CHAPTER 17

TAKE TWO VULTURE'S EGGS AND CALL ME IN THE MORNING

SCIENCE AND MEDICINE

"PLUTARCH AND HIPPOCRATES

The ancient Greeks divided their studies into subjects, just like today, but their dividing lines were usually very different from what they are today. For example, ancient Greeks learned history from the works of the poet Homer. Nowadays, we view Homer's *Iliad* and *Odyssey* as literature. And while today we put physics, biology, and chemistry in the category of science, the ancient Greeks saw the sciences as a kind of philosophy.

This makes sense if you realize that ancient people didn't rely on scientific experimentation to find out how things work. Instead, they investigated the world around them by observing (looking and drawing conclusions based on what you see) and speculating (wondering and taking educated guesses). This is pretty much how philosophers work, too. They observe, think, make guesses, and discuss their ideas with others.

Scientists and mathematicians were the first Greeks to move away from relying on myths to explain the world and toward systematic observation. Greek scientists had the benefit of the great thinkers who had come before them, especially in Egypt and in Mesopotamia. The Greeks certainly came up with many new and often revolutionary ideas, but they didn't have to start from scratch. With the help of the thinkers who had come before them, they discovered and invented some amazing things. The fact that their number system didn't have a zero makes their mathematical achievements even more impressive.

Here are some of these thinkers:

Pythagoras was from Ionia and lived in the sixth century BCE. He thought that numbers could explain the universe.

The problem was that the crown had points and balls and irregular shapes, so it couldn't be measured accurately.

Supposedly, Archimedes was thinking about this problem when he decided to take a bath. The bathtub was filled to the brim, and when he stepped into it, it overflowed. It occurred to him that the amount of water that spilled out was the same size as the part of his body that he put into it: If he put in a toe, only a few drops would overflow, but if he put in his whole leg, more would come out.

So if he filled a bowl with water and put into it a lump of gold the same size as the one the king had given the craftsman, he could catch the water that spilled out and measure it. Then he could fill the bowl again, put the crown in, and see if the same amount of overflow was produced. If the crown was larger or smaller than the lump of gold, the amount of water that came out would be greater or lesser.

The legend says that Archimedes was so excited to have thought of this that he ran naked through the streets of Syracuse, shouting "Eureka!," which means "I've found it!" (It turns out that the goldsmith had indeed cheated the king.)

Archimedes got so caught up in his work that supposedly he was killed because he wouldn't leave it. The biographer Plutarch reports in the *Life of Marcellus* that

> Archimedes was wrapped up in working out some problem that involved a diagram. With both his mind and his eyes fixed on the subject of the speculation, he never noticed that the Romans had burst into the city and captured it . . . and so when a Roman soldier surprised him by coming up to him and ordering him to follow him to his commander Marcellus, he refused, because he wasn't completely finished with the problem on which he was working. Enraged, the soldier drew his sword and ran him through.

Plutarch, *Life of Marcellus*, about 100 CE

Eratosthenes was also from a part of the Greek world that now isn't Greek: Cyrene, in what is now Libya. He settled in the Greek city of Alexandria, Egypt, in about 255 BCE.

Many people today think that nobody wanted to give Christopher Columbus money to sail west to the Indies

An angry Roman soldier killed Archimedes when he refused to leave his work and follow the soldier's orders. The soldier was later executed for his crime.

because in 1490s everybody believed that the world was flat. But this isn't true. The Greeks (almost 2,000 years earlier) had already figured out that the world was a sphere, and in fact Eratosthenes figured out the earth's size.

Hippocrates of Cos is best known for the Hippocratic Oath, a pledge that many new doctors still take in which they swear to behave honorably.

> I swear by Apollo the physician, and Aesculapius, and Health, and All-heal, and all the gods and goddesses, that, according to my ability and judgment, I will keep this Oath. . . . I will follow that system of regimen which, according to my ability and judgment, I consider for the benefit of my patients, and abstain from whatever is deleterious and mischievous. . . . Whatever, in connection with my professional practice or not, in connection with it, I see or hear, in the life of men, which ought not to be spoken of abroad, I will not divulge, as reckoning that all such should be kept secret. While I continue to keep this Oath

"Hippocrates, *The Oath*, 400 BCE

CENTERS OF SCIENTIFIC AND MEDICAL EXPLORATION IN THE GREEK WORLD

> unviolated, may it be granted to me to enjoy life and the practice of the art, respected by all men, in all times! But should I trespass and violate this Oath, may the reverse be my lot!

This oath is very similar to a much older one from Egypt. Little is known about Hippocrates's life other than that he lived in the fifth century BCE.

"Epilepsy" comes from *epilepsia*, which means "a taking hold." This disease can cause people to lose consciousness and have muscle spasms. People with epilepsy cannot control their movements during a seizure and it may look like some supernatural force has grabbed them.

Hippocrates's main contribution to medical science was his insistence that there is a reason behind illnesses. He said that doctors were embarrassed to admit that they couldn't figure out the cause of **epilepsy** and other conditions and so blamed it on the gods. The only sacred part of illness, Hippocrates said, was the holy bond between the doctor and his patients.

Hypatia also came from an area outside of what is now Greece: Egypt. She was born about 370 CE, so she lived much later than most of the other well-known Greek scientists. She lectured in mathematics and philosophy in the city of Alexandria. Unfortunately for Hypatia, the times in which she lived were very dangerous for people who praised non-Christian ideas, and she was murdered.

It took a long time for some of the ideas of these scientists to be accepted by the general public. Often, people prefer to believe what they've always been told and refuse to accept new theories. Some Greek scientists had a hard time convincing those around them that they were right.

For instance, a scientist named Aglaonike could predict eclipses of the moon. You'd think that after she was proven right, people would believe her. But instead, she was regarded as a sorceress. Apparently some people couldn't tell the difference between predicting an event and causing it.

And although most educated Greeks believed Eratosthenes and the other scientists who said that the world was a sphere, almost everyone else believed what their eyes told them: that the earth is flat.

Greek scientists believed things that nowadays look pretty odd. Some of it isn't their fault—they didn't have telescopes and microscopes and precise measuring instruments. Also, nobody had yet come up with the idea of carefully controlled scientific experiments. If something made sense, they figured it was probably true.

So if they thought that the earth stood still and the rest of the universe revolved around it, that's understandable. It took almost 2,000 years before astronomers understood the real situation. If they thought that a bad line-up of the stars caused diseases, they can't be blamed for not knowing about the existence of microbes. Who could believe that something so tiny that you can't even see could kill a human?

But even if they got some of the facts wrong, the ancient Greeks managed to push Western science into the direction it has followed ever since. Observation, seeking a rational explanation for events, and willingness to explore new ideas are still the most important parts of scientific exploration.

THE HEAD BONE'S CONNECTED TO WHAT?

The Greeks learned a lot from the Egyptians in the field of anatomy. When the Egyptians mummified their dead, they usually removed many of the body's internal organs. That way, they found out a great deal about how the human body was put together.

Hypatia was a teacher of philosophy as well as a mathematician and astronomer.