Practice one: TPO 21 lecture 3

Script:	生词栏：
Narrator Listen to part of a lecture in a biology class. Professor Probably back in some previous biology course you learned that snakes evolved from lizards, and that the first snakes weren't venomous and then along came more advanced snakes, the venomous snakes. Ok, venomous snakes are the ones that secrete poisonous substances or venom, like the snakes of the viper family or cobras. Then there is non-venomous snakes like constrictors and pythons. Another family of snakes, the colubrids, don't really fit neatly into either category though. Colubrids, and you probably learned this too, although they are often classified as venomous snakes, they are actually generally non-venomous. They are classified as venomous snakes because they resemble them, their advanced features more than the other non-venomous snakes. Now, what if I told you that there is a good chance that most everything I just said is wrong? Well, everything except the part about snakes evolving from lizards. See, the basic theory about snake evolution has been challenged by a recent study that revealed a whole new understanding of evolutionary relationship for reptiles, you know, which reptiles descended from which ancestors. The researchers study the proteins in the venom genes of various species of colubrids. Emm... snake venom is a mixture of proteins, some toxic, poisonous, and some not. By analyzing the DNA, the genetic material of the proteins, the researchers could focus on the toxic genes and use them to trace the evolution of snake venom, and from this, the evolution of snakes. Traditionally, to understanding evolutionary relationships, we looked at various easily observed physical characteristics of animals, their skeleton, the size of their brain, and... and then classify them based on similarities and differences. The problem with this method is that characteristics that appear similar may actually have developed in quite different ways. For example, some venoms are chemical-based, and others are bacteria-based, so they clearly had to have developed along different routes and may not be as closely related as we thought. Now, and not everyone will agree about this. The classification based on DNA seems to be much more reliable. Ok, back to the research. The researchers found that venom evolved before snakes even existed, about a hundred million years before.	

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Now, a couple of venomous lizards were included in this study. And the researchers found some of the same DNA in their venom as in the snakes' venom. This suggested that the common ancestor of all snakes was actually venomous lizard, which means that actually, according to this research, anyway, in terms of the snakes' ancestry, there is no such thing as a non-venomous snake, not even colubrids. What separates colubrids from other snakes we have been classifying is venomous, is not the lack of venom, but the lack of an effective way to deliver the venom into its prey. In most venomous snakes, like vipers and cobras, the venom is used to catch and inmoblize the prey; but in colubrids, venom drips onto the prey only after the prey is in the snake's mouth. So for colubrids, the venom must serve some other purpose, maybe linked to digesting prey. As the different families of venomous snakes evolved, the teeth moved forward, becoming larger, and the venom becoming stronger, so the evolution of the obvious venomous snakes, like cobras and vipers, is about the evolution of an efficient delivery system, not so much the evolution of the venom itself. So, if there are no truly non-venomous snakes, were the so-called non-venomous snakes, like constrictors and pythons, were they venomous at some point in their evolution? Well, that's not clear at this point. Constrictors have evolved to kill their prey by crushing, but perhaps they once were venomous, and then at some point their venom-producing apparatus4 wasn't needed anymore, so it gradually disappeared. There's one species of snake, the brown tree snake, that uses both constriction and venom, depending on its prey. So, well, it is possible. So, we have these new concepts of snakes' evolution and a new DNA database, all these information on the genetic makeup of snake venom. And what we have learned from this has led researchers to believe that venom proteins may have some exciting applications in the field of medical research. You see, venom alters biological functions in the same way certain drugs do, and the big benefit of drugs made from snakes venom would be that they target only certain cells, so maybe that'll create fewer side effects. Now, it sounds far-fetched5, venom is the basis for human drugs. So far, only one protein has been targeted for study as a potential drug, but who knows, maybe someday.	

Practice Two: TPO 23 lecture 3

Script： Narrator: Listen to part of a lecture in a marine biology class. Professor: We have been talking about how sea animals find their way underwater, how they navigate, and this brings up an interesting puzzle, and one I'm sure you'll all enjoy. I mean, everybody loves dolphins, right? And dolphins, well, they actually produce two types of sounds. Uh, one being the vocalizations you are probably all familiar with, which they emit through their blowholes. But the one we are concerned with today is the rapid clicks that they use for echolocation, so they can sense what is around them. These sounds, it has been found, are produced in the air-filled nasal sacs of the dolphin. And the puzzle is how does the click sounds get transmitted into the water? It's not as easy as it might seem. You see, the denser the medium, the faster sound travels. So sound travels faster through water than it does through air. So what happens when a sound wave um ? OK. You've got a sound wave traveling merrily along through one medium, when suddenly; it hits a different medium, what does gonna happen then? Well, some of the energy is going to be reflected back, and some of it is going to be transmitted into the second medium. And ? and ? and if the two media have really different densities, like air and water, then most of the energy is going to be reflected back, very little of it will keep going, uh, get transmitted into the new medium. I mean, just think how little noise from the outside world actually reaches you when your head is underwater. So, how did the dolphin's clicks get transmitted from its air-filled nasal sacs into the ocean water? Because given the difference in density between the air in the nasal cavity and the seawater, we'd expect those sounds to just kind of go bouncing around inside the dolphin's head, which will do it no good at all. If it's going to navigate it, needs those sounds to be broadcast and bounced back from objects in its path.	

TPO 23 lecture 3

Script： Well, turns out dolphins have a structure in their foreheads, just in front of their nasal sacs, called a melon. Now, the melon is kind of a large sac-like pouch, made up of fat tissue. And this fat tissue has some rather fascinating acoustical properties. Most of the fat that you find in an animal's body is used for storing energy, but this fat, which you find in dolphins, and only in the melon and around the lower jaw. This fat is very different, very rich in oil. And it turns out it has a very different purpose as well. Now, one way to um, modify the overcome this mismatch in the density of air and water would be ? if you travels through velocity of the sound wave, make it precisely match the speed at which water. And that's exactly what marine biologists have discovered the melon Note that the bursa, these little projections at the rear of the melon, are right up against the air-filled nasal sacs. And these bursa, it turns out, are what's responsible for transferring sound to the melon. The sound waves are then transmitted by the bursa through the melon. First through a low velocity core, and then through a high velocity shell, where their speed is increased before they are transmitted into the surrounding seawater. So now the signals can be efficiently transferred into the water, with minimal reflection. The only other place, this special fatty tissue, like that in the melon, the only other place is found in the dolphin, is in the lower jaw. Turns out that the lower jaw, well, it is made of a specially thin bone. And it is very sensitive to vibrations, to sound energy traveling through the seawater. It turns out that the jaw is primarily responsible for capturing and transferring returning sound waves to the dolphin's inner ear. So these rapid clicks that are sent out bounce off objects, maybe a group of fish swimming over here, a boat coming from over there. The sounds bounce off them and the lower jaw captures the returning sounds, making it possible for the dolphin to sense what's in the surrounding water and decide where to swim.	