## 

# 2019/03/18

Og1 reading

## Nineteenth-Century Politics in the United States

The development of the modern presidency in the United States began with Andrew Jackson who swept to power in 1829 at the head of the Democratic Party and served until 1837.

During his administration, he immeasurably enlarged the power of the presidency.

"The President is the direct representative of the American people," he lectured the Senate when it opposed him.

"He was elected by the people, and is responsible to them." With this declaration, Jackson redefined the character of the presidential office and its relationship to the people.

During Jackson's second term, his opponents had gradually come together to form the Whig party.

Whigs and Democrats held different attitudes toward the changes brought about by the market, banks, and commerce.

The Democrats tended to view society as a continuing conflict between "the people”—farmers, planters, and workers—and a set of greedy aristocrats.

This "paper money aristocracy" of bankers and investors manipulated the banking system for their own profit, Democrats claimed, and sapped the nation's virtue by encouraging speculation and the desire for sudden, unearned wealth.

The Democrats wanted the rewards of the market without sacrificing the features of a simple agrarian republic.

They wanted the wealth that the market offered without the competitive, changing society; the complex dealing; the dominance of urban centers; and the loss of independence that came with it.

Whigs, on the other hand, were more comfortable with the market.

For them, commerce and economic development were agents of civilization.

Nor did the Whigs envision any conflict in society between farmers and workers on the one hand and businesspeople and bankers on the other.

Economic growth would benefit everyone by raising national income and expanding opportunity.

The government's responsibility was to provide a well-regulated economy that guaranteed opportunity for citizens of ability.

Whigs and Democrats differed not only in their attitudes toward the market but also about how active the central government should be in people's lives.

Despite Andrew Jackson's inclination to be a strong President, Democrats as a rule believed in limited government.

Government's role in the economy was to promote competition by destroying monopolies' and special privileges.

In keeping with this philosophy of limited government, Democrats also rejected the idea that moral beliefs were the proper sphere of government action.

Religion and politics, they believed, should be kept clearly separate, and they generally opposed humanitarian legislation.

The Whigs, in contrast, viewed government power positively.

They believed that it should be used to protect individual rights and public liberty, and that it had a special role where individual effort was ineffective.

By regulating the economy and competition, the government could ensure equal opportunity.

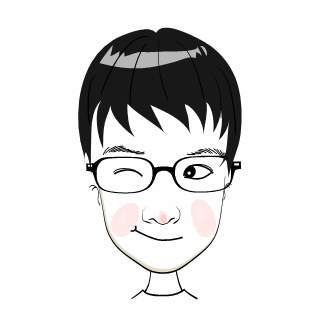
Indeed, for Whigs the concept of government promoting the general welfare went beyond the economy.

In particular, Whigs in the northern sections of the United States also believed that government power should be used to foster the moral welfare of the country.

They were much more likely to favor social-reform legislation and aid to education.

In some ways the social makeup of the two parties was similar.

To be competitive in winning votes, Whigs and Democrats both had to have significant support among farmers, the largest group in society, and workers.

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Neither party could win an election by appealing exclusively to the rich or the poor.

The Whigs, however, enjoyed disproportionate strength among the business and commercial classes.

Whigs appealed to planters who needed credit to finance their cotton and rice trade in the world market, to farmers who were eager to sell their surpluses, and to workers who wished to improve themselves.

Democrats attracted farmers isolated from the market or uncomfortable with it, workers alienated from the emerging industrial system, and rising entrepreneurs who wanted to break monopolies and open the economy to newcomers like themselves.

The Whigs were strongest in the towns, cities, and those rural areas that were fully integrated into the market economy, whereas Democrats dominated areas of semisubsistence farming that were more isolated and languishing economically.

Paragraph 1: The development of the modern presidency in the United States began with Andrew Jackson who swept to power in 1829 at the head of the Democratic Party and served until 1837. During his administration, he immeasurably enlarged the power of the presidency. "The President is the direct representative of the American people," he lectured the Senate when it opposed him. "He was elected by the people, and is responsible to them." With this declaration, Jackson redefined the character of the presidential office and its relationship to the people.

# 2019/03/19

Og1 reading

## The Expression of Emotions

Joy and sadness are experienced by people in all cultures around the world, but how can we tell when other people are happy or despondent?

It turns out that the expression of many emotions may be universal.

Smiling is apparently a universal sign of friendliness and approval.

Baring the teeth in a hostile way, as noted by Charles Darwin in the nineteenth century, may be a universal sign of anger.

As the originator of the theory of evolution, Darwin believed that the universal recognition of facial expressions would have survival value.

For example, facial expressions could signal the approach of enemies (or friends) in the absence of language.

---- 表情是相通的

Most investigators concur that certain facial expressions suggest the same emotions in all people.

Moreover, people in diverse cultures recognize the emotions manifested by the facial expressions.

In classic research Paul Ekman took photographs of people exhibiting the emotions of anger, disgust, fear, happiness, and sadness.

He then asked people around the world to indicate what emotions were being depicted in them.

Those queried ranged from European college students to members of the Fore, a tribe that dwells in the New Guinea highlands.

All groups, including the Fore, who had almost no contact with Western culture, agreed on the portrayed emotions.

The Fore also displayed familiar facial expressions when asked how they would respond if they were the characters in stories that called for basic emotional responses.

Ekman and his colleagues more recently obtained similar results in a study of ten cultures in which participants were permitted to report that multiple emotions were shown by facial expressions.

The participants generally agreed on which two emotions were being shown and which emotion was more intense.

----- 不同地方的人的表情是相似的

Psychological researchers generally recognize that facial expressions reflect emotional states.

In fact, various emotional states give rise to certain patterns of electrical activity in the facial muscles and in the brain.

The facial-feedback hypothesis argues, however, that the causal relationship between emotions and facial expressions can also work in the opposite direction.

According to this hypothesis, signals from the facial muscles ("feedback") are sent back to emotion centers of the brain, and so a person's facial expression can influence that person's emotional state.

Consider Darwin's words: "The free expression by outward signs of an emotion intensifies it.

On the other hand, the repression, as far as possible, of all outward signs softens our emotions.

" Can smiling give rise to feelings of good will, for example, and frowning to anger?

----- 表情可以影响心情

Psychological research has given rise to some interesting findings concerning the facial-feedback hypothesis.

Causing participants in experiments to smile, for example, leads them to report more positive feelings and to rate cartoons (humorous drawings of people or situations) as being more humorous.

When they are caused to frown, they rate cartoons as being more aggressive.

What are the possible links between facial expressions and emotion?

One link is arousal, which is the level of activity or preparedness for activity in an organism.

Intense contraction of facial muscles, such as those used in signifying fear, heightens arousal.

Self-perception of heightened arousal then leads to heightened emotional activity.

Other links may involve changes in brain temperature and the release of neurotransmitters (substances that transmit nerve impulses.)

The contraction of facial muscles both influences the internal emotional state and reflects it.

Ekman has found that the so-called Duchenne smile, which is characterized by ''crow’s feet" wrinkles around the eyes and a subtle drop in the eye cover fold so that the skin above the eye moves down slightly toward the eyeball, can lead to pleasant feelings.

