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Rocks and Minerals

岩石与矿物

GLEN PHELAN (美) 著

外语教学与研究出版社
FOREIGN LANGUAGE TEACHING AND RESEARCH PRESS

英文注释

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“国家地理科学探索丛书”（英文注释版）第二辑分为8个系列，共46本，内容涉及自然科学和社会研究，除对本套丛书第一辑已包含的“生命科学”、“物理科学”、“地球科学”和“文明的进程”4个系列进行了补充外，又推出了4个新的系列——“生活中的科学”、“科学背后的数学”、“专题研究”以及“站在时代前沿的科学家”。

这套丛书秉承《国家地理》杂志图文并茂的特色，在书中配有大量精彩的图片，文字地道易懂、深入浅出，将科学性和趣味性完美结合，称得上是一套精致的小百科全书。特别值得一提的是本套丛书在提高青少年读者英语阅读能力的同时，还注重培养他们的科学探索精神、动手能力、逻辑思维能力和沟通能力。

本套丛书既适合学生自学，又可用于课堂教学。丛书各个系列均配有一本教师用书，内容包括背景知识介绍、技能训练提示、评估测试、多项选择题及答案等详尽的教学指导，是对课堂教学的极好补充。

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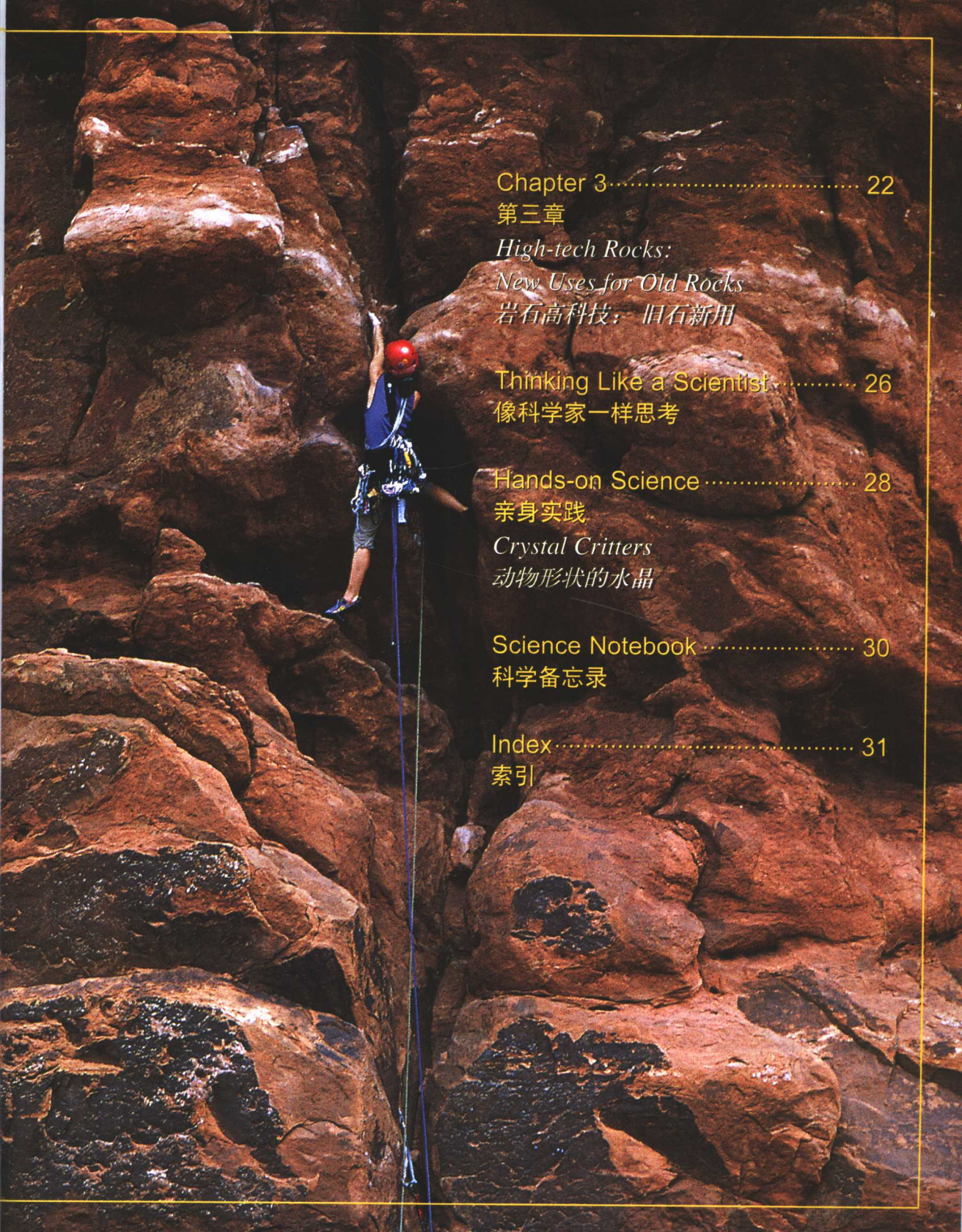
Dazzling Crystals

