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.

### TPO 18 Lecture 2 Art History

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 145th and 16th 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 CO2 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 Rameses1? 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>

1Rameses (/rᴂməsi:z/;also commonly spelled Rameses or Ramses /rᴂmsi: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.

TPO 26

### 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

TPO 27

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](http://en.wikipedia.org/wiki/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](http://en.wikipedia.org/wiki/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](http://en.wikipedia.org/wiki/Rene_Decartes).

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](http://en.wikipedia.org/wiki/Cartesian_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](http://www.pnas.org/content/98/10/5937.full), a bit of a surprise. It’s very rare. Most animals don’t have it. And it’s called [mirror self-recognition](https://en.wikipedia.org/wiki/Mirror_test), 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](https://en.wikipedia.org/wiki/Mirror_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 [corvid](https://en.wikipedia.org/wiki/Corvid)s, birds of the corvidae family.

Corvids include ravens, jays, crows and [magpies](https://en.wikipedia.org/wiki/Magpie) 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](https://en.wikipedia.org/wiki/Geoffrey_Chaucer), on [The Canterbury Tales](http://en.wikipedia.org/wiki/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](http://books.google.com/books/about/The_Canterbury_Tales.html?id=eZGDIFy2pvkC). 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](http://en.wikipedia.org/wiki/Photopigment).

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,](file:///C:\Users\22580\Desktop\新建文件夹\en.wikipedia.org\wiki\Light-emitting_diode%25E2%2580%258E) 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](http://wikitravel.org/en/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](file:///C:\Users\22580\Desktop\新建文件夹\en.wikipedia.org\wiki\Pedodiversity%25E2%2580%258E). 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](file:///C:\Users\22580\Desktop\新建文件夹\en.wikipedia.org\wiki\Wallace_Clement_Sabine%25E2%2580%258E) started to do extensive studies on [reverberation](file:///C:\Users\22580\Desktop\新建文件夹\en.wikipedia.org\wiki\Reverberation%25E2%2580%258E).

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](http://en.wikipedia.org/wiki/Cante_flamenco#Types_of_Cante)[[1]](#footnote-1). You remember we said it means “deep song” in [Andalusian Spanish](http://en.wikipedia.org/wiki/Andalusian_Spanish)? Not only because it’s sung in a 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](http://en.wikipedia.org/wiki/Clovis_culture) 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](file:///C:\Users\22580\Desktop\新建文件夹\en.wikipedia.org\wiki\Escape_velocity%25E2%2580%258E). 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 (sic[[2]](#footnote-2)) 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](file:///C:\Users\22580\Desktop\新建文件夹\en.wikipedia.org\wiki\Carbon_nanotube%25E2%2580%258E).

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](file:///C:\Users\22580\Desktop\新建文件夹\en.wikipedia.org\wiki\Geostationary_orbit%25E2%2580%258E) 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](file:///C:\Users\22580\Desktop\新建文件夹\en.wikipedia.org\wiki\Arthur_C._Clarke%25E2%2580%258E) 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 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](file:///C:\Users\22580\Desktop\新建文件夹\en.wikipedia.org\wiki\Metacognition%25E2%2580%258E).

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>

<http://news.nationalgeographic.com/news/2008/04/080424-trex-mastodon.html>

<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](file:///C:\Users\22580\Desktop\新建文件夹\en.wikipedia.org\wiki\Jarosite%25E2%2580%258E) 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](file:///C:\Users\22580\Desktop\新建文件夹\en.wikipedia.org\wiki\Amino_acid%25E2%2580%258E).

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 rage[[3]](#footnote-3) 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. 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](file:///C:\Users\22580\Desktop\新建文件夹\en.wikipedia.org\wiki\Les_Paul%25E2%2580%258E) 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](https://en.wikipedia.org/wiki/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**



**Narrator**

Listen to a conversation between a student and an employee in the campus computer center.

**Computer center employee**

Hi, what can I help you with today?

**Student**

Hi, um, I wanted to-you see, the thing is, I don't know much about computers, so I was wondering if, uh, if there's a class or something . . . so I can learn how to use computers, like to write papers for my classes.

**Computer center employee**

Oh, I see . . . u m, we don't really offer a course for beginners, since most students already have computing experience. But all the computers in our labs have a general tutorial installed on them. You could just go there and run it.

**Student**

And the tutorial explains everything? I mean, it might sound strange but I've never used a computer.

**Computer center employee**

Well, all the computer labs on campus are staffed with student assistants, and I'm sure that any one of them would be more than willing to get you started.

**Student**

Yeah? That sounds good. But is it expensive?

**Computer center employee**

No, in fact, it won't cost anything; it's one of the services of the computer center.

**Student**

That's great. How do they-l mean, how do I get in touch with the student assistants? Should I just go to a computer lab and ask whoever's there?

**Computer center employee**

Sure, you could do that, or I can let you have a list of names of the students who are assistants in the labs. You might know one of them.

**Student**

Actually, I think I'd prefer someone I don't know, um, so I can ask dumb questions . . . Is there anyone you'd recommend?

**Computer center employee**

All of our student assistants are really knowledgeable about computers. I mean, they have to be, in order to work in the computer labs . . . It doesn't mean that they're necessarily good at teaching beginners . . . but you probably won't be a beginner for very long.

**Student**

Hope not.

**Computer center employee**

And I just thought of something else. The bookstore has a lot of books on computers-there might be one for people like you. I mean, people who don't have a lot of experience with computers. I actually bought one for my father so he could learn how to use e-mail, basic word processing, that sort of thing-and it worked pretty well for him.

**Student**

OK, I'II try that, too. And if the bookstore doesn't have it, they can just order it for me?

**Computer center employee**

Right. Now is there anything else I can help you with today?

**Student**

Uh, just the list of names and the times they're working. I'd like to get going on this as soon as possible.

**Computer center employee**

Right. Good luck.

### 纸质版TPO4 lecture1（economics）



**Narrator**

Listen to part of a lecture in an economics class.



**Professor**

When attempting to understand international trade, some things seem so obvious that they can hardly be controverted, and other points that are important are invisible unless you've thought about the subject carefully.

Consider the following: if there's an increase in imports, let's say, um, let's say imports of furniture, and the domestic producers of furniture find this new competition very difficult and are cutting production and employment, then it seems obvious and easy to understand and many people conclude from this that increasing imports will cause generally greater unemployment at home.

What is not so obvious is that how much we import and how much we export ... those are interdependent and you can't understand the one without the other. But the exports that are generated are not easily discernable, so most people don't see them. They see only the imports of furniture rising and employment in domestic furniture production falling.

So as a result, many people argue that we ought to protect jobs by limiting imports-either by tariffs, quotas, regulations, or whatever-without realizing that this also has the effect of reducing potential future exports to the rest of the world, things that we can produce very, very . . . cost effectively and therefore profitably.