Ekman’s observation may be relevant to the British expression “keep a stiff upper lip” as a recommendation for handling stress.

It might be that a “stiff” lip suppresses emotional response—as long as the lip is not quivering with fear or tension.

But when the emotion that leads to stiffening the lip is more intense, and involves strong muscle tension, facial feedback may heighten emotional response.

Paragraph 1: Joy and sadness are experienced by people in all cultures around the world, but how can we tell when other people are happy or despondent? It turns out that the expression of many emotions may be universal. Smiling is apparently a universal sign of friendliness and approval. Baring the teeth in a hostile way, as noted by Charles Darwin in the nineteenth century, may be a universal sign of anger. As the originator of the theory of evolution, Darwin believed that the universal recognition of facial expressions would have survival value. For example, facial expressions could signal the approach of enemies (or friends) in the absence of language.

# 2019/03/20

Og1 listening, conversation 1

### Advice About Graduate School Application

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

Professor: Hey, Ellen. How are you doing?

Student: Oh, pretty good, thanks. How are you?

Professor: OK.

Student: Did you, um, have a chance to look at my grad school application ... you know, the statement of purpose I wrote?

Professor: Well, yeah. In fact, here it is, I just read it.

Student: Oh, great! What did you think?

Professor: Basically, it’s good. What you might actually do is take some of these different points here, and actually break them out into separate paragraphs. So, um, one: your purpose for applying for graduate study-uh, why do you want to go to graduate school- and an area of specialty; and, uh, why you want to do the area you’re specifying; um, and what you want to do with your degree once you get it.

Student: OK.

Professor: So those are ... they’re pretty clear on those four points they want.

Student: Right.

Professor: So you might just break them out into, uh . . . you know, separate paragraphs and expand on each point some. But really what's critical with these is that, um, you’ve gotta let yourself come through.See, you gotta let them see you in these statements. Expand some more on what’s happened in your own life and what shows your ...your motivation and interest in this area-in geology. Let’ em see what really, what ...what captures your imagination about this field.

Student: OK, so make it a little more ... personal? That's OK?

Professor: That's fine. They look for that stuff. You don’t wanna go overboard …

Student: Right.

Professor: ...but it’s critical that. . . that somebody sees what your passion is-your personal motivation for doing this.

Student: OK.

Professor: And that’s gotta come out in here. Um, and let’s see, uh, you might also give a little, uh-since this is your only chance to do it, you might give a little more explanation about your unique undergraduate background. So, you know, how you went through, you know, the music program; what you got from that; why you decided to change. I mean it’s kind of unusual to go from music to geology, right?

Student: Yeah. I was …I was afraid that, you know, maybe the personal-type stuff wouldn’t be what they wanted, but...

Professor: No, in fact it’s ... um, give an example: I... I had a friend, when I was an undergrad, um, went to medical school. And he put on his med school application-and he could actually tell if somebody actually read it cause, um, he had asthma and the reason that he wanted to go to med school was he said he wanted to do sports medicine because he, you know, he had this real interest. He was an athlete too, and . . . and wanted to help athletes who had this physical problem. And he could always tell if somebody actually read his letter, because they would always ask him about that.

Student: ...Mmm ... so something unique.

Professor: Yeah. So see, you know, that’s what’s good and, and, I think for you probably, you know, your music background's the most unique thing that you’ve got in your record.

Student: Right.

Professor: ... Mmm ... so you see, you gotta make yourself stand out from a couple hundred applications. Does that help any?

Student: Yeah, it does. It gives me some good ideas.

Professor: And ... what you might also do too is, you know, uh, you might get a friend to proof it or something at some point.

Student: Oh, sure ... sure.

Professor: Also, think about presentation-how the application looks. In a way, you're actually showing some other skills here, like organization. A lot of stuff that's ... that they're not... they’re not formally asking for, they’re looking at. So your presentation format, your grammar, all that stuff, they're looking at in your materials at the same time.

Student: Right. OK.

# 2019/03/21

Og1 listening, lecture 1

### Method to Manage Water Supplies

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

Professor: So I wanted to discuss a few other terms here ... actually, some, uh, some ideas about how we manage our resources.

Let’s talk about what that …what that means. If we take a resource like water. ..well, maybe we should get a little bit more specific here-back up from the more general case-and talk about underground water in particular.

So hydrogeologists have tried to figure out... how much water can you take out from underground sources? This has been an important question.Let me ask you guys: how much water, based on what you know so far, could you take out of, say, an aquifer... under the city?

Male Student: As ... as much as would get recharged?

Professor: OK. So we wouldn't want to take out any more than naturally comes into it. The implication is that, uh, well, if you only take as much out as comes in, you're not gonna deplete the amount of water that’s stored in there, right?

Wrong, but that’s the principle. That’s the idea behind how we manage our water supplies. It’s called "safe yield.“Basically what this method says is that you can pump as much water out of a system as naturally recharges ... as naturally flows back in.

So this principle of safe yield-it's based on balancing what we take out with what gets recharged. But what it does is, it ignores how much water naturally comes out of the system.

In a natural system, a certain amount of recharge comes in and a certain amount of water naturally flows out through springs, streams, and lakes. And over the long term the amount that’s stored in the aquifer doesn’t really change much. It's balanced. Now humans come in . . . and start taking water out of the system. How have we changed the equation?

Female Student: It’s not balanced anymore?

Professor: Right. We take water out, but water also naturally flows out. And the recharge rate doesn’t change, so the result is we’ve reduced the amount of water that’s stored in the underground system.

If you keep doing that long enough-if you pump as much water out as naturally comes in-gradually the underground water levels drop. And when that happens, that can affect surface water. How? Well, in underground systems there are natural discharge points-places where the water flows out of the underground systems, out to lakes and streams.

Well, a drop in the water level can mean those discharge points will eventually dry up. That means water’s not getting to lakes and streams that depend on it. So we’ve ended up reducing the surface water supply, too.

You know，in the state of Arizona we’re managing some major water supplies with this principle of safe yield, under a method that will eventually dry up the natural discharge points of those aquifer systems.

Now, why is this an issue? Well, aren’t some of you going to want to live in this state for a while? Want your kids to grow up here, and your kids' kids? You might be concerned with . . . does Arizona have a water supply which is sustainable-key word here? What that means . . . the general definition of sustainable is will there be enough to meet the needs of the present without compromising the ability of the future to have the availability ... to have the same resources?

Now, I hope you see that these two ideas are incompatible: sustainability and safe yield. Because what sustainability means is that it's sustainable for all systems dependent on the water-for the people that use it and for... uh, for supplying water to the dependent lakes and streams.

So I’m gonna repeat this: so if we're using a safe-yield method, if we're only balancing what we take out with what gets recharged, but-don’t forget, water's also flowing out naturally. Then the amount stored underground is gonna gradually get reduced and that’s gonna lead to another problem. These discharge points-where the water flows out to the lakes and streams-they’re gonna dry up. OK.

