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TPO 01

Scientists have learned some interesting things about the intellectual abilities of babies. They say there is evidence that babies as young as five month old can do basic arithmetic: that they can add. Scientists think that babies know that one plus one equals two and not one, the evidence is indirect because obviously, you can not ask a five month old baby to add up some numbers for you so they devised an experiment where in this experiment a baby is shown a doll on a table. okay, so the baby looks at the doll. Then the researcher lowers a screen in front of the doll. So now the doll is hidden behind the screen. But the baby has already seen the doll and so know it is there. Well, then the researcher takes a second doll and very obviously places it behind the screen with the first one. Okay, so now you have two dolls behind the screen, right? Well ,no. Because what the researchers did was they secretly took away one of the dolls. And then when they raised the screen back up, the baby, well, it expects to see two dolls, right? But there is only one there. And guess what? The baby is surprised. It expects two, but it only sees one. How could the researchers tell that the baby is surprised. Well, they recorded the baby's eye movements on camera. And we know that when a baby is surprised by something, a loud noise or an unexpected flash of light maybe, it stares at where the noise or light is coming from and that is what the babies in the experiment did. They stared because a baby knows if you add one doll and one doll, you should have two dolls. So, when it sees one doll, then it stares because it is surprised.

TPO 02

So, let's talk about money. What is money? Well, typically, people think of coins and paper bills as money. But that is using a somewhat narrow definition of the term. A broad definition is this: money is anything that people can use to make purchases with. Since many things can be used to make purchases, money can have many different forms. Certainly, coins and bills are one form of money. People exchange goods and services for coins or paper bills and they use this money these bills to obtain other goods and services. For example you might give a taxi driver five dollars to purchase a ride in his taxi. And he in turn gives the five dollar to a farmer to buy some vegetables. But as I said, coins and bills are not the only form of money under this broad definition. Some societies make use of a barter system. Basically, in a barter system, people exchange goods and services directly for other goods and services. The taxi driver, for example, might give a ride to a farmer in exchange for some vegetables. Since the vegetables are used to pay for a service, by a broad definition the vegetables are used in barter as a form of money. Now as I mentioned there is also a second, a narrower definition of money, in the United States, only coins and bills are legal tender, meaning that by law, a seller must accept them as payment. The taxi driver must accept coins or bills as payment for a taxi ride, okay? But in the U.S, the taxi driver is not required to accept vegetables in exchange for a ride. So a narrower definition of money might be whatever is legal tender in a society, whatever has to be accepted as payment.

TPO 03

In advertising, various strategies are used to persuade people to buy products. In order to sell more products, advertisers will often try to make us believe that a product will meet our needs or desires perfectly, even if it is not true. The strategies they use can be subtle.. friendly forms of persuasion that are sometimes hard to recognize. In a lot of ads, repetition is a key strategy. Research shows that repeated exposure to a message even something meaningless or untrue is enough to make people accept it or see it in a positive light. You've all seen the car commercials on TV like the one that refers to its roomy cars over and over again, you know which one I mean. This guy is driving around and he keeps stopping to pick up different people. He picks up three or four people. And each time, the narrator says plenty of room for friends, plenty of room for family, plenty of room for everybody. The same message is repeated several times in the course of the commercial. Now the car, the car actually looks a kind of small. It is not a very big car at all. But you get the sense that it is pretty spacious. You think that the viewer will reach the logical conclusion that the slogan misrepresent the product. Instead, what usually happens is that when the statement plenty of room is repeated often enough, people are actually convinced that it is true. Um, another strategy they use is to get a celebrity to advertise a product, it turns out that we are more likely to accept an advertising claim made by somebody famous. A person we admire and find appealing, we tend to think they are trustworthy. So you might have a car commercial that features a well known race car driver. Now, it may not be a very fast car, it could even be an inexpensive vehicle with a low performance rating. But if a popular race car driver is shown driving it and saying I like my car 's fast. Then, people will believe that the car is impressive for its speed.

TPO 04

In order for art to communicate, to appeal to the emotions or the intellect, it has to combine various visual elements to express meaning, or emotion. It's really the visual components of the work, things like color, texture, shape, lines and how these elements work together, that tell us something about the work. Artists combine and manipulate these visual elements to express a message or to create a mood. Think about how a painter might use color for example, you all know from experience that different colors appeal in different ways to the senses and can convey different meanings. An artist chooses certain colors to evoke a particular mood and make powerful statements. The color red for example, is a strong color and can conjure up strong emotions, such as extreme joy or excitement or even anger. Blue on the other hand, it's considered a cool color. Blue colors tend to have a calming effect on viewers. Another visual element important to art is texture. By texture, I mean the surface quality or feel of the work, it's smoothness or roughness or softness. Now of course in some types of arts, the texture is physical. It can actually be touched by the fingers. But in painting for example, texture can be visual. The way an artist paints certain area of the painting can create the illusion of texture, an object's smoothness, or roughness, or softness. A rough texture can evoke strong anger emotions and strength, while a smooth texture is more calming and less emotional. As I said earlier, artists often combine elements to convey a message about the work. Take a painting that, say uses a lot of strong colors like reds and oranges and uses brush strokes that are broad, wide sweeping brush strokes that suggest a rough texture. Well, these elements together can convey a wilder more chaotic emotion in the viewer then, more than, say, a painting with tiny smooth brush strokes and soft or pale colors. Artists use these visual effects and the senses they arouse to give meaning to their work.

TPO 05

Why do we do these things we do? What drives us to participate in certain activities? To buy a certain car, or even to choose a certain career. In other words, what motivates us to do what we do? Well, in studies of motivation, psychologists distinguish between two very different types. Our reasons for doing something, our motivations can be extrinsic, in other words, based on some kind of external reward like praise or money. Or they can be intrinsic, meaning we engage in activity because it pleases us internally. Both create strong forces that lead us to behave in certain ways. However, intrinsic motivation is generally considered to be more long lasting than the other. As I said, extrinsic motivation is external, it's the desire to behave in a certain way in order to obtain some kind of external reward. A child for example, who regularly does small jobs around the house, does them not because she enjoys taking out the garbage or doing the dishes but because she knows if she does these things, she will be given a small amount of money for doing them. But how motivated will the child be to continue doing the work if her parents suddenly stop giving her money for it? With intrinsic or internal motivation, we want to do something because we enjoy it or get a sense of accomplishment from it. Most people who are internally motivated get pleasure from the activity. So they just feel good about doing it. For example, I go to the gym several times a week. I don't go because I am training for a marathon or anything, I just enjoy it. I have more energy after I exercise and I know it's good for my health. So it makes me feel good about myself. And that's what kept me going there for the past five years.

TPO 06

One of the hardest parts of teaching is keeping your students' attention. Now, the key to doing this is understanding the concept of attention. Basically, there are two types of attention. The first type is active, active attention is voluntary. It's when you intentionally make yourself focus on something. And since it requires effort, it's hard to keep up for a long time. Okay, so let's say you are teaching a biology class, and today's topic is frogs. All right. You're standing at the front of the room and lecturing, a frog is a type of animal known as an amphibian. Well, this is not necessarily going to keep the students' interest. But most of them will force themselves to pay active attention to your lecture. But it's only a matter of time before they get distracted. Now the other type of attention is passive attention, when it's involuntary. Passive attention requires no effort, because it happens naturally, if something is really interesting, students don't have to force themselves to pay attention to it. They do it without even thinking about it. So back to our biology lecture, you start talking about frogs and then you pull a live frog out of your brief case. You're describing it while you hold it up, show the students how long its legs are and how they are used for jumping for example. Then maybe you will even let the frog jump around a bit on the desk or the floor. In this case, by doing something unexpected, something more engaging, you can tap into their passive attention. And it can last much longer than active attention. As long as the frog is still there, your students will be interested.

TPO 07

If a consumer has to choose between two products, what determines the choice? Assume that someone, a purchaser, is choosing between two products that cost the same. Okay? If people have a choice between two identically priced products, which one will they choose? They choose the one they think is of higher quality, of course. But what does it mean for a product to be a high quality product? Well, business analysts usually speak of two major factors of quality. One factor is reliability, and the other is what we call features. So reliability. What's reliability? Well, a product is reliable if it works the way we expect it to work. If it can go a reasonable amount of time without needing repairs. If a product, a car, for example, doesn't work the way it should and needs repairs too soon, We say it's unreliable. So product reliability means basically, the absence of defects or problems that you aren't expecting. It used to be that when people thought about product's quality they thought mainly about reliability. Today, it's different. People do still care about reliability, don't get me wrong. It's just that manufacturing standards are now so high that we'll take cars for example, today. Today's cars are very reliable. So reliability is important, but it's not going to be the deciding factor. So if reliability isn't the deciding factor anymore. What is? Features. All those extras, the things a product has that aren't really necessary but that make it easier to use or that make it cool. For example, new cars today are loaded with features like electric windows, sunroofs, air-conditioning, stereos and so forth. When people are comparing products today, they look at features. Because reliability's pretty much equal across the board. And that's why manufactures include so many features in their products.