The fundamental proposition in international economics is that it makes sense to import those things that we . . . that can be produced more economically abroad than at home and export things to the rest of the world that we can produce more cost effectively than produced elsewhere in the world. Therefore, if we limit imports, we put ourselves in danger of not being able to export.

The details of this relationship will take much longer to explain than I can fully go into now but the point of the matter is that gains-the benefits of gains-from international trade result from being able to get things cheaper by buying them abroad than you can make them at home. Now there're some things that we can make at home that are . . . that we can do more economically than they can do abroad.

In the case of the United States, typically high-technology products, uh . . . are things that Americans have innovated in and started firms doing that sort of thing at which they do very well. Whereas goods that produce . . . that use a lot of relatively low skill labor, like furniture production, cotton production, sugar production . . . those are things that are frequently made more inexpensively in places where wage rates are low and the cost of using capital is very high.

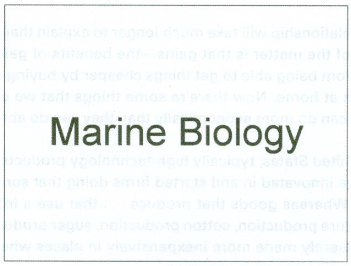
However, in Florida they produce a lot of sugar, but the costs are so high, if we didn't have extensive restrictions on imports of sugar, the output of sugar would decline dramatically. But the sugar industry in the U.S. doesn't produce high-paying jobs, it uses resources in ineffective ways and it blocks the import of more cost-effectively produced sugar. It, it's a very bad bargain for the people in the United States to want to protect low-paying jobs thereby halting the growth of world trading and international . . . uh, more international specialization. It would be better to remove restrictions on imports and allow other countries in the world . . . countries that can produce them more cheaply . . . let them specialize in producing those products.

Now, I agree that people who are directly affected by imports, what they focus on . . . is, is that their prospects . . . their job prospects are being reduced, and their economic circumstances are getting worse. And that's a relevant problem and an important problem; what isn't so obvious is . . . that by retraining and relocating people to places and industries where jobs are expanding rather than contracting, we can make the whole economy function more effectively and productively than by trying to block imports.

Um, what is interesting to note is that, even if there were no international trade issues, like imports, any changes that occur in a country's economy-any new technology, change in preferences, change in regulations or whatever-will lead to "adjustments" that lead some sectors of the economy to decline and others to expand.

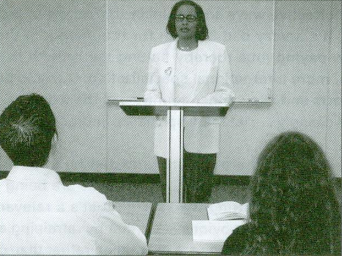
And that's what we have to figure out, and that's a hard problem to deal with in detail, is how to facilitate people adjusting from sectors where their job prospects are not so good, and in particular where real wages aren't so high, to acquire skills that will permit them to move into higher-paying jobs in other parts of the economy either by retraining or relocating. Helping pay for the relocation of these people would be very helpful, but trying to block the changes is really counterproductive. It makes people in our country poorer, and it makes people elsewhere in the world poorer as well.

### 纸质版TPO4 lecture2 biology



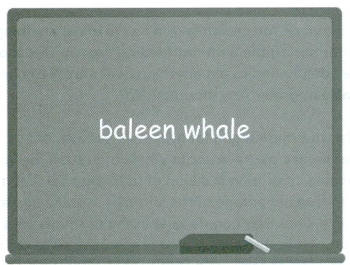
**Narrator**

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

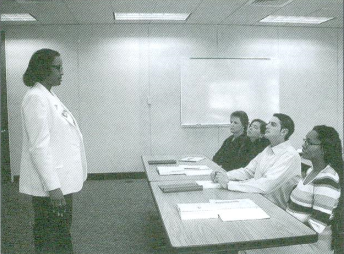


**Professor**

I want to continue our discussion about whales. Specifically, today, um, I want to talk about whale migration-um, why whales head south for the winter. Or really why whales in the cold water of the Northern Hemisphere head south for the winter. Now, not all kinds of whales migrate, but most baleen whales do.



And interestingly enough, we still don't really know why the baleen whales migrate. We do have several theories, however, which I'II discuss today. U h, can anybody name one reason why baleen whales might migrate south, to the warm tropical water?



**Male student**

Uh, for food? You know, the whales move to warmer water in order to find a good area to feed.

**Professor**

Good guess. That should be an obvious reason-after all, most animals that migrate do so for the purpose of finding food. But, uh, that doesn't seem to be the case with baleen whales. To understand why, you need to know something about water temperature. There are a lot of technical reasons that I'm not going to go into right now. But let's just say that nutrients don't rise to the surface of tropical water like they do in other kinds of water. Tropical water simply never gets cold enough. So . . . well, what this means, uh, is that tropical water doesn't have much of the plankton that most whales feed on.

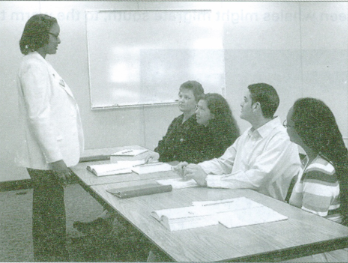
**Male student**

I don't understand-if there's no plankton, how do the whales survive through the winter?

**Professor**

Right. How do they survive? You see, they don't have to eat anything, because they've stored up so much fat during the summer feeding season that they can just survive off of that. So if they don't need to eat anything, we're back to our original question. Why do baleen whales migrate? Any theories? No?

Well, there's one idea out there that a lot of people believe. In fact, uh, you could say it's the most popular theory we have about whale migration. Basically, the argument is that for baleen whales, migration is a kind of balancing act. Let me explain. On one hand, whales need to take advantage of the summer months by eating as much food as they can. And that's what they can do best in the northern seas. This allows them to build up a lot of fat. But in the winter, food is scarce even in the north, so what the whales need to do is save energy. And that's what migrating south can help them do . . . Amanda, you have a question?



**Female student**

Yes. Um, the balancing-act theory doesn't make sense to me. Maybe whales might need to save energy during the winter, but wouldn't moving all the way down to tropics make them lose energy?

**Professor**

That's a good point, and it's one reason why this isn't a perfect theory. It does cost the whales energy to migrate, but it's easier for whales to save energy in warm water than it is to save energy in cold water, so there might still be, you know, a good reason to move south for the winter. OK?



Now, before moving on to the next chapter, I want to briefly discuss how the baleen whale manages to navigate. It's pretty remarkable, because the whales manage to return to the same places year after year, and have to travel over an enormous area of ocean in order to do it. I mean, it's not like whales can just look at a map, right? So exactly how do they do it?

