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科学探索丛书

SCIENTISTS IN THE FIELD

实地科学探索

PAUL SERENO

Digging for Dinosaurs

恐龙探究

REBECCA L. JOHNSON AND PAUL C. SERENO (美) 著



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朱燕燕 注

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Piecing Together the Past

整合过去

1. tower	vt.	高耸, 屹立
2. rock	nl.	岩石
3. formation	nl.	构成, 形成
4. graveyard	nl.	墓地

Towering¹ rock² formations³ in the Ischigualasto Valley, graveyard⁴ of the dinosaurs

Paul Sereno picked his way down a rocky slope¹. Out of the corner of his eye, he spotted² an odd-shaped³ stone. No, not a stone—a bone! There was another bone next to the first, and another. Paul had found his first dinosaur skeleton⁴!



Paul Sereno, paleontologist

In 1988 Paul and a student team traveled to the Ischigualasto Valley in Argentina⁵. The oldest dinosaurs, legend⁶ had it, were to be found in this desert⁷ valley. There, some 40 years ago, scientists had unearthed⁸ bones of an early dinosaur they called *Herrerasaurus*⁹. But no skull¹⁰ or complete skeleton had been found.

Herrerasaurus lived about 228 million years ago when dinosaurs were first appearing¹¹. Over millions of years, dinosaurs spread¹² across the globe¹³. They evolved¹⁴, or changed over time, into thousands of

different species¹⁵. The last of the dinosaurs died out¹⁶, or became extinct¹⁷, about 65 million years ago.

But dinosaurs left clues¹⁸. Footprints¹⁹, bones, and teeth were preserved²⁰ as fossils²¹. These are the kinds of clues Paul Sereno examines as he explores²² the past. So get ready to join Paul Sereno, world-famous dinosaur detective²³, as he pieces together the story of dinosaurs.



1. slope	<i>n.</i>	斜坡	13. globe	<i>n.</i>	地球
2. spot	<i>v.</i>	发现	14. evolve	<i>v.</i>	进化
3. odd-shaped	<i>adj.</i>	奇形怪状的	15. species	<i>n.</i>	种; 物种
4. skeleton	<i>n.</i>	骨架	16. die out		灭绝
5. Argentina		阿根廷	17. extinct	<i>adj.</i>	灭绝的
6. legend	<i>n.</i>	传说	18. clue	<i>n.</i>	线索
7. desert	<i>n.</i>	沙漠	19. footprint	<i>n.</i>	脚印
8. unearth	<i>v.</i>	发掘; 掘出	20. preserve	<i>v.</i>	保留
9. <i>Herrerasaurus</i>	<i>n.</i>	赫勒拉龙	21. fossil	<i>n.</i>	化石
10. skull	<i>n.</i>	头骨	22. explore	<i>v.</i>	探索
11. appear	<i>v.</i>	出现	23. detective	<i>n.</i>	发现者
12. spread	<i>v.</i>	迁移			

Paul Sereno: Painter to Paleontologist

保罗·塞里诺：从画家到古生物学家

Are you crazy¹ about dinosaurs? Can you rattle off² dinosaur names from Apatosaurus³ to Velociraptor⁴? Believe it or not, Paul Sereno hardly gave a hoot⁵ about dinosaurs at your age.

Paul Sereno grew up in Naperville⁶, Illinois⁷, a suburb of Chicago. His mother was an artist and a teacher. His father was a civil engineer⁸. Paul was the second of six children.

- | | | |
|-----------------------|------|-------------|
| 1. crazy | adj. | 狂热的 |
| 2. rattle off | | (不费力地) 飞快说出 |
| 3. Apatosaurus | n. | 谬龙 |
| 4. Velociraptor | n. | 迅猛龙 |
| 5. hardly give a hoot | | 对……全然漠视 |

- | | |
|-------------------|----------------|
| 6. Naperville | 内珀维尔 |
| 7. Illinois | 伊利诺伊州 |
| 8. civil engineer | 土木工程师 |
| 9. Tom Sawyer | 《汤姆·索耶历险记》的主人公 |

Paul Sereno (center) as Tom Sawyer⁹ in a school play



As a young boy, Paul didn't like school. Summer was his favorite season. He and his brothers and sisters would often sign up for¹ nature classes. They went hiking². They collected leaves or insects³. Soon they had an impressive⁴ insect collection⁵ and were hatching⁶ caterpillars⁷ in the house.