# 2019/03/22

Og1 listening, lecture 2

## Nature of Human Soul

Narrator: Listen to part of a lecture in a philosophy class. The professor has been talking about ethics.

Professor: OK, if we’re going to discuss goodness and justice - what makes an individual good or a society just or virtuous-then we need to start with the ancient Greeks. So we'll start with Plato-Plato's philosophy. Now, some of you may have studied Plato's philosophy in some other course, so this might be easy. OK, at the risk of boring you, let me give you just an overview of Plato’s ethical theory. Plato says the soul has-and by "soul" he simply means that which animates the body, gives it life-anyway, he says that the soul has three separate parts …called, um, "faculties," which I’ll come back to. He believed that goodness in an individual was to be found when the three parts of the soul worked together, when they weren't in conflict, but existed in harmony. A good or just person will have a soul in which the three faculties work well together.

So how does he arrive at that analysis? Well, he starts out in his very famous work The Republic, um, he starts out by saying it's very difficult to get a grasp on what the individual's soul looks like. So, to get some idea of what the individual human soul is like, he says we should study the structure of society-what kinds of people and activities every society has to have. He argues that every society has to have three groups of people: workers, soldiers, and leaders. And each has a sort of defining characteristic.

Every society has to have workers like farmers or, um, people who work in factories, producing all the things that we need for everyday life. And according to Plato, the key feature of workers is that they’re focused on their own desires or appetites- interested in satisfying the needs of the body. So workers are associated with desire... OK?

Now, if you live in a society that has a good amount of wealth-um, good agriculture, good industry-other societies are probably going to try to take it. So you need a class of soldiers, who are supposed to protect the state from external threats. Well, these soldiers, well, they're going to be in dangerous situations quite frequently, so you need people with, um, a ... a lot of high spirit-uh, an emotional type of individual. Emotion is what characterizes this group.

And then, Plato says, the third group you need is leaders. Their main role will be to think rationally, to use their reason or intellect to make decisions. As decision makers, leaders determine what the state is to do, how the affairs of the citizens are to be run.

Plato then asks himself: OK, assume we’ve got such a society with these three groups. When will this society be a good, um, a ... a just society? Well, you can only have a good society when its three parts are working well together-each doing its proper thing. And Plato believes this can only happen if workers and soldiers learn moderation, or self-control.

But why? Why do workers and soldiers have to learn self-control? Well, how can a society flourish if the workers and soldiers don’t control their desires and emotions? Plato thinks that if they aren't under control, workers will sleep too much and play too much, so they’re not going to get their jobs done. And soldiers need to channel their high-spiritedness in a certain direction, precisely by being courageous.

But you're not going to get that automatically. You need to teach them this kind of moderation. So you need an educational system that first of all will train the leaders, so that they’ll make good decisions, so they’ll know what's wise. Then make leaders responsible-um, uh, turn over to them the education of the other two groups. And through education, build a society so that the workers and soldiers learn to use their intellect to control their desires and emotions. If you had all that, then, for Plato, you'd have a good or just society.

Now, take that picture - that social, political picture-and apply it to the individual person. You remember about the soul? That it consists of three separate parts, or faculties? Can you guess what they are? Desires, emotions, and intellect-the characteristics associated with the three groups of society. And can you guess how Plato defines a good or just person? Well, it’s parallel to how he characterizes a good or just society. The three parts have to be in harmony. In each of us, our desires and emotions often get the better of us, and lead us to do foolish things. They're in conflict with the intellect. So, to get them to all work together, to coexist in harmony, every person needs to be shaped in the same way that we’ve shaped society-through the educational system. Individuals must be educated to use their intellect to control their emotions and desires. That’s harmony in the soul.

# 2019/03/25

Og1 listening, conversation 2

### Review for a Biology Examination

Narrator: Listen to part of a conversation between two students. The woman is helping the man review for a biology examination.

Male Student: OK, so ... what do you think we should go over next?

Female Student: How about if we go over this stuff about how bacteria become resistant to antibiotics.

Male Student: OK.

Female Student: Um, but first of all, though, how many pages do we have left? I told my roommate I’d meet her at the library at seven o’clock.

Male Student: Ummm ... There's only a few pages left. We should be finished in a few minutes.

Female Student: OK. So, ummm ...

Male Student: About how bacteria become resistant to antibiotics.

Female Student: Oh yeah, OK. So you know that some bacteria cells are able to resist the drugs we use against them, and that’s because they have these special genes that, like, protect them from the drugs.

Male Student: Right. If I remember correctly, I think the genes, like ... weaken the antibiotics, or, like ... stop the antibiotics from getting into the bacteria cell, something like that?

Female Student: Exactly. So when bacteria have these genes, it's very difficult for the antibiotics to kill the bacteria.

Male Student: Right.

Female Student: So do you remember what those genes are called?

Male Student: Umm…

Female Student: Resistance genes.

Male Student: Resistance genes. Right. Resistance genes. OK.

Female Student: And that makes sense, right? Because they help the bacteria resist the antibiotics.

Male Student: Yeah, that makes sense. OK.

Female Student: OK. But the question is: how do bacteria get the resistance genes?

Male Student: How do they get the resistance genes? They just inherit them from the parent cell, right?

Female Student: OK, yeah, that's true. They can inherit them from the parent cell, but that's not what I’m talking about.

Male Student: OK.

Female Student: I’m talking about how they get resistance genes from other cells in their environment, you know, from the other cells around them.

Male Student: Oh, I see what you mean. Umm, is that that stuff about “hopping genes," or something like that?

Female Student: Right. Although actually they’re called "jumping genes,” not "hopping genes.”

Male Student: Oh, OK. Jumping genes.

Female Student: Yeah, but they have another name, too, that I can’t think of. Umm ... let me see if I can find it here in the book ...

Male Student: I think it’s probably on…

Female Student: Oh, OK, here it is. Transposons. That’s what they’re called.

Male Student: Let me see. OK. Trans …po ... sons …trans... posons. So "transposon" is another name for a jumping gene?

Female Student: Right. And these transposons are, you know, like, little bits of DNA that are able to move from one cell to another. That’s why they’re called "jumping genes." They kind of, you know, “jump” from one cell to another.

Male Student: OK.

Female Student: And these transposons are how resistance genes are able to get from one bacteria cell to another bacteria cell. What happens is that a resistance gene from one cell attaches itself to a transposon and then, when the transposon jumps to another cell...

Male Student: The other cell gets the resistance gene and...

Female Student: Right.

Male Student: That's how it becomes resistant to antibiotics.

Female Student: Right.

Male Student: Wow. That's really cool. So that's how it happens.

Female Student: That’s how it happens.

# 2019/03/26

Og1 listening, lecture 3

### Size of Root Systems

Narrator: Listen to part of a talk in a botany class.

Professor: OK, so we've talked about some different types of root systems of plants, and I’ve shown you some pretty cool slides, but now I want to talk about the extent of the root system-the overall size of the root system ... the depth. I want to tell you about one particular experiment. I think you're going to find this pretty amazing. OK, so there was this scientist...this very meticulous scientist decided that the best place to see a whole root system-to actually see how big the entire system got-the best place would be to grow it... where?