Well, a lot of experimental work still needs to be done, but we have been able to figure out at least three ways the baleen whale navigates without getting lost. The first is the ability to use Earth's magnetic field like it was a map. That sounds strange, but we know that many birds use that method, use the magnetic field, and it's possible that whales have the biological ability to do the same thing.

Another theory is that if they stay close to the coast, whales might be able to find familiar landmarks and use those as guides. But we don't really know if a whale's eye-sight is good enough to be able to do that, so that's not a perfect theory.

And finally, we know that many whales make very loud sounds that can travel literally hundreds of miles underwater. Through a process called echolocation, it's possible that these whales hear the sounds bounce off of islands or other pieces of land and use those echoes as clues to help them find their way.

**Narrator**

Listen again to part of the lecture. Then answer the question.

**Professor**

To understand why, you need to know something about water temperature. There are a lot of technical reasons that I'm not going to go into right now. But let's just say that nutrients don't rise to the surface of tropical water like they do in other kinds of water.

**Narrator**

What does the professor mean when she says this:

**Professor**

There are a lot of technical reasons that I'm not going to go into right now.

**Narrator**

Listen again to part of the lecture. Then answer the question.

**Professor**

It's pretty remarkable, because the whales manage to return to the same places year after year, and have to trawl over an enormous area of ocean in order to do it. I mean, it's not like whales can just look at a map, right?

**Narrator**

What point does the professor make when she says this:

**Professor**

I mean, it's not like whales can just look at a map, right?

### 纸质版TPO4 conversation 2



**Narrator**

Listen to a conversation between a student and a professor.

**Student**

Hi, uh… Professor Anderson… wondering if you had a couple minutes . . .

**Professor**

Of course, Paula…

**Student**

Thanks . . . uh, you sent me a letter recently about doing, uh, an honors project-inviting me to come in and talk about . . .

**Professor**

Right, right, well, as your academic advisor, it's my job to look out for your academic interests, and based on your grades, and some very positive feedback I've heard from your professors, I wanted to formally invite you to consider doing an honors project . . .

**Student**

Yeah . . . well, thanks . . . uh, actually I kinda wanted to ask you . . . quite frankly-like how much work it would probably be? I mean, I'm gonna be spending a lot of time applying to law schools next semester and . . .

**Professor**

Well, let me tell you how it works . . . and then you can decide from there.

**Student**

OK

**Professor**

Basically, the honors project is an opportunity to do . . . some in-depth work on a topic you're interested in before graduating college. You register for the class, but it doesn't work the same way a regular class does-you find a professor who you want to work with-you ask the professor-a sort of mentor who's knowledgeable on the topic you're interested in-the topic you're gonna write your honors thesis on . . .

**Student**

Writing a thesis? That's part of the project? Ah, like how many pages are we talking?

**Professor**

Usually about 50 . . . but it's a valuable experience, writing a thesis paper.

**Student**

So, basically, after I register for the class, I need to ask a professor who'll sorta help me…

**Professor**

Actually, you need to do that-a professor needs to agree to oversee your honors project-before you register.

**Student**

Oh, OK…

**Professor**

I mean, I know it sounds kinda daunting, but that's what the professor's there for-to help guide you through the different steps of the process and . . . uh . . . most students are very pleased with the experience . . . they're able to demonstrate advanced research skills, which is important; especially in your case, writing an honors thesis would be a big plus . ..

**Student**

You think so?

**Professor**

Absolutely. Especially considering your plans, since you're applying to law schools. It shows initiative, that you've done well as an undergraduate-to be allowed to do the honors project . . . that you're able to work independently and, of course, you would graduate with honors . . .

**Student**

Yeah, it does sound good-it's just, you know, l've never written something like that before, so . . .

**Professor**

Well, you choose something you're interested in-maybe you can even expand a shorter research paper from another class or . . .

**Student**

So, like, maybe . . . You know, I took this course from Professor Connelly-his course on Comparative Governments last semester and, uh . . . did pretty well-l wrote a paper actually, on political parties in Venezuela and-and he seemed to like my research. Anyway. he, uh, I got an A in the course.

**Professor**

Good, so it sounds like you do have a general idea for a topic, and you might know what professor you want to work with . . . and look, it's still a couple weeks before registration, maybe you should talk to Professor Connelly and then get back to me.

**Student**

Yeah, I will-thanks. I'II come by again sometime next week.

**Professor**

That's fine. Good luck.

**Narrator**

What does Professor Anderson imply when he says this:

**Professor**

. . . they're able to demonstrate advanced research skills, which is important; especially in your case, writing an honors thesis would be a big plus . . .

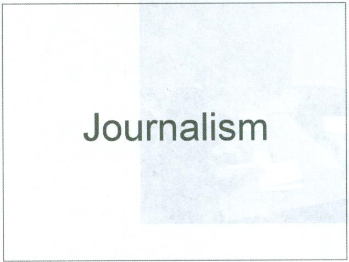
**Narrator**

What does the woman imply when she says this:

**Student**

Yeah, it does sound good-it's just, you know, I've never written something like that before . . . so . . .

### 纸质版TPO4 Lecture 3 journalism



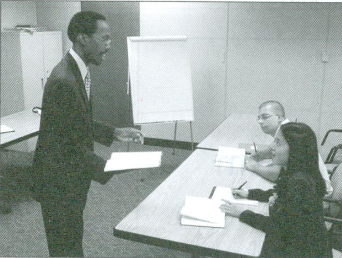
**Narrator**

Listen to part of a lecture in a journalism class. The professor has been discussing newspapers.



**Professor**

About 40 years ago, half of all Americans felt they'd be lost without a daily newspaper. But today, only one in ten Americans say they'd be lost without a paper. In fact, today, half of all Americans say they don't need a newspaper at all. And so people in the newspaper industry are trying to figure out how they can get more people reading the newspaper more often. They're trying to crack journalism's riddle for the ages: what makes people read newspapers? OK, well, let me ask you-as a journalism student, what do you think is the answer to this question? Elizabeth?



**Female student**

U m, I would probably try to improve the content of the newspaper.

**Professor**

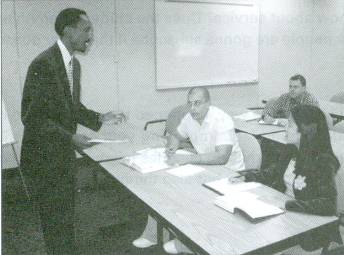
Better content. Hmm. You mean like well-written editorials and articles?

**Female student**

Well, I mean provide more interesting content, like, I would first try to find out what readers really want to read . . . and then put that into the paper.