TPO 08

Today, we'll talk about how companies determine the initial price for their products. By that I mean, when they first introduce a product to the market. There are different approaches, and today we'll discuss two of them. They are quite different, each with their own advantages. One approach or strategy sets the initial price of the product high, followed by a lower price at a later stage. Why? Well, when introducing a new product, companies want to build a high quality image for it. Products that cost more are believed to be of higher quality. So during the early stages of the product life cycle, companies can make very high profits from consumers willing to pay more for a high quality product. And although consumers know that the prices will eventually go down, they are also willing to pay more to get the product sooner. This approach works very well with, oh, innovative high tech products for example. Now just think about when video recorders or video cameras or even cell phones first came out. They were very expensive. But then they became much more accessible. Another very common strategy sets an initial price low. Now this happens when the market is already saturated with the product. And the strategy is to undercut its competitors. Say there is a newly starting computer maker trying to gain market share. So what did they do? Well, they offer a computer at an affordable price, lower than existing brands. By doing this, the company appeals to new consumers who weren't probably even interested in getting a computer, and well, of course to existing consumers who might now be tempted to switch brands. Now how does this company make profits with its low price computer? Well, one thing that's often done is to encourage their customers to buy accessories also manufactured by them, like printers or software for example.

TPO 09

We all know that insects like to eat plants. But some plants have been able to.. to develop ways to protect themselves from insects. Today I am going to talk about some ways plants defend themselves. Now, some plants have physical features that prevent insects from landing on them, like the passion plant for example, its leaves have little spiky hairs all over them. They are like spikes, sticking out of the plant that are so numerous and dense that they prevent insects from landing on the leaves. Basically there is just no room for the insects to land. And since insects can't land on the leaves they can't eat them. So the little hairs serve as a physical feature that helps protect the passion plant from insects. All right, but other plants protect themselves using chemical defenses, like the potato plant. The potato plant's able to release a chemical throughout its leaf system whenever an insect attacks it, starts eating a leaf. So saying an insect starts eating a potato plant's leaf. That will cause the plant to react by releasing a chemical throughout its leaf system. The insect swallows this chemical as it eats and this chemical discourages the insect from wanting to eat any more of the plant. How? Well, the substance makes the insect feel full, like it's already had enough to eat. The insect no longer feels hungry. So it stops eating the plant. So by emitting this chemical, the potato plant protects itself from insects.

TPO 10

Okay, we generally assume that babies can feel only very basic emotions like happiness or anger. That is that babies just react to things that happen directly to them. HoWe've, some new research is suggesting that babies may be able to feel concern for others, to have empathy for others. Now empathy is a complex emotion. It involves a baby relating to someone else 's emotions, not just reacting to things happening directly to them. Let's talk about an experiment that may show that babies could be capable of feeling empathy. Okay, for the first part of the experiment, well, oh, mm, we've always known that babies start to cry when they hear other babies crying, right? One baby in the room starts crying and all the rest join in, we've always assumed that the other babies cried because they were reacting to the noise of the crying. That the noise itself was distressing. So in the experiment, researchers played a tape recording, a tape of babies crying, to another baby, and sure enough the baby started crying when he heard the sound of other babies crying. This was no surprise of course. And the researchers assumed that the baby cried because of the noise. But the next part of the experiment was surprising. The researchers played the baby a tape of his own crying. Now it was just as noisy so the researchers expected him to cry. HoWe've this time, the baby did not cry. He wasn't upset by the sound of his own cry. Why not? Well, maybe it wasn't the noise that had made him cry before when he heard other babies' crying. In fact, maybe noise had nothing to do with it. It could be that the baby felt empathy for the other babies and that was why he got upset when he heard them crying. The researchers concluded that it is indeed possible that babies feel empathy concern for others.

TPO 11

So we are talking about interior design, ah, specifically the basic principles typically used in home and office decoration in the United States. Effective designs create a delicate balance between two things. You need unity and you also need contrast, which is essentially a break in unity. Now this might seem a little contradictory, but let me explain why we need both of these for an effective design. So for the first principle, we need unity in our design, think of it as consistency. Well, an easy and a very effective way to do this is by bringing together similar elements, a common example is by matching colors, you pick a color and use it for different parts of the room. Say you pick green, and then use a light shade of green for the walls and maybe a somewhat darker shade for the fabric on the sofa. And finally complement that with a matching green in the rug. When elements match, the room is unified and gives its residents a sense of order and comforts. Okay, but there is such a thing as too much unity. Remember you need a balance of unity and contrast, if all you do is focus on unity, the result will be a boring room. So what do you do? Well, you apply the second basic principle of design, which is contrast. Contrast serves to disrupt or break up the unity in places. But in a careful intentional way. Um, well, let's continue using color as an example. To create contrast, color contrast, you need to abruptly change your color scheme once a while. Ah, let's say, you could throw bright red cushions on your dark green sofa for example. Contrast makes things stand out. The green will look even greener next to the red. So, now your room is more interesting. Not completely the same. But watch out, too much contrast is also dangerous, just like too much sameness is. Too much contrast will make the room felt busy, chaotic.

TPO 12

So when we talk about the demand for a product, we are referring to how much consumers want to buy it, right? And often the demand for a product is influenced by its price. The more expensive it becomes, the less chance that people will want to buy it. Okay, but that's not the whole story. Sometimes, the demand for a product can also be influenced by the price of other related products. First there are those products called substitute goods, if products can be substituted for one another then, well, then, they are called substitute goods. They are similar enough to be interchangeable. And an increase in the price of one means an increase in the demand for the other, like... like butter and margarine. They are pretty much used for the same purposes. Margarine is butter's substitute. And you can bake equally well with either. Well, when the price of butter goes up, it becomes less affordable, and so what will people do? They buy margarine instead, right? So, you see, an increase in the price of butter, increases the demand for margarine. Now another instance where the price of one product can influence the demand of another is when you have two products that can't be used without each other. Those products, we call complement goods, they complement or complete each other if you will, like compact discs and compact disc players. You need both products in order to use either, so if the price of either product increases, demand for both is likely to decrease. And if the price of CDs goes up, well, demand for them will go down, right? And because CDs and CD players complement each other, what will also happen, is that the demand for CD players will go down, too.

TPO 13

Now, many sea animals, in order to hide from predators have overtime developed different kinds of camouflage to help them blend in with their environment and avoid detection by predators. Picture the surface of the sea floor, it is as varied as the land we live on. It's got peaks, and valleys, vegetation, rock areas and some sea animals have developed permanent colors or shapes to resemble these environmental features. This camouflage helps disguise them from predators by enabling them to blend into a specific part of the sea. For instance, take a kind of fish, like the leafy sea dragon, well, the name says it at all. It resembles a small green dragon with leaf like protrusions sticking out like arms. And because of its color and shape, it blends in extremely well with green sea plants. So when the leafy sea dragon is swimming through these plants, predators have trouble seeing it. But when it enters other environments, without these green plants, its camouflage doesn't work any more. Now other sea animals are difficult to spot anywhere in the sea. Because their type of camouflage enables them to change color, take the cuttlefish, a fish that's closely related to the squid and octopus. Unlike leafy sea dragons, cuttlefish have not developed any particular shape to hide from predators. But they have a lot more mobility because their camouflage allows them to blend into any environment. Because cuttlefish have shifting pigments that allow them to change color in a matter of seconds. And so they can almost instantaneously match the color of their surroundings. If they are swimming by green sea plants, they'll turn green, and if they are swimming over the brown seafloor, they'll turn brown.

