

have come from nothing. This idea was not so widespread among the Greeks. For one reason or another, they assumed that "something" had always existed.

How everything could come from nothing was therefore not the all-important question. On the other hand the Greeks marveled at how live fish could come from water, and huge trees and brilliantly colored flowers could come from the dead earth. Not to mention how a baby could come from its mother's womb!

The philosophers observed with their own eyes that nature was in a constant state of transformation. But how could such transformations occur?

How could something change from being substance to being a living thing, for example?

All the earliest philosophers shared the belief that there had to be a certain basic substance at the root of all change. How they arrived at this idea is hard to say. We only know that the notion gradually evolved that there must be a basic substance that was the hidden cause of all changes in nature. There had to be "something" that all things came from and returned to.

For us, the most interesting part is actually not what solutions these earliest philosophers arrived at, but which questions they asked and what type of answer they were looking for. We are more interested in how they thought than in exactly what they thought.

We know that they posed questions relating to the transformations they could observe in the physical world. They were looking for the underlying laws of nature. They wanted to understand what was happening around them without having to turn to the ancient myths. And most important, they wanted to understand the actual processes by studying nature itself. This was quite different from explaining thunder and lightning or winter and spring by telling stories about the gods.

So philosophy gradually liberated itself from religion. We could say that the natural philosophers took the first step in the direction of scientific reasoning, thereby becoming the precursors of what was to become science.

Only fragments have survived of what the natural philosophers said

## THE PHILOSOPHERS' PROJECT

Here we are again! We'll go directly to today's lesson without detours around white rabbits and the like.

I'll outline very broadly the way people have thought about philosophy, from the ancient Greeks right up to our own day. But we'll take things in their correct order.

Since some philosophers lived in a different age—and perhaps in a completely different culture from ours—it is a good idea to try and see what each philosopher's *project* is. By this I mean that we must try to grasp precisely what it is that each particular philosopher is especially concerned with finding out. One philosopher might want to know how plants and animals came into being. Another might want to know whether there is a God or whether man has an immortal soul.

Once we have determined what a particular philosopher's project is, it is easier to follow his line of thought, since no one philosopher concerns himself with the whole of philosophy.

I said *his* line of thought—referring to the philosopher, because this is also a story of men. Women of the past were subjugated both as females and as thinking beings, which is sad because a great deal of very important experience was lost as a result. It was not until this century that women really made their mark on the history of philosophy.

I do not intend to give you any homework—no difficult math questions, or anything like that, and conjugating English verbs is outside my sphere of interest. However, from time to time I'll give you a short assignment.

If you accept these conditions, we'll begin.

## THE NATURAL PHILOSOPHERS

The earliest Greek philosophers are sometimes called *natural philosophers* because they were mainly concerned with the natural world and its processes.

We have already asked ourselves where everything comes from. Nowadays a lot of people imagine that at some time something must

and wrote. What little we know is found in the writings of Aristotle, who lived two centuries later. He refers only to the conclusions the philosophers reached. So we do not always know by what paths they reached these conclusions. But what we do know enables us to establish that the earliest Greek philosophers' project concerned the question of a basic constituent substance and the changes in nature.

### THREE PHILOSOPHERS FROM MILETUS

The first philosopher we know of is *Thales*, who came from Miletus, a Greek colony in Asia Minor. He traveled in many countries, including Egypt, where he is said to have calculated the height of a pyramid by measuring its shadow at the precise moment when the length of his own shadow was equal to his height. He is also said to have accurately predicted a solar eclipse in the year 585 B.C.

Thales thought that the source of all things was water. We do not know exactly what he meant by that, he may have believed that all life originated from water—and that all life returns to water again when it dissolves.

During his travels in Egypt he must have observed how the crops began to grow as soon as the floods of the Nile receded from the land areas in the Nile Delta. Perhaps he also noticed that frogs and worms appeared wherever it had just been raining.

It is likely that Thales thought about the way water turns to ice or vapor—and then turns back into water again.

Thales is also supposed to have said that "all things are full of gods." What he meant by that we can only surmise. Perhaps, seeing how the black earth was the source of everything from flowers and crops to insects and cockroaches, he imagined that the earth was filled with tiny invisible "life-germs." One thing is certain—he was not talking about Homer's gods.

