uh, some filmmakers even thought it shouldn't be used, that it would destroy the purity of cinema, somehow reverse all the progress that had been made in the art of cinema. Abby?

Abby: What about all the sounds you hear in some silent movies? Like, you know, a loud sound when somebody falls down or something?

Professor: Okay, you're talking about a soundtrack added much later, which has over time become part of the film we know. But this recorded track didn't exist then.

And it's not that most people didn't want sound in films. It's just that the technology wasn't available yet. Don't forget that instead of recorded sound, there was often live music that accompanied movies in those days, like a piano player or a larger orchestra in the movie theater.

Also, think of the stage, the live theater, it has used wonderful sound effects for a long time. And if wanted, these could be produced during the viewing of a film. You know, the rolling of drums for thunder or whatever. But that wasn't as common.

Oh, and another thing, that they might have in movie theaters in the early days, was a group of live actors reading the parts to go along with the film, or, and this seems a particularly bad idea to us now, one person narrating the action, an early example of a long tradition of movie producers, the ones concerned mostly about making money, not having much confidence in their audience, thinking that people somehow couldn't follow the events otherwise.

So, it finally became possible to play recorded sound as part of the film in the 1920s. Trouble was, it wasn't always used to very good effect. First it was, you know, amazing to see somebody's mouth move at the same time you hear the words, or hear a door close when you see it closing on screen.

But that luster wears off, of course. And if you're a director, a filmmaker, what's the next step?

Abby: Well, you sound to enhance the movie right? Bring something more to it that wasn't possible?

Professor: Yes. That's exactly what directors, who were more interested in cinema as art, not commerce, were thinking.

But they also predicted that there would be a problem that sound would be misused and, boy, was it ever.Because the commercial types, the producers and so on, were thinking, "Okay. Now that sound is possible, let's talk as much as possible and forget about the fact that we're making a movie, that we have this powerful visual medium."

So many of the films of the twenties were basically straight adaptations of successful shows from the stage, theatre. The name they used for sound films then was "talking films" and that was on the mark, since, well, all they pretty much did was talk and talk.

So, remedy? Well what was proposed by a number of filmmakers and theorists was the creative expressive use of sound, what they generally called nonsynchronous sound.

Okay, synchronous sound means basically that what we hear is what we see. Everything on the soundtrack is seen on the screen. And everything was recorded simultaneously, which… Well, since the sound technicians working on films often had experience with live radio that made sense to them. Recording the sound separately and adding it in afterward? Well, that idea was less obvious.

Anyway synchronous sound means the source of the sound is the image on the screen.Nonsynchronous sound then is…

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Abby: The sound doesn't match the picture?

Professor: Right. Now we can look at this in various ways. But let's take it as literally as possible.

Music, unless we see the radio or the orchestra, that's nonsynchronous. If the camera shot is of the listener rather than the speaker that's nonsynchronous. If we hear, say, background sounds that aren't on the screen, that's nonsynchronous.

So, that doesn't seem so radical, does it? But again, those early producers didn't think their audiences could keep up with this.

Abby: Excuse me, but did you say earlier that some filmmakers actually advocated not using sound at all?

Professor: Well, yes. But that was a bit of an exaggeration, I guess. What I meant to say was that some filmmakers thought that the way the film sound was actually used was setting the art of filmmaking back.But everyone agreed that sounds solved some very difficult issues and offered potentially exciting tools.

TPO 53-Lecture 2 (Two Kinds of Pollution)

Listen to part of a lecture in an environmental science class.

Professor: The Chesapeake Bay on the east coast of United States is huge. The largest estuary in the U.S., and it's very important to local economies.

But like many of the world's waterways, the Chesapeake is being polluted. And efforts to stop that from happening have not been entirely successful. And that's partly because of the type of pollution affecting the Chesapeake which may not be what you might predict.

Um, first let's mention that the sources of pollution are of two general types. And let's begin with what's known as point source pollution. Point source pollution has an identifiable source and you can find the specific point where say one particular pipe is dumping pollutants into the bay. And then treat the water right there where the pollution's coming from.