**Professor**

Yes, in fact, not too long ago, there was an extensive study conducted to investigate what draws people to newspapers. Uh, they found out that there's a clear, strong link between satisfaction with content and overall readership. Those newspapers that contained what the readers wanted most brought in the most readers. No big surprise there, right? So, what kind of content brings in readers? The study found that people-centered local news ranks at the top of the list . . . stories about ordinary people. For example, you could write about the experiences of those who were involved in a news story, and their friends and relatives . . . The vantage points would be those of ordinary people, not of police or other officials . . . OK? Now the study also showed that people want more stories about movies, TV, and weather, and fewer stories and photos about natural disasters and accidents . . . So. to get reader satisfaction, you need to select the right topics, and within those topics, the right news events or stories to cover. Yes, James?



**Male student**

It seems to me that a lot of what you just mentioned doesn't line up with the principles of good journalism. Catering to readers' tastes may improve overall readership, but what about the social responsibilities that newspapers have? I mean, there are some topics that newspapers need to write about in order to serve the public interest. Those topics may not always be fun and interesting for the average reader, but it's still the newspaper's responsibility to make that information available to the public.

**Professor**

That's a good point. You need a good mix of content. You can't just rush towards an attractive topic and forget about the reporting role of newspapers. There's a danger of going soft-newspapers do have to perform their obligations to citizens. So what newspapers sometimes do is to combine serious journalism with a reader-friendly presentation. Um, let me give you an example: When the justice department opened an investigation on the local police-some pretty serious stuff that could be boring to some readers-well, one local newspaper ran a lead story on their front page, but they also simplified the format by including small breakout boxes that presented-in a nutshell-the highlights of the story. That way, they could report the serious stories they needed to report, and, and still hold their readers' attention. OK? U h, going back to the research on readership growth we were talking about . . . Uh, the most vital step of all, the study shows, may be making the paper easier to use. How can we make the paper "easier to use"? Well, it means stories need to include information, such as phone numbers, times, dates, addresses, Web sites and the like, so that readers can "go and do" things based on what they've read.

**Female student**

Professor Ellington? Um, when you said we need to make the paper "easier to user" I thought you were gonna say something about use of graphics, colors, and stuff like that.

**Professor**

Well, I guess those things do help in a way, but it turned out that those contemporary touches, uh, such as more attractive designs, extensive use of color, and informational graphics matter much less than you'd expect. Surprising, isn't it?

**Female student**

Yeah, it is . . . Um, how about service? Does the study say anything about improving service? I don't think people are gonna subscribe if the paper doesn't arrive, or shows up late .. .

**Professor**

Or shows up wet, which by the way, happened to me this morning. Oh, absolutely. Service affects readership. In fact, improving your service is much more likely to increase your readership than making changes in your editorial content . . . Not only on-time delivery in good condition, but also things like efficient billing, affordability, um .. . Yes?

**Female student**

They could also, like, increase the number of sites where they sell single copies.

**Professor**

Certainly that's one way to improve service.

**Narrator**

What does the student imply when ha says this:

**Male student**

It seems to me that a lot of what you just mentioned doesn't line up with the principles of good journalism. Catering to readers' tastes may improve overall readership, but what about the social responsibilities that newspapers have?

**TRACK 73 TRANSCRIPT**

**Narrator**

Listen again to part of the lecture. Then answer the question.

**Female student**

I don’t think people are gonna subscribe if the paper doesn't arrive, or shows up late . . .

**Professor**

Or shows up wet, which by the way, happened to me this morning. Oh, absolutely. Service affects readership.

**Narrator**

What does the professor imply when he says this:

**Professor**

Or shows up wet, which by the way, happened to me this morning. Oh, absolutely.

### 纸质版TPO4 Lecture4 （geology）



**Narrator**

Listen to part of a lecture in a geology class.

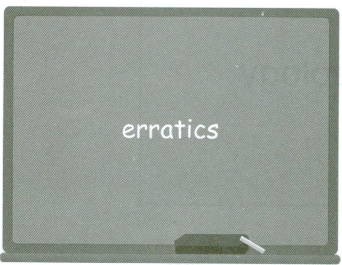


**Professor**

Um, beginning in the late 1960s, geologists began to uncover some evidence of a rather surprising kind when they looked . . . um . . . at various places around the world. What they found out when they examined rocks from about a . . . the period from about 750 million years ago to about 580 million years ago, they found that . . . it seemed that glaciers covered the entire surface of the Earth-from pole to pole, including the tropics.

Um . . . how did they come to this astonishing conclusion? What was the evidence for this? Especially when glaciers today are found only at the poles . . . or in the mountains.

Well, uh . . . basically when glaciers grow and move they leave behind a distinctive deposit consisting of primarily . . . of, at least on the top level, of ground up little bits of rock . . . almost . . . they almost look like rocks that have been deposited by streams, if you've ever seen those. And that's caused because, although the glacier is ice, it is actually flowing very slowly and as it moves it grinds the top layer of rock, it breaks off pieces and carries them away. So when you have glaciation you have a distinctive pattern of these pieces of rock which are called "erratics."

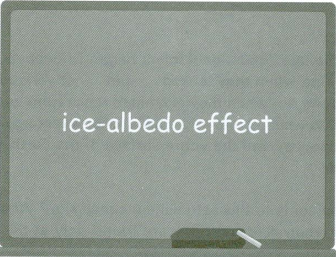


Erratics are rocks . . . they're the stones that are often carried long distances by glaciers.

So, in the 1960s and onward up through the 1990s, we keep finding evidence for glaciation, no matter what the latitude . . . even in tropical latitudes. Now, today there are glaciers in the tropics but only at very high elevations. But 750 million years ago, apparently there were glaciers even at sea level in the tropics.

How could this have happened?

Well. first . . . the growth of glaciers, uh, benefits, if you will, from a kind of a positive feedback loop called the "ice-albedo effect."



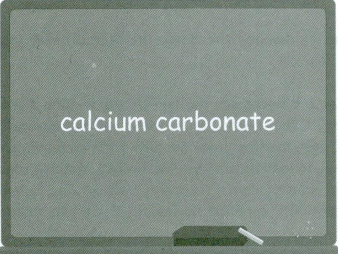
With the ice-albedo effect, glaciers-'cause they're white-reflect light and heat more . . . much more than does liquid water . . . or soil and rock, which are dark and absorb heat. So, the more glaciers there are, the more heat is reflected, so the climate gets cooler, and glaciers grow even more.

However . . . normally, on a global scale, there is a major process that functions to curb the growth of glaciers. And, that process involves carbon dioxide.



Now, we're all familiar with the notion that carbon dioxide is what we call a "green-house gas.” The more carbon dioxide there is in the atmosphere, the more heat the atmosphere retains. That's what a greenhouse gas does. So, the greenhouse-gas effect is kinda the opposite of the albedo effect.

Um . . . now as it happens . . . when silicate rocks, which is a very common class of rock, when they're exposed to the air and to normal weathering, they erode. Carbon dioxide is attracted to these eroding rocks and binds to them, forming calcium carbonate.



