

## Change and Permanence

Aristotle took a sensible attitude toward the thinkers who preceded him. He said he thought it was wise to pay attention to what they had to say in order to discover which of their opinions were correct and which were incorrect. By sifting the true from the false, some advance might be made.

Two earlier thinkers—Heraclitus and Parmenides—held very extreme views about the world. Heraclitus declared that everything, absolutely everything, was constantly changing. Nothing, absolutely nothing, ever remained the same. One of his followers, Cratylus, even went so far as to say that this made it impossible to use language to communicate, for words are constantly changing their meanings. The only way to communicate is by wiggling your finger.

At the other extreme, Parmenides declared that permanence reigns supreme. Whatever is, is; whatever is not, is not; nothing ever comes into existence or perishes; nothing at all changes, nothing moves. The appearance of change and motion, which

Parmenides acknowledged as part of our daily experience, is an illusion. We are being deceived by our senses. In reality, everything always remains the same.

You may wonder how Parmenides could persuade anyone to accept so extreme a view, and one so contrary to our everyday experience. One of his followers, a man named Zeno, tried to invent arguments that would persuade us that when we perceived things moving about, we were being deceived. We were suffering an illusion.

One of these arguments ran somewhat like this: You want to hit a ball from one end of the tennis court to another. In order to get there, the ball first has to go through half the distance. It has to reach the net. In order to get there, it first has to go through half the distance—at least to the service box. In order to get there, it first has to go through half the distance; and so on indefinitely, by a continual halving of the distances that remain. From this, if we followed the direction of Zeno's reasoning, we would be led to the conclusion that the ball could never get started—could never leave your racket.

Aristotle was acquainted with these opinions and arguments. His common sense as well as his common experience told him they were wrong. If words are always changing their meanings, how could Heraclitus and his followers repeatedly say that everything is changing and suppose, as they obviously did, that they were saying the same thing each time, not the opposite? If the motion of the heavenly bodies is an illusion, then so is the change from day to night. If nothing comes into existence or perishes, no one dies, but where are Parmenides and his friend Zeno now?

Heraclitus and Parmenides were wrong, but not all wrong. In fact, each was partly right, and the whole truth, Aristotle thought, consisted in combining two partial truths.

On the one hand, motion and change, coming to be and passing away, occur throughout the world of nature and were occurring long before human beings came on the scene. Far from being full of illusions, our common experience of nature grasps the reality of change. Things are the way they seem to be—changing.

On the other hand, not everything is always changing in every respect. In every change, there must be something permanent—something that persists or remains the same while becoming different in one respect or another. That tennis ball, for example, which you tried to hit across the court, did move from one place to another, but when it reached your opponent's baseline, it was the same tennis ball that you propelled in that direction. If it had been a different tennis ball, conjured up by a magician standing on the sidelines, it would have been called a foul.

Motion from here to there (which Aristotle called local motion or change of place) is the most obvious of the changes in which something remains the same. The moving thing is the unchanging subject of the change that is local motion. If it was "your tennis ball" when it left your racket, it is still "your tennis ball" when your opponent hits it back—the selfsame, identical ball, not another ball.

While we are talking about local motion, let me mention a distinction that Aristotle makes between two kinds of local motion. When you accidentally drop a tennis ball, it falls to the ground because it is heavy (you and I say because of gravity, which is another word for heavy). You did not throw it down. It fell naturally. That was a natural, not an artificial, motion.

But when you hit the tennis ball with your racket, that is a man-made motion, not a natural one. The force of your stroke overcomes the natural tendency of the ball to fall because of its weight, and this force sends it on a path it would not have fol-

lowed if you had not propelled it in that direction by your stroke. The same thing is true when we propel a rocket to the moon. That is not a natural motion for a heavy body like a rocket. Without the propelling force we give it, it would not naturally leave the earth's field of gravity.

From tennis balls to rockets, from elevators to cannonballs, there is a wide variety of bodies in local motion that would not be moving as they do were it not for man's interference with nature. Since they are not natural, should we call these motions artificial? That word might be used, for they are motions brought about by men. Aristotle called them violent motions—violent in the sense that they violate the natural tendency of the bodies in question.

What other changes that occur naturally also occur artificially, or through man's having a hand in them? The heat of the sun ripens a tomato and turns it from green to red. That is not a change in place, but a change in color. It is not a local motion, but the alteration of an attribute of the tomato.

From being green at one time, the tomato has become red at another, just as the tennis ball, from being here at one time, is there at another. What is common to these two changes is time, not space. No change of place occurred in the ripening of the tomato, only a change in quality; but neither change—the change in place and the change in quality—took place without a change in time.

People paint green things red, or red things green—houses, tables, chairs, and so on. The ripening of the tomato is a natural alteration; the painting of things is an artificial alteration of them. The house, table, or chair, which was at one time green, did not become red at another time without human intervention.

In addition to local motion (or change in place) and alteration (or change in quality), there is still a third kind of change

that is both natural and artificial. This time let us begin with the artificial form of it.

Take a rubber balloon and blow it up. As you do so, it changes in size as well as in shape. It gets larger, and will continue to do so as you blow air into it. And when you let air out of it, it decreases in size and returns to its original shape.

Left on the table by itself, the balloon would not have increased in size. Blown up, with its end twisted and bound, the balloon will not decrease in size. The change in size, accompanied by a change in shape, is your doing. You have caused two artificial changes to occur at the same time—a change in quality (the alteration of the balloon's shape) and a change in quantity (the increase or decrease in the balloon's size).

