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Listen to part of a lecture in an economics class. The professor has been talking about international trade. (P=Professor. S=Student)

P: Ok, so let's recap from yesterday. Why do nations engage in international trade? Well, It's often because they have a surplus more than they need, and they also trade for the opposite reason when they have shortages and can't produce everything they want or need domestically. So these explanations are good as far as they go. But there's another scenario we need to discuss. And that is what if a country is capable of producing something it wants or needs, but it can also import that same product from another country? Now, how does the country decide whether to make the product itself or import it?

Ok, take an example. Um. Think about the bananas that you buy in the supermarket. If you look closely, you'll see that most bananas in the united states are imported, imported from countries with tropical climates. But the united states has warm regions. It has green houses. Clearly, it would be possible to grow bananas here. So why doesn't the US do that? Scott?

S: Well, it's like a lot cheaper and more efficient for countries with tropical climates, for tropical countries to grow bananas, isn't it? I mean, they don't need greenhouses to grow bananas, and they're not so limited to certain regions.

P: Okay, good. That's exactly right. Tropical countries have what we call an absolute advantage in producing bananas. Absolute advantage is the term we use when a country can produce more of a product using fewer resources. They're the most efficient producer of something. And the united states can't be that with bananas. So it's better off specializing in other goods that it can make more efficiently. Let's take an example. Say we have two countries and say they each make only two products, and they trade only with each other. Simplistic I know. But well, you'll see where I'm going with this in a moment. Ok. So as I was saying, two countries, two products, one country can produce both products more efficiently than the other country. Should these two countries even trade at all?

S: Uh, well, no, I mean, like, what's in it for the more efficient country?

P: Well, what is in it for them? Let's, uh, well, let's call these countries um, X and Y. Country x makes both TVs and chairs more efficiently than country Y does. It has an absolute advantage in producing both commodities? No question. But what economists also look at is relative efficiency. And from that perspective, we see that country X is a lot more efficient at making TVs than it is at making chairs and in country Y. Ah, well, it turns out they're more efficient at making chairs than TVs. So we say that country Y has a comparative advantage at chair making. And country X has a comparative advantage at TV making. So what should happen?

Well, first, both countries should specialize in the production of just one thing. The product they're most efficient at making. Country X should make only TVs and country Y should make only chairs, then the two of them should trade. Specialization and trade are going to lead to increases in production and increased overall supply of goods and generally lower prices. Right?

S: Professor, I still don't see how countries figure out when and where they have a comparative advantage.

P: Well, you can't fully understand the concept of comparative advantage without also considering the related concept of opportunity cost. Opportunity cost is what you lose, uh, the options you have to give up in order to use your time and resources for something else, countries can determine where their comparative advantages lie, uh. like making TVs instead of chairs by figuring out what they can make with the lowest opportunity cost. Ah. you know, maybe this will be clear if we apply it on a personal level. Now think about when you go out to a movie. your direct monetary cost is the price of the movie ticket. Right? But you also spend two hours at the theater. Your opportunity cost includes both, uh, whatever else you could have spent your money on. Um, ten candy bars may be and whatever else you could have accomplished during the time you were watching the movie, uh, you might have completed your homework for this class, or you might have work two hours overtime at your job, thereby earning instead of spending money. See, these lost possibilities are your opportunity cost.

L2

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

As you know, from your reading and air masses. Uh, it's a large body of air that's got uniform properties in terms of temperature and moisture. There are four types of air masses. And the one will concentrate on today is the continental polar air mass. Continental polar air masses originate form over continent near the poles over areas that are typically cold and dry. And it's the polar air masses from the arctic in northern Canada that largely influence weather patterns in the united states, especially in the eastern.... east of the rocky mountains.

Now, these continental polar air masses are not generally associated with heavy precipitation. In fact, since they generally remain dry and cold throughout their track across north America, they bring the mostly clear skies and cooler temperatures we see throughout most of the eastern united states during the winter months. However, when a polar air mass sweeps across the great lakes region in late autumn and winter, it can bring extremely heavy snow falls to that region. We refer to the snow storms as lake effect snows, snows whose moisture comes from the great lakes themselves.

Let me explain how this happens. But first, here's a map of the region. You see Rochester on the southern shore of lake Ontario and buffalo and the far eastern shore of lake Erie. These two cities are among the snowiest cities in America, thanks largely to the lake effect. Over one recent ten year period, Rochester and buffalo each received like twenty seven meters of snow. It's nearly ninety feet. Okay, let's turn to the other pair of cities on this map, Thunder Bay and Marquette.