When he was in fourth grade, Paul went on his first fossil-hunting trip to an abandoned⁸ coal mine. Among the piles of rock, he found fossils of worms and other creatures⁹ that once lived at the bottom of an ancient¹⁰ sea. These fossils, older than dinosaur fossils, were pretty cool. But to Paul, a huge, beautifully colored moth¹¹, raised by hand from a tiny¹² caterpillar—that was really cool!



Cecropia moth²¹

One thing Paul did enjoy in school was art. In high school he created his first painting. It was a picture of bottles and the French horn¹³ he played in band¹⁴. Paul decided he wanted to study art in college. But in order to get into college, he had to score well on the entrance exam. He devoted¹⁵ all his energies¹⁶ to this goal. He even read the dictionary during his lunch hour to learn new words.

The hard work paid off¹⁷, and Paul was accepted at Northern Illinois University¹⁸. There he took painting and other classes. Paul also studied anatomy¹⁹, the structure²⁰ of living things. He loved learning about how plants and animals have changed over millions of years.

1. sign up for		报名参加	12. tiny	<i>adj.</i>	极小的
2. hike	<i>v.</i>	徒步旅行	13. French horn		法国号
3. insect	<i>n.</i>	昆虫	14. band	<i>n.</i>	管乐队
4. impressive	<i>adj.</i>	吸引人的	15. devote	<i>v.</i>	将……献(给)
5. collection	<i>n.</i>	收藏	16. energy	<i>n.</i>	精力
6. hatch	<i>v.</i>	孵化	17. pay off		得到好结果
7. caterpillar	<i>n.</i>	毛毛虫	18. Northern Illinois University		北伊利诺伊大学
8. abandoned	<i>adj.</i>	废弃的	19. anatomy	<i>n.</i>	解剖学
9. creature	<i>n.</i>	动物	20. structure	<i>n.</i>	结构
10. ancient	<i>adj.</i>	古老的	21. Cecropia moth		惜古比天蚕蛾
11. moth	<i>n.</i>	蛾			

The Turning Point¹

One fall while he was in college, Paul and his older brother visited the American Museum of Natural History in New York. On a behind-the-scenes² tour³, Paul saw the bones of strange creatures in room after room. He watched artists working on reconstructions⁴, and he learned about scientists planning fossil-hunting trips to many parts of the world.

Though he loved art, Paul suddenly knew he wanted to be a paleontologist, a person who studies ancient life-forms⁵. As a paleontologist, he could combine⁶ his talent⁷ in art with his interest in fossils and ancient life and his desire⁸ to explore the world. For Paul, paleontology⁹ seemed like the perfect¹⁰ job.

Paleontologists at the American Museum of Natural History clean the skull of a huge fossil reptile¹¹ in the 1940s.

1. turning point		转折点	6. combine	v.	结合
2. behind-the-scenes	adj.	秘密的；不公开的	7. talent	n.	才能
3. tour	n.	参观	8. desire	n.	愿望
4. reconstruction	n.	重新组合	9. paleontology	n.	考古学
5. life-form	n.	生物	10. perfect	* adj.	完美的
			11. reptile	n.	爬行动物



A year later, in 1979, Paul had a small desk among the fossils in the American Museum. He began studying paleontology at nearby Columbia University¹. It was an exciting time for paleontologists. Many students were trying to figure out² family trees³ of different groups of animals and plants.