耀眼的水晶

A rock climber on a cliff at Arches
National Park, Utah

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Shaping a Mountain

一座山的形成

1. Crazy Horse Memorial 疯马纪念碑
2. scale model 比例模型; 缩尺模型
3. foreground (图画) 前景; 最突出的地位

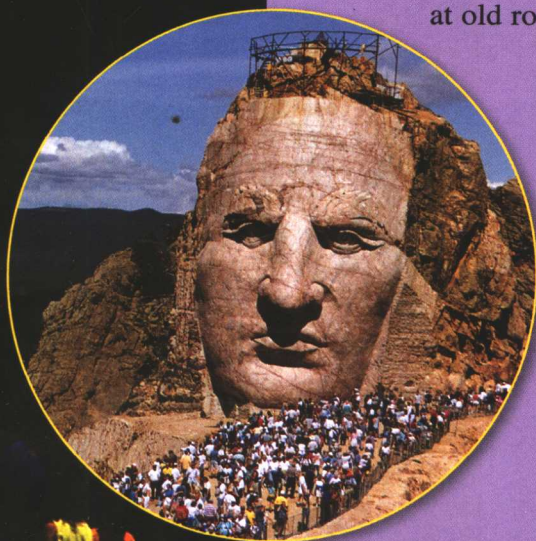
The Crazy Horse Memorial¹
with scale model² in foreground³

The Crazy Horse Memorial is taking shape in the Black Hills of South Dakota¹. This gigantic carving² is a tribute³ to the Sioux⁴ leader Crazy Horse and his people. The work began in 1948 and still has decades⁵ to go. It takes a long time to carve rock, especially a whole mountain of it!

The story of Crazy Horse Mountain begins before it was even a mountain. Over a billion⁶ years ago, the rock that makes up Crazy Horse Mountain was a hot, thick, liquid mixture⁷ called magma⁸. It was deep underground where the temperatures are hot enough to melt⁹ rock. Over time, the magma rose toward the surface. As the magma rose, it cooled enough to become solid rock called granite¹⁰. The granite was still underground, with layers of other rock above it.

About 100 million¹² years ago, more rising magma slowly pushed the granite and top rock layers above the surrounding¹³ flat plains. Since that time glaciers¹⁴ and rivers have worn away¹⁵ the top rock layers. Now the granite that makes up most of the Black Hills is exposed¹⁶. One of those massive¹⁷ hunks¹⁸ of granite is Crazy Horse Mountain.

How do scientists know all this? Scientists study rocks to learn about the solid parts of Earth. This book will show you how to look at old rocks in new ways to unlock their secrets.



- | | | |
|-----------------|-------------|----------------------|
| 1. South Dakota | | 南达科他州 |
| 2. carving | <i>n.</i> | 雕刻品 |
| 3. tribute | <i>n.</i> | (表示敬意的) 礼物 |
| 4. Sioux | <i>n.</i> | 苏人 (美国南部和加拿大北部的印第安人) |
| 5. decade | <i>n.</i> | 十年 |
| 6. billion | <i>n.</i> | 十亿 |
| 7. mixture | <i>n.</i> | 混合物 |
| 8. magma | <i>n.</i> | 岩浆 |
| 9. melt | <i>v.</i> | 融化 |
| 10. granite | <i>n.</i> | 花岗岩; 花岗石 |
| 11. layer | <i>n.</i> | 层 |
| 12. million | <i>n.</i> | 百万 |
| 13. surrounding | <i>adj.</i> | 周围的 |
| 14. glacier | <i>n.</i> | 冰川; 冰河 |
| 15. wear away | | 磨损; 磨去 |
| 16. expose | <i>v.</i> | 暴露; 显露 |
| 17. massive | <i>adj.</i> | 大而重的; 大块的 |
| 18. hunk | <i>n.</i> | 大块 |

