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英文注释

MATH BEHIND THE SCIENCE

科学背后的数学

# Decoding Data

## 解读数据

REBECCA L. JOHNSON (美) 著

外语教学与研究出版社

FOREIGN LANGUAGE TEACHING AND RESEARCH PRESS

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**如**果你希望在享受英语阅读乐趣的同时又能增长知识、开拓视野，由外语教学与研究出版社与美国国家地理学会合作出版的“国家地理科学探索丛书”（英文注释版）正是你的选择。

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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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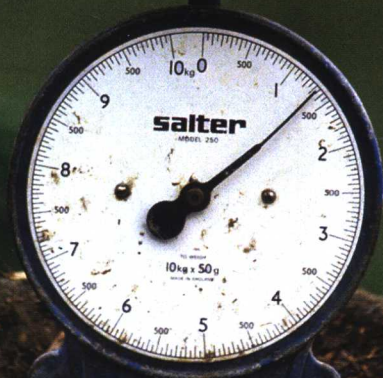
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# Math to the Rescue

## 数学来帮忙

Collecting data is a big part of science. Think back to the last experiment you did in science class. Did you weigh, measure<sup>1</sup>, or time<sup>2</sup> something? If so, you probably ended up with a flurry<sup>3</sup> of facts. How did you make sense of it all?

**M**ath can bring order to this kind of chaos<sup>4</sup>. Using math, scientists (including science students) can decode the data they collect. Then they can better use it to draw conclusions<sup>5</sup> and make comparisons<sup>6</sup>—maybe some predictions<sup>7</sup>, too.

One way to make sense of data is to organize<sup>8</sup> the data into tables and graphs. These are simple yet powerful tools. To really grasp their power, however, you need to see them in action. Let's look in on some scientists' research to see how the math behind the science really works.

- |            |    |           |
|------------|----|-----------|
| 1. measure | v. | 测量; 计量    |
| 2. time    | v. | 测定……所花的时间 |
| 3. flurry  | n. | 混乱        |
| 4. chaos   | n. | 混乱        |

- |                      |    |        |
|----------------------|----|--------|
| 5. draw a conclusion |    | 得出结论   |
| 6. comparison        | n. | 比较     |
| 7. prediction        | n. | 预料     |
| 8. organize          | v. | 组织; 安排 |



### E-mail from the Field

**Subject:** Brrrrrrrrrrrrrr!

**From:** mcormick@noaa.gov

**To:** j.wolon@unq.edu.au, f\_azul@uc.edu.eg

Fahrana and Jane,

Greetings from the bottom of the world! Believe it or not, I'm almost getting used to the cold here in the middle of Antarctica<sup>1</sup>. One of my daily tasks at the research station is to keep track of<sup>2</sup> the temperature throughout the day. Yesterday's high was -63°F! That's about -53°C for us metric folks<sup>3</sup>!

Well, it's time to bundle up<sup>4</sup> again and head<sup>5</sup> out into "the freezer" to collect more temperature data. Drop me an E-mail when you get a chance and tell me how your research is going.

Warmly (ha!),

Mick

1. Antarctica

南极洲

2. keep track of

记录

3. metric folk

(此处指) 使用公制的人

4. bundle up

穿得暖和 (或臃肿)

5. head

v. 朝特定方向行进

# Cold Facts

## 冰冷的数据

Antarctica is the world's highest, driest, windiest, and coldest place. You won't find cities, roads, or even many people on this icy continent<sup>1</sup>. You will find isolated<sup>2</sup> research stations where scientists live and work.

One of the biggest challenges about doing research in Antarctica is the intense<sup>3</sup> cold. The lowest temperature ever measured on Earth was recorded here—an incredible<sup>4</sup>  $-128.6^{\circ}$  Fahrenheit<sup>5</sup>!

Temperatures below zero can be dangerous. Bare skin can freeze in seconds. When Mick takes his temperature readings, he records the data in his field notebook. But he leaves his gloves on while writing.

- |               |             |              |
|---------------|-------------|--------------|
| 1. continent  | <i>n.</i>   | (地球上的) 洲; 大洲 |
| 2. isolated   | <i>adj.</i> | 孤立的          |
| 3. intense    | <i>adj.</i> | 极度的          |
| 4. incredible | <i>adj.</i> | 难以置信的        |
| 5. Fahrenheit | <i>adj.</i> | 华氏温度计的; 华氏的  |

## A Universal<sup>1</sup> Language

Take a look at one of the pages from Mick's notebook (in blue and gold). Notice how he's recorded the temperature four times a day, at the same times every day. He's organized the data in columns<sup>2</sup> and rows<sup>3</sup> in two simple tables. Creating a table is an easy way to arrange the data. Running down the left sides of the tables are dates and times. Running across the top are headings for dates, times, and temperatures in degrees Fahrenheit (°F) and degrees Celsius<sup>4</sup> (°C). Every time Mick takes a temperature reading, he writes it in the appropriate<sup>5</sup> space.