Despite⁴ their popularity⁵, very little was known about dinosaurs. When and where did the first dinosaurs appear? How did dinosaurs evolve, or change over time? As he studied fossils, Paul's interest in dinosaurs grew. He wanted to answer these and other questions about these mysterious⁶ creatures.

After getting his doctoral degree⁷ at Columbia, Paul got a job teaching at the University of Chicago⁸ in 1987. That year he began planning his first expedition⁹—to the Ischigualasto Valley in Argentina.

Discovering Dinosaurs

In the hot, dusty¹⁰ badlands¹¹ of the Ischigualasto Valley, Paul and his team unearthed hundreds of fossils, including several partial¹² skeletons of *Herrerasaurus*. Three years later, Paul returned to the valley to continue the work. This time the skeleton of a smaller dinosaur was discovered. Like *Herrerasaurus*, this meter-long (3-foot-long) cousin¹³ was a two-legged carnivore¹⁴, or meat eater. Unlike *Herrerasaurus*, this creature was a species that had never been found before, and it needed a name. Paul's team called it *Eoraptor*¹⁵, which means “dawn¹⁶ stealer.”



Skulls of *Eoraptor* reveal²⁰ their small, razor-sharp²¹ teeth.

1. Columbia University	哥伦比亚大学
2. figure out	弄清楚
3. family tree	家谱; 系统
4. despite <i>prep.</i>	尽管
5. popularity <i>n.</i>	普及
6. mysterious <i>adj.</i>	神秘的
7. doctoral degree	博士学位
8. University of Chicago	芝加哥大学
9. expedition <i>n.</i>	探险
10. dusty <i>adj.</i>	灰尘覆盖的
11. badland <i>n.</i>	荒地

12. partial <i>adj.</i>	部分的
13. cousin <i>n.</i>	亲戚
14. carnivore <i>n.</i>	食肉动物
15. Eoraptor <i>n.</i>	始盗龙
16. dawn <i>n.</i>	黎明; 拂晓
17. Greek <i>adj.</i>	希腊的
18. fearfully <i>adv.</i>	非常; 极
19. lizard <i>n.</i>	蜥蜴
20. reveal <i>v.</i>	显示; 展现
21. razor-sharp <i>adj.</i>	(剃刀般)锋利的



Paul Sereno and his team uncover¹ an 18-meter (60-foot) dinosaur in Niger².

1. uncover
2. Niger

移去...的恐龙物
尼日尔

Next, Paul took a team to Africa. Their goal was to look for dinosaurs that lived when the mighty¹ *Tyrannosaurus*² roamed³ North America.

When *Eoraptor* lived—about 228 million years ago—all of the continents were joined in a single great supercontinent⁴ called Pangaea⁵. By the last half of the dinosaur age, in the Cretaceous⁶ period (145–65 million years ago), Pangaea had broken apart into the continents we recognize⁷ today. The dinosaurs living on those continents became more and more different over time. So Paul knew that Africa's Cretaceous dinosaurs might look quite different from those in North America. When Paul set out⁸ for Africa, only a few dinosaurs had been discovered there. He began the search for dinosaur fossils in the Sahara⁹, the world's largest desert. There among sand dunes¹⁰ and rocky cliffs¹¹, Paul and his team found many fossils, including some species brand-new¹² to science (see page 12).

You might wonder why Paul is so successful in his dinosaur detective work. After all, many paleontologists never find a new species. Paul says his success has to do with the kind of team that goes with him into the field. He takes students with a passion¹³ for fossils, young paleontologists, and sometimes a teacher, doctor, engineer, or photographer¹⁴. They all share the dream of a major¹⁵ fossil discovery—and that takes them through all the hardships¹⁶ and challenges¹⁷ involved¹⁸ in working for months in a desert.