Female Student: Um, water?

Professor: In water. So he took rye plants-it was rye plants-and he started growing them in water. Now, you’ve all heard of growing stuff in water before, right?

Male Student: It's done commercially, right? Uh, like to grow vegetables and flowers?

Professor: Right.They grow all kinds of commercial crops in water. So if you're growing things in water, you can add the fertilizer. What do you need to do to that water besides put fertilizer in it? Anyone ever actually tried to grow plants in water? You must bubble water through it. Bubble gas through it. I’m sorry, you must bubble gas through it. So, gas, you have to bubble through. Think about the soil we talked about last week, about growing plants in soil. Think about some of you who have killed your favorite houseplants, 'cause you loved them too much. If you overwater, why do your favorite houseplants die?

Female Student: Oh, no oxygen.

Professor: Not enough oxygen for the roots ... which do what twenty-four hours a day in all seasons?

Female Student: Respiration?

Professor: Respire ... respiration ... they breathe. So if you just stick rye plants in water, it doesn't make a difference how much fertilizer you add, you also need to bubble gas through the water, so they have access to that oxygen. If they don’t have that, they're in big trouble. OK. So this guy this scientist-grew a rye plant in water so he could see the root system, how big it got-its surface area. I read about this and the book said one thousand kilometers of roots. I kept thinking: this has to be a mistake. It just doesn’t make any sense to me that... that …that could be right. But that’s what all the books have, and no one's ever corrected it. So let me explain to you about this rye plant. If you take a little seed of many grasses-and remember rye is a grass; if you take a tiny little seed and you germinate it - actually, take one of my least favorite grasses that starts growing about May. What's my least favorite grass that starts growing about May?

Male Student: Crabgrass.

Professor: Crabgrass.

Remember how I showed you in the lab, one little seed starts out producing one little shoot. Then at a week or so later you’ve got about six shoots, and then, three weeks later you’ve got about fifteen shoots coming out all directions like this- all those little shoots up there? Well, that’s what they did with the rye. And the little seedling started and pretty soon there were several shoots, and then more shoots. In the end, that one single seed produced eighty shoots, with an average of fifty centimeters of height ... from one seed. Eighty shoots coming out, average fifty centimeters high. When they looked at the shoot versus the root surface, they found that the shoot surface, with all of its leaves, had a total surface area of about five square meters. Now, here’s the biggie: when they looked at the root surface area, you would expect that the root and the shoot would be in balance, right? So they should be pretty close in terms of surface area, right?

Male Student: Uh-un.

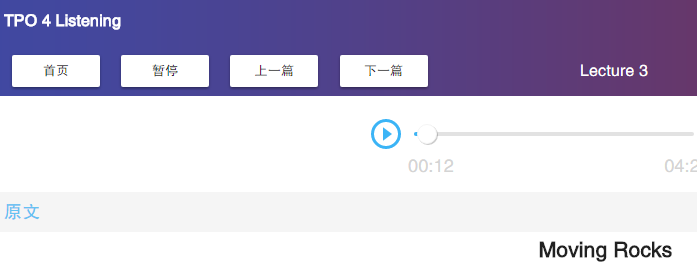
Professor: What’s that? Did somebody say "no"? Well, you're absolutely correct. Instead of five square meters, the root system was found to have more than two hundred square meters of surface area. Where did all of that extra surface area come from? Who did it? Who was responsible for all those extra square meters of surface area? What did roots do to increase their surface area?

Female Student: Root hairs.

Professor: Root hairs, that’s exactly it. So those root hairs were responsible for an incredible chunk of surface area. They constantly have to be spread out in the water so they can absorb minerals from the fertilizer, and of course they need oxygen access as well.

# 2019/03/27

## 听力



### Moving Rocks（TPO 4）

Narrator: Listen to part of a lecture in a geology class.

Professor: Now we’ve got a few minutes before we leave for today. So I’ll just touch on an interesting subject that I think makes an important point. We’ve been covering rocks and different types of rocks for the last several weeks. But next week we are going to do something a bit different. And to get started I thought I’d mention something that shows how uh…as a geologist, you need to know about more than just rocks and the structure of solid matter. Moving rocks, you may have heard about them. It’s quite a mystery.

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

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

Theory NO.1 ---Wind. Some researchers think powerful uh…windstorms might move the rocks. Most of the rocks move in the same direction as the dominant wind pattern from southwest to northeast. But some, and this is interesting, move straight west while some zigzag or even move in large circles. Hmmm…How can that be? How about wind combined with rain? The ground of this desert is made of clay. It’s a desert, so it’s dry. But when there is the occasional rain, the clay ground becomes extremely slippery. It’s hard for anyone to stand on, walk on.

Some scientists theorized that perhaps when the ground is slippery the high winds can then move the rocks. There’s a problem with this theory. One team of scientists flooded an area of the desert with water, then try to establish how much wind force would be necessary to move the rocks. And get this: you need winds of at least five hundred miles an hour to move just the smallest rocks! And winds that strong have never been recorded. Ever! Not on this planet. So I think it’s safe to say that that issue’s been settled.

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

There are a few other theories. Maybe the ground vibrates, or maybe the ground itself is shifting, tilting. Maybe the rocks are moved by a magnetic force. But sadly all these ideas have been eliminated as possibilities. There’s just no evidence. I bet you are saying to yourself, “well, why don’t scientists just set up video cameras to record what actually happens?”

Thing is, this is a protected wilderness area. So by law that type of research isn’t allowed. Besides, in powerful windstorms, sensitive camera equipment would be destroyed. So why can’t researchers just live there for a while until they observe the rocks’ moving? Same reason. So where are we now? Well, right now we still don’t have any answers.

So all this leads back to my main point – you need to know about more than just rocks as geologists. The researchers study in moving rocks. Well, they combine their knowledge of rocks with knowledge of wind, ice and such…uh not successfully, not yet.

But you know, they wouldn’t even have been able to get started without um… earth science understanding – knowledge about wind, storms, you know, meteorology. You need to understand physics. So for several weeks like I said we’ll be addressing geology from a wider perspective. I guess that’s all for today. See you next time.

## 阅读

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| TPO3 | 中 |

### Depletion of the Ogallala Aquifer

The vast grasslands of the High Plains in the central United States were settled by farmers and ranchers in the 1880s. This region has a semiarid climate, and for 50 years after its settlement, it supported a low-intensity agricultural economy of cattle ranching and wheat farming. In the early twentieth century, however, it was discovered that much of the High Plains was underlain by a huge aquifer (a rock layer containing large quantities of groundwater). This aquifer was named the Ogallala aquifer after the Ogallala Sioux Indians, who once inhabited the region

The Ogallala aquifer is a sandstone formation that underlies some 583,000 square kilometers of land extending from northwestern Texas to southern South Dakota. Water from rains and melting snows has been accumulating in the Ogallala for the past 30,000 years. Estimates indicate that the aquifer contains enough water to fill Lake Huron, but unfortunately, under the semiarid climatic conditions that presently exist in the region, rates of addition to the aquifer are minimal, amounting to about half a centimeter a year.