Calcium carbonate is eventually washed into the ocean where it settles to the bottom. This process, this forming of calcium carbonate, has the effect of sucking the carbon dioxide out of the air and storing it at the bottom of the ocean.



Now, follow me here. The process that's sucking carbon dioxide out of the air, keeping the greenhouse gas levels low, cannot happen if the rock is covered with ice.

So, while glaciers reflect light and heat . . . cooling the Earth, they at the same time cover rocks so there's less calcium carbonate formed . . . which leaves more carbon dioxide in the atmosphere. Higher levels of carbon dioxide keep the atmosphere warm . . . which slows the growth of glaciers. So, it's a balance, and the glacier growth remains pretty much under control.

Now, what happened 750 million years ago to upset that balance? It seems a relatively simple explanation actually . . .

750 million years ago . . . all the major continents are rocky, bare, and pretty much lined up along the equator; they hadn't yet moved to where they are today. So, what happened was, perhaps a slight cooling of . . . the very slight and temporary cooling of the Sun-which still happens from time to time-and the Earth starts to cool, the ice starts to spread on the oceans . . . starting at the poles.

Now, by the time the ice reaches about two-thirds of the way to the equator, it's too late.

See . . . because the continents are the last things to be covered by glaciers, they continue weathering . . . the rocks keep eroding and the carbon dioxide levels keep falling . . . So, the ice-albedo effect from the glaciers is increasing in strength while the atmosphere continues to lose its ability to retain heat making glacier growth unstoppable. Now you have what's called a "runaway freeze." And for perhaps as long as 50 million years, possibly with some interludes, the Earth was frozen from pole to pole, like a giant snowball.

**TRACK 75 TRANSCRIPT**

**Narrator**

Listen again to part of the lecture. Then answer the question.

**Professor**

Well, uh . . . basically when glaciers grow and move they leave behind a distinctive deposit consisting of primarily . . . of, at least on the top level, of ground up little bits of rock . . . almost . . . they almost look like rocks that have been deposited by streams, if you've ever seen those.

**Narrator**

Why does the professor say this:

**Professor**

. . . they almost look like rocks that have been deposited by streams, if you've ever seen those.

纸质版TPO5

### 纸质版TPO5 conversation 1



**Narrator**

Listen to a conversation between a student and an admissions officer at City College.

**Student**

Hi. Can I ask you a few questions about starting classes during your summer session?

**Admissions officer**

Sure. Ask away! It starts next week, you know.

**Student**

Yeah, and I want to get some required courses out of the way so I can . . . maybe I can graduate one term earlier and get out into the job market sooner.

**Admissions officer**

That sounds like a good idea. Let me pull up the summer school database on my computer here . . .

**Student**

OK.

**Admissions officer**

OK, there it is. What's your student ID number?

**Student**

Oh, well, the thing is . . . I'm not actually admitted here. I'll be starting school upstate at Hooper University in the fall. But I'm down here for the summer, staying with my grandparents, 'cause I have a summer job near here.

**Admissions officer**

Oh, I see, well . . .

**Student**

So I'm outta luck?

**Admissions officer**

Well, you would be if you were starting anywhere but Hooper. But City College has a sort of special relationship with Hooper . . . a full exchange agreement . . . so our students can take classes at Hooper and vice versa. So if you can show me proof . . . um, your admissions letter from Hooper, then I can get you into our system here and give you an ID number.

**Student**

Oh, cool. So . . . um . . . I wanna take a math course and a science course-preferably biology. And I was also hoping to get my English composition course out of the way, too.

**Admissions officer**

Well all three of those courses are offered in the summer, but you've gotta understand that summer courses are condensed-you meet longer hours and all the assignments are doubled up because . . . it's the same amount of information presented and tested as in a regular term, but it's only six weeks long. Two courses are considered full time in summer term. Even if you weren't working, I couldn't let you register for more than that.

**Student**

Yeah, I was half expecting that. What about the schedule? Are classes only offered during the day?

**Admissions officer**

Well, during the weak, we have some classes in the daytime and some at night, and on the weekends, we have some classes all day Saturday or all day Sunday for the six weeks.

**Student**

My job is pretty flexible, so one on a weekday and one on a weekend shouldn't be any problem. OK, so after I bring you my admissions letter, how do I sign up for the classes?

**Admissions officer**

Wall, as soon as your student ID number is assigned and your information is in our admissions system, you can register by phone almost immediately.

**Student**

What about financial aid? Is it possible to get it for the summer?

**Admissions officer**

Sorry, but that's something you would've had to work out long before now. But the good news is that the tuition for our courses is about half of what you're going to be paying at Hooper.

**Student**

Oh, well that helps! Thank you so much for answering all my questions. I'll be back tomorrow with my letter.

**Admissions officer**

I won't be here then, but do you see that lady sitting at that desk over here? That's Ms. Brinker. I'll leave her a note about what we discussed, and she'll get you started.

**Student**

Cool.

**Narrator**

Listen again to part of the conversation. Then answer the question.

**Student**

So I'm outta luck?

**Admissions officer**

Well, you would be if you were starting anywhere but Hooper.

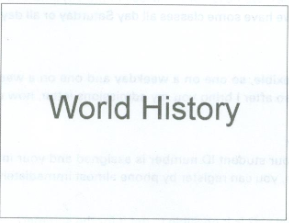
**Narrator**

What does the woman mean when she says this:

**Admissions officer**

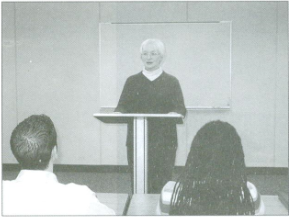
Well, you would be if you were starting anywhere but Hooper.

### 纸质版TPO5 Lecture1 world history



**Narrator**

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

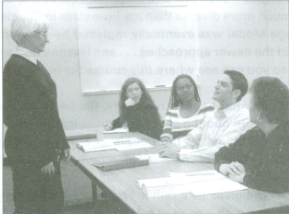


**Professor**

In any introductory course, I think it's always a good idea to step back and ask our-selves "What are we studying in this class, and why are we studying it?"

So, for example, when you looked at the title of this course in the catalog-"Introduction to World History"-what did you think you were getting into . . . what made you sign up for it- besides filling the social science requirement?

Anyone . . .?

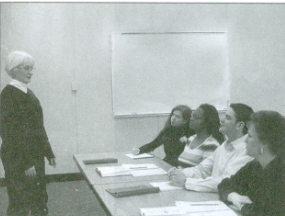


**Male student**

Well . . . just the-the history-of everything . . . you know, starting at the beginning . . . with . . . I guess, the Greeks and Romans . . . the Middle Ages, the Renaissance . . . you know, that kinda stuff . . . like what we did in high school.