TPO 14

A lot of plants and animals live near the surface of the ocean, and that means there is a lot of food near the surface, because there are lots of plants and animals to eat. But if you go down to the deepest parts of the ocean, it's cold and dark. And there is not a lot living down there. So, food is very scarce. So organisms that live down at these great depths have developed special adaptations to help them survive in this environment where food is so hard to find. For example, many deep sea organisms have body features that enable them to eat prey that are larger than themselves. A good example, aum.. There is a species of eel that has an enormous mouth and a large stomach that's capable of expanding. And these unusual features allow this eel to eat prey larger than itself. That's a big advantage because the eel eats something big. That's a lot of food, a lot of nutrition. So the eel can go for quite a while before it has to find food again. Another helpful adaptation in some deep sea organisms is the ability to generate light. And some organisms use that light to help them capture food. For example, there is a kind of fish, called the angler fish. And on its head, this fish has a little structure that produces light that glows in the dark. This little structure, this little light is positioned close to the fish's mouth. Other fish are attracted to this light, they think it's something small they can eat. So they swim straight toward it and that brings them close enough for the angler fish to capture them and eat them.`

TPO 15

Birds, have some of the best vision capabilities in the animal kingdom. Some birds species have vision that is eight to ten times greater than humans. Overall, a bird 's eyes are extremely important for its survival. One aspect of birds' eyes that play a role in helping them survive, in other words, to find food or to avoid predators is the position of the eyes in the skull. Some birds have eyes that face forward on the skull, kind of similar to how humans' eyes are positioned. Forward facing eyes allow a bird to clearly see and judge distances. Because it can focus on objects with both of its eyes. And correctly perceive height, width and depth. One type of bird with eyes positioned in the front of the skull is the hawk. Hawks eat animals like mice. Hawks have such good eyesight that they can spot a tiny mouse in the field from high up in the air. They spot the mouse and swoop down to catch it. Without such good eyesight. They would not be able to spot or catch their food. Other birds have eyes that are located on each side of the skull. This positioning of the eyes can help a bird to avoid predators. Instead of just seeing what's directly in front, they can see things that are on either side, permitting them to watch for danger in all directions. Imagine a duck waiting near the edge of a lake, it needs to spend time eating grasses and insects. But it also is on constant lookout for danger from its predator, like the fox. And eye on each side of the duck 's head allows it to see a fox approaching from either side. If it spots a fox, it can then fly away to safety. The placement of the eyes are critical in helping the duck avoid predators.

TPO 16

Okay, ever thought about the things that happen to you and what's responsible for them? We psychologists have a term, locus of control. Locus of control refers to.. um.. where people think control over their lives comes from. Whether it comes from themselves or from somewhere else. People who think that control is in themselves are internals and people who think it comes from somewhere else are externals. Let's say there are two people going for job interviews. One of them is an internal, she has an internal locus of control. Since she thinks that control comes from within herself, she will believe that her success and her preparation are really her responsibility. So she is likely to really work on her interview skills ahead of time. Then if she gets the job, she will believe that it's because she's worked so hard. And if she doesn't get it, well, she will probably be disappointed with herself and try to figure out how she can improve for the next time. Okay, and another job candidate is an external. He perceives other things, say, his interviewers to have more influence, after all, it's their decision. It depends on what mood they are in, and you know, luck. Now with his external locus of control, he is not as hard on himself so he is more likely to take risks. He might interview for a job that he is not completely qualified for and if he gets it, he will think he is really lucky and because he believes external forces are in control, he might think it's because the interviewers were having a good day. If he doesn't get it, he'll probably blame the interviewers or bad luck, rather than look at himself and try to figure out what he could have done better.

TPO 17

Now let's talk about a particular cultural process, diffusion, since the beginning of human history, diverse cultures have taken advantage of one another's innovations when they've come into contact. Diffusion is the process whereby something cultural, like a custom, a type of food or an invention, is spread from one group to another or from one society to another. One group adopts a cultural item, or more selectively just part of a cultural item of another group. You see? Now diffusion can occur through a variety of ways, military conquest or tourism, or even something like the influence of satellite TV shows around the world. For example, take something like reading a modern newspaper here in the US, have you ever thought about where the letters, the characters on the page are reading? Where they came from? They were borrowed from another culture many centuries ago. Then the printing of the words, well that process was invented in Germany, and finally the paper itself. Paper was invented in China. These innovations from all over the world were shared across cultures over time and so today we have newspapers in the US. So the process of diffusion might take place over long distances and over long periods of time. Now I am not saying that diffusion happens easily. As I mentioned, sometimes, it's selective. For instance, many people in the US have accepted the practice of acupuncture. The Chinese practice of using needles to cure a disease or relieve pain. So lots of people in the US have realized that acupuncture is effective. But few of them fully understand or have committed themselves to the philosophy behind acupuncture. Cultures tend to resist ideas which seem too foreign, too different from their own beliefs and values. But the ideas which aren't perceived as too different are often incorporated, absorbed, diffused into their culture. So the practice of acupuncture has been absorbed into US culture but not the philosophy of Chinese medicine.

TPO 18

People who are likely to buy a company's product are called target customers. And these target customers influence a company's marketing strategy. In order to develop a marketing strategy, a company will look at certain characteristics of the target customers to decide when and where to advertise so that they will reach the target customers most effectively. I'd like to talk to you today about two characteristics of target customers that can influence marketing strategy. Specifically, age and geographic location of the target customers. Say a company makes toy cars, who are its target customers? Kids, right? So if the company wants to make sure its television advertising reaches its target customers, they'd want to advertise during times when kids are actually watching television, like during children's television shows. That way it can make sure that kids see the advertisements. And that way the company would get people in that age group to go buy toy cars or to ask their parents to buy them at least. Now another important characteristic to consider is geographic location, places where the company's target customers live. Think about a company that makes boats, its target customers are people who own homes near oceans or lakes, places where they can use boats. After all, people who don't live near water don't have much use for boats. So by placing advertisements on signs along the road or on television in cities and towns that are near oceans or lakes. The company would be more likely to reach the target customers for its boats and sell more of them as a result.

TPO 19

Today, I want to talk about sea birds. Now, sea birds hunt and eat fish. And well, their food can be hard to find because their food sources spread out over a large expanse of water. So what sea birds have done is that over time they've made adaptations. They've developed special characteristics that help them find food. One adaptation involves the length of the birds' wings. The albatross, for example, is a large sea bird that spends most of its life flying over ocean water in search of food, fish to feed itself and to carry back to the nest for its chicks. Now, most birds flap their wings up and down when they fly, which uses up a lot of energy. But the albatross has these special long wings that it can hold perfectly still. It's able to fly without moving its wings up and down. These long wings allow it to glide or float on the wind. And this uses very little energy. This is important, because as I said, the albatross has to cover huge expanse of ocean to locate food. Sometimes, up to eleven hundred miles a day. Because of its long wings, it can glide along over the ocean using little energy as it searches for food. Another important adaptation of many sea birds is an acute highly developed sense of smell. Take the fulmar, like the albatross, the fulmar needs to find food that's scattered far out over the ocean, but the fulmar has a rather unusual advantage. It has tiny tubes inside the nose holes in its beak. And these special tube shaped nostrils help it to pick up the scent of food. Now this highly developed sense of smell is especially important because the fulmar's main source of food, plankton, are tiny organisms that are hard to see. But they give off a very sharp distinctive odor. So when fulmars are flying around looking for food they may not be able to see them. But they can find the plankton by smelling them even from far away

TPO 20

When people are in difficult situations, sometimes they experience feelings of helplessness or psychological pain. So what will they do? They unconsciously use strategies called defense mechanisms to protect themselves psychologically from their painful emotions. Ah, let's say a woman has a pet dog. She's had this dog for a long time. And he's kept her company and guarded her for years but one day he runs away. This woman looks everywhere and asks other people if they've seen her dog. But she just can't find him. Now she feels helpless and sad because she misses her dog. So she'll unconsciously find ways to deal with her painful feelings, one defense mechanism she might use is fantasy. With fantasy, the woman uses her imagination, so instead of just feeling helpless and sad about her lost dog. She invents a happy story in her mind. She might imagine that a nice family found him and feeds him and that he is really happy with them. She will picture the dog playing, running around, having fun because of this fantasy, she doesn't have to feel sad about her dog running away. It's a fantasy. It's not real, but it keeps her pain away. Another defense mechanism she might use is what we call sublimation, Sublimation is different from fantasy because sublimation isn't about pretending, it's about turning negative emotions into something useful, practical, so the women might start a dog training school that way by training dogs, perhaps she can help prevent other people's dog from running away like hers did. In other words, with sublimation as a defense mechanism, the woman redirects her negative feelings about losing her dog into a positive constructive activity.

TPO 21

Back in the eighteenth century, in a time known as the industrial revolution. Some countries, well, England, in particular, started using new technology, like steam powered machines to produce goods. And the use of these machines brought about some significant changes. Let's go over two main changes that occurred. One change was that the center of production moved from homes to factories. Let's take fabric or cloth as an example. Historically, for a very long time, people had made cloth by hand in their homes, earning a little money from their home based cloth production. But then these new steam powered machines for waving cloth were invented and placed in factories and these machines could wave cloth much more quickly and efficiently. So there wasn't any reason to keep making cloth slowly in homes when it could be made faster on factory machines. Thus the majority of cloth production shifted from home based business to factory production. Another result of the new technology is that cities started to forming around factories. Like, let's say there was a cloth factory that was built in a certain small village. Now, of course, the factory needed workers to operate the machines used in cloth production. So the factory would hire a lot of rural workers, who would then move from the countryside to the village. So instead of being spread out all over the countryside, the workers started to congregate in the village with the factory. As a result, the village got bigger and bigger and eventually grew into a city.