And that's what's happened over the past thirty years or so. Modifications have been made in factories and sewage treatment plants to treat polluted water before it's released into public waterways. But there's also something we call non-point source pollution.

Nowadays the most serious pollution threat doesn't come from any particular source like a factory or sewage treatment plant, but originates from many sources over a large area. And this non-point source pollution is a challenge to deal with because it doesn't just enter the bay through one pipe. You can't identify precisely where it's coming from.

And to be specific, the biggest problem now facing the Chesapeake Bay is due not to toxins but to nutrients contained in chemical fertilizers used on farms all over the region. These nutrients like phosphorus and especially nitrogen wash away what we call agricultural runoff. That's when water from a hard rain or from melting snow carries these chemicals down to streams and into the bay.

And there they stimulate the explosive growth of algae and that uses up much of the oxygen in the water, oxygen that fish and other aquatic organisms need to stay alive. So since there is no single place you can treat the runoff before it reaches the bay, any efforts to reduce this non-point source pollution generally need to be aimed at keeping pollution out of the streams in the first place.

But before we go into that, let's look at the role of nitrogen fertilizer in modern farming. Until about sixty years ago, before a great increase in industrialization, this wasn't a problem. In the past, farmers use natural fertilizers, and rotated crops so that in addition to commercial food crops like corn and wheat, they might plant legumes like alfalfa and clover for animal feed.

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But these legumes also enriched the soil by converting nitrogen in the atmosphere into nitrates, a form of nitrogen that crops like wheat or corn could use as nutrient. And these and other cover crops, planted to hold the soil after the wheat or corn was harvested. They stored much of the surplus nitrogen during the time of the year when the runoff tended to be the greatest.

But farming practices changed as farmers came under pressure to use more and more chemical fertilizer in order to increase crop production on the same amount of land. But more isn’t always better, at least in terms of chemical fertilizer in the environment. And along the way, farmers switch from legumes to animal feeds more suited to intensive large scale animal production.

And the excess nitrogen once trapped by these cover crops either washed away in the next big rain or went down into the groundwater and either way eventually ended up in the streams and the bay, and that as we said means more algae in the water and less oxygen for the fish and other aquatic life to breathe.

So what’s being done? Well, two things.

First, after the main crops are harvested, more farmers are planting cover crops again. Other kinds like rye and barley that hold the nitrogen and keep it from washing out of the soil during the months when that most likely to occur. And the second strategy is to plant buffer zones at the edges of streams. Not crops but natural areas, trees. The roots of these trees can absorb the excess nitrogen in the runoff before it reaches the streams. Farmers sometimes object to letting trees grow on land where they might otherwise be cultivating crops. But there’s a government program that compensates them, that pays them for creating these buffer zones between their fields and the streams that eventually feed into bays like the Chesapeake and it’s beginning to show some success.

TPO 53-Conversion 2 (Advice for Cafeteria)

Listen to a conversation between a student and a cafeteria manager.

Manager: Oh, hi, you're Amy, right?

Student: Yes.

Manager: I haven't seen you here for a while. Welcome back.

Student: Thanks. Uh, you're right. I haven't been eating here regularly like I used to.

Manager: Why not?

Student: A couple of reasons. First of all, I have a class that ends during lunch time. So by the time I get here, there's hardly any food left.

Manager: Really?

Student: Yeah. And then I have a chemistry lab at night this semester. It's 2 hours every Tuesday and Thursday. You know that building is way across campus. So I just eat something in my dorm before I leave or skip dinner altogether. I come here afterward, but lab lets out at 7:30 and...By then the cafeteria is already closed.

Manager: Oh, I'm really sorry. Well, what about getting something to go and eating it in class?

Student: I can’t. Food isn't permitted anywhere near the laboratories. I wish you stayed open later.

Manager: Have you complained formally? We've always had a suggestion box. And now, you can send us an e-mail.

Student: As a matter of fact, I did fill out a suggestion card. I asked for longer hours and for better food choices, too. But that was like weeks ago. And nothing’s changed from what I can see.