Measuring temperature on the Fahrenheit scale<sup>6</sup> is common in the United States. But people in most other countries—and scientists everywhere—use the Celsius scale. This scale is part of the metric system<sup>7</sup>—the international system for measuring. It's like a universal language. Mick writes the temperatures in both °F and °C. That way anyone can understand his data with ease.

- |                  |             |              |
|------------------|-------------|--------------|
| 1. universal     | <i>adj.</i> | 人人懂得 (或使用) 的 |
| 2. column        | <i>n.</i>   | (数) 列        |
| 3. row           | <i>n.</i>   | (表格的) 横栏     |
| 4. Celsius       | <i>adj.</i> | (温度) 摄氏的     |
| 5. appropriate   | <i>adj.</i> | 恰当的          |
| 6. scale         | <i>n.</i>   | 标度; 刻度       |
| 7. metric system |             | 公制           |
| 8. inland        | <i>adj.</i> | 内陆的          |
| 9. coastal       | <i>adj.</i> | 近 (或沿) 海岸的   |

### Inland<sup>8</sup> Antarctica

Date/Time	Temperature	
	°F	°C
<b>11/12</b>		
6 a.m.	-68	-56
12 p.m.	-66	-54
6 p.m.	-66	-54
12 a.m.	-64	-53
<b>11/13</b>		
6 a.m.	-61	-52
12 p.m.	-59	-51
6 p.m.	-57	-49
12 a.m.	-62	-52

### Coastal<sup>9</sup> Antarctica

Date/Time	Temperature	
	°F	°C
<b>11/12</b>		
6 a.m.	-10	-23
12 p.m.	2	-17
6 p.m.	-6	-21
12 a.m.	-11	-24
<b>11/13</b>		
6 a.m.	-13	-25
12 p.m.	-3	-19
6 p.m.	0	-18
12 a.m.	-4	-20

## What's Colder?

Antarctica may be the coldest place on Earth. But it's not the same temperature everywhere on the continent. Mick often checks with scientists at other research stations to find out how cold it is where they are working.

The table (in purple and orange) shows temperature data from a research station on Antarctica's coast. How do temperatures on the coast compare to

those at Mick's location in the middle of the continent?

You can easily compare different sets of data when they are organized in tables. In this case, it looks like the temperatures along the coast are downright<sup>1</sup> balmy<sup>2</sup> compared to Mick's location. You might be okay wearing only *three* layers of clothing outside!

1. downright	<i>adv.</i>	相当
2. balmy	<i>adj.</i>	温和的
3. king penguin		王企鹅
4. floe	<i>n.</i>	浮冰 (块)



King penguins<sup>3</sup> on an ice floe<sup>4</sup>, along the coast of Antarctica



1. rub in		反复讲
2. roller coaster		(游乐场的) 环滑车
3. krill	<i>n.</i>	磷虾
4. cruise	<i>n.</i>	航行
5. track	<i>v.</i>	追踪
6. creature	<i>n.</i>	生物

### E-mail from the Field

**Subject: Ocean Motion**

**From: j.wolon@unq.edu.au**

**To: mcormick@noaa.gov, f\_azul@uc.edu.eg**

G'day Mick and Fahrana,

Don't mean to rub it in<sup>1</sup>, but it's nice and WARM out here in the Pacific Ocean off the Australian coast. On the other hand, all that ice and snow you're sitting on isn't moving like the ocean is. For the last two days, the ship's been riding huge waves. My stomach feels like I'm on a roller coaster<sup>2</sup>!

My team and I are studying shrimplike krill<sup>3</sup> on this research cruise<sup>4</sup>. We're tracking<sup>5</sup> the movements of these tiny creatures<sup>6</sup> day and night. We've discovered the krill are on a sort of roller coaster ride, too.

Cheers,

Jane

# Discoveries of the Deep

## 深海的发现

**K**rill are a type of plankton<sup>1</sup>, an amazing<sup>2</sup> collection of tiny creatures that drift<sup>3</sup> through the ocean by the trillions<sup>4</sup>. Lots of ocean animals eat krill. They're a bit like the shrimp cocktail of the sea!