The next philosopher we hear of is *Anaximander*, who also lived in Miletus at about the same time as Thales. He thought that our world was only one of a myriad of worlds that evolve and dissolve in something he called the boundless. It is not so easy to explain what he meant by the boundless, but it seems clear that he was not thinking of a known substance in the way that Thales had envisaged. Perhaps he meant that

the substance which is the source of all things had to be something other than the things created. Because all created things are limited, that which comes before and after them must be "boundless." It is clear that this basic stuff could not be anything as ordinary as water.

A third philosopher from Miletus was *Anaximenes* (c. 570–526 B.C.). He thought that the source of all things must be "air" or "vapor." Anaximenes was of course familiar with Thales' theory of water. But where does water come from? Anaximenes thought that water was condensed air. We observe that when it rains, water is pressed from the air. When water is pressed even more, it becomes earth, he thought. He may have seen how earth and sand were pressed out of melting ice. He also thought that fire was rarefied air. According to Anaximenes, air was therefore the origin of earth, water, and fire.

It is not a far cry from water to the fruit of the earth. Perhaps Anaximenes thought that earth, air, and fire were all necessary to the creation of life, but that the source of all things was air or vapor. So, like Thales, he thought that there must be an underlying substance that is the source of all natural change.

### NOTHING CAN COME FROM NOTHING

These three Milesian philosophers all believed in the existence of a single basic substance as the source of all things. But how could one substance suddenly change into something else? We can call this the *problem of change*.

From about 500 B.C., there was a group of philosophers in the Greek colony of Elea in Southern Italy. These "Eleatics" were interested in this question.

The most important of these philosophers was *Parmenides* (c. 540–480 B.C.). Parmenides thought that everything that exists had always existed. This idea was not alien to the Greeks. They took it more or less for granted that everything that existed in the world was everlasting. Nothing can come out of nothing, thought Parmenides. And nothing that exists can become nothing.

But Parmenides took the idea further. He thought that there was no

such thing as actual change. Nothing could become anything other than it was.

Parmenides realized, of course, that nature is in a constant state of flux. He perceived with his senses that things changed. But he could not equate this with what his reason told him. When forced to choose between relying either on his senses or his reason, he chose reason.

You know the expression "I'll believe it when I see it." But Parmenides didn't even believe things when he saw them. He believed that our senses give us an incorrect picture of the world, a picture that does not tally with our reason. As a philosopher, he saw it as his task to expose all forms of perceptual illusion.

This unshakable faith in human reason is called *rationalism*. A rationalist is someone who believes that human reason is the primary source of our knowledge of the world.

#### All Things Flow

A contemporary of Parmenides was *Heraclitus* (c. 540–480 B.C.), who was from Ephesus in Asia Minor. He thought that constant change, or flow, was in fact the most basic characteristic of nature. We could perhaps say that Heraclitus had more faith in what he could perceive than Parmenides did.

"Everything flows," said Heraclitus. Everything is in constant flux and movement, nothing is abiding. Therefore we "cannot step twice into the same river." When I step into the river for the second time, neither I nor the river are the same.

Heraclitus pointed out that the world is characterized by opposites. If we were never ill, we would not know what it was to be well. If we never knew hunger, we would take no pleasure in being full. If there were never any war, we would not appreciate peace. And if there were no winter, we could never see the spring.

Both good and bad have their inevitable place in the order of things, Heraclitus believed. Without this constant interplay of opposites the world would cease to exist.

"God is day and night, winter and summer, war and peace, hunger and satiety," he said. He used the term "God," but he was clearly not re-

ferring to the gods of the mythology. To Heraclitus, God—or the Deity—was something that embraced the whole world. Indeed, God can be seen most clearly in the constant transformations and contrasts of nature.

Instead of the term "God," Heraclitus often used the Greek word *logos*, meaning reason. Although we humans do not always think alike or have the same degree of reason, Heraclitus believed that there must be a kind of "universal reason" guiding everything that happens in nature.

This "universal reason" or "universal law" is something common to us all, and something that everybody is guided by. And yet most people live by their individual reason, thought Heraclitus. In general, he despised his fellow beings. "The opinions of most people," he said, "are like the playthings of infants."