You could hunt for¹ a lot of rocks in Joshua Tree National Park. But what about where you live? No mountains? No beaches? No problem. You don't have to travel hundreds of miles to look for rocks. Just take a walk around the neighborhood.

Rocks are just about everywhere. In fact, you can probably find them within a few feet of your front door. The concrete² sidewalk³ and asphalt⁴ street are made of a hardened⁵ mixture that includes crushed⁶ stone and small pebbles⁷. You may have seen these pebbles on a sidewalk that is breaking apart.

The sides of some buildings are made of sandstone⁸, limestone⁹, or granite. A building might have marble¹⁰ floors inside. Some park benches and playground equipment¹¹ are made of rock, too. You'll find all sorts of rocks along streams, in fields, and along roads. And if you dig in a garden, you're bound to¹² run into¹³ small stones.

Searching for rocks and collecting them is called rockhounding¹⁴. It can be a lot of fun. Before you go rockhounding, though, it helps to find out a little bit more about this thing called rock.

1. hunt for		寻找; 搜寻	10. marble	<i>n.</i>	大理石
2. concrete	<i>adj.</i>	混凝土(制)的	11. equipment	<i>n.</i>	器械
3. sidewalk	<i>n.</i>	人行道	12. be bound to		一定; 必然
4. asphalt	<i>adj.</i>	沥青的	13. run into		偶然碰见
5. hardened	<i>adj.</i>	硬化的; 变硬的	14. rockhounding	<i>n.</i>	矿石采集
6. crush	<i>v.</i>	压碎			
7. pebble	<i>n.</i>	卵石; 小圆石			
8. sandstone	<i>n.</i>	沙岩			
9. limestone	<i>n.</i>	灰岩; 石灰岩			



What Is a Rock?

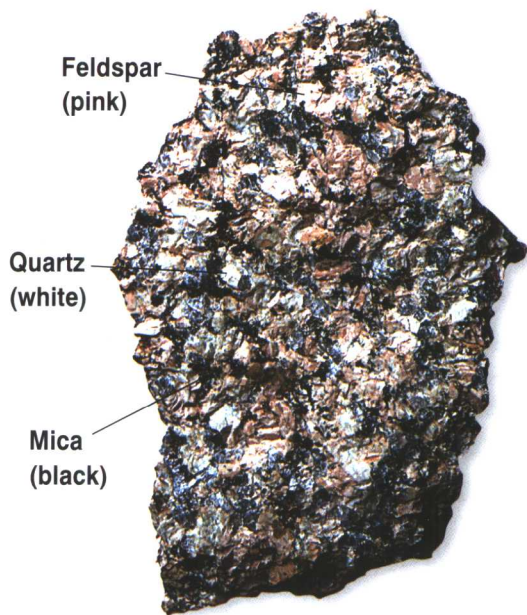
You probably know a rock when you see one. But what makes it a rock? A rock is a natural solid material made up of one or more minerals. A mineral is a material that is found in nature. It is not alive and never was alive. So a piece of plastic isn't a mineral, because it was made by people, not by nature. Coal isn't a mineral, because it formed from plants and animals that lived millions of years ago.