Manager: You know, I was just promoted to cafeteria manager, and one of the things I'm trying to do is pay more attention to students' concerns. There have been a lot of complaints similar to yours over the years.

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Student: Yeah. A lot of my friends complain about the cafeteria, but I figure nothing will ever be done.

Manager: Well, some things can change. For instance, you mentioned you like better food choices. Is there anything in particular you like added to the menu?

Student: Hmm, I guess it'd be nice to get hot cereal in the morning, and maybe a wider choice of soups and salads at lunch and dinner. And there should definitely be enough food to feed everyone whenever the cafeteria is open.

Manager: Hmm hmm. ... But all good suggestions. Say, were you aware that the university has recently formed a food advisory committee? It includes myself, a nutritionist, the school chef, a food science professor and the person who oversees the cafeteria budget.

Student: Do you want me to talk to the committee?

Manager: I was thinking you might like to serve on the committee. If you are interested, I'll recommend you as the student representative.

Student: Oh, I'm not so sure if I have enough spare time to get that involved.

Manager: Ok, then why don't I let you know when and where our next meeting is? And we will put you on the agenda. You may also want to send me an e-mail with all of your suggestions. Now that I am in charge, I will make sure they get serious consideration.

Student: I’d appreciate that. Thanks.

TPO 53-Lecture 3 (The History of Tea)

Listen to part of a lecture in a world history class.

Professor: Now, according to Chinese legend, the first person to drink tea was a Chinese emperor who lived nearly 5000 years ago. This emperor was, oh, you could call him an amateur scientist. And he wisely required all drinking water to be boiled for hygiene. So, once, emm, when visiting some distant part of his empire, he noticed that a breeze had blown some leaves into his pot of boiling water and these leaves turned the water kind of brown. So, well, would it be your first impulse to drink this? Probably not. But he thought the resulting brews smell pretty good. And in the name of science and discovery, he tasted it. And the practice of drinking tea was born.

Oh, well, a good story. But actually we cannot say with any certainty just who first discovered how to make tea. We can be confident though, that the Chinese have been using it in some form for close to 5000 years. And from those earliest times, more and more tea was cultivated to meet the growing demand, and tea became an important part of the economy of China. In fact, it was formed into sort of bricks, and used as a common type of currency for trade. But its effect on Chinese culture was even more profound. Tea became extremely popular in China, and scholars even wrote works discussing how to grow tea, prepare it, drink it, really championing tea; one of them saying it was like the sweetest dew of heaven.

Now, recommendations like this could only add to its huge popularity there. But tea was also spreading throughout Asia. In Japan, perhaps even more than in China, tea became a major cultural symbol, and one of refinement of etiquette and aesthetics. Well, best seen in the traditional Japanese tea ceremony, which is still performed today. This is an intricate formal ritual, emm, ceremony that can take hours to complete.Clearly, tea became not just a beverage in Japanese culture but much much more. Tea eventually got to western Europe, after European traders, mainly Portuguese and Dutch, brought the first small commercial shipment of tea back to Europe. Unfortunately, it was mostly just treated as a curiosity, since no one knew quite how it was supposed to be used.

A few has some pretty strong opinions though. One German doctor wrote a book saying tea was harmful, actually poisonous. But at about the same time, another doctor from Holland wrote another book calling tea ‘a miracle cure for just about everything’. Who to believe?

So, anyway, tea didn’t really catch on in Germany or France, as something just to enjoy drinking, they seem to prefer coffee. But England did take to tea. And to an extent that nobody could have foreseen. Such that, even today

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we tend to associate England, Great Britain with tea. And, well, a bit of perspective, at the start of the 18th century, almost nobody in England drank tea. But by the end of it, almost everybody did. By the 1750s, official records show tea imports up from almost nothing to about 20 million kilos. And those records didn't even begin to account for all the tea smuggled into the country illegally to avoid paying taxes. And as for reasons for the popularity of tea there, well, tea first became fashionable after the king of England married a Portuguese princess who loved tea. And pretty soon, more and more people started copying her and drinking tea. Later, when a direct trade route was established between China and England, the supply of tea greatly increased. Most important though, tea drinking became sociable. And although coffee houses or tavern were generally considered to be for men only, tea shops became places where women could come. And even bring their families. And soon there were tea parties, books on tea etiquette, and even tea gardens—parks filled with lights and walkways and venues for musical performances, places where people of all social classes could go to drink tea and socialize. By the end of the 18th century, all classes of English society drank tea, from royalty to common workers. Tea became a staple of everyday life, part of the common culture, and traditionally considered by many, the very mark of being English.