1. mighty	<i>adj.</i>	强大的
2. Tyrannosaurus	<i>n.</i>	霸王龙
3. roam	<i>v.</i>	漫步；漫游
4. supercontinent	<i>n.</i>	超大陆
5. Pangaea	<i>n.</i>	泛古陆；联合古陆
6. Cretaceous	<i>adj.</i>	白垩纪的
7. recognize	<i>v.</i>	确认；认识
8. set out		出发
9. Sahara		撒哈拉大沙漠
10. dune	<i>n.</i>	沙丘
11. cliff	<i>n.</i>	悬崖
12. brand-new	<i>adj.</i>	全新的
13. passion	<i>n.</i>	激情

14. photographer	<i>n.</i>	摄影师
15. major	<i>adj.</i>	主要的；较重要的
16. hardship	<i>n.</i>	艰苦
17. challenge	<i>n.</i>	挑战
18. involve	<i>v.</i>	包含
19. consider	<i>v.</i>	认为
20. layer	<i>n.</i>	层
21. New Mexico		新墨西哥州
22. Diplodocus	<i>n.</i>	梁龙
23. Allosaurus	<i>n.</i>	跃龙
24. Stegosaurus	<i>n.</i>	剑龙
25. Brachiosaurus	<i>n.</i>	腕龙

Interesting Question

Q: Where can you find dinosaur fossils in the United States?

A: The western U.S. is considered¹⁹ one of the best fossil areas in the world. One bone-rich layer²⁰ of rock extends more than 1,600 kilometers (1,000 miles) from New Mexico²¹ to Canada. Since 1877 when the first bones were discovered in this layer, many dinosaurs have been unearthed, including *Diplodocus*²², *Apatosaurus*, *Allosaurus*²³, *Stegosaurus*²⁴, and *Brachiosaurus*²⁵.

Dinosaur Discoveries



Afrovenator²³

New species discovered in Niger. It was 9 meters (30 feet) long, with long, pointed²⁴ teeth.



Jobaria²⁵

New species discovered in Niger. This huge herbivore²⁶, or plant eater, grew to more than 18 meters (60 feet) in length²⁷.



Deltadromeus²⁸

New species discovered in Morocco²⁹. With its long, slender³⁰ legs, *Deltadromeus* must have been the track star of the dinosaur world 90 million years ago.



Carcharodontosaurus³¹

Discovered in Morocco, it's among the largest carnivores that ever roamed Earth, with a nearly 2-meter-long (6-foot-long) skull.