A rock might be made of only one mineral. Most rocks, however, are mixtures of many minerals. A rock is something like a cookie¹. An oatmeal² cookie is made up of raisins³, walnuts⁴, oatmeal, and other ingredients⁵. They all stick together as the cookie bakes⁶. Now look at the piece of granite below. It's mostly made up of

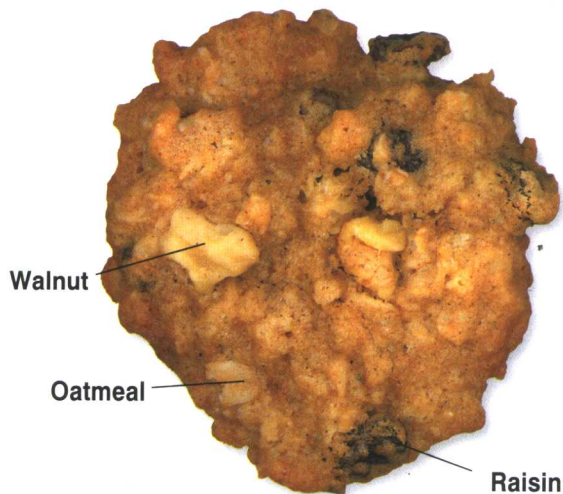
pieces—or grains⁷—of quartz⁸, feldspar⁹, and mica¹⁰. These minerals lock together like pieces of a jigsaw puzzle¹¹.

The minerals that make up granite are only a few of about 3,500 known minerals. All these minerals make up many different rocks. But every rock is either igneous¹², sedimentary¹³, or metamorphic¹⁴. With any luck¹⁵ you'll find samples¹⁶ of all three when you go rockhounding.

1. cookie	<i>n.</i>	甜饼干; 曲奇饼
2. oatmeal	<i>n.</i>	燕麦粉
3. raisin	<i>n.</i>	葡萄干
4. walnut	<i>n.</i>	山核桃
5. ingredient	<i>n.</i>	原料; 成分
6. bake	<i>v.</i>	烘; 烤
7. grain	<i>n.</i>	细粒; 颗粒
8. quartz	<i>n.</i>	石英
9. feldspar	<i>n.</i>	长石
10. mica	<i>n.</i>	云母
11. jigsaw puzzle		拼图玩具; 七巧板
12. igneous	<i>adj.</i>	火成的
13. sedimentary	<i>adj.</i>	沉积的
14. metamorphic	<i>adj.</i>	变质的
15. with any luck		如果一切顺利的话
16. sample	<i>n.</i>	样品

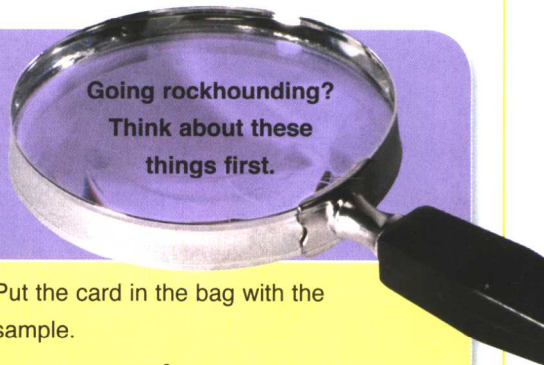


Granite piece



Oatmeal cookie

Interesting Questions...



Going rockhounding?
Think about these things first.

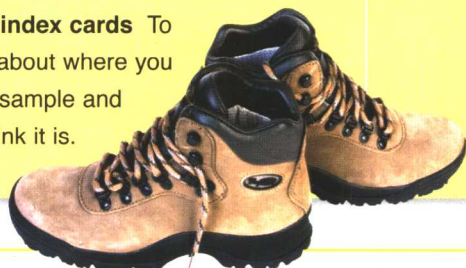
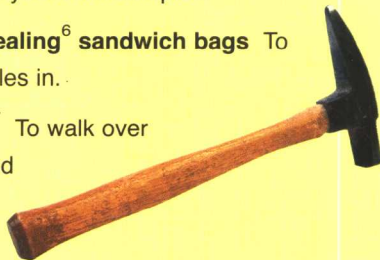
Q: What are the best places to collect rocks?

A: Check with the library, a nature center, a natural history museum, or a university department¹ of geology². See if your phone book lists any rock shops. The shop owner may know all the best places to collect rocks.

Q: What should I bring?

A: It depends on how serious a rock hound you are. Here are a few basic things:

- **Geologist's hammer**³ To break off a fresh sample of rock. Don't use a regular⁴ hammer—it might break.
- **Magnifying glass**⁵ To get a good look at the minerals in your rock samples.
- **Plastic self-sealing**⁶ sandwich bags To put your samples in.
- **Hiking boots**⁷ To walk over loose rocks and sometimes sharp ones.
- **Field guide**⁸ To compare your rocks to the ones in this book and tell what type they are.
- **Pencil and index cards** To write notes about where you found each sample and what you think it is.