TPO 22

Many animals live underground in the soil, not just little animals like worms but also bigger animals like mammals, living underground has advantages, it protects animals from aboveground predators. However the underground environment also presents challenges, and animals that live underground have developed physical adaptations to deal with them. One challenge is well, simply how to move underground through the dirt. Another challenge for the animal is to protect vulnerable parts of its body from the environment that it's moving thorough. Now, moving through soil is not like moving through air or water. Because soil, earth is thick and dense. So animals that live underground have evolved physical features that help them move through dirt efficiently. For example the mole, a small furry mammal, has really wide super strong front feet with big claws. The mole's feet act like... like shoves so it can dig through the dirt. The claws cut into the dirt, loosen it up and then once the dirt is loosened up. The broad feet throw the dirt behind the mole as it moves forward. These shovel like front feet allow a mole to dig its way through the dirt astonishingly quickly. But even for an animal that can move efficiently through the dirt, living underground can still be problematic. Because it's easy for particles to get caught in sensitive parts of the animal's body. Like for mammals, in their eyes, so underground animals have developed adaptations to prevent this. Again, let's take the example of the mole, to begin with, moles have tiny eyes, and these eyes are covered with a thin skin, a protective membrane that's actually got hair on it. These hairs protect the mole's eyes from dirt particles. So as the mole goes digging through the dirt with its head pushed forward. The dirt particles come into contact with the hairy membrane covering the mole's tiny eyes. And the particles just slide by, don't get caught in the mole's eyes. So the eyes, the mole's sensitive parts are protected.

TPO 23

Now, plants like animals, and like us for that matter, need nutrients, substances that provide nourishment to survive, thrive and grow. We get our nutrients from the food we eat, plants though, most plants anyway absorb their nutrients from the soil, right? Through their root systems? Okay, but there are plants that don't get their nutrients from the soil, the places they grow, the soil is bad, so they get their nutrients from insects instead from trapping and digesting insects. They are called carnivorous plants. Carnivorous plants capture insects in different ways, they have different trapping mechanisms. Active traps and passive traps. A plant with an active trap, a good example is the Venus fly trap. The Venus fly trap actually moves to catch its prey, or parts of it do anyway. Its leaves, it has special leaves that are hinged in the middle. The two halves of the leaf open and close, sort of like a mouth to catch insects and on these leaves is sweet nectar that attracts insects. Insects like this sweet stuff, and when they get lured in and land on the leaf, well, the leaves spring shut. It's an active trap and the insect springs it so to speak. The leaves quickly closes and forms a little cage trapping the insect between the leaves. The Venus fly trap is then able to digest the insect and get its nutrients. But other carnivorous plants, their methods are passive they don't have any moving parts to trap things, they have passive traps, like the sundew plant. The sundew plant also produces a sweet nectar that attracts insects. Its leaves are full of little hairs that secrete the sweet substance. But what happens when insects land on the sundew's leaves to get at this sweet nectar? Well, unfortunately for the insects, the hairs on the leaves also produce a super sticky glue like substance so an insect gets stuck in them and can't fly away. It basically gets glued there, allowing the sundew to digest it and absorb nutrients.

TPO 24

Authors of fiction, short stories and novels, of course have many decisions to make when they are writing their works. One of those decisions is how they are going to narrate or tell the story, what perspective or what point of view the story will be told from. So authors need to choose a type of narrator. Some person or voice to tell the story and this narrator can affect the readers' experience when they read the story. Now the author might choose to have an objective narrator. And an objective narrator can describe what people, the characters in the story, what they do and what they say, but that's about all. So suppose we have a story, for example, that's about a man and a woman about to take a trip. When the story is told by an objective narrator, the only information that we get as readers is what the characters say to each other what they do. They get on the train, they sit down, they look out the window. That's all. And this leaves questions that force the reader to interpret the events, to fill in information and decide what the characters' conversation and actions might mean. Another kind of narrator that an author might use is an omniscient narrator. In this case, the narrator, the voice that is telling the story, knows everything, and I mean everything about the characters, so let's imagine our same man and woman traveling, but described by an omniscient narrator, not only do we, the readers know what they do and say, but we also know what they are thinking, for example, we are told that the couple is going to visit an old friend of the man's and we learn what the man is thinking. That he is nervous, because he hasn't seen his friend in a long time. That he is worried if his wife will like the friend. So an omniscient narrator provides more information and answers questions that the reader might have about the characters or the action.

TPO 25

Rocks near the Earth's surface are directly exposed to elements in the environment such as air and water, and also to conditions such as temperature change, as well as to living organisms. And this exposure to the environment can actually cause even huge rocks to break into smaller pieces. This process is called weathering. Uh, let's talk about a couple of ways weathering occurs.

First of all, rocks are often exposed to water. In cold, wet environments, rocks can break due to water freezing inside of them. How does this happen? Well, 'cause I am sure you know, when water freezes, it expands. And over time, this can lead to weathering. Um... imagine a rock with a small opening or crack in it. It rains, and water gets into the crack and stays there. Then at night, the temperature drops. And the water inside the crack freezes. This growing expanding ice pushes outward on either side of the crack, causing it to get slightly bigger. When this happens again and again, the crack becomes larger. And eventually, pieces of the rock break off.

OK. Weathering can also be caused by plants, by plant growth. If a plant seed gets blown into the crack of a rock, it may take root. And its roots will grow down into the rock. The plant roots can cause the rock to break down, uh, fracture. You may have seen this with large trees growing on top of a rock, a great example of this. Usually there is enough dirt in the crack of a rock or on top of a rock to allow a tree to start growing there. As the tree grows over the years, the tree's roots extend down well into the cracks and crevasses of the rock in search of water and nutrients. Over time, the roots get bigger and grow deeper, widening and enlarging the cracks, causing the rock to break apart.

TPO 26

When consumers are buying a product, most of the time they are not buying just the product itself. They are also buying the container the product comes in. So the design of the container is very important. It can be the deciding factor when consumers are trying to decide which brand of a product to buy. So let's talk about a couple of ways product containers can be designed to appeal to consumers.

One important design goal is to make the container as user-friendly as possible, as convenient to use as possible. Take, for example, when companies started using plastic containers for condiments, such as ketchup, mustard and mayonnaise. In the past, these products came in glass containers with lids you had to screw off. And then you had to either pour the ketchup or mustard on your food, which could be messy., or scoop it out with a spoon. But flexible plastic containers were much more convenient to use. And so they were more attractive to consumers. You just held the container over your food, gave it a little squeeze and out came the ketchup or mustard, uh, much faster and easier than having to remove a lid first.

Another important design goal is to give the container a pleasing appearance, so that consumers will feel comfortable displaying it in their home. Take, for example, a company that sells cookies. Instead of selling their cookies in a plain cardboard box, they might sell them in a nice metal box and they might decorate that nice metal box with beautiful pictures of some kind. That way, when consumers present the cookies to guests, for example, they look nice, they look classy. Attractive containers like that can make a product much more appealing

TPO 27

So, most cities of the ancient world tended to be small, often limited to the banks of a river. They had very little means to expand. These old cities couldn't really cross natural barriers like rivers or be located very far from water sources. But Roman cities on the other hand, grew much larger. How did this happen?

Well, for one thing, the Romans had more advanced technology. Let's look at a couple of Roman developments that allowed their city to expand.

One development that allowed Roman city to grow was their advanced building materials. The Romans developed a special kind of concrete, a building material that would harden underwater. And this concrete made new kinds of structures possible. Take their bridges for example. Because of this special concrete, they could build better bridges, bridges that could go across wide rivers, bridges that were big enough to transport equipment and materials with wagons and carts. So with these strong bridges, Roman cities could grow on both sides of the river, creating larger cities than would have been possible otherwise.

Another development that helped Roman cities expand was an improved way to move fresh clean water. People need the access to freshwater. And the Romans created an especially creative way to bring it to them. They built structures called aqueducts. Now, aqueducts are a series of open channels, waterways the stretched from water sources high in the mountains to cities. They were carefully planned and built so that a steady drop in altitude provided a steady flow of water to cities. These aqueducts could move a tremendous amount of water over great distances and even bring freshwater to places far from rivers. Because of this, people could have clean water for drinking and bathing without being located near a river. So cities were able to grow larger, in new locations.