On this research cruise, Jane is tracking krill underwater with sonar<sup>5</sup>. Sonar is short for sound navigation<sup>6</sup> ranging<sup>7</sup>. Scientists use sonar as a way to make sound waves “see” things below the water’s surface.

Krill in the Antarctic Ocean

- |               |             |                  |
|---------------|-------------|------------------|
| 1. plankton   | <i>n.</i>   | 浮游生物             |
| 2. amazing    | <i>adj.</i> | 使人十分惊奇的          |
| 3. drift      | <i>v.</i>   | 漂流               |
| 4. trillion   | <i>n.</i>   | 大量；无数            |
| 5. sonar      | <i>n.</i>   | 声呐（声波或超声波水下探测系统） |
| 6. navigation | <i>n.</i>   | 导航               |
| 7. range      | <i>v.</i>   | 测定（目标的）距离        |

Jane tracks krill every hour—day and night. In her log<sup>1</sup> book, she has pages and pages of data that look like this.

## Krill Movement

11/ 14

Time	Depth (in meters)
12 p.m.	80
1 p.m.	80
2 p.m.	78
3 p.m.	76
4 p.m.	75
5 p.m.	72
6 p.m.	70
7 p.m.	58
8 p.m.	35
9 p.m.	29
10 p.m.	22
11 p.m.	20
12 a.m.	20

## Data from the Deep

All those numbers about time and depth don't make much sense when they're listed like that. Jane decoded them by making a graph. Graphs turn numbers into a sort of picture. In a graph you can compare different kinds of data and see important patterns<sup>2</sup> and trends<sup>3</sup>.

Jane chose to make a line graph. Line graphs are especially good for making a picture out of data that continue over time—like tracking krill from hour to hour.

1. log	<i>n.</i>	航海日志
2. pattern	<i>n.</i>	模式
3. trend	<i>n.</i>	趋势
4. squid	<i>n.</i>	枪乌贼

**Many ocean animals including squid<sup>4</sup>, such as this one, eat krill.**



To make her graph, Jane had to figure out how to display the data based on the range<sup>1</sup> of numbers. She used the x-axis<sup>2</sup>, the horizontal<sup>3</sup> line at the bottom of the graph, to represent<sup>4</sup> “Time of Day (in hours).” She used the y-axis<sup>5</sup>, the vertical<sup>6</sup> line on the left side, to represent “Depth (in meters).”