Put the card in the bag with the sample.

- **Safety goggles**⁹ To protect your eyes from flying pieces of rock. You **MUST** wear safety goggles if you break rocks!
- **Backpack**¹⁰ To carry all your samples.

Q: What else should I know?

A: If you want to collect on private property¹¹, always ask for permission¹² first. Also ask permission before collecting in parks and nature centers. Many do not allow collecting. Always go rockhounding with an adult¹³.



- | | | |
|---------------------|-------------|--------------|
| 1. department | <i>n.</i> | 系 |
| 2. geology | <i>n.</i> | 地质学 |
| 3. hammer | <i>n.</i> | 锤子; 榔头 |
| 4. regular | <i>adj.</i> | 普通的 |
| 5. magnifying glass | | 放大镜 |
| 6. self-sealing | <i>adj.</i> | 自动密封的; 自行封口的 |
| 7. boot | <i>n.</i> | 靴子 |
| 8. guide | <i>n.</i> | 指南; 手册 |
| 9. goggle | <i>n.</i> | [~s] 护目镜; 风镜 |
| 10. backpack | <i>n.</i> | 背包 |
| 11. property | <i>n.</i> | 地产 |
| 12. permission | <i>n.</i> | 许可 |
| 13. adult | <i>n.</i> | 成年人 |

A Rockhounding Field Trip

Imagine your class is going on a field trip to collect rocks. You'll be stopping at two terrific¹ places to rockhound—a creek² and a quarry³. A quarry is a place where rock is dug out of the ground.



Most igneous rocks form while they are still underground. The magma rises slowly and stops below the surface. So the magma cools slowly. Then the mineral grains, or crystals, have time to grow large enough to show in the rock.

When magma rises quickly all the way to the surface, volcanoes¹⁰ form. The magma shoots¹¹ out or spills¹² out onto the surface. This magma is called lava¹³. The lava cools so quickly that crystals don't have time to grow large. One kind of igneous rock—obsidian¹⁴—has crystals so tiny that the rock looks like shiny black or brown glass. There's no obsidian in Stony Creek though. There were no volcanoes here.

First Stop—Stony Creek⁴

One of the first rocks that catches your eye in Stony Creek has grains⁵ big enough to see without a magnifying glass. What kind of rock is this? You take out your field guide and find a picture of it. It's gabbro⁶. The black specks⁷ are the mineral augite⁸. The gray or white specks are the mineral feldspar.