TPO 28

So when we look at lakes, they seem to be permanent. We assume they'll be around forever. But in fact, lakes aren't permanent. They can actually disappear. Sometimes they disappear through natural processes, and sometimes because of human activities.

First, let's look at one way lakes can disappear naturally, and that is by gradually getting filled in with organic sediment. This often happens with lakes that have lots of plants growing in them. When the plants die, they break down into a muddy substance, which falls to the bottom of the lake. They are then replaced by new plants, which eventually also die and fall to the bottom. And over the years, all this dead plant material builds up on the bottom of the lake. And as it builds up, it starts to fill up the lake and there's less and less room left for water. And eventually, the lake gets completely filled in and disappears. OK.

And lakes can also disappear pretty rapidly sometimes as a result of human activities. For example, we know that farmers need water to irrigate their crops. And sometimes to get that water, they pump the water out of the nearby lake. They install pipes that run from the lake to their farms and they pump the water out of the lake and into their fields. That's okay if the lake is continually being refilled with rainwater or with water from streams that run into the lake. But if there isn't enough rainwater or stream water to replace the water the farmers take out of the lake, the lake will eventually dry up.

TPO 29

OK. So of course businesses want to sell as many of their products as possible. Often a business sells mostly one type of product. But sales of this product may stop increasing because most potential customers have already bought it. In this situation, many companies will try to diversify, um...to develop new or diverse products in order to increase sales. There are a couple of efficient ways that a company can diversify using some of their existing resources.

One way a company can diversify is to use an existing technology...uh, technology that they already have, to develop a new product. If a company already has the machines and technology to make a certain product, sometimes it can efficiently use that same technology to make a different product. For example, a company that makes televisions might start making computer monitors because the technology used to make these two products is very similar. So the company can use its existing technological resources to make the monitors. But with the monitors, it can reach new customers, people that wouldn't buy television screens, like businesses that need to buy monitors for their employees' computers.

Another way a company can diversify is to try to appeal to its existing customers, its customer base, with a new product. One of a company's most important resources is its existing customers and these customers might have other needs that the company could fulfill with a different product. For example, a company that sells skis might have a large customer base that enjoys winter sports, like skiing down snowy mountains. So they might start making ski jackets. That same customers that buy skis would also need warm ski jackets to wear while they are skiing. And since they like the company's skis, they might be more likely to buy the jackets with the company's name on them.

TPO 30

When we humans walk from place to place, we move on the Earth's surface, across the Earth's surface. Many animals of course, do the same thing, horses and dogs and cows and so on, all move on the surface, across the surface of the Earth.

But there are also quite a few animals that have the ability to move from place to place underground, beneath the Earth's surface. This moving around underground is known as subsurface locomotion. Subsurface locomotion has a number of benefits.

One benefit of subsurface locomotion is that it enables animals to minimize their exposure to extreme temperatures. This is very helpful for animals that live in areas with harsh climates, where it could be very dangerous to spend large amounts of time on the surface. For example, in the Sahara desert in Africa, there's a type of lizard that's able to move beneath the surface, through the sand very quickly. Because this lizard can move so easily and so quickly underground, it doesn't have to travel on the surface, where it would be exposed to dangerously high temperatures.

Another benefit of subsurface locomotion is that it can help animals capture prey. That's because animals on the surface can't see predators that are approaching underground. Our lizard in the Sahara desert is again a good example. The way it works is, when an insect is walking nearby on the surface, it produces very subtle vibrations in the sand. When the lizard senses these vibrations, it moves very quickly underground where it can't be seen towards the source of the vibrations. It then suddenly pops up right under the insect and catches it completely by surprise.

TPO 31

Even though it's cold and snow-covered, the Arctic houses many species of animals that manage to survive the harsh conditions there. These Arctic animals have adapted to the extremely cold temperatures primarily because of certain body features that help them to survive in the cold Arctic climate. Let's look at a few of them.

For one thing, many Arctic animals have developed a protective covering on their feet. The covering usually consists of fur or feathers which act as a protective layer between the cold and the animals' skin. Since they spend so much of their time on snowy, icy surfaces, whether they are standing on the ground or swimming in the water, they can easily lose heat through their feet. This is especially true of Arctic birds. A bird like the Arctic Snowy Owl, for example, has feathers on its body the way other birds do. But unlike most birds, it also has feathers all over its feet. This shields and protects the feet from the icy ground so that very little of the owl's foot actually touches snowy or icy surfaces, which helps its feet to stay warm.

Another physical characteristic that some Arctic animals share is having smaller bodies and smaller, shorter body parts. In other words, their bodies are often more compact than other animals'. And the parts of their bodies that stick out or protrude like the legs, ears or tails are smaller and shorter. And the result is that there is less body surface exposed to the cold air. A great example is the Arctic wolf. Unlike the larger grey wolves that live in warmer climates, Arctic wolves have relatively small, compact bodies that efficiently retain heat. They also have smaller ears and shorter legs so that they lose less body heat than animals with larger bodies or longer body parts. And in the climate where the temperature is below zero most of the year, that's very important.

TPO 32

Roads, paved roads are everywhere and sometimes seem like part of the natural landscape. But, of course, roads are not part of nature and, in fact, road construction can have harmful effects on the environment and seriously impact both animal life and plant life.

One harmful environmental effect of roads is that they contribute to the movement of plant species from one area to another. This causes problem for existing plants, plants already growing in that area because when a new plant species gets into an area where it wasn't growing before, the new plants compete for resources with existing plant life. For example, this happened in California with a weed called the yellow star thistle. What happened was the star thistle's seeds got stuck to the tires of cars driving down the road and the seeds were distributed to new areas. This put the star thistle in competition for natural resources, like water, with the original plant life of the area. That made it harder for the native plants to survive.

Also roads, especially major highways, can act as barriers and divide up an animal's habitat into smaller ones where there is not enough food to support the population. These busy highways, with cars speeding past day and night, act like boundaries that animals are afraid to cross. So they sometimes get shut in on a small piece of land where there isn't enough food to support them. This is a serious problem for animals that need access to large expanse of land to look for food. For example, there are these foxes called Kitfoxes that live in the southwestern United States. They hunt small animals like mice and squirrels which are spread out over large areas of open grasslands. And now, because of these roads, the Kitfox population has declined significantly because now they don't get enough food.

TPO 33

OK, so last time we were talking about the processes of starting up a business on your own. And how new business owners often encounter a lot of obstacles. But one way to get an easier start is through franchising. That's when there's already a well-known, established company and you open up a new branch of that company in a new location. Your new business will be a part of the larger established company with the same name and it'll be run just like the other branches of that company. Let's discuss some advantages of franchising.

Now, one great advantage of franchising is that the company provides training to you and all of your employees. They teach you about all the aspects of the business and you're given a plan to follow for success. So, you don't have to do the training yourself or come up with your own business plan. For example, if you're opening up a new division of a restaurant that sells pizza, say. Somebody from the company will come to the restaurant that you're opening and they'll train you and your employees in how to prepare the pizzas, how to take food orders, plus everything about how to operate the restaurant so it'll be run exactly like all the other restaurants in the company.

Another advantage of franchising is the established customer base because your business will have the same name as the company that's already well-known. It'll already have loyal customers following. So when you open a new division people will want to come because they'll be confident of its quality. So, again, let's say you're opening a new restaurant, a pizza place. The restaurant is already well-known because it has such good pizza. So when you open your own restaurant with the same name in a new location, people know your pizza's going to be really good, too. They'll go to your restaurant because they already trust they'll have a good experience there.

TPO 34

So, OK, we've been talking about frogs, and like all amphibians, frog has thin skin, which means they lose moisture through their skin easily. Now, typically, we think of frogs as living in wet environments. But for frogs who live in dry places, with desert-like conditions, this can be a problem. Frogs have been able to survive in such areas by having different physical features, special dry-climate features that help them maintain an adequate level of moisture in their cells and avoid drying out.

Some frogs do this by preventing water loss through their skin. By creating a sort of covering over their skin, they greatly reduce their skin's exposure to the dry air. The covering acts like a barrier that locks in moisture. For example, some frogs secrete a substance through their skin, a fatty substance that they rub off over their skin using their hands and feet, which creates a waxy layer all around their bodies that's almost completely water-tight.

Other frogs maintain an adequate level of moisture through a different physical feature, one that allows them to store water inside their bodies for later use. A specially modified internal organ inside their bodies enables them to have a high water-storage capacity. So the frogs are able to absorb and store moisture during wet rainy times which they can rely on to get through dry periods. The aptly named water-holding frog, for example, has a bladder that is highly elastic and stretchable. When it does rain, the frog absorbs water through its skin and its bladder stretches to hold this extra water. The water is then slowly released from the special bladder into the frog's internal tissues until the next rain which might not be for several months.

