"Great discoveries and improvements invariably involve the co-operation of many minds. I may be given credit for having blazed the trail but when I look at the subsequent developments I feel the credit is due to others rather than to myself."

—Alexander Graham Bell

14 *The Imperative Question*

The name Tycho Brahe may be meaningless to you.

Tycho Brahe was a Danish astronomer who died in 1601, seven years before the telescope was invented. For over two decades he studied the moon and the planets from his island observatory near the Danish coast. At his death all Brahe's notes from his long years of lunar and planetary observations were left to an assistant, Johannes Kepler.

Before his death Brahe had developed a theory, namely, that the moon and sun orbited around our stationary earth while all other planets revolved around the sun.

Although Brahe was subsequently proven wrong, Johannes Kepler, using Brahe's voluminous notes and observations, finally evolved planetary laws of motion that were milestones in astronomy.

Later, flushed with emotion from his monumental discoveries, Kepler wrote, "Has not God himself waited six thousand years for someone to contemplate his work with understanding?"

With all deference to both great astronomers, and in great humility, the feeling has often swept over me that I am walking the same path traveled by Tycho Brahe . . . and I have already walked it ten years longer than he in my quest for an answer to *my*

imperative question: "Are there unknown environmental forces, predictable in their effects, that influence human beings and other forms of life and even nonlife here on earth—and if so, what are they, and how do they operate?"

My quest has not been in vain.

I have noted, with great satisfaction and a tinge of pride, the tremendous upsurge in interest concerning the study of cycles in recent years. Since our Foundation became affiliated with the University of Pittsburgh several other universities have expressed a desire to establish Institutes or Centers of Comparative Cycle Research. A fresh air has blown through academic quarters, generated perhaps by our recent discoveries and adventures in space.

The increasing knowledge of cycles in human affairs has not yet provided us with complete knowledge of the future. Perhaps it never will, for even when we know all that is to be known of cycles, we will know only part of the picture. Consider man's elaborate study of the tides. Even with the known astronomical basis of tidal behavior computed to amazing accuracy, the most careful projections of the tidal forces are often upset by winds, which for the most part are utterly unpredictable for any great distance into the future.

Nevertheless, projections of cycle patterns do come true over longer periods of time and with greater reliability than forecasts by any other method known.

And so we persist with our imperative question, which in truth can be divided into three parts:

1. What is it "out there" that causes cycles?
2. How do these external rhythmic forces get transmitted to earth?
3. What is the mechanism whereby human beings, plants, and animals are affected?

We still do not know what it is "out there" that vibrates or cuts lines of force at all these various wavelengths, but science has taken great strides in the space age that supply us with at least partial answers to questions 2 and 3.

Now we know that the entire solar system operates in an electromagnetic field. Thus we know that things that happen "out there" *can and do* affect us here on earth.

But much more important from the viewpoint of cycle study is the accelerating accumulation of evidence that electromagnetic forces affect plant and animal life and even inorganic chemical reactions.

The Quest Is Joined

A small group of brilliant scientists, working in different fields around the world, has contributed greatly in pioneering the inevitable solution to the great cycle mystery.

You will recall Yale's Professor Harold Burr's discovery that the electric potential of trees varied in cycles and that different trees varied in the same way even though separated by thirty miles. Obviously something external to the trees and yet common to them in both places was operating to cause this strange behavior.

And you will recall Northwestern's Professor Frank Brown, who discovered that the activity of both plants and animals fluctuates in cycles even when they are kept in hermetically sealed containers under constant conditions of light, temperature, humidity, and barometric pressure. A potato, kept under controlled conditions, evidences cycles and even predicts the weather two days in advance. More particularly, its metabolic rate goes up and down in a manner determined by some as yet unknown environmental force fluctuating with barometric pressure.

What causes these curious behaviors? Probably the potato growth is sensing geophysical forces that are also changing the weather. To discover what this force is, or what these forces are, Brown has conducted a multitude of experiments. In one experiment Brown let mud snails emerge from a funnel-shaped aluminum canal into an evenly illuminated arena. Their tendency to move right or left was measured on an underlying grid. The angle at which the snails crawled on the grid varied according to the time of day and the phase of the moon and could be altered by placing a magnet beneath the entrance of the funnel. Obviously at least some animals do perceive lunar variations in subtle environmental forces; one of these forces appears definitely to be magnetism.

In another experiment Brown found that the common planar-

ian worm will turn away from a weak source of gamma radiation, and that these animals know the difference between north and south, east and west. (That's better than some human beings I know.)

Another contributor to our progress was Professor Y. Rocard, of the Sorbonne at Paris. Professor Rocard discovered that human beings responded to these electromagnetic forces too. He has followed dowsers (men with dowsing rods who go around looking for the best places to dig for water) with extremely sensitive instruments and learned that there are real differences in the magnetic fields in those places where the rods bent downward. Conversely, he has forced the rods to dip by exposing the dowsers to hidden artificial fields.

Even inorganic substances react to these environmental forces. More than 400,000 experiments, covering a ten-year period, by Professor Giorgio Piccardi, of Florence, Italy, show that the time required to complete various chemical reactions varies with the time of day, the time of year, the sunspot cycle, and whether or not the chemicals in his test tubes and flasks are protected from external electromagnetic forces by metallic shields.

What does all this add up to? Daylight!

No longer is it necessary for us to say "Things act as if *something somewhere somehow* acted on something that in turn somehow acted on us to make us act in a patterned way." We can now theorize that *something somewhere* acts on the electromagnetic field in which the earth is immersed and that this field affects the chemistry of our bodies to make us alternately optimistic or pessimistic, energetic or slothful, warlike or pacific.

We now have hundreds of well-authenticated cycles and thousands of allegations of other cycles to be restudied and reevaluated. Periods group at certain definite wavelengths. Things that have the same wavelength turn at about the same time. Cycles keep on coming true after discovery, and when distorted return to their former timing. Cycles go back continuously for hundreds and thousands of years; in fact, they have left their imprint on rock strata that are millions of years old.

A new science is taking form beneath our hands and eyes. New

vistas invite exploration almost daily. Things are moving so fast and so favorably that it is difficult to keep pace with them. We are not "there" yet, but things have been pretty well roughhewn, and except for cause, *the discovery of which is merely a matter of time,* our mosaic is fairly well complete.

But much remains to be done and I have no desire to join Tycho Brahe until the great cycle mystery has been resolved. However, my desires count for little in the pattern of God and if it is not destined for me to carry this quest through to final victory it is my earnest prayer that somewhere there is another Kepler.

Perhaps it will be you.

Perhaps it will be you who someday will run his finger down a row of figures in a computation performed by Dewey in 1941, 1944, 1958, or 1970 and say, "Here. Here is the answer!"

The solution of our mystery is near at hand, requiring only much hard work—and time.

Time. I have lived with that word for the better part of my life. I have measured time. I have cut time into chunks. I have turned time back to explore pulsations long ago silenced. I have projected time into the future.

Still I cannot hold it back—and there is so much yet to be accomplished.

I am reminded of some words spoken by Dr. Reinhold Niebuhr at a commencement exercise several years ago:

Nothing that is worth doing can be accomplished in your lifetime; therefore, you will have to be saved by hope. Nothing that is beautiful will make sense in the immediate instance; therefore, you must be saved by faith. Nothing that is worth doing can be done alone, but has to be done with others; therefore, you must be saved by love.