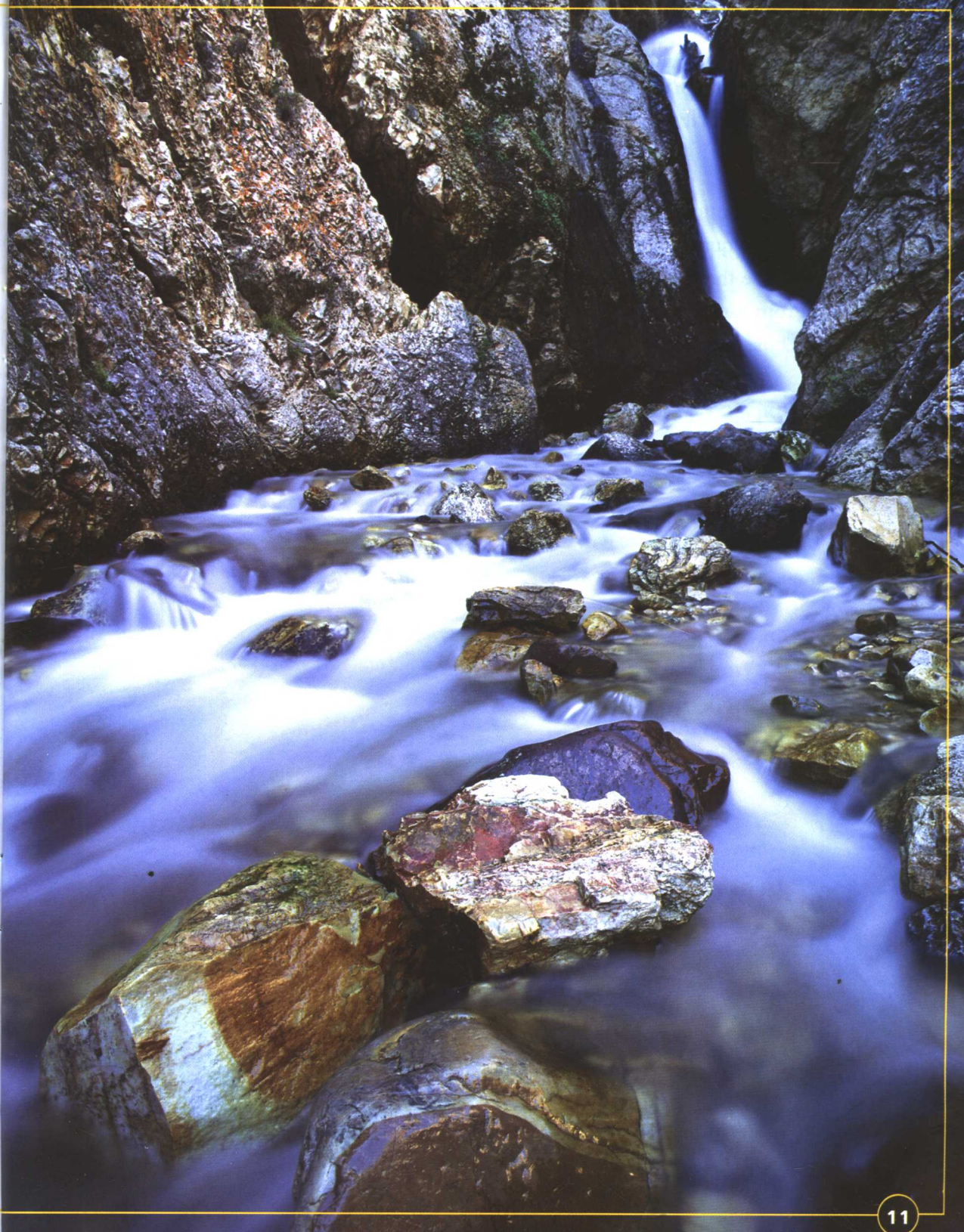
Both granite and gabbro are igneous rocks. These rocks start out as hot magma deep underground. Forces in Earth might push the magma toward the surface. As the magma rises, it cools. As the magma cools, the chemicals⁹ in it become solid and lock together, forming minerals. That's igneous rock.

1. terrific	<i>adj.</i>	非常好的
2. creek	<i>n.</i>	小河；溪
3. quarry	<i>n.</i>	采石场
4. Stony Creek		石溪公园
5. grain	<i>n.</i>	细粒；颗粒
6. gabbro	<i>n.</i>	辉长岩
7. speck	<i>n.</i>	斑点；微粒
8. augite	<i>n.</i>	辉石
9. chemical	<i>n.</i>	化学成分
10. volcano	<i>n.</i>	火山
11. shoot	<i>v.</i>	喷射
12. spill	<i>v.</i>	溢出；溅出
13. lava	<i>n.</i>	熔岩；火山岩
14. obsidian	<i>n.</i>	黑曜岩