TPO 35

Okay. So as we know, archaeologists discover objects from past civilizations, stuff like old pottery, old tools, even sometimes, old bits of fabric, and they examine these artifacts to learn about past civilizations. But why are some artifacts preserved well enough to last for thousands of years, while others just wear away and disappear? Well, a lot of it has to do with the environmental conditions in the area where the artifacts are found.

Artifacts are preserved better in environments where the bacteria that cause decay are less likely to grow. So let's look at two environmental conditions that discourage bacterial growth and thus help preserve archaeological artifacts.

One environmental condition that inhibits bacterial growth and helps preserve artifacts is aridity, um, lack of moisture. Bacteria that cause decay can't survive well in dry environments. And artifacts don't decay as fast in arid climates without much moisture, so many of the best preserved archaeological artifacts have been found in such climates.

For example, in the deserts of Egypt, archaeologists have found tombs more than two thousand years old with brightly colored wall paintings in them. And those wall paintings, well, their colors were still as clear and bright as a painting made today.

Another environmental condition is lack of oxygen. Bacteria, like all living things, depend on oxygen to grow. So when there's no oxygen present, they can't grow and cause decay. So artifacts are usually well preserved when they end up in environments that contain little or no oxygen, like, for example, the bottom of the ocean, which is where archaeologists found an ancient ship that had sunk and settled into the mud at the bottom of the Mediterranean Sea. The ship was carrying vases and the vases were still intact and remarkably well preserved.

TPO 36

So, we know animals in many climates have to develop strategies; ways to protect themselves when the weather becomes especially hot and dry in the summers. Let's start talking about how one small creature, a snail, can do this. Now, as you know, a snail is a very small creature with a soft, moist body, most of which is protected by a hard shell. A snail is a good example of an animal that has developed certain strategies for coping with high temperatures and drought, or lack of water. First, to avoid the heat when the sun comes out, snails move into the shelter of vegetation ... you know, plants or leaves, to get out of the sun and into the shade. Now, of course the ground can become very hot in the sun. It absorbs and radiates heat, so snails will move up off of the ground to places where it is cooler. They may attach themselves to a wall or a tree where it is cooler than on the ground. Now, it's not just heat that snails need to worry about. They also need to avoid drying out due to lack of water, so during a really warm, dry day or during the summer months, snails secrete a sticky, slimy substance made up of calcium and it covers the opening of their shell; covers and closes it up. This keeps the moisture inside the shell and prevents the snail from drying out. Snails can stay inside their shells closed up like this for a long time, even several months if it's a really dry summer. Their bodies, well everything slows down and so they don't need food. They can survive on what food they've stored up, but when it rains and water is available again, the snail opens up its shell to get some.

TPO 37

So last class we were talking a bit about the history of photography and as I was saying, with the invention of the camera in the mid to late 1800s, for the first time people were able to record realistic images. Up until then, painting, portraits, landscapes, were the way that realistic images were recorded; the image of a person's face, the painting of a mountain range, but with the invention of the camera, now there was this new piece of technology; this machine that took realistic images and this had an enormous effect on painting. One effect was that painters began using photographs as a tool; a tool to help them paint more realistically. Before the camera, it was extremely difficult to realistically depict a moving object in a painting, but now photography was able to capture fleeting moments; freeze them in time and painters were able to use these photographs as a basis for their paintings. For example, the legs of a horse as its running. Photography could now capture the exact position of a horse's legs in midair, which a painter could use to more realistically create a painting of horses galloping . Photography also affected painting in a more conceptual way. The fact that cameras could now perfectly record realistic images led some painters to change their style; to stop painting realistically and adopt a more abstract way of painting. An abstract style enabled painters to contrast their art with photography, to set their art apart from the art of photography. They didn't want their paintings to look anything like photographs. They wanted their art to be more imaginative, more abstract. For example, if a painter were painting people f he or she might not use natural skin tones for the skin and instead paint the people's skin unnatural colors, like green, purple, or blue, which of course is not realistic.

TPO 38

So, we've been talking about life in ancient times and today I want to discuss an important aspect of ancient civilizations: the economy. As the economies of ancient civilizations developed over time and became more complex, certain changes tended to occur. Lets talk about a couple of the changes that happened as the economies of ancient civilizations developed. One of the key economic changes was in the way that people paid for goods and services. As their civilizations developed, many began to use currency, money, to pay for goods and services rather than trading with each other. A monetary system made it easier to make purchases because people could buy from anyone, not just those that wanted to trade. So, for example, say a man who baked bread wanted a new coat .Well, with a monetary system, the man could buy a new coat from the coat maker with money. This was better than trading because the coat maker might not want to trade a coat for the bread maker's bread. Now, another economic change was that ancient civilizations began to acquire items from far away. In the past, people would only trade locally, but as their civilizations developed, they began trading with other people in distant places, so they were able to acquire goods they wouldn't have otherwise. For example, the ancient Romans never had silk fabric until they started trading with the Chinese who lived a great distance from them. Once the Romans started traveling far away to China, they could acquire silk, which was highly prized by the Romans because you just couldn't get it anywhere nearby.

TPO 39

There are certain animals that live high in the mountains, at altitudes of above the tree line where trees don't grow. And moving around in this mountainous environment can be challenging, because the mountain slopes can be very steep and rocky. Besides that, there's often ice or snow making these rocky slopes slippery and dangerous. So animals that live at high altitudes have special features that help them move around in this difficult mountainous environment.

So for one thing, many mountain animals have strong muscles that help them climb up and down the steep slopes. As they are moving around looking for food, they have to climb up these really steep mountain sides at a dramatic incline and get down again too. For many animals, this would be a real problem, requiring great strength and balance. Um, mountain goats, which live high up in the mountains in parts of North America. Mountain goats have a large, well-muscled chest and front leg area, and these big developed muscles in this area help them pull themselves up these near vertical slopes and balance in tight positions when climbing down.

Also, mountain animals often have specially adapted feet that help them keep from slipping when they're walking over ice or rocks. High altitude mountain slopes can be very slippery, especially when there are snow or ice on them. And it's a long way down if they fall. So mountain animals need to have a safe, sure footing. Take the bighorn sheep for instance. These sheep have special toes that move independently so they can dig into the rock and ice and the back parts of their feet have special round rubbery pads that help them grip the surface of the rock or ice to prevent sliding as they move around.

TPO 40

All right. So...um...a good salesperson needs to know how to talk to customers effectively.

Sometimes customers looking to buy products will raise concerns, things that may be keeping them from buying the product. And salespeople stand a much better chance of selling their products if they can effectively address these concerns. Let's look at a couple of strategies they use to address customers' concerns.

Okay. Now one strategy is to point out something special about the product. Something that outweighs the customer's concern, like a special feature. Like, say a customer is in an electronic store, and a salesperson is showing her a portable laptop computer. The customer expresses a concern saying the computer is expensive. Well, that's true. But the salesperson can provide information to outweigh the concern about the price by pointing out how fast the computer is, how much work it can get done in a short time. This special feature may outweigh the customer's concern, convince her that it's worth the price. So she's more likely to buy it.

Now another strategy is to demonstrate something about the product, actually use the product in front of the customer in response to a concern. Going back to the electronic store example, say the customer raises concerns about whether the laptop is portable enough, that it looks like it would be difficult to pack up and carry. Well, the salesperson could address this concern by unplugging the computer, putting it into its carrying case and slinging it over his shoulder, right in front of the customer. That is, he can demonstrate how easy it is to transport. This demonstration may help eliminate the customer's concerns about buying the computer.

TPO 41

Children like to play. Everybody knows that. When kids play, they have fun. But there's more to play than just having fun. Play is also important if kids are to develop in an emotionally healthy way. From a psychological perspective, well, let's talk about two reasons psychologists believe play benefits kids.

First, play helps children feel more in control. Why? Well, some psychologists have suggested that small children often feel helpless. They have to depend on other people, adults, for everything. They've got very little control over their own lives. Parents decide when they eat, what they eat, what they wear. This constant state of dependency can make kids feel uneasy and anxious. But when kids play, they're able to control their world of play. They decide...oh...which toy they're gonna play with and how they're gonna play with it. Maybe they take some building blocks and make a building out of them. They are constructing something with no help at all. So according to this theory, playing gives children a sense of being in control and they don't feel so helpless.

And here's another way play contributes to healthy psychological development. It gives children a safe way to explore certain urges, desires they have, but ones that don't represent...well...typically acceptable behavior. For example, uh, take the urge to be destructive.