**Professor**

OK . . . Now, what you're describing is one approach to world history.



In fact, there are several approaches-basic "models" or "conceptual frameworks" of what we study when we "do" history. And what you studied in high school-what I call the "Western-Heritage Model," this used to be the most common approach in U.S. high schools and colleges . . . in fact, it's the model I learned with, when I was growing up back-oh, about a hundred years ago . . .

Uh . . . at Middletown High School, up in Maine . . .l guess it made sense to my teachers back then-since, well, the history of western Europe was the cultural heritage of everyone in my class . . . and this remained the dominant approach in most U.S. schools till . . . oh, maybe . . . 30, 40 years ago . . . But it doesn't take more than a quick look around campus-even just this classroom today-to see that the student body in the U.S. is much more diverse than my little class in Middletown High . . . and this Western-Heritage Model was eventually replaced by-or sometimes combined with-one or more of the newer approaches . . . and I wanna take a minute to describe these to you today, so you can see where this course fits in.

OK . . . so . . . up until the mid-twentieth century, the basic purpose of most world-history courses was to learn about a set of values . . . institutions . . . ideas . . . which were considered the "heritage" of the people of Europe-things like . . . democracy . . . legal systems . . . types of social organization . . . artistic achievements . . .

Now, as I said, this model gives us a rather limited view of history. So, in the 1960s and 70s it was combined with-or replaced by-what I call the "Different-Cultures Model." The '60s were a period in which people were demanding more relevance in the curriculum, and there was criticism of the European focus that you were likely to find in all the academic disciplines. For the most part, the Different-Cultures Model didn't challenge the basic assumptions of the Western-Heritage Model. What it did was insist on representing other civilizations and cultural categories. in addition to those of western Europe . . .

In other words, the heritage of all people: not just what goes back to the Greeks and Romans, but also the origins of African . . . Asian . . . Native American civilizations. Though more inclusive. it's still, basically, a "heritage model" . . . which brings us to a third approach, what I call the "Patterns-of-Change Model."

Like the Different-Cultures Model, this model presents a wide cultural perspective. But, with this model, we're no longer limited by notions of fixed cultural or geo-graphical boundaries. So, then, studying world history is not so much a question of how a particular nation or ethnic group developed, but rather it's a look at common themes-conflicts . . . trends-that cut across modern-day borders of nations or ethnic groups. In my opinion, this is the best way of studying history, to better understand current-day trends and conflicts.

For example, let's take the study of the Islamic world. Well, when I first learned about Islamic civilization, it was from the perspective of Europeans. Now, with the Patterns-of-Change Model, we're looking at the past through a wider lens. So we would be more interested, say, in how interactions with Islamic civilization-the religion . . . art . . . literature-affected cultures in Africa . . . India . . . Spain . . . and so on.

Or . . . let's take another example. Instead of looking at each cultural group as having a separate, linear development from some ancient origin, in this course we'll be looking for the common themes that go beyond cultural or regional distinctions. So . . . instead of studying . . . a particular succession of British kings . . . or a dynasty of Chinese emperors . . . in this course, we'll be looking at the broader concepts of monarchy, imperialism . . . and political transformation.

### 纸质版TPO5 Lecture2 World History

**Narrator**

Listen again to part of the lecture. Then answer the question.

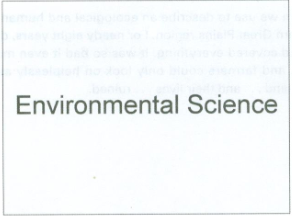
**Professor**

So, for example, when you looked at the title of this course in the catalog-"Introduction to World History"-what did you think you were getting into . . . what made you sign up for it-besides filling the social-science requirement?

**Narrator**

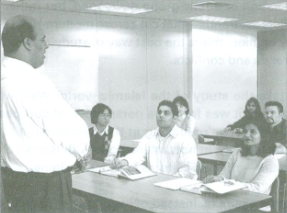
What is the professor's attitude?

**TRACK 90 TRANSCRIPT**



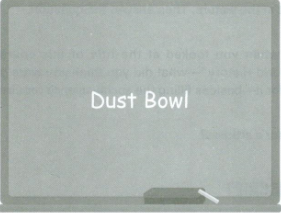
**Narrator**

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



**Professor**

OK, now let's talk about another environmental concern-soil erosion. It's a major problem, all around the world. Sometimes erosion damages soil so severely that the. land can no longer be cultivated and it's just abandoned. That happened in a big way right here in the United States. Some of you have probably read the novel The Grapes of Wrath. And maybe you remember that the story took place in the 1930s, during the time of what was called the Dust Bowl.



Dust Bowl is a term we use to describe an ecological and human disaster that took place in the southern Great Plains region. For nearly eight years, dust and sand blew across the area and covered everything. It was so bad it even made breathing and eating difficult . . . and farmers could only look on helplessly as their crops were destroyed and the land . . . and their lives . . . ruined.



Now, there'd always been droughts and strong winds in that region, But that was OK because the native grasses had deep roots in the ground that were able to hold the soil in place. So the wind wasn't able to, you know, erode the soil too badly. This changed, though, between 1900 and 1930. Agriculture was expanding rapidly then, and lots of farmers in the southern Great Plains wanted to grow wheat and other crops they could sell for cash-uh, crops that would be profitable. So they ripped up much of the grassland to plant these crops like wheat, which don't hold the soil

down nearly as well. At the same time, livestock-uh, cattle, too many of them-were feeding on grasses in the area and damaging a lot of the grassland. So these animals caused even more erosion of the soil.

It didn't help that many of the actual owners of the land were not living anywhere near the area-a lot of the landowners lived way back east, and rented out the land to local people who lived on the land and worked on it, but, um, didn’t have much reason to take really good care of it. I mean, it wasn't their land, right? The tenant farmers weren't really interested in conserving someone else's soil-not for the long term, anyway.

Also, some thought the land couldn't really be damaged-you know, that the soil was so rich and deep that . . . it didn't matter if the topsoil, the soil on the surface, blew away. They thought they could just plow up more. But they were wrong. Good top-soil takes a long time to form-it can literally take thousands of years to create good topsoil that will grow vegetation-and a very short time to ruin it. So after only a few years of excessive plowing, the land pretty much couldn't be farmed anymore. And people moved on to other places and let the old areas just sit there. And when they didn't plant anything on that land, that made it vulnerable to even more erosion. So it was kind of a vicious cycle, you could say.

Another problem, ironically, was that advances in technology were actually destroying the land, instead of improving it. A lot of farmers were using huge new tractors that dug deep into the ground and tore up a lot of the soil.

And then, of course, there was the weather. You know, when people look back on the Dust Bowl era, they tend to blame the drought-the lack of rain between 1934 and 1937. We can't ignore the drought-l mean, it was the worst on record at the time and did help bring on this disaster. But-without the soil destruction-the drought alone wouldn't have resulted in the devastation we call the Dust Bowl. It was poor farming techniques that made that happen.