Obsidian

Gabbro





Next Stop—Miller's Quarry

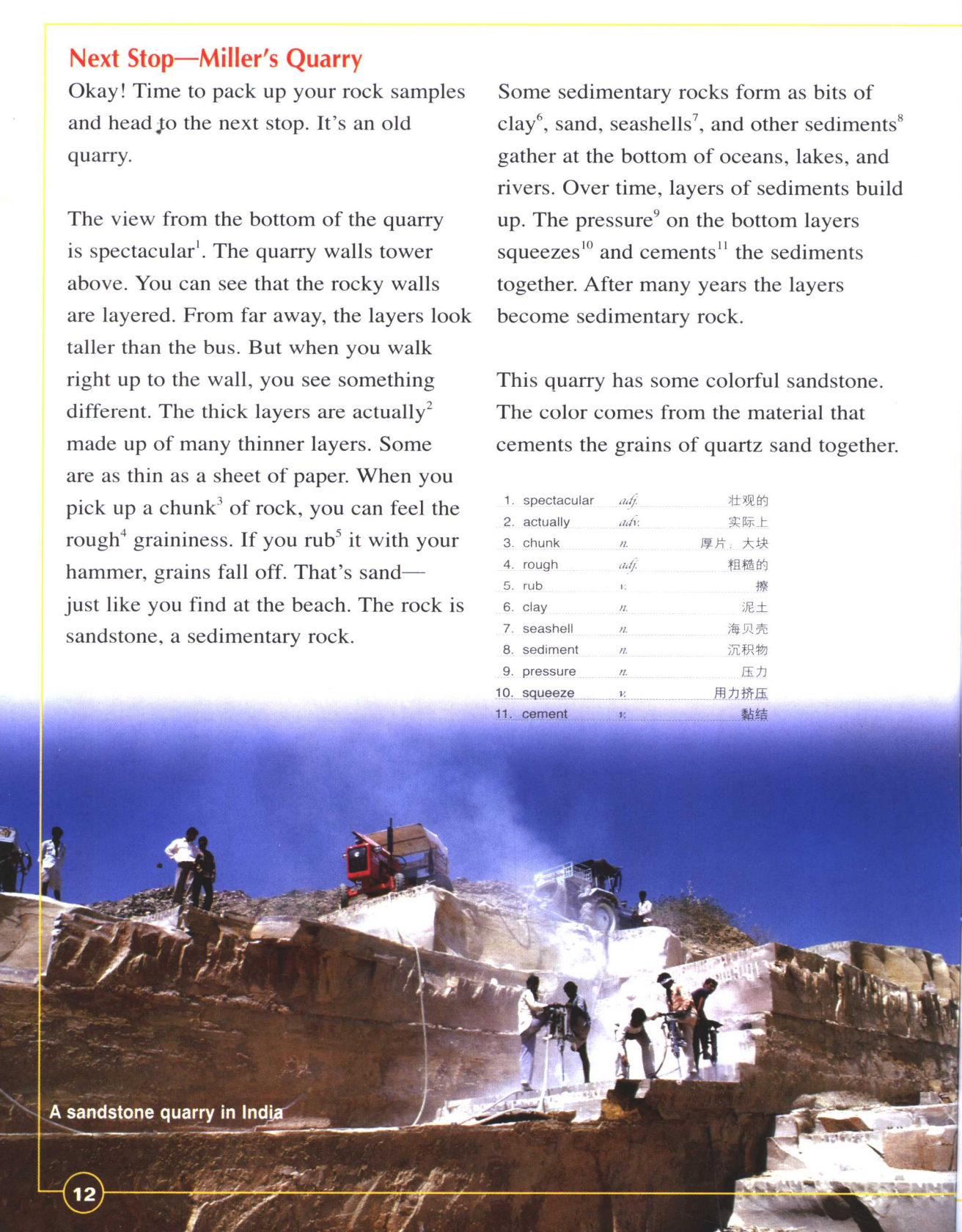
Okay! Time to pack up your rock samples and head to the next stop. It's an old quarry.

The view from the bottom of the quarry is spectacular¹. The quarry walls tower above. You can see that the rocky walls are layered. From far away, the layers look taller than the bus. But when you walk right up to the wall, you see something different. The thick layers are actually² made up of many thinner layers. Some are as thin as a sheet of paper. When you pick up a chunk³ of rock, you can feel the rough⁴ graininess. If you rub⁵ it with your hammer, grains fall off. That's sand—just like you find at the beach. The rock is sandstone, a sedimentary rock.

Some sedimentary rocks form as bits of clay⁶, sand, seashells⁷, and other sediments⁸ gather at the bottom of oceans, lakes, and rivers. Over time, layers of sediments build up. The pressure⁹ on the bottom layers squeezes¹⁰ and cements¹¹ the sediments together. After many years the layers become sedimentary rock.

This quarry has some colorful sandstone. The color comes from the material that cements the grains of quartz sand together.