All kids have this urge, but if they try to act on it and start actually breaking things or messing things up around the house, their parents will get upset. But kids are naturally curious. They want to explore what it's like to be destructive, but they don't want their parents to be upset with them. So by acting out destructive behaviors during play, the problem is solved cuz in play, they're allowed to be destructive. Think about it. Think of the example before where a kid builds something out of blocks. Isn't it really common to see a kid build a tower or something and then just smash it all down? Destructive in a way, but no harm done, right?

TPO 42

What happens, biologically speaking, when a major climate change occurs? Well, scientists generally agree that the extinction of various animal and plant species is one very likely effect. This has happened in the past. An example is, is the disappearance, 35,000 years ago, of a giant Australian bird, called the thunderbird. Now, now, these birds were so big they couldn't fly. But as I was saying, many scientists are convinced that it was a change in climate that caused this species to become extinct. Here's the evidence. Here's why scientists think it was a climate change. Researchers have discovered an enormous number of 35,000-year-old thunderbird bones, all together in one spot. The bones were found near an ancient, dried-up lake. Now, it's really rare to find so many bones from the same species in one place, but there it is. You have all these 35,000-year-old thunder bird bones all together near this dried- up lake. So what's the explanation? Well, many scientists believe that a change in the Australian climate may be behind this. Their hypothesis is, they think that during a very long, dry period, when there was no rainfall, the birds may have flocked together at this lake. You see, during a drought, animals tend to gravitate towards the last few remaining water sources. But then if it still doesn't rain, if the drought lasts too long, the water source may dry up too. And...and if that happens, the animals that have gathered there...well...well...well...they die. Scientists think, this ancient lake, where they found the bones, was one of the last remaining sources of freshwater during the drought. So that's where all these birds gathered. They survived there for a time, but eventually the lake dried up. And well...that was it. By the time the drought ended, the species was extinct.

TPO 43

Okay. So we've been talking about what most animals do when they need food. They simply go out and look for it.

But some animals do something entirely different when they need food. Surprising as it may sound, some animals actually spend a great deal of time taking care of their own food source. They cultivate it, sort of the way human farmers would. So it will keep growing until it's ready for them to use.

Let's start with an animal that cultivates plants. There's a certain fish - it's called a damselfish - that likes to eat a special kind of seaweed. So wherever a patch of this seaweed grows, there will usually be damselfish swimming above and around it. Now the fish are there to provide protection from other plants so the seaweed can grow and then regrow as the damselfish eat it. For example, if other plants start growing over the seaweed blocking sunlight. The damselfish remove those plants by biting off the parts that are getting too tall. So by protecting the seaweed from being overrun and damaged by other plants, the damselfish always have a supply of food ready to use.

Now, some animals don't cultivate plants; they take care of other animals as a source of food. Take ants for instance. There are some species of black ants that care for tiny insects called aphids. These aphids produce a sweet liquid that the ants like to eat. So ants guard the aphids from being eaten by other animals and help feed the aphids. In fact, sometimes the ants even carry aphid eggs back to their own nests and raise the young aphids there. Then the aphids grow and produce the sweet liquid that the ants eat. So the ants make use of the aphids as a reliable source of food.

TPO 44

So we've been talking about forest fires. And usually when a forest fire occurs, the animals in the area will of course run away, flee as fast as they can so as not to get hurt by the flames. Some animals, though, actually benefit from forest fires and so will seek them out because forest fires can be helpful, can help them fulfill certain survival needs.

Let's discuss two benefits forest fires could have for these animals.

One benefit is that they can make it easier for predators to find food. A forest fire will force animals out of their hiding places and out into the open, which predators take advantage of because fleeing animals are much easier to catch than they normally are when they are hiding. For example, scientists have observed wild turkeys doing this. These birds will go to the edge of a forest fire and wait there in order to catch all the insects running out of the burning forest, which is a much easier way to catch insects than the normal way of pecking for them on the ground.

Another benefit forest fires could have is to help provide a good place for the development of young animals. Forest fires can make an otherwise harmful environment more suitable for their development. For example, some trees in the forest are poisonous to beetles. They have a special chemical that keeps beetles away. But after a fire, beetles will seek out these trees because the trees are dead and beetles are able to lay their eggs in the trees without being hurt by the chemical. The young beetles use the trees' nourishment until they mature into adult beetles.

TPO 45

So we've talked a little about how fish use senses like vision, touch and so forth, but what I want to talk about now is a special ability some fish have. The ability to produce electricity in their bodies. You are probably familiar with these fish, these fish that send out electric currents from their bodies naturally. So what's the purpose of this? Well as you might expect, it can serve some important roles in helping fish survive.

First, fish, like all animals, need food to survive. Well, the ability to produce electricity helps some fish to capture prey, you know, other organisms in the water that they eat. Take the electric eel for example. The eel produces a strong electric current in its body. When the eel comes into contact with one of the smaller fish it depends on for food, the electric current that it sends out shocks the smaller fish and paralyzes it. It's not able to get away from the eel. The eel captures the fish easily and can eat it at its leisure. So this ability to use electricity to capture prey ensures that the eel gets the food it needs to survive.

The ability to produce electricity also helps fish to successfully navigate their environment by detecting nearby objects. Some fish have poorly developed eyes. And the water they live in can be muddy and dark. Now, there's a fish called the knife fish that produces electricity. This creates an electric field around the knife fish's body. When the knife fish swims close to, say a rock, it sends a disturbance, um, an interference in its electric field. The fish then realizes that there's a rock nearby and that it has to avoid crashing into it. Once this happens, the knife fish swims away from the rock and thus avoids harming itself.

TPO 46

When we think about the past, when we try to remember the past, we remember some things better than others. Why is that? Well, there are a few different explanations.

One explanation is that we remember something better if we already have some previous knowledge about it, some previous understanding of it. For example, let's say you are going to go to a classical music concert. If you don't know anything about classical music before you go to the concert, you probably won't remember many details of the concert later on. For example, if somebody asks you about the concert a year later, you probably won't remember what pieces the orchestra played, what order they played them in and so on. On the other hand, if you already know a lot about classical music before you go to the concert, for example, if you've been studying and playing classical music for many years, it's probably going to be much easier for you to recall the details of the concert later on.

Another explanation is that we remember better when there's something unusual or different about what we are trying to remember. For example, let's say you are in a class at a university, a big class with over a hundred students in it. A year later, which of those a hundred students are you mostly likely to remember? Probably the ones who were unusual or different in some way, maybe a man who was exceptionally tall, or a woman who was exceptionally intelligent. The fact that these students were somehow different from the other students will make them easier to remember.

TPO 47

When early humans wanted to eat meat, they hunted wild animals. That's how humans got meat for thousands of years. But then around 10,000 years ago, humans began to domesticate animals, that is, they began to control animals, to feed them, to raise them. And the domestication of animals had a number of benefits for early humans. Let's talk about a couple of these benefits.

One benefit of animal domestication was that it provided early humans with a more consistent and reliable source of meat. When early humans hunted wild animals, sometimes they were able to find and catch the animals, but other times they weren't. So the wild animals were not a reliable source of meat. But with domesticated animals, meat was always available.

For example, goats were one of the first animals to be domesticated. They were easily controlled and organized into herds led by a person, a shepherd. So they could accompany groups of people as they moved from place to place. And whenever the people needed meat, they could eat the goats. They were always available.

Another benefit of animal domestication was that domesticated animals could supply a variety of foods other than meat. When early humans hunted wild animals, the only kind of food they got was meat. But domesticated animals were able to supply, in addition to meat, other kinds of food products.

For example, let's take a look again at domesticated goats. Live goats produce milk, so early humans could collect the milk and drink it. And they could also process the milk and turn it into other kinds of food, like yogurt and cheese, which could be stored.

TPO 48

Okay. So we have been discussing how companies use advertising to help sell their products. Now although advertisements can benefit companies, there are people who are critical of advertising because of certain environmental problems it can cause. So let's talk about two ways advertising can be seen to negatively affect the environment.

One way is by wasting natural resources, like trees, by advertising to consumers who do not have a need for the product or service. The advertisement is irrelevant or useless for them. For instance, a piece of mail I got advertising a kitchen renovation service. A whole big booklet, lots of paper, about different ways to remodel your kitchen: changing the floors, adding new cupboards or appliances, but this was all a lot of wasted paper, wasted trees because I don't even own my place. I rent an apartment. So a kitchen renovation service is irrelevant to me. I can't use it. And I'm sure that booklet was mailed to lots of other people who also rent and who just threw the booklet into trash because they have no need for a kitchen renovation.

