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SCIENCE FIVE THOUSAND YEARS HENCE[1]

By Dr. ALBERT F. BLAKESLEE

DIRECTOR, THE DEPARTMENT OF GENETICS, CARNEGIE INSTITUTION OF WASHINGTON AT COLD SPRING HARBOR, L. I., N. Y.; PRESIDENT OF THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

I HAVE been asked to predict the condition of science five thousand years hence when the Time Capsule is dug out of the Flushing meadows—provided there are any meadows here in A.D. 6939. Land has been rising and falling in different parts of the globe within historic time, and within five thousand years the Time Capsule may be considerably below sea level or raised several hundred feet above where it is now.

While I speak *to* the youth of to-day, I am speaking *for* the youth that will be living one hundred and fifty generations hereafter, in other words to your great, great, one hundred and fifty times great grandchildren.

One can predict only in terms of what is known in the past. Let us compare what has actually occurred within these fifty centuries with what a man five thousand years ago might have predicted for the present. He could not have thought about development of world civilization because the world to him was only a limited region. Civilizations could develop and decline with little or no influence on one another because of lack of means of communication. His knowledge of the geographical world and of the laws of nature was so limited that it would have been impossible for him to predict the condition of the world in 1940. Science, as we understand this term, did not exist in B.C. 3060.

Are we to-day in our ignorance as incapable of predicting the future five thousand years hence as was the man five thousand years ago? In many ways probably yes; in other ways we have an advantage.

[1] Address before the American Institute of the City of New York at the World's Fair, September 23, in connection with the sealing-in of the Westinghouse Time Capsule. The address was broadcast in part over the NBC network.

We have made a start. So far as his physical and his mental equipment are concerned, I see no evidence that man to-day is better than five thousand years ago. He does, however, have better tools—by tools I include the methods of science as well as the actual instruments, such as the microscope, which enable him to delve deeper into the unknown and learn the laws of nature. The development of science seems to act like a falling body in that, once started, its speed is enormously accelerated with time. There is an interrelation of science such that each new tool or method makes possible newer tools and further discoveries. In many branches, and perhaps in science as a whole, more progress has been made within the life span of a single man than in all time before.

Last week I had the privilege of taking part in the celebration of the bicentennial of the founding of the University of Pennsylvania by Benjamin Franklin. Two hundred years is not a long time so far as the recorded history of mankind is concerned. It is only a one-twenty-fifth part of the period of time we are discussing to-day. Two hundred years is a long time, however, in the history of my own field of biological research. In 1740 Benjamin Franklin and the other founding fathers of the University of Pennsylvania knew little about biology for the simple reason that biology at that time was an almost undeveloped subject. An adequate system of naming plants and animals was lacking, and it was only thirteen years later, in 1753, that Linnaeus published his "Species Plantarum" and introduced to the world the binomial system of classification which has been used ever since for the names of both plants and animals. Few of the titles of the biological papers which were given at last week's celebration in Philadelphia could have had any meaning to Franklin and his colleagues because such words as *germ plasm, chromosomes* and *genes* were not in use till more than a century after Franklin's time.

A couple of years ago at the Richmond meeting of the American Association for the Advancement of Science there was celebrated the one-hundredth anniversary of the cell theory. The newness of our knowledge of cells is evident when we realize that more than two thirds of the last century's study of cells is covered by the life span of one of the speakers on the program of the Pennsylvania Bicentennial. Chromosomes were discovered in 1873 when he was three years old and were given the name of chromosomes in 1888, when he was an eighteen-year-old freshman in Kansas University. An example from my own special field of genetics is the fact that knowledge of the mechanisms of heredity has been developed entirely within the last forty years. Progress was slow at first but has become increasingly rapid until now we feel justified in predicting the conscious control of the evolution of plants, animals and even of man himself. Thus in addition to having more and better tools, man, five thousand years hence, may be a better creature physically, mentally and morally.

Detailed prophecies, of course, are impossible. We can only guess at trends. The psalmist said, "Oh! had I wings like a dove, for then I would fly away and be at rest." Many doubtless have had the same desire to fly. Leonardo da Vinci less than five hundred years ago drew plans of a flying apparatus. It was only, however, after the invention of the internal combustion engine that flying became an accomplished fact. This was the outcome of centuries of yearning. We make progress in learning by yearning. If we study what the things are which mankind yearns for, we may be sure that these will be things in which progress will have been made five thousand years from now.

We have yearned not only for wings, which we have now acquired, but also that we may fly away and be at peace. I believe within five thousand years man will have made progress in satisfying this yearning; whether by changing his environment through improvements in social organization or through changing the nature of man, we can not foretell. I believe progress is due in knowledge of how man may live in harmony and at peace in large as well as in small groups. I believe that governments will depend increasingly on expert knowledge—that we shall seek information before legislation rather than the reverse. I believe that by the scientific method we shall more effectively seek the truth and that the truth shall make us free.

THE VALUE OF THE FUNDAMENTAL SCIENCES IN THE ESTABLISHMENT OF ANESTHESIOLOGY[1]

By Dr. JOHN S. LUNDY

SECTION ON ANESTHESIA, THE MAYO CLINIC, ROCHESTER, MINNESOTA

THIS seems to be a suitable occasion for an individual who has had an opportunity to participate in the development of anesthesiology,[2] a new specialty in medicine, to call your attention to the fact that the fundamental sciences are the outstanding factors in

[1] Read before the meeting of the North Dakota Academy of Science, Fargo, North Dakota, April 26, 1940.

[2] J. S. Lundy, E. B. Tuohy, R. C. Adams, L. H. Mousel and T. H. Seldon, *Proc. Staff Meet., Mayo Clin.*, 15: 241–254, 1940.