1. spectacular	<i>adj.</i>	壮观的
2. actually	<i>adv.</i>	实际上
3. chunk	<i>n.</i>	厚片; 大块
4. rough	<i>adj.</i>	粗糙的
5. rub	<i>v.</i>	擦
6. clay	<i>n.</i>	泥土
7. seashell	<i>n.</i>	海贝壳
8. sediment	<i>n.</i>	沉积物
9. pressure	<i>n.</i>	压力
10. squeeze	<i>v.</i>	用力挤压
11. cement	<i>v.</i>	黏结



A sandstone quarry in India

As you walk along the quarry wall, you notice that the layers of yellow, orange, and brown give way to a rock of milky white. What is it? Check it out¹ in the field guide. It looks like quartzite². That's a metamorphic rock. It forms when extreme³ heat and pressure deep underground

change existing⁴ rocks into other rocks. In this case⁵, the sandstone became quartzite.

You have collected a lot of cool-looking rocks. But you've barely⁶ scratched⁷ the surface. Want to see more? Get ready for some rocks that dazzle.

Thinking Like a Scientist: Classifying⁸

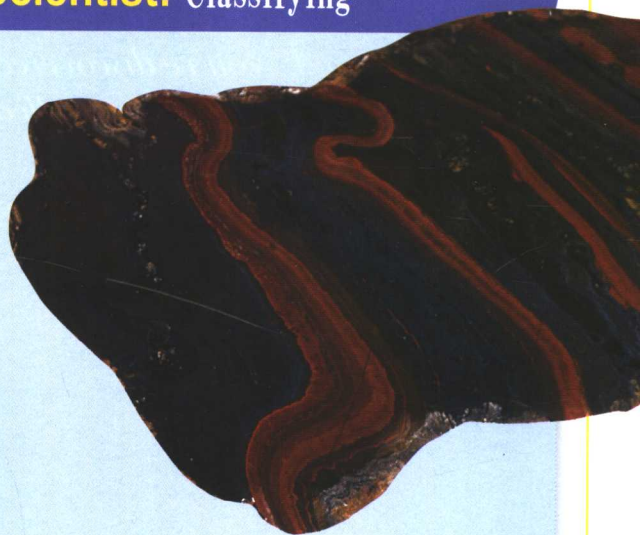
Part of the fun of rockhounding is classifying the rocks you collect. That means you figure out⁹ what kind of rock each one is. One way to classify a rock is to look through a field guide, page by page, until you find your rock. This can take a long time. You can narrow¹⁰ your search by taking your best guess at what kind of rock it is. Then you can go to that section¹¹ of the field guide to look for your rock.

For example, look at the rock on this page. Is it igneous, sedimentary, or metamorphic? Try to figure out what kind of rock this is based on the descriptions of the rock types.

Igneous Contains¹² grains that might have formed as magma cooled

Sedimentary Has fairly¹³ straight¹⁴, smooth sediment layers

Metamorphic Has very small grains and may look twisted¹⁵ or squeezed



1. check...out		检查; 验证
2. quartzite	<i>n.</i>	石英岩
3. extreme	<i>adj.</i>	极度的
4. existing	<i>adj.</i>	目前的; 现有的
5. in this case		假使这样的话
6. barely	<i>adv.</i>	几乎不; 简直没有
7. scratch	<i>v.</i>	扒; 挖
8. classify	<i>v.</i>	把……分类
9. figure out		想出; 明白
10. narrow	<i>v.</i>	使变窄; 使有局限
11. section	<i>n.</i>	(文章等的)段落; 节
12. contain	<i>v.</i>	包含
13. fairly	<i>adv.</i>	相当
14. straight	<i>adj.</i>	直的
15. twist	<i>v.</i>	使弯曲

A Gallery of Minerals:

Some Real Gems

矿物长廊：一些真正的宝石

You are rockhounding in a field. Your eye catches a dull¹ gray softball-size² rock on the ground. You pick it up and tap³ it with your hammer. It sounds hollow⁴. A couple of good whacks⁵ with the hammer and...you've discovered hidden treasure! Inside, the rock sparkles⁶ with real gems called amethysts⁷!

1. dull *adj.* (色彩等) 不鲜明的; 晦暗的
2. softball-size *adj.* 垒球大小的
3. tap *v.* 轻敲
4. hollow *adj.* 空的
5. whack *n.* 重击
6. sparkle *v.* 闪耀; 发光
7. amethyst *n.* 紫水晶