Since then, though, we've paid more attention to trying to prevent a future Dust Bowl. One thing Congress did was enact a massive government effort to improve soil conservation, called the Soil Erosion Act. Under this law, large stretches of land in the southern Great Plains were identified as being at risk for erosion and were taken out of production and turned into permanent grassland. What that did-by protecting the land from excessive farming-was to stabilize the soil. Also, the Soil Erosion Act helped educate farmers to practice better soil conservation techniques, like reducing how often they plowed and using better equipment that would, you know, minimize damage to the soil structure.

**Narrator**

Listen again to part of the lecture. Then answer the question.

**Professor**

A lot of the landowners lived way back east, and rented out the land to local people who lived on the land and worked on it, but, um, didn't have much reason to take really good care of it. I mean, it wasn't their land, right?

**Narrator**

Why does the professor say this:

**Professor**

I mean, it wasn't their land, right?

### 纸质版TPO5 conversation2



**Narrator**

Listen to a conversation between a student and his academic advisor.

**Student**

Excuse me, Ms. Chambers? Um, I don't have an appointment, but l was kinda wondering if you had a minute to help me with something.

**Academic advisor**

Oh, sure. Have a seat.



What's on your mind?

**Student**

Well, uh . . . I guess I really don't know where to start . . . It's not just one class. It's . . . I'm not doing all that great. Like on my homework assignments. And in class. And I don't know why. I mean, l just don't get it! l-l read the assignments and I do the homework and I'm still not doing too well . . .

**Academic advisor**

Um, which classes? You mean, like Spanish . . . you're taking Spanish, right?

**Student**

Oh, no, not Spanish . . . if it weren't for Spanish I'd really be in trouble . . . no, but it's really all the others, psychology and sociology especially.

**Academic advisor**

Is it the material, what you read in the textbooks? You don't understand it?

**Student**

No, that's just it-l think I understand stuff when I read it . . .

**Academic advisor**

You don't re . . .

**Student**

Remember? Well, I remember names and definitions, but . . . like, in class, when the professor asks us about the theories, what they're all about, I never have the answer.

**Academic advisor**

Sounds like you're trying to learn by memorizing details, instead of picking out the main points of the reading. So, tall me, how do you study?

**Student**

Well, l-l . . . l mean. I read the assigned chapters, and I try to underline everything . . . like all of the words I don't know, and I always memorize the definitions. But, I dunno, when I get back in class, it always seems like the other students've gotten a better handle on what was in the reading. So, maybe it's just me . . .

**Academic advisor**

Oh, it's not. Believe me. Lots of students . . . You know, my first year as a college student . . . I really had a hard time. I spent hours reading in the library . .. but I was just wasting time. 'cause I wasn't really studying the right things. I did the same sort of thing it sounds like you're doing, not focusing on what's really important in the reading, but on the smaller details.

**Student**

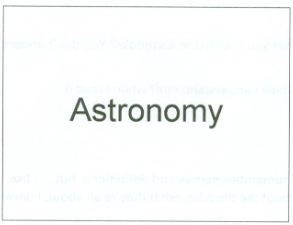
Yeah, maybe. But I spend so much time studying, it seems like I should be doing better.

**Academic advisor**

The first year of college can be a little overwhelming, I know. Point is, lots of students have trouble adjusting at first, you know, figuring out how to study, how to use their time, you know, to your best advantage. It's good that you do the assigned readings . . . but, you've . . . well, I think you're unnecessarily underlining and memorizing. That takes a lot of time, and, well, it's not the best use of your time. Here's something you can do: when you read, just read the assigned sections, and then . . . and without

looking back at the text-write a summary of the key points, the main ideas in the chapter. And after you do that, it-it's good to go back and reread the text. And you look for any examples you can find to support those key points. Let me show you an example of what I mean.

### 纸质版TPO5 Lecture3 astronomy



Narrator

Listen to part of a lecture in an astronomy class.



**Professor**

I'II tell you a story about how one astronomy problem was solved. It happened many years ago, but you'll see that it's interesting and still relevant. Two, three hundred years ago, astronomers already had telescopes, but they were not as powerful as those we have now. Let's say . . . they were at the level of telescopes amateur astronomers use today. Tell me, what do you see in the night sky when you use a telescope like that? Quick, tell me.

**Female student**

Planets . . .

**Professor**

Right . . .

**Male student**

Even . . . like . . . the moons of Jupiter?

**Professor**

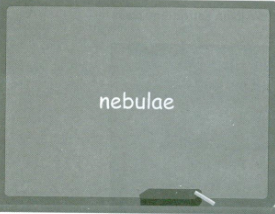
Right . . .

**Female student**

Stars.

**Professor**

OK . . . what else? , . . You think that's all? . . . Ever heard of nebulae? . . . I bet you have . . . Well, let's just, um, put it up anyway . . .



Nebulae are small fuzzy patches you see in the sky, they look like little clouds. Many of them have a spiral shape, and that's why we called them spiral nebulae . . . So astronomers in the eighteenth century . . . eighteenth century . . . when they looked through the telescope, they could see planets-and they knew those were planets . . .the moons of Jupiter-and they knew they were the moons of Jupiter . . . and then they saw spiral nebulae and they didn't have a clue.

What could those be? So, some of them thought-"these things are cloudy and fuzzy, so they're probably small clouds of cosmic dust, and they don't have to be very far away from us." But there were others who thought, "OK, the things look small and fuzzy, but maybe they're actually distant galaxies of stars, but we can't see the stars, because they're so far away and they seem so tiny that they look like dust, and even the whole galaxy looks like a tiny little cloud."



Which of the two theories do you think was more . . . uh, surprising?

**Male student**

The galaxy one.

**Professor**

And why?

**Male student**

Well, I mean it assumed that the nebulae are not what they look like at first sight. The first theory assumed that, right?

**Professor**

OK. And now tell me this . . . which one would have seemed more likely at the time?

**Male student**

Uh . . . They couldn't tell.

**Professor**

Right. Two morals here: first, there can be different explanations for the same observation. And second, "obvious" doesn't necessarily mean "right" . . . What happened next was . . . for a long time nothing. More than 150 years. No one could decide . . . Both hypotheses seemed plausible . . . And a lot was at stake-because if the galaxy theory was right, it would be proof that the universe is enormous . . . and if the dust theory was right . . . maybe not so enormous. So the size of the universe was at stake . . . Finally in the 1920s we came up with a telescope that was strong enough to tell us something new here. When we used it to look at the spiral nebulae, we saw . . . well, we were not absolutely sure . . . but it really looked like there were stars in those nebulae. So not dust after all, but stars . . .



But how far away were they, really? How would you measure that? Any ideas? Laura?