The first wells were drilled into the Ogallala during the drought years of the early 1930s. The ensuing rapid expansion of irrigation agriculture, especially from the 1950s onward, transformed the economy of the region. More than 100,000 wells now tap the Ogallala. Modern irrigation devices, each capable of spraying 4.5 million liters of water a day, have produced a landscape dominated by geometric patterns of circular green islands of crops. Ogallala water has enabled the High Plains region to supply significant amounts of the cotton, sorghum, wheat, and corn grown in the United States. In addition, 40 percent of American grain-fed beef cattle are fattened here.

This unprecedented development of a finite groundwater resource with an almost negligible natural recharge rate—that is, virtually no natural water source to replenish the water supply—has caused water tables in the region to fall drastically. In the 1930s, wells encountered plentiful water at a depth of about 15 meters; currently, they must be dug to depths of 45 to 60 meters or more. In places, the water table is declining at a rate of a meter a year, necessitating the periodic deepening of wells and the use of ever-more-powerful pumps. It is estimated that at current withdrawal rates, much of the aquifer will run dry within 40 years. The situation is most critical in Texas, where the climate is driest, the greatest amount of water is being pumped, and the aquifer contains the least water. It is projected that the remaining Ogallala water will, by the year 2030, support only 35 to 40 percent of the irrigated acreage in Texas that is supported in 1980.

The reaction of farmers to the inevitable depletion of the Ogallala varies. Many have been attempting to conserve water by irrigating less frequently or by switching to crops that require less water.Others, however, have adopted the philosophy that it is best to use the water while it is still economically profitable to do so and to concentrate on high-value crops such as cotton. The incentive of the farmers who wish to conserve water is reduced by their knowledge that many of their neighbors are profiting by using great amounts of water, and in the process are drawing down the entire region’s water supplies.

In the face of the upcoming water supply crisis, a number of grandiose schemes have been developed to transport vast quantities of water by canal or pipeline from the Mississippi, the Missouri, or the Arkansas rivers. Unfortunately, the cost of water obtained through any of these schemes would increase pumping costs at least tenfold, making the cost of irrigated agricultural products from the region uncompetitive on the national and international markets. Somewhat more promising have been recent experiments for releasing capillary water (water in the soil) above the water table by injecting compressed air into the ground. Even if this process proves successful, however, it would almost triple water costs. Genetic engineering also may provide a partial solution, as new strains of drought-resistant crops continue to be developed. Whatever the final answer to the water crisis may be, it is evident that within the High Plains, irrigation water will never again be the abundant, inexpensive resource it was during the agricultural boom years of the mid-twentieth century.

# 2019/03/30

## 阅读

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| TPO4 03 地理 | 中 |

### TPO4 03---Petroleum Resources

Petroleum, consisting of crude oil and natural gas, seems to originate from organic matter in marine sediment. Microscopic organisms settle to the seafloor and accumulate in marine mud. The organic matter may partially decompose, using up the dissolved oxygen in the sediment. As soon as the oxygen is gone, decay stops and the remaining organic matter is preserved.

Continued sedimentation—the process of deposits’ settling on the sea bottom—buries the organic matter and subjects it to higher temperatures and pressures, which convert the organic matter to oil and gas. As muddy sediments are pressed together, the gas and small droplets of oil may be squeezed out of the mud and may move into sandy layers nearby. Over long periods of time (millions of years), accumulations of gas and oil can collect in the sandy layers. Both oil and gas are less dense than water, so they generally tend to rise upward through water-saturated rock and sediment.

Oil pools are valuable underground accumulations of oil, and oil fields are regions underlain by one or more oil pools. When an oil pool or field has been discovered, wells are drilled into the ground. Permanent towers, called derricks, used to be built to handle the long sections of drilling pipe. Now portable drilling machines are set up and are then dismantled and removed. When the well reaches a pool, oil usually rises up the well because of its density difference with water beneath it or because of the pressure of expanding gas trapped above it. Although this rise of oil is almost always carefully controlled today, spouts of oil, or gushers, were common in the past. Gas pressure gradually dies out, and oil is pumped from the well. Water or steam may be pumped down adjacent wells to help push the oil out. At a refinery, the crude oil from underground is separated into natural gas, gasoline, kerosene, and various oils. Petrochemicals such as dyes, fertilizer, and plastic are also manufactured from the petroleum.

As oil becomes increasingly difficult to find, the search for it is extended into more-hostile environments. The development of the oil field on the North Slope of Alaska and the construction of the Alaska pipeline are examples of the great expense and difficulty involved in new oil discoveries. Offshore drilling platforms extend the search for oil to the ocean’s continental shelves—those gently sloping submarine regions at the edges of the continents. More than one-quarter of the world’s oil and almost one-fifth of the world’s natural gas come from offshore, even though offshore drilling is six to seven times more expensive than drilling on land. A significant part of this oil and gas comes from under the North Sea between Great Britain and Norway.

Of course, there is far more oil underground than can be recovered. It may be in a pool too small or too far from a potential market to justify the expense of drilling. Some oil lies under regions where drilling is forbidden, such as national parks or other public lands. Even given the best extraction techniques, only about 30 to 40 percent of the oil in a given pool can be brought to the surface. The rest is far too difficult to extract and has to remain underground.

Moreover, getting petroleum out of the ground and from under the sea and to the consumer can create environmental problems anywhere along the line. Pipelines carrying oil can be broken by faults or landslides, causing serious oil spills. Spillage from huge oil-carrying cargo ships, called tankers, involved in collisions or accidental groundings (such as the one off Alaska in 1989) can create oil slicks at sea. Offshore platforms may also lose oil, creating oil slicks that drift ashore and foul the beaches, harming the environment. Sometimes, the ground at an oil field may subside as oil is removed. The Wilmington field near Long Beach, California, has subsided nine meters in 50 years; protective barriers have had to be built to prevent seawater from flooding the area. Finally, the refining and burning of petroleum and its products can cause air pollution. Advancing technology and strict laws, however, are helping control some of these adverse environmental effects.

# 2019/04/03

## 阅读

### TPO6 02 --William Smith

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| TPO6 02 | 中 | William Smith |

In 1769 in a little town in Oxfordshire, England, a child with the very ordinary name of William Smith was born into the poor family of a village blacksmith. He received rudimentary village schooling, but mostly he roamed his uncle's farm collecting the fossils that were so abundant in the rocks of the Cotswold hills. When he grew older, William Smith taught himself surveying from books he bought with his small savings, and at the age of eighteen he was apprenticed to a surveyor of the local parish. He then proceeded to teach himself geology, and when he was twenty-four, he went to work for the company that was excavating the Somerset Coal Canal in the south of England.

This was before the steam locomotive, and canal building was at its height. The companies building the canals to transport coal needed surveyors to help them find the coal deposits worth mining as well as to determine the best courses for the canals. This job gave Smith an opportunity to study the fresh rock outcrops created by the newly dug canal. He later worked on similar jobs across the length and breadth of England, all the while studying the newly revealed strata and collecting all the fossils he could find. Smith used mail coaches to travel as much as 10,000 miles per year. In 1815 he published the first modern geological map, “A Map of the Strata of England and Wales with a Part of Scotland,” a map so meticulously researched that it can still be used today.