Now, additionally, advertising can have a negative effect on the natural beauty of the environment. People are often less able to enjoy the beauty of the natural surroundings if there are large advertisements blocking their view of the landscape or distracting them from the natural beauty around them. Let's face it. No matter how beautiful an area of nature is to begin with, its beauty is damaged by visible advertisements. So...like, for example, this happens with big advertisements on the side of roads, huge billboards. Say there's a road passing through a beautiful area in the mountains, but there are all these big billboards advertising restaurants and products along the side of the road. The land is naturally very beautiful, but you can't fully appreciate it. The big billboard advertisements get in the way.

TPO 49

So of course many animals live in groups with others of their species. And there are benefits to living together in groups. It can help animals survive. But there are also certain disadvantages. So today we are going to talk about two disadvantages of living in groups for animals.

One disadvantage is that animals that live in groups may be more visible to predators. If there's a big group of animals, predators are more likely to spot them than they would an individual animal on its own. So sometimes animals in a group may be more vulnerable to being captured by predators. For instance, Sardines, really small fish, swim in groups, and other larger ocean animals, like some kind of whales, eat them. So while a whale probably wouldn't notice one Sardine, it would see a group of Sardines very easily and thus be able to capture them for food.

Another disadvantage has to do with caring for the young. In a large group, there are a lot of young animals around and it can be difficult for animals to find or identify their own young. And they may end up taking care of other animals to young instead. So their own young may not get the care they need. For example, some bats live in caves. And with one type of bat, millions of them live together in the same cave. And with young bats so crowded together in the cave. It's sometimes hard for a mother bat to find her babies. So when a mother bat returns from finding food to feed her babies, she might end up feeding the babies of another mother bat, meaning her own babies don't get fed.

TPO 50

So, we've been talking about how animals have developed different ways of surviving and one way is from having developed special physical characteristics that help protect them from the dangers in their environment. These are known as "protective adaptations" and there are two different kinds. Some animals have "defensive adaptations" and that means they protect themselves by having body structures that make it hard for predators to get at them, and other animals have "offensive adaptations", body structures that keep predators away.

Alright. Let's talk with the turtle. It's a good example of an animal with a defensive adaptation. Since you've probably all seen turtles you already know that it has a hard shell that covers its back and vital organs. Its shell is its special characteristic, and it's so strong it won't break or split open, making it very hard for a predators to get at it. The turtle also has a flexible neck so it can pull its head down under its shell. Its legs can also fold up under the shell and provide more protection still.

Alright, but now let's talk about the porcupine. That's an animal that protects itself with an offensive adaptation by threatening a predator with physical harm. In case you haven't seen a porcupine recently, just imagine an animal with a small body that is covered with thousands of long sharp needlelike quills. Those quills are its special physical characteristic. So whenever a predator gets too near, when it brushes against the porcupine, those sharp quills come loose and become imbedded in the predator's skin. So predators know enough to stay away because they see the porcupine's threatening quills and they don't want to risk being hurt by them.

TPO 51

Ok, so, many animals benefit from living in groups. It provides them with protection from predators and with social companionship. So it's important for these animals to maintain their group's unity. They need ways to either avoid conflicts or if they do occur to resolve them peacefully. To help them achieve this, many animals use what are called display behaviors. These are behaviors that are mostly for show, symbolic behaviors that send a message to the other animals and help maintain their group's unity. One way is through the use of threatening display behaviors. Threatening display behaviors are used to communicate a warning but they aren't meant to really harm other animals; rather they help animals avoid fights. Some monkeys, like Baboons for instance, frequently use threatening display behaviors. Like, well let's say, two Baboons find some fruit and they both want it. One Baboon, maybe the first Baboon to see the fruit, might stare at the other one and make threatening noises, grunts to let the other Baboon know it wants the fruit. Because the other Baboon understands the meaning of stares and grunts, it can give up the fruit without a fight. And this behavior benefits the group by preventing conflict. But sometimes physical fights do occur and animals need a way to reconcile afterwards to make up to ensure that everyone in the group continues to get along. In these cases, an animal might use friendly display behavior to restore group unity. Let's return to the Baboon example. Let's say the two Baboons do end up getting into a physical fight over the fruit. After the conflict, the two animals need a way to resolve things. So what they do is approach each other while making friendly noises and may even hug each other as if to say everything is ok now, I'm not angry with you anymore. And through this friendly display behaviors, friendly noises or hugs, the Baboons can make up and the group can go back to normal.

TPO 52

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

OK, so what are some of the most effective public policies when it comes to fighting environmental problems? There are a lot of different approaches but...this is, in my opinion, too often we underestimate how much can be accomplished just by appealing to people's sense of moral duty, to their civic duty. In other words, getting people to voluntarily stop polluting because, well just because it's the right thing to do. These programs that try to get people to voluntarily stop doing things that hurt the environment are called moral suasion. Now, obviously this type of approach won't be effective for all problems but it will solve some. For some environmental concerns, moral suasion has been very effective. The classic case is, well, Smokey the Bear. Now, don't laugh. When the forest service first came out with the "Smokey the Bear" campaign, it may have seemed a little childish. You remember the character, the bear dressed up like a foreign stranger, saying things like please don't hurt my animal friends or please don't start forest fires. Well, it worked. It worked because it made people more sensitive to these problems. This "Smokey the Bear" campaign, this kind of campaign in general raises people's awareness of the problem and appeals to their sense of moral duty, to do the right thing. Another good example of this is recycling. In the early days of recycling, local community promoted these voluntary efforts. They make people aware of the need to reduce the amount of garbage by recycling. They provided neighborhoods with containers to put their glass and newspapers in instead of throwing them away. Some people started doing it, and others followed. Maybe people thought I have this recycling container, my neighbor is doing it, I should do it too. Nowadays, of course, everyone recycles. The point is, in order to get people to really do it, to get high rates of compliance, the program heavily relied on moral suasion.

TPO 53

Everyone knows food can become spoiled, go bad and become inedible. Usually the cause is harmful bacteria that grow naturally in food. So one of the best ways to prevent food from spoiling is to slow down bacteria growth. But how do you do that? Well, what influences how fast bacteria grow? Mainly it's temperature and moisture. So if you want to prevent food spoilage, you need to slow bacteria growth by controlling these factors. Why is controlling temperatureso important? Because the bacteria that cause food spoilage grow fast at warm temperatures, and more slowly at cooler temperatures. When your food is kept cool, it lasts longer right? For example, fresh fish left out in the sun on a warm day will spoil in a few hours, but if you freeze the fish, it will keep for months and months, right? That' s because low temperatures drastically slow down bacteria growth. Now I said that moisture is another factor you need to control, and every living thing needs moisture, and bacteria are no exception. Food that's high in water content provides the moisture that bacteria need to grow. Let's ...uh let's compare two different kinds of milk, ok? Let's compare regular liquid milk with dry powdered milk. Regular milk spoils quickly right? But milk in powder form can be stored quite a long time, in fact, for years. Of course, bacteria are present in powdered milk too, but what's different between powdered and regular milk is the water content. Powdered milk has had the water, the moisture removed. And without moisture, bacteria can't grow. And this isn't truth just for milk, just about any fresh food will spoil more quickly than the dried food.

TPO 54

Most animals, including humans follow biological cycles that are 24 hours long. Now what determines these 24-hour cycles? Do animals have something like a 24-hour clock inside them? Or are biological cycles determined by external factors, like the alternation of daylight and darkness. Well, research suggests that the answer is somewhere in between. Animals do have an internal clock, but external cues are important, too. Take flying squirrels. Flying squirrels are nocturnal. They are active during the night and sleep during the day. But in the experiment, some of these squirrels were kept in constant darkness. They were not exposed to any daylight for about a month, now do the squirrels continue to follow regular cycles of activity? Actually, they did. They continue to have regular patterns of sleeping and waking. This indicates that animals do having an internal clock which regulates their activity cycles. But...um, the internal clock is not precisely 24 hours long. Instead of following 24-hour cycles, the squirrels followed cycles that were about half an hour shorter than that. So every day they woke up a little bit earlier. Without external cues, without sunlight to fine-tune their internal clocks, the squirrels ' biological cycles drifted. So eh, what happened when the squirrels were exposed to daylight again? Well, after a month of darkness, a month of waking up half an hour earlier each day, the squirrels' activity cycle had shifted a lot. So, at first, their schedules didn't match up with the normal day. They weren't active during the nighttime as flying squirrels usually are. Instead, they were waking up in the middle of the day. But after a while, the squirrel cycles began to change. Gradually, external cues, the cycle of light and darkness adjusted their internal clocks. So, eventually, um...they were brought back into a normal 24-hour schedule.