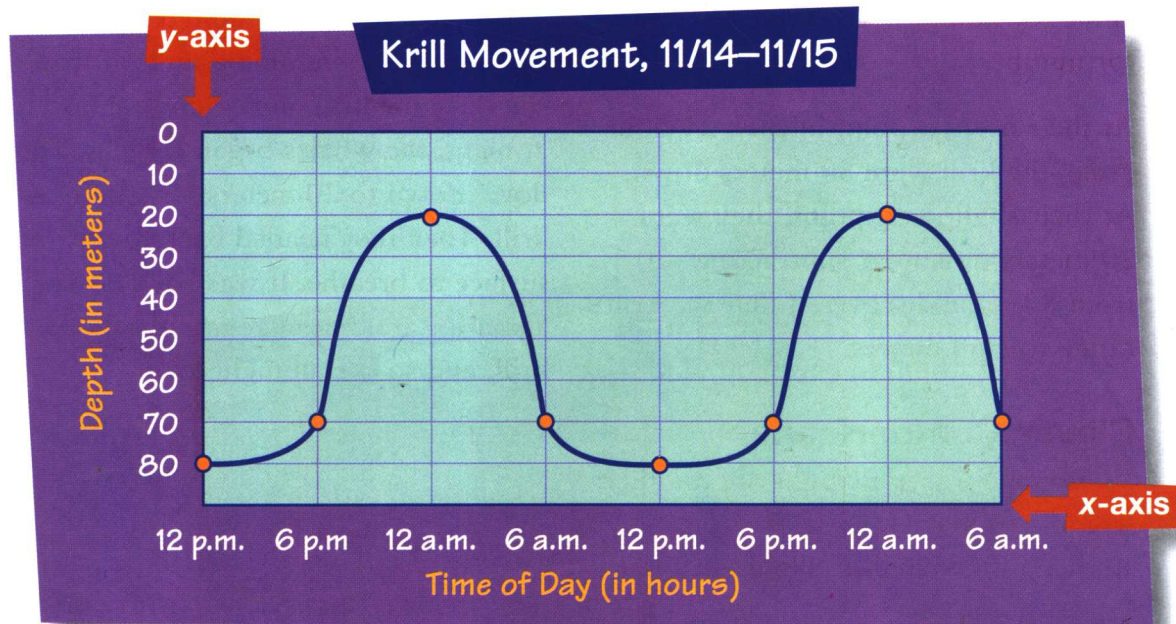
## Connecting the Dots

Jane drew the x-axis and the y-axis and labeled<sup>7</sup> them. She also gave her graph a title. Then she started to plot<sup>8</sup> her data on the graph. For example, the krill were 80 meters below the surface at noon (12 p.m.) on November 14. Jane found 12 p.m. on 11/4, then went to 80 meters. At that point, she marked a

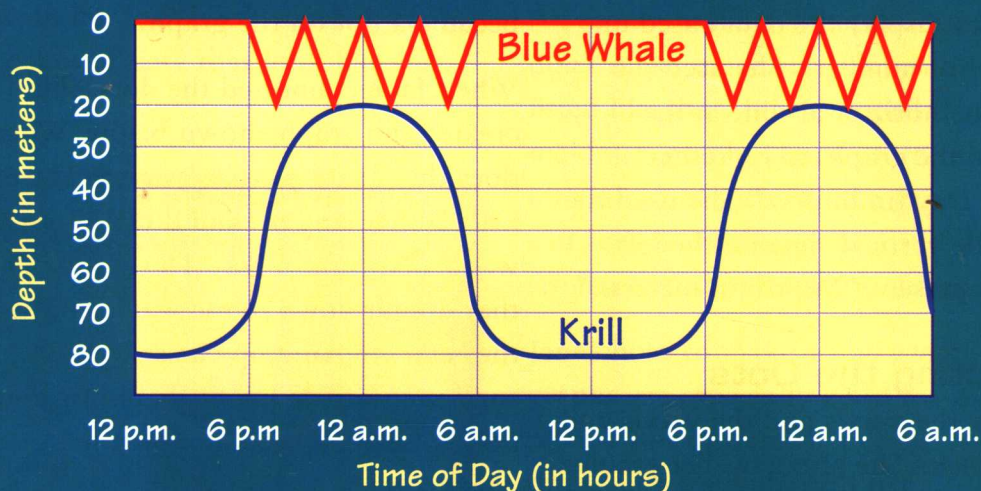
dot. Each number in her log book became a dot on the graph.

When Jane connected the dots, she created the graph shown below. What does this “data picture” show? The krill are moving up and down in the water in a certain way. During the day they are far down in the water. At dusk<sup>9</sup> they start moving up closer to the surface. After midnight they start going deeper again. The krill repeat this pattern every 24 hours.

1. range	<i>n.</i>	范围
2. x-axis	<i>n.</i>	x轴
3. horizontal	<i>adj.</i>	水平的；横的
4. represent	<i>v.</i>	代表
5. y-axis	<i>n.</i>	y轴
6. vertical	<i>adj.</i>	垂直的；竖的
7. label	<i>v.</i>	用标签标明
8. plot	<i>v.</i>	在图上标绘出……的位置
9. dusk	<i>n.</i>	黄昏



## Blue Whale and Krill Movement, 11/14–11/15



### Ranging<sup>1</sup> Up and Down

Jane's graph also shows the range<sup>2</sup> of the krill's movement. In math, range is the difference between the greatest value (or number) and the least value (or number).

At their deepest point in each 24-hour cycle, the krill were 80 meters down. At their shallowest point, they were 20 meters down. By subtracting<sup>3</sup> 20 from 80, Jane discovered that the krill's range was 60 meters.

### Clever Comparisons

While Jane was studying krill, another scientist on board the ship was studying blue whales<sup>4</sup>. He used sonar

to track the movement of the whales. He graphed some of his data and showed the results to Jane.

Can you decode the data and figure out what the whales were doing? If you guessed they were dining on krill, you're right! As the krill moved up in the water at night, the whales began feeding. They dove<sup>5</sup> down to 20 meters for a gulp<sup>6</sup> of krill. Then they headed back to the surface to breathe. It was back down again for another huge mouthful of krill, and so on, all night long.

- |               |    |             |
|---------------|----|-------------|
| 1. range      | v. | (在一定范围内) 变动 |
| 2. range      | n. | 值域          |
| 3. subtract   | v. | 减: 减去       |
| 4. blue whale |    | 蓝鲸          |
| 5. dive       | v. | 潜水          |
| 6. gulp       | n. | 一(大)口       |