TPO 53-Lecture 4 (Saturn's Rings)

Listen to part of a lecture in an astronomy class.

Professor: Saturn's rings have always baffled astronomers.Until about 30 years ago, we thought the rings were composed of particles of ice and rock that were left over from Saturn's formation, extra material that never managed to form er...er coalesce into a moon.

As you know, it's believed that Saturn and all the planets in our solar system, coalesced from a swirling cloud of gas some 4.8 billion years ago. However, if the rings are made of leftovers from that process, then they'd also be about 4.8 billion years old. The problem is that anything gathering space dust for that long would certainly have darkened by now.

But Saturn's rings, most of them anyway, are pristine, so bright and shiny that they make Saturn "the jewel of the solar system". So the hypothesis that the rings are just made of material left over from the time of planetary formation. That hypothesis must be wrong. Saturn's rings are much younger than the planet itself. They may have formed only a few hundred million years ago, around the time the earliest dinosaurs lived on earth. We realize now that the ring particles, which range in size from microscopic dust to boulders, bigger than large houses, well, a lot of these particles are eventually lost. Then we believed they gradually spiral down out of the rings and into the planet's atmosphere. This occurs as a result of the planet's gravity. And also because of the effects of its magnetic field.

Now, if material from Saturn's rings is being lost, and nothing new is added from time to time, the rings would be disappearing, but that's not happening. So somehow, there must be new material feeding the ring system. Question is, where is this new material coming from? So, we're back to square one. But, instead of asking how did the rings form, we should be asking… anyone? Beth?

Student: How do the rings form?

Professor: How do the rings form! Because they are apparently replenishing themselves somehow. OK, here is one possibility. The moons, the dozens of moons, they all orbit Saturn, are providing raw material for the rings.

A moon in the system is complex at Saturn's, and Saturn has at least 49 known moons which vary tremendously in size and shape. A moon in such a complex system, is not only affected by the gravitational force of the planet, but also by that of the other moons.

Student: So the planet may be pulling a moon one way, and other moons may be pulling it other ways?

Professor: Exactly. Such forces could actually alter a moon's orbit, and as a result there might be a collision when moon might crash into another. And the debris from that collision could become part of the rings. Then there are tidal forces, a moon might get too close to the planet and get broken apart by Saturn's tidal forces.

Student: Excuse me! You mean, tidal force is like high tide and low tide on the oceans?

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Professor: Well, by tidal force, I'm referring to the gravitational pull of Saturn on its moons. In the mid-1800s, a French scientist named Edouard Roche was studying the effects of a planet's tidal forces on its moons.Roche was able to show mathematically that if one celestial body, say a moon, if it passes too close to another, say a planet, that has a gravitational force stronger than the force of self-attraction that holds the moon together.

Well, that first body, that moon, it'd be ripped apart. We call the distance at which this happens the "Roche limit". So if one of Saturn's moons reaches the Roche limit of the planet, or even a larger moon, it would disintegrate, be torn apart and thus add more material to the ring system.

And there's another way new material might be added to the Saturn's rings, an asteroid crashing into one of the moons. This hypothesis is supported by the fact that some of the many rings are a bit reddish in color. Yes, George?

Student: I'm sorry, I don't follow the logic.

Professor: Well, this reddish coloration suggests the presence of complex organic molecules, carbon-based molecules, mixed in with the water ice. Remember, the rest of Saturn's rings are made almost entirely of water ice. And none of Saturn's moons is red. But asteroids could be. And thus could end up contributing to the ring system, the kind of carbon-based molecules we're talking about.