**Female student**

Well, how about measuring how strong those stars shine? Because, if the star is far away, then its light would be weak, right?

**Professor**

Yes . . . but there's a problem here. You need to know how bright the star is in the first place, because some stars are naturally much brighter than others. So, if you see a star that's weak . . . it can mean one of two things . . .

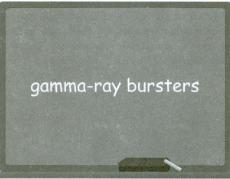
**Female student**

Oh . . . it's either far away or it's just a weak star.

**Professor**

And you can't really always tell which. But you're on the right track. There is a kind of star where you can calculate its natural brightness . . . and-you guessed it-we found some in the nebulae. It's called a variable star-or a "variable" for short-because its brightness varies in regular intervals. I won't go into detail here, but . . . basically . . . the longer the interval, the brighter the star, so from the length of those intervals we were able to calculate their natural brightness. This told us how distant they were-and many turned out to be very, very far away. So we can be sure that the spiral nebulae really are very distant galaxies-which is what some eighteenth-century astronomers guessed but didn't have the instruments to prove . . .

Now, one reason I told you this story is that today there are still plenty of situations when we see something out there, but we really aren't sure what it is. An example of one such mysterious observation would be gamma-ray bursters.



We've known about these gamma-ray bursters for a long time now, but we can't all agree on what they are.

**Narrator**

Listen again to part of the lecture. Then answer the question.

**Professor**

But how far away were they, really? How would you measure that? Any ideas? Laura?

**Female student**

Well, how about measuring how strong those stars shine? Because, if the star is far away, then its light would be weak, right?

**Professor**

Yes . . . but there's a problem here. You need to know how bright the star is in the first place, because some stars are naturally much brighter than others. So, if you see a star that's weak . . . it can mean one of two things . . .

**Female student**

Oh . . . it's either far away or it's just a weak star.

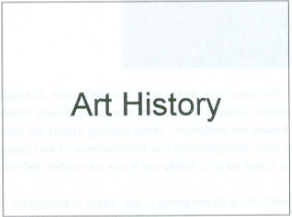
**Narrator**

What can be inferred about the student when she says this:

**Female student**

Oh . . . it's either far away or it's just a weak star.

### 纸质版TPO5 Lecture 4 art history



**Narrator**

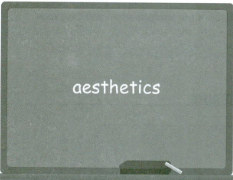
Listen to part of a lecture in an art history class.



**Professor**

Today we're going to talk about how to look at a piece of art, how to "read" it-what you should look for . . . what aspects of it you should evaluate. A lot of people think that if you stand in front of a work of art and gaze at it for a couple of minutes, you're evaluating it. But truly reading a piece of art, evaluating it properly, is a complex process, a process that takes time.

When we're confronted with a piece of art, there're several things we have to keep in mind, for example, its beauty . . . that's where aesthetics comes in.



Aesthetics is the philosophy that deals with the definition of beauty, which goes all the way back to ancient Greece. They, um, the early Greek philosophers said that beauty and art are based on imitation. Their feeling about art was that it's beautiful when it imitates life; they thought that the truthfulness of an image, how truthful it is to life, determines its value as art. Today we have a broader definition of aesthetics.

Now don't identify aesthetics as personal taste. Taste is bound by time; taste is tied to a society, a given set of moral values, usually. You may not like a piece of art from a different culture-it may not be your taste-but you appreciate its beauty 'cause you recognize certain aesthetic principles. Art generally adheres to certain aesthetic principles like balance, uh, balanced proportions, contrast, movement, or rhythm.



We'll discuss aesthetics more in detail when we look at some pieces of art together. Another thing to keep in mind in evaluating art is that art has a purpose, generally determined by the artist. You may not know what it is, and you don't need to know what it is to appreciate a piece of art, but it helps. For example, if you know what the artist's purpose is . . . if you know that a piece of art expresses the artist's feeling about a political or social situation, you'll probably look at it differently.

Now, besides beauty and purpose, what are the other aspects of a piece of art that need to be evaluated? Very simple-you examine a piece of art following these four formal steps. The first step is description . . . describe physical characteristics of the piece-like this painting is large, it's oil on canvas. Describe the subject-it's a person, it's a landscape-or predominant colors like, um, earth colors . . . that's a description.

OK? So, you've described the piece. The next step is analysis. You're looking at the piece for any universal symbols, characters, or themes it might contain. Certain symbols are universal, and the artist counts on your understanding of symbols. Even colors have symbolic significance, as you may know. And also objects depicted in a piece of art are often used to represent an abstract idea. Like wheels or spheres-they look like circles, right?-so wheels and spheres represent wholeness and continuity. I have a handout, a list of these symbols and images and their interpretations, that I'll give you later. But for now, the point is that after you describe the piece of art, you analyze its content . . . you determine whether it contains elements that the artist is using to try to convey a certain meaning.

If it does, the next step is interpretation. Interpretation follows analysis very closely. You try to interpret the meaning of the symbols you identified in the piece. Almost all art has an obvious and an implied meaning. The implied meaning is hidden in the symbolic system expressed in the piece of art. What we see depicted is one scene, but there can be several levels of meaning. Your interpretation of these symbols makes clear what the artist is trying to tell us.

The last step is judgment or opinion-what do you think of the piece, is it powerful or boring?- but I give that hardly any weight. If the four steps were to be divided up into a chart, then description. analysis, and interpretation would take up 99 percent. Your opinion is not important in understanding a piece of art. It's nice to say: I like it . . . I wouldn't mind hanging it over my couch, but to evaluate a piece of art, it's not critical.

OK. Now you know what I mean by "reading" a piece of art, and what it entails. Try to keep all that in mind next time you go to an art museum. I can tell you right now that you probably won't be able to look at more than 12 pieces of art during that visit.

OK, now let's look at a slide of a piece of art and try to "read" it together.

**TRACK 96 TRANSCRIPT**

**Narrator**

What does the professor imply when ha says this:

**Professor**

Try to keep all that in mind next time you go to an art museum. I can tell you rig ht now that you probably won't be able to look at more than 12 pieces of art during that visit.

1. [Spanish](http://en.wikipedia.org/wiki/Spanish_language) *hondo* = "deep". The name is spelt with a j as a form of [eye dialect](http://en.wikipedia.org/wiki/Eye_dialect) because traditional [Andalusian pronunciation](http://en.wikipedia.org/wiki/Andalusian_Spanish) has retained an aspirated h lost in other forms of Spanish. [↑](#footnote-ref-1)
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。 [↑](#footnote-ref-2)
3. a widespread temporary enthusiasm or fashion: *computer games are all the rage* . [↑](#footnote-ref-3)