In 1831 when Smith was finally recognized by the Geological Society of London as the “father of English geology,” it was not only for his maps but also for something even more important. Ever since people had begun to catalog the strata in particular outcrops, there had been the hope that these could somehow be used to calculate geological time. But as more and more accumulations of strata were cataloged in more and more places, it became clear that the sequences of rocks sometimes differed from region to region and that no rock type was ever going to become a reliable time marker throughout the world. Even without the problem of regional differences, rocks present a difficulty as unique time markers. Quartz is quartz—a silicon ion surrounded by four oxygen ions—there’s no difference at all between two-million-year-old Pleistocene quartz and Cambrian quartz created over 500 million years ago.

As he collected fossils from strata throughout England, Smith began to see that the fossils told a different story from the rocks. Particularly in the younger strata, the rocks were often so similar that he had trouble distinguishing the strata, but he never had trouble telling the fossils apart. While rock between two consistent strata might in one place be shale and in another sandstone, the fossils in that shale or sandstone were always the same. Some fossils endured through so many millions of years that they appear in many strata, but others occur only in a few strata, and a few species had their births and extinctions within one particular stratum. Fossils are thus identifying markers for particular periods in Earth's history.

Not only could Smith identify rock strata by the fossils they contained, he could also see a pattern emerging: certain fossils always appear in more ancient sediments, while others begin to be seen as the strata become more recent. By following the fossils, Smith was able to put all the strata of England's earth into relative temporal sequence. About the same time, Georges Cuvier made the same discovery while studying the rocks around Paris.Soon it was realized that this principle of faunal (animal) succession was valid not only in England or France but virtually everywhere. It was actually a principle of floral succession as well, because plants showed the same transformation through time as did fauna. Limestone may be found in the Cambrian or—300 million years later—in the Jurassic strata, but a trilobite—the ubiquitous marine arthropod that had its birth in the Cambrian—will never be found in Jurassic strata, nor a dinosaur in the Cambrian.

# 2019/04/04

## 听力

Og1 listening, lecture 4

### Organizational Structure of Companies

Listen to part of a lecture in a business management class.

Professor: OK, uh, let's talk about organization and structure in a company. How are companies typically structured?

Female Student: Functionally.

Professor: And …？

Female Student: By projects.

Professor: Right. By function ... and by projects. Twenty years ago companies were organized in function groups, where people with a certain expertise worked together as a unit- the, uh, architects in one unit, the finance people in another unit. Well, nowadays a lot of companies are organized around projects-like a construction company could be building an office building in one city and an apartment house somewhere else, and each project has its own architects and engineers.

Now, the good thing about project organization is that it’s easier to change to adapt to the needs of the project-it’s a small group, a dedicated team, not the whole company. Now, with that in mind, here's a question for you: why do we continue to organize ourselves by function, even now, when in fact we admit that projects are the lifeblood of a lot of organizations? Why do some companies maintain a functional organization instead of organizing around projects? Yes?

Female Student: Because, um, if you don’t have that functional structure within your organization, chances are you'd have a harder time meeting the goals of the projects.

Professor: Why?

Female Student: Why?

Professor: Listen, let’s say we got four new cars we want to design. Why do we need a functional organization? Why not just organize the company around the four projects-these people make car number one, these other people make car number two...

Female Student: Yeah, but who’s gonna be responsible for what? You know, the way you tell who's …

Professor: Well …well, we’ll appoint a manager: new car number one manager, car number two manager they’re completely responsible. Why should we have a single engineering department that has all four cars passing through it?

Female Student: When you design a car, you need the expertise of all the engineers in the company. Each engineer needs to be in touch with the entire engineering department.

Professor: Yeah, but I keep ... I keep asking why. I wanna know why. Yes.

Male Student: Well, to eliminate redundancy's probably one of the biggest factors in an organization. So that, uh... so that there’s, there’s …standards of... for uniformity and efficiency in the organization.

Professor: OK. And ... and that's probably the primary reason for functional organization right there-is that we want some engineering consistency. We want the same kind of technology used in all four cars. If we disperse those four engineers into four parts of the organization and they work by themselves, there's a lot less chance that the technology's gonna be the same from car to car. So instead we maintain the functional organization - that means the engineers work together in one part of the building. And their offices are next to each other because we want them to talk to each other. When an engineer works on a project, they bring the expertise of their whole functional group with them.

But there's a downside of that, though, isn’t there? I mean organizing a company into functional groups is not all positive. Where's the allegiance of those engineers? It's to their coordinator, right? It's to that chief engineer. But we really want our one engineer, the engineer that's working on car number one, we want that person‘s loyalty to be to that project as well as to the head of the engineering group. We ... we really want both, don’t we? We want to maintain the functional organization, so we can maintain uniformity and technology transfer, and expertise. We want the cutting-edge expertise in every group. But at the same time we also want the engineer to be totally dedicated to the needs of the project. Ideally, we have a ... a hybrid, a combination of both functional and project organization.

But there's a problem with this kind of hybrid structure. When you have both functional and project organization, well, what does that violate in terms of basic management principles?

Female Student: Unity of command.

Professor: Unity of command, that's exactly right. So this ... this is a vicious violation of unity of command, isn't it? It says that this engineer working on a project seems to have two bosses. We ... we got the engineering boss, and we got the project manager boss. But the project manager is responsible for the project, and is not the official manager of the engineer who works on the project. And we try to maintain peace in the organizations, and sometimes it’s disrupted and we have conflicts, don't we? The project manager for car one wants a car part to fit in a particular way, for a specific situation, a specialized case. Well, the, uh, engineering director says no, we gotta have standardization. We gotta have all the cars done this way. We can't make a special mold for that particular part for that particular car. We're not gonna do that. So we got a conflict.

# 2019/04/08

## 听力

### Desert Lakes---TPO9 Lecture3

Narrator: Listen to part of a lecture in a Geology class.

Lecturer: So, continuing our discussion of desert lakes, now I want to focus on what's known as the "Empty Quarter". The "Empty Quarter" is a huge area of sand that covers about a quarter of the Arabian Peninsula. Today it's pretty desolate, barren and extremely hot.

But there've been times in the past when monsoon rains soaked the Empty Quarter and turned it from a desert into grassland that was dotted with lakes and home to various animals. There were actually two periods of rain and lake formation: the first one began about 37,000 years ago; and the second one dates from about 10,000 years ago.

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

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

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

According to the study, two factors were important for lake formation in the Empty Quarter: first, the rains that fell there were torrential. So it would've been impossible for all the water to soak into the ground. Second, as you know, sand dunes contain other types of particles, besides sand, including clay and silt.

Now, when the rain fell, water ran down the sides of the dunes, carrying clay and silt particles with it. And wherever these particles settled, they formed a pan, a layer that water couldn't penetrate. Once this pan formed, further run-off collected, and formed a lake.Now, the older lakes, about half the formations, the ones that started forming 37, 000 years ago, the limestone formations we see, they're up to a kilometer long, but only a few meters wide, and they're scattered along the desert floor, in valleys between the dunes.