So in the midst of all nature's constant flux and opposites, Heraclitus saw an Entity or one-ness. This "something," which was the source of everything, he called God or *logos*.

#### Four Basic Elements

In one way, Parmenides and Heraclitus were the direct opposite of each other. Parmenides' reason made it clear that nothing could change. Heraclitus' sense perceptions made it equally clear that nature was in a constant state of change. Which of them was right? Should we let reason dictate or should we rely on our senses?

Parmenides and Heraclitus both say two things:

Parmenides says:

- a) that nothing can change, and
- b) that our sensory perceptions must therefore be unreliable.

Heraclitus, on the other hand, says:

- a) that everything changes ("all things flow"), and
- b) that our sensory perceptions are reliable.

Philosophers could hardly disagree more than that! But who was right? It fell to *Empedocles* (c. 490–430 B.C.) from Sicily to lead the way out of the tangle they had gotten themselves into.

He thought they were both right in one of their assertions but wrong in the other.

Empedocles found that the cause of their basic disagreement was that both philosophers had assumed the presence of only *one* element. If this were true, the gap between what reason dictates and what "we can see with our own eyes" would be unbridgeable.

Water obviously cannot turn into a fish or a butterfly. In fact, water cannot change. Pure water will continue to be pure water. So Parmenides was right in holding that "nothing changes."

But at the same time Empedocles agreed with Heraclitus that we must trust the evidence of our senses. We must believe what we see, and what we see is precisely that nature changes.

Empedocles concluded that it was the idea of a single basic substance that had to be rejected. Neither water nor air *alone* can change into a rosebush or a butterfly. The source of nature cannot possibly be one single "element."

Empedocles believed that all in all, nature consisted of four elements, or "roots" as he termed them. These four roots were *earth, air, fire, and water.*

All natural processes were due to the coming together and separating of these four elements. For all things were a mixture of earth, air, fire, and water, but in varying proportions. When a flower or an animal dies, he said, the four elements separate again. We can register these changes with the naked eye. But earth and air, fire and water remain everlasting, "untouched" by all the compounds of which they are part. So it is not correct to say that "everything" changes. Basically, nothing changes. What happens is that the four elements are combined and separated—only to be combined again.

We can make a comparison to painting. If a painter only has one color—red, for instance—he cannot paint green trees. But if he has yellow, red, blue, and black, he can paint in hundreds of different colors because he can mix them in varying proportions.

An example from the kitchen illustrates the same thing. If I only have flour, I have to be a wizard to bake a cake. But if I have eggs, flour, milk, and sugar, then I can make any number of different cakes.

It was not purely by chance that Empedocles chose earth, air, fire,

and water as nature's "roots." Other philosophers before him had tried to show that the primordial substance had to be either water, air, or fire. Thales and Anaximenes had pointed out that both water and air were essential elements in the physical world. The Greeks believed that fire was also essential. They observed, for example, the importance of the sun to all living things, and they also knew that both animals and humans have body heat.

Empedocles might have watched a piece of wood burning. Something disintegrates. We hear it crackle and splutter. That is "water." Something goes up in smoke. That is "air." The "fire" we can see. Something also remains when the fire is extinguished. That is the ashes—"earth."

After Empedocles' clarification of nature's transformations as the combination and dissolution of the four "roots," something still remained to be explained. What makes these elements combine so that new life can occur? And what makes the "mixture" of, say, a flower dissolve again?

Empedocles believed that there were two different forces at work in nature. He called them *love* and *strife*. Love binds things together, and strife separates them.

He distinguishes between "substance" and "force." This is worth noting. Even today, scientists distinguish between *elements* and *natural forces*. Modern science holds that all natural processes can be explained as the interaction between different elements and various natural forces.

Empedocles also raised the question of what happens when we perceive something. How can I "see" a flower, for example? What is it that happens? Have you ever thought about it, Sophie?

Empedocles believed that the eyes consist of earth, air, fire, and water, just like everything else in nature. So the "earth" in my eye perceives what is of the earth in my surroundings, the "air" perceives what is of the air, the "fire" perceives what is of fire, and the "water" what is of water. Had my eyes lacked any of the four substances, I would not have seen all of nature.