As you can see, they're both on the shore of lake superior. But Marquette consistently gets two to three times more snow than thunder bay. Why? Uh, basically what happens is that during the summer, bodies of water, especially ones as large as the great lakes, absorb huge amounts of energy, both from the sun and from the warm summer air that's passing over them. So the lakes become these giant reservoirs of heat, whereas the land around the lakes, well, land doesn't store heat as effectively as water does. As a result, during the cold seasons fall and winter, the land loses its heat quickly. the land gets cold fast, and as you go farther north, it gets very, very cold. But the lake store heat more efficiently, so they stay warmer longer. So eventually you get these significant temperature disparities between the lakes and the land that surrounds each one. There can be about an eight degrees Celsius temperature difference at the southern great lakes, and up to about a seventeen degree disparity farther north, where the water is still warm. But the land is particularly cold. Then, here comes the dry continental polar air mass, cold air, moving southeastward across the fairly warm lakes. Polar air masses generally move from the north and west to the south and east. Okay, and warm air rises, right? So the warm, moist air from the lake rises up into the cold, dry air above it. Then the difference in temperature inside the air mass creates instability and unstable and turbulent situation in the atmosphere. As the warm air rises through the cold air, it cools down and condense, is forming clouds. In the clouds, snowflakes form, and snowfall occurs over the lake and on the downward shores. And because they're downwind, cities to the south and east of the great lakes will get more snow. So because of their location, Marquette, Buffalo and Rochester get buried each winter, while Thunder Bay on lake superior is northern shore doesn't get hit as hard.

Oh, uh, I should mention that many scientists predict that lake effect snow storms will increase in frequency and intensity over the course of this century. They pointed out that the average temperature of the great lakes surface waters increased during the last century, while ice cover decreased. So if this continues, which we certainly can't rule out, there will be less lake water freezing and more that evaporates into the continental polar air masses for longer periods of time each winter. So winters around the great lakes will keep getting wetter. which means more snow, or does it? Well, let me point out that if air temperatures keep increasing in the next hundred years, polar air mass temperatures will too. And winners will be much milder and get snow. Even though these areas get a lot of precipitation, the air would still have to be cold enough to support snow fall as opposed to rain.

L3

Listen to part of a lecture in a zoology class. (P=Professor, S=Student)

S: Um, professor? we were talking about the principles of classification, how uh, some types of animals are related to other animals and um, similarities between different kinds of animals. But I was reading the textbook last night and it mentioned that um, there lots of animals that are related to each other, even though they have some major dissimilarity. Could you talk about that a little bit?

P: Sure, and I'm glad you brought that up. But first, um, out of curiosity, are any of you from the south western part of the united states? No ? Well, then I'm probably explaining something a little new to most of you, because when you ask about that, the example that jumps to my mind is uh, one type of lizard, the Hela monster. Hela monsters pretty much all live in the desert areas of the southwestern united states and in northern Mexico, parts of northern Mexico. The Hela monster looks and acts a lot like other lizards, but in one key way, it seems different. I mean, Hela monsters would be classified as lizards because, well, uh, the Hela monster and all lizards share certain characteristics. Some of the features of the skull, the jaw, and other parts of the skeleton. All lizards inherit these features from a common ancestor. That's why they are classified as lizards. And most lizards also have things like fore legs, uh, a long tail skin covered in scales. Let's see, um, a triangular head. And yes, Michelle?

S: You know, there's actually an illustration of one on, let's see page twelve of our handouts.

P: Thanks, Michelle. Let's all take a look. Basically, It's a fairly large creature. My guess about two feet long. It has, well, you can see those spots or blotch as all along its body, ah.. Mike?

S: Um, you said that Hela monsters are different from most other lizards. But what you just described and the picture, well, It's It's like lots of other lizards, right?

P: Yes. As I said, Hela monsters are like other lizards, but uh, they have one significant difference. In contrast to nearly all other lizards. Hela monsters are venomous.

S: Venomous? You mean poisonous like snakes?

P: Well, yes. In fact, Hela monsters are a lot like some snakes in that way, but snakes don't have all those other characteristics I mentioned before, but many snakes, many kinds of snakes are venomous. So are Hela monsters more closely related to snakes or to lizards?

S: Ah... snakes?

P: No! lizards! It's true that Hela monsters and snakes do have that one major characteristic in common. And of course, snakes and Hela monsters are both reptiles. But what helps us decide where the Hela monster belongs? Well, and this is the point I want to stress here.

Similar features in different species may occur because they were inherited from a common ancestor. Then those features are a sign that the species are related. But they may also evolve independently. And they may even evolve for completely different reasons, um, different purposes. And and that's what's happening here. Not only did the venom system of snakes and Hela monsters evolve independently, but they also function quite differently from each other. Snakes use their venom to hunt and subdue prey for food, but Hela monsters just, uh, they basically use it for self defense.

You'll only see a Hela monster use its venom if it's attacked, or um, if it feels threatened in some way, you see Hela monsters, when they sense danger. they first try to hide, um, to to mix in with the environment, the colors of their skin with all its spots and blotches blend well with the colors of their surroundings, but sometimes their camouflage can fail. So then for defense, they use their venom. So so getting back to the point, it would be a mistake to classify snakes and Hela monsters in in the same category, just because they're both venomous.

Oh, oh, there's another interesting thing about Hela monsters in their venom. There's a chemical in their venom that's being used in a new drug to help fight type two diabetes and the experiments with this new drug. Well, this could really represent an important medical breakthrough. It's worth noting that this chemical is only found in the venom of Hela monsters. It doesn't occur in snakes, and It doesn't occur in any other lizard.