That Crocodile¹ Smile

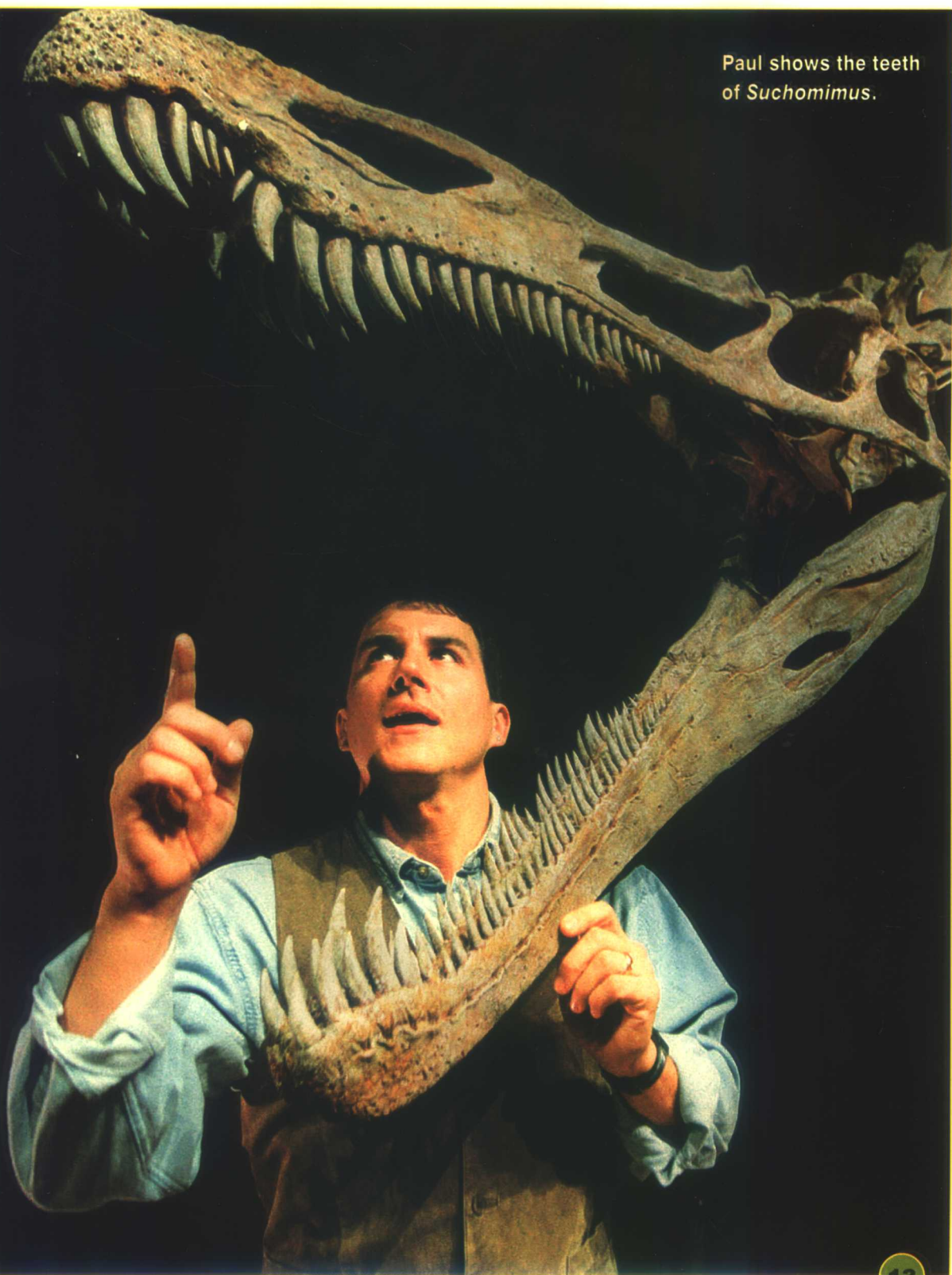
One of the new species that Paul and his team discovered in Africa was especially strange-looking. The clue that led to its discovery was a giant² thumb³ claw⁴ that was just lying on the surface⁵ of the desert as if someone had put it there yesterday. Actually⁶, it was about 100 million years old! After digging around the claw, the team unearthed most of a huge skeleton that was 11 meters (36 feet) long. Like *Tyrannosaurus*, it was a predator⁷. But this dinosaur had a sail⁸ on its back and a long, low skull with more than a hundred teeth in its jaws⁹. Paul's team named it *Suchomimus*¹⁰, meaning "crocodile mimic¹¹," because its skull looked a bit like a crocodile's.

Suchomimus's teeth were sharp, and the largest ones were located¹² at the front of the jaws. Paleontologists often infer¹³ what dinosaurs ate by the shape of their fossilized¹⁴ teeth. To infer means to draw a conclusion¹⁵ based on what you know. Paul and his team inferred that *Suchomimus* might have snapped up¹⁶ prey¹⁷ as a crocodile does, because its teeth are similar¹⁸ to a crocodile's.

After making so many discoveries in Africa, Paul's reputation¹⁹ as a dinosaur hunter spread. Many people wanted to hunt for fossils with Paul. Have you ever wondered what it would be like to hunt for dinosaur fossils? Well, grab²⁰ your hat and sunscreen²¹ and let's join Paul on one of his recent²² expeditions.