Changes in quantity occur naturally as well as artificially. For example, rocks on a seacoast wear away as they are continually battered by waves. They get smaller. The action of waves may also make seacoast caves larger. More familiar experiences of natural increase—in size and weight—occur in the world of living things. Plants and animals grow. Their growth involves many changes, of course, but among them are changes in quantity—increases in size and weight.

Although one aspect of the growth of a living body is certainly an increase or a change in quantity, it has a peculiar characteristic that we do not find in the increase of inanimate bodies. You build a fire and you can make it larger by adding more logs. If more and more logs are available to pile on it, there would appear to be no limit to the size of the fire you can build. If you feed carrots to a rabbit, the rabbit grows in size, but no matter how many carrots you feed the rabbit, there is a limit to the rabbit's increase in size.

You can build smaller or larger pyramids and, given enough stones and human labor, you can make one larger than any pyramid that has ever been built. But no matter what you do in the

feeding of animals, you cannot make them grow to be larger than a certain size. You cannot make a house cat the size of a lion or a tiger.

The reverse is also true. The balloon you blew up decreases in size as you let the air out of it, and the decrease can go on to the point where the balloon is completely collapsed. But when animals cease to grow, they may cease to increase in size, but they do not decrease in size to the vanishing point so long as they remain alive.

But animals and plants die. So, too, do balloons burst and cease to be balloons when you blow too much air into them. This brings us to a fourth kind of change—both natural and artificial—that is so different from the other three that Aristotle separates it sharply from the rest.

All the others, as we have seen, take time to happen. Time elapses as bodies move from here to there, alter in color or shape, get larger or smaller. But when the balloon bursts, it ceases to be a balloon instantaneously. That change would appear to take no time, certainly no appreciable amount of time. It occurs in an instant; or perhaps we should say: at one instant the balloon exists, and at the very next instant it no longer exists. All we have left are shreds or fragments of rubber, not a balloon we can blow up.

The same is true of the rabbit that dies. In one instant it is alive; at the next, it is no more. All we have left is the carcass, which, in the course of further time, will progressively decay and disintegrate.

This special kind of change (which Aristotle refers to as coming to be and passing away) is special in other ways than being instantaneous. It is so special that it raises serious problems for us.

In every change, we have been saying so far, something re-

mains permanent and unchanging. The body or thing that changes in place, in color, or in size remains the same body when it moves from one place or another, when it alters in color, when it increases in size. But what remains the same when the balloon bursts? What remains the same when the rabbit dies? The decaying, disintegrating carcass is not the rabbit we fed carrots to. The shreds of rubber are not the balloon we blew up.

Nevertheless, there is something permanent in this special kind of change. It is easier to see what it is in the production or destruction of things by men than it is in the birth and death of plants and animals.

Pieces of wood, nails, and glue do not come together naturally to make a chair. Men make chairs by putting these materials together in a certain way. They are the same materials *before* they were put together and shaped into a chair as they are *after* that happens, at the instant when the chair comes into existence as something you can sit on.

You find the chair uncomfortable or you have other chairs and want a table instead of this one. You probably cannot reuse all the nails or the glue, but you can take the chair apart and, using the pieces of wood and some of the nails, you can build a small table with most of the same materials. If you had not used glue in the first place, and if you had been able to extract all the nails in usable form, the materials in the chair that has ceased to be and in the table that has come into being would be identical. They would differ only in respect to how they are put together.

It would, therefore, appear to be the case that in artificial productions and destructions, what persists or remains the same throughout the change is not the thing that was produced and destroyed, but only the materials that a person used in putting it together and the materials that are left when it is taken apart.

Something like that is also the case in the death of the rabbit. Being a living body, the rabbit is, after all, a material thing, just as the chair or table is a material thing. There is matter in its makeup. And that matter remains, not in the same form, of course, but nevertheless it remains, when the rabbit breaks up—dies, decays, disintegrates. And just as the inorganic materials of a chair may enter into the composition of a table, so the organic materials of a rabbit may enter into the composition of another living thing.

The rabbit may have been killed by a jackal and devoured for nourishment. To the extent that the jackal is able to assimilate what it eats, the organic materials of the rabbit enter into the bone, flesh, and muscle of the jackal.

Modern science has a name for what is going on here—a name that Aristotle did not use. We call it the conservation of matter. However it is referred to, the point is that something persists in the special kind of change that is coming to be and passing away. That something, in the case of artificial things such as tables and chairs, consists of the materials out of which they are made.

In man-made productions, we can usually identify what these materials are—these particular pieces of wood, these particular nails. It is not always as easy to identify the particular unit or units of matter that persist when one animal eats another or when living things die. But there can be no doubt that in all instances of coming to be and passing away, both natural and artificial, either matter itself or materials of a certain kind undergo transformation.

What is meant by “matter itself” as contrasted with “materials of a certain kind”? Human beings, in making or destroying artificial things, never work with matter itself, but only with materials of a certain kind. Does nature, unlike man, work with matter itself? If so, then that which persists or remains the subject



of change in artificial production and destruction is not the same as that which persists or remains the subject of change in natural coming to be and passing away.

*Similar, but not the same.* The transformation of identifiable materials in human production and destruction is only like but not identical with the transformation of matter in natural coming to be and passing away. Nevertheless, the similarity or likeness may help us to understand what happens when, in nature, things come to be and pass away. We will look into this more closely in the following chapters.