### Something of Everything in Everything

Anaxagoras (500–428 B.C.) was another philosopher who could not agree that one particular basic substance—water, for instance—might be transformed into everything we see in the natural world. Nor could he accept that earth, air, fire, and water can be transformed into blood and bone.

Anaxagoras held that nature is built up of an infinite number of minute particles invisible to the eye. Moreover, everything can be divided into even smaller parts, but even in the minutest parts there are fragments of all other things. If skin and bone are not a transformation of something else, there must also be skin and bone, he thought, in the milk we drink and the food we eat.

A couple of present-day examples can perhaps illustrate Anaxagoras' line of thinking. Modern laser technology can produce so-called holograms. If one of these holograms depicts a car, for example, and the hologram is fragmented, we will see a picture of the whole car even though we only have the part of the hologram that showed the bumper. This is because the whole subject is present in every tiny part.

In a sense, our bodies are built up in the same way. If I loosen a skin cell from my finger, the nucleus will contain not only the characteristics of my skin: the same cell will also reveal what kind of eyes I have, the color of my hair, the number and type of my fingers, and so on. Every cell of the human body carries a blueprint of the way all the other cells are constructed. So there is "something of everything" in every single cell. The whole exists in each tiny part.

Anaxagoras called these minuscule particles which have something of everything in them *seeds*.

Remember that Empedocles thought that it was "love" that joined the elements together in whole bodies. Anaxagoras also imagined "order" as a kind of force, creating animals and humans, flowers and trees. He called this force mind or intelligence (*nous*).

Anaxagoras is also interesting because he was the first philosopher we hear of in Athens. He was from Asia Minor but he moved to Athens at the age of forty. He was later accused of atheism and was ultimately forced to leave the city. Among other things, he said that the sun was

not a god but a red-hot stone, bigger than the entire Peloponnesian peninsula.

Anaxagoras was generally very interested in astronomy. He believed that all heavenly bodies were made of the same substance as Earth. He reached this conclusion after studying a meteorite. This gave him the idea that there could be human life on other planets. He also pointed out that the Moon has no light of its own—its light comes from Earth, he said. He thought up an explanation for solar eclipses as well.

P.S. Thank you for your attention, Sophie. It is not unlikely that you will need to read this chapter two or three times before you understand it all. But understanding will always require some effort. You probably wouldn't admire a friend who was good at everything if it cost her no effort.

The best solution to the question of basic substance and the transformations in nature must wait until tomorrow, when you will meet Democritus. I'll say no more!

Sophie sat in the den looking out into the garden through a little hole in the dense thicket. She had to try and sort out her thoughts after all she had read.

It was as clear as daylight that plain water could never turn into anything other than ice or steam. Water couldn't even turn into a watermelon, because even watermelons consisted of more than just water. But she was only sure of that because that's what she had learned. Would she be absolutely certain, for example, that ice was only water if that wasn't what she had learned? At least, she would have to have studied very closely how water froze to ice and melted again.

Sophie tried once again to use her own common sense, and not to think about what she had learned from others.

Parmenides had refused to accept the idea of change in any form. And the more she thought about it, the more she was convinced that, in a way, he had been right. His intelligence could not accept that "something" could suddenly transform itself into "something completely different." It must have taken quite a bit of courage to come right out and say it, because it meant denying all the natural changes

that people could see for themselves. Lots of people must have laughed at him.

And Empedocles must have been pretty smart too, when he proved that the world had to consist of more than one single substance. That made all the transformations of nature possible without anything actually changing.

The old Greek philosopher had found that out just by reasoning. Of course he had studied nature, but he didn't have the equipment to do chemical analysis the way scientists do nowadays.

Sophie was not sure whether she really believed that the source of everything actually was earth, air, fire, and water. But after all, what did that matter? In principle, Empedocles was right. The only way we can accept the transformations we can see with our own eyes—without losing our reason—is to admit the existence of more than one single basic substance.

Sophie found philosophy doubly exciting because she was able to follow all the ideas by using her own common sense—without having to remember everything she had learned at school. She decided that philosophy was not something you can learn; but perhaps you can learn to *think* philosophically.