1. crocodile	<i>n.</i>	鳄鱼	17. prey	<i>n.</i>	猎物
2. giant	<i>adj.</i>	巨大的	18. similar	<i>adj.</i>	类似的
3. thumb	<i>n.</i>	(动物的)第一指	19. reputation	<i>n.</i>	名声
4. claw	<i>n.</i>	爪	20. grab	<i>v.</i>	抓起
5. surface	<i>n.</i>	表面	21. sunscreen	<i>n.</i>	(防晒油中的)遮光剂
6. actually	<i>adv.</i>	实际上	22. recent	<i>adj.</i>	近来的; 新近的
7. predator	<i>n.</i>	食肉动物	23. Afrovenator	<i>n.</i>	非洲猎龙
8. sail	<i>n.</i>	脊鳍	24. pointed	<i>adj.</i>	尖的
9. jaw	<i>n.</i>	颌	25. Jobaria	<i>n.</i>	约巴龙
10. Suchomimus	<i>n.</i>	似鳄龙	26. herbivore	<i>n.</i>	食草动物
11. mimic	<i>n.</i>	模仿者	27. length	<i>n.</i>	长度
12. locate	<i>v.</i>	找到	28. Deltadromeus	<i>n.</i>	三角洲奔龙
13. infer	<i>v.</i>	推断; 推论	29. Morocco		摩洛哥
14. fossilize	<i>v.</i>	变成化石	30. slender	<i>adj.</i>	修长的
15. draw a conclusion		得出结论	31. Carcharod- ontosaurus	<i>n.</i>	鲨齿龙
16. snap up		匆匆吃下			

Paul shows the teeth
of *Suchomimus*.



In the Field: Digging Up Dinosaurs

实地作业：挖掘恐龙

You are in dinosaur territory¹—on the southern² edge³ of the Sahara in the country of Niger in West Africa. It's 10 a.m. on an autumn day and it's already 50°C (120°F). Your mouth is dry and lips are cracked⁴, but you don't notice. You're on your knees, hunched⁵ over a dinosaur skull. That's all that matters.



This tooth belongs to the *Carcharodontosaurus*, a predator that lived 90 million years ago.

With a paintbrush⁶ you gently⁷ sweep away sand and pebbles⁸ from some of the pointed teeth in the dinosaur's lower jaw. Slowly, more of the skull emerges⁹, and the glinting¹⁰ teeth almost look like the dinosaur is smiling back at you for the expert¹¹ dental¹² work you've done! Nearby, Paul and some team members are uncovering the fossils of other kinds of dinosaurs. You stop to stretch¹³, take a drink of water, and get a quick update¹⁴ on their finds.

For Paul and his team, finding fossils involves spending long and tiring hours working beneath the scorching¹⁵ sun. There can be many false¹⁶ clues—a stone that looks like a bone, a bone fragment¹⁷ that doesn't lead anywhere.

- | | | |
|---------------|-------------|---------|
| 1. territory | <i>n.</i> | 地区；区域 |
| 2. southern | <i>adj.</i> | 南方的 |
| 3. edge | <i>n.</i> | 边缘 |
| 4. cracked | <i>adj.</i> | 破裂的 |
| 5. hunch | <i>v.</i> | 弓起背部 |
| 6. paintbrush | <i>n.</i> | 漆刷 |
| 7. gently | <i>adv.</i> | 轻轻地 |
| 8. pebble | <i>n.</i> | 卵石 |
| 9. emerge | <i>v.</i> | 出现 |
| 10. glinting | <i>adj.</i> | 闪烁的 |
| 11. expert | <i>adj.</i> | 内行的 |
| 12. dental | <i>adj.</i> | 牙齿的；牙科的 |

- | | | |
|----------------|-------------|----------|
| 13. stretch | <i>v.</i> | 舒展肢体；伸懒腰 |
| 14. update | <i>n.</i> | 更新 |
| 15. scorching | <i>adj.</i> | 灼热的 |
| 16. false | <i>adj.</i> | 错误的；假的 |
| 17. fragment | <i>n.</i> | 碎片 |
| 18. thigh bone | | 股骨 |

Paul brushes a huge thigh bone¹⁸ of *Jobaria* in the Sahara.