So, the theory is, the lakes formed there on the desert floor, in these long narrow valleys. And we know, because of what we know about similar ancient desert lakes, we know that the lakes didn't last very long, from a few months to a few years on average. As for the more recent lakes, the ones from 10,000 years ago, well, they seemed to have been smaller, and so may have dried up more quickly.

Another difference, very important today for distinguishing between older lake beds and newer ones, is the location of the limestone formations. The more recent beds are high up in the dunes. Why these differences? Well, there are some ideas about that, and they have to do with the shapes of the sand dunes, when the lakes were formed.

37, 000 years ago, the dunes were probably nicely rounded at the top, so the water just ran right down their sides to the desert floor. But there were thousands of years of wind between the two rainy periods, reshaping the dunes. So, during the second rainy period, the dunes were kind of chopped up at the top, full of hollows and ridges, and these hollows would've captured the rain right there on the top.

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

The study makes a couple of interesting points about the fossils, which I hope will be looked at in future studies. At older lake sites, there’s fossil remains from hippopotamuses, water buffalo, animals that spend much of their lives standing in water, and also, fossils of cattle.

However, at the sites of the more recent lakes, there’s only cattle fossils, additional evidence for geologists that these lakes were probably smaller, shallower, because cattle only use water for drinking. So they survive on much less. Interestingly, there are clams and snail shells; but, no fossils of fish. We're not sure why. Maybe there was a problem with the water. Maybe it was too salty. That's certainly true of other desert lakes.

# 阅读材料

### TPO7 01----The Geologic History of the Mediterranean

In 1970 geologists Kenneth J. Hsu and William B.F. Ryan were collecting research data while aboard the oceanographic research vessel Glomar Challenger. An objective of this particular cruise was to investigate the floor of the Mediterranean and to resolve questions about its geologic history. One question was related to evidence that the invertebrate fauna (animals without spines) of the Mediterranean had changed abruptly about 6 million years ago. Most of the older organisms were nearly wiped out, although a few hardy species survived. A few managed to migrate into the Atlantic. Somewhat later, the migrants returned, bringing new species with them. Why did the near extinction and migrations occur?

Another task for the Glomar Challenger’s scientists was to try to determine the origin of the domelike masses buried deep beneath the Mediterranean seafloor. These structures had been detected years earlier by echo-sounding instruments, but they had never been penetrated in the course of drilling. Were they salt domes such as are common along the United States Gulf Coast, and if so, why should there have been so much solid crystalline salt beneath the floor of the Mediterranean?

With question such as these clearly before them, the scientists aboard the Glomar Challenger processed to the Mediterranean to search for the answers. On August 23, 1970, they recovered a sample. The sample consisted of pebbles of hardened sediment that had once been soft, deep-sea mud, as well as granules of gypsum and fragments of volcanic rock. Not a single pebble was found that might have indicated that the pebbles came from the nearby continent. In the days following, samples of solid gypsum were repeatedly brought on deck as drilling operations penetrated the seafloor. Furthermore, the gypsum was found to possess peculiarities of composition and structure that suggested it had formed on desert flats. Sediment above and below the gypsum layer contained tiny marine fossils, indicating open-ocean conditions. As they drilled into the central and deepest part of the Mediterranean basin, the scientists took solid, shiny, crystalline salt from the core barrel. Interbedded with the salt were thin layers of what appeared to be windblown silt.

The time had come to formulate a hypothesis. The investigators theorized that about 20 million years ago, the Mediterranean was a broad seaway linked to the Atlantic by two narrow straits. Crustal movements closed the straits, and the landlocked Mediterranean began to evaporate. Increasing salinity caused by the evaporation resulted in the extermination of scores of invertebrate species. Only a few organisms especially tolerant of very salty conditions remained. As evaporation continued, the remaining brine (salt water) became so dense that the calcium sulfate of the hard layer was precipitated. In the central deeper part of the basin, the last of the brine evaporated to precipitate more soluble sodium chloride (salt). Later, under the weight of overlying sediments, this salt flowed plastically upward to form salt domes. Before this happened, however, the Mediterranean was a vast desert 3,000 meters deep. Then, about 5.5 million years ago came the deluge. As a result of crustal adjustments and faulting, the Strait of Gibraltar, where the Mediterranean now connects to the Atlantic, opened, and water cascaded spectacularly back into the Mediterranean. Turbulentwaters tore into the hardened salt flats, broke them up, and ground them into the pebbles observed in the first sample taken by the Challenger. As the basin was refilled, normal marine organisms returned. Soon layer of oceanic ooze began to accumulate above the old hard layer.The salt and gypsum, the faunal changes, and the unusual gravel provided abundant evidence that the Mediterranean was once a desert.

### TPO15 03--- Glacier Formation

Glaciers are slowly moving masses of ice that have accumulated on land in areas where more snowfalls during a year than melts. Snow falls as hexagonal crystals, but once on the ground, snow is soon transformed into a compacted mass of smaller, rounded grains. As the air space around them is lessened by compaction and melting, the grains become denser. With further melting, refreezing, and increased weight from newer snowfall above, the snow reaches a granular recrystallized stage intermediate between flakes and ice known as firn. With additional time, pressure, and refrozen meltwater from above, the small firn granules become larger, interlocked crystals of blue glacial ice. When the ice is thick enough, usually over 30 meters, the weight of the snow and firn will cause the ice crystals toward the bottom to become plastic and to flow outward or downward from the area of snow accumulation.

Glaciers are open systems, with snow as the system’s input and meltwater as the system's main output. The glacial system is governed by two basic climatic variables: precipitation and temperature. For a glacier to grow or maintain its mass, there must be sufficient snowfall to match or exceed the annual loss through melting, evaporation, and calving, which occurs when the glacier loses solid chunks as icebergs to the sea or to large lakes. If summer temperatures are high for too long, then all the snowfall from the previous winter will melt. Surplus snowfall is essential for a glacier to develop. A surplus allows snow to accumulate and for the pressure of snow accumulated over the years to transform buried snow into glacial ice with a depth great enough for the ice to flow. Glaciers are sometimes classified by temperature as faster-flowing temperate glaciers or as slower-flowing polar glaciers.

Glaciers are part of Earth’s hydrologic cycle and are second only to the oceans in the total amount of water contained. About 2 percent of Earth’s water is currently frozen as ice. Two percent may be a deceiving figure, however, since over 80 percent of the world’s freshwater is locked up as ice in glaciers, with the majority of it in Antarctica. The total amount of ice is even more awesome if we estimate the water released upon the hypothetical melting of the world’s glaciers. Sea level would rise about 60 meters. This would change the geography of the planet considerably. In contrast, should another ice age occur, sea level would drop drastically. During the last ice age, sea level dropped about 120 meters.

When snowfalls on high mountains or in polar regions, it may become part of the glacial system. Unlike rain, which returns rapidly to the sea or atmosphere, the snow that becomes part of a glacier is involved in a much more slowly cycling system. Here water may be stored in ice form for hundreds or even hundreds of thousands of years before being released again into the liquid water system as meltwater. In the meantime, however, this ice is not static. Glaciers move slowly across the land with tremendous energy, carving into even the hardest rock formations and thereby reshaping the landscape as they engulf, push, drag, and finally deposit rock debris in places far from its original location. As a result, glaciers create a great variety of landforms that remain long after the surface is released from its icy covering.

Throughout most of Earth’s history, glaciers did not exist, but at the present time about 10 percent of Earth’s land surface is covered by glaciers. Present-day glaciers are found in Antarctica, in Greenland, and at high elevations on all the continents except Australia. In the recent past, from about 2.4 million to about 10,000 years ago, nearly a third of Earth’s land area was periodically covered by ice thousands of meters thick. In the much more distant past, other ice ages have occurred.

### TPO19 03 ---- Discovering the Ice Ages

In the middle of the nineteenth century, Louis Agassiz, one of the first scientists to study glaciers, immigrated to the United States from Switzerland and became a professor at Harvard University, where he continued his studies in geology and other sciences. For his research, Agassiz visited many places in the northern parts of Europe and North America, from the mountains of Scandinavia and New England to the rolling hills of the American Midwest. In all these diverse regions, Agassiz saw signs of glacial erosion and sedimentation. In flat plains country, he saw moraines (accumulations of earth and loose rock that form at the edges of glaciers) that reminded him of the terminal moraines found at the end of valley glaciers in the Alps. The heterogeneous material of the drift (sand, clay, and rocks deposited there) convinced him of its glacial origin.

The areas covered by this material were so vast that the ice that deposited it must have been a continental glacier larger than Greenland or Antarctica. Eventually, Agassiz and others convinced geologists and the general public that a great continental glaciation had extended the polar ice caps far into regions that now enjoytemperate climates. For the first time, people began to talk about ice ages. It was also apparent that the glaciation occurred in the relatively recent past because the drift was soft, like freshly deposited sediment. We now know the age of the glaciation accurately from radiometric dating of the carbon-14 in logs buried in the drift. The drift of the last glaciation was deposited during one of the most recent epochs of geologic time, the Pleistocene, which lasted from 1.8 million to 10,000 years ago. Along the east coast of the United States, the southernmost advance of this ice is recorded by the enormous sand and drift deposits of the terminal moraines that form Long Island and Cape Cod.

It soon became clear that there were multiple glacial ages during the Pleistocene, with warmer interglacial intervals between them. As geologists mapped glacial deposits in the late nineteenth century, they became aware that there were several layers of drift, the lower ones corresponding to earlier ice ages. Between the older layers of glacial material were well-developed soils containing fossils of warm-climate plants. These soils were evidence that the glaciers retreated as the climate warmed. By the early part of the twentieth century, scientists believed that four distinct glaciations had affected North America and Europe during the Pleistocene epoch.

This idea was modified in the late twentieth century, when geologists and oceanographers examining oceanic sediment found fossil evidence of warming and cooling of the oceans. Ocean sediments presented a much more complete geologic record of the Pleistocene than continental glacial deposits did. The fossils buried in Pleistocene and earlier ocean sediments were of foraminifera—small, single-celled marine organisms that secrete shells of calcium carbonate, or calcite. These shells differ in their proportion of ordinary oxygen (oxygen-16) and the heavy oxygen isotope (oxygen-18). The ratio of oxygen-16 to oxygen-18 found in the calcite of a foraminifer's shell depends on the temperature of the water in which the organism lived. Different ratios in the shells preserved in various layers of sediment reveal the temperature changes in the oceans during the Pleistocene epoch.

Isotopic analysis of shells allowed geologists to measure another glacial effect. They could trace the growth and shrinkage of continental glaciers, even in parts of the ocean where there may have been no great change in temperature—around the equator, for example. The oxygen isotope ratio of the ocean changes as a great deal of water is withdrawn from it by evaporation and is precipitated as snow to form glacial ice. During glaciations, the lighter oxygen-16 has a greater tendency to evaporate from the ocean surface than the heavier oxygen-18 does. Thus, more of the heavy isotope is left behind in the ocean and absorbed by marine organisms. From this analysis of marine sediments, geologists have learned that there were many shorter, more regular cycles of glaciation and deglaciation than geologists had recognized from the glacial drift of the continents alone.

# 听力材料

### TPO9---Desert Lakes

Narrator: Listen to part of a lecture in a Geology class.

Lecturer: So, continuing our discussion of desert lakes, now I want to focus on what's known as the "Empty Quarter". The "Empty Quarter" is a huge area of sand that covers about a quarter of the Arabian Peninsula. Today it's pretty desolate, barren and extremely hot.

But there've been times in the past when monsoon rains soaked the Empty Quarter and turned it from a desert into grassland that was dotted with lakes and home to various animals. There were actually two periods of rain and lake formation: the first one began about 37,000 years ago; and the second one dates from about 10,000 years ago.

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

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

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

According to the study, two factors were important for lake formation in the Empty Quarter: first, the rains that fell there were torrential. So it would've been impossible for all the water to soak into the ground. Second, as you know, sand dunes contain other types of particles, besides sand, including clay and silt.

Now, when the rain fell, water ran down the sides of the dunes, carrying clay and silt particles with it. And wherever these particles settled, they formed a pan, a layer that water couldn't penetrate. Once this pan formed, further run-off collected, and formed a lake.Now, the older lakes, about half the formations, the ones that started forming 37, 000 years ago, the limestone formations we see, they're up to a kilometer long, but only a few meters wide, and they're scattered along the desert floor, in valleys between the dunes.

So, the theory is, the lakes formed there on the desert floor, in these long narrow valleys. And we know, because of what we know about similar ancient desert lakes, we know that the lakes didn't last very long, from a few months to a few years on average. As for the more recent lakes, the ones from 10,000 years ago, well, they seemed to have been smaller, and so may have dried up more quickly.

Another difference, very important today for distinguishing between older lake beds and newer ones, is the location of the limestone formations. The more recent beds are high up in the dunes. Why these differences? Well, there are some ideas about that, and they have to do with the shapes of the sand dunes, when the lakes were formed.

37, 000 years ago, the dunes were probably nicely rounded at the top, so the water just ran right down their sides to the desert floor. But there were thousands of years of wind between the two rainy periods, reshaping the dunes. So, during the second rainy period, the dunes were kind of chopped up at the top, full of hollows and ridges, and these hollows would've captured the rain right there on the top.

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

The study makes a couple of interesting points about the fossils, which I hope will be looked at in future studies. At older lake sites, there’s fossil remains from hippopotamuses, water buffalo, animals that spend much of their lives standing in water, and also, fossils of cattle.

However, at the sites of the more recent lakes, there’s only cattle fossils, additional evidence for geologists that these lakes were probably smaller, shallower, because cattle only use water for drinking. So they survive on much less. Interestingly, there are clams and snail shells; but, no fossils of fish. We're not sure why. Maybe there was a problem with the water. Maybe it was too salty. That's certainly true of other desert lakes.