

Books

THE UNIVERSE AND DR. EINSTEIN

by Lincoln Barnett: With a foreword by Albert Einstein
William Sloane Associates, New York 127 pp. \$2

by H. P. Robertson

Professor of Mathematical Physics

I SUPPOSE EVEN THE MOST pessimistic of scientists must admit that the tenor of science reporting to the general public has improved remarkably during the past couple of decades. Further evidence of this improvement is to be found in this excellent little book by Lincoln Barnett, a somewhat elaborated form of a series of articles of the same title which appeared recently in Harper's Magazine.

Mr. Barnett has quite appropriately chosen to weave his popular account of the rise and meaning of the quantum and relativity theories about the dramatic personality of Albert Einstein. His general thesis is that these developments—for so much of which Einstein is responsible—herald the retreat from a mechanistic “explanation” of the physical universe to an abstract mathematical “description” of it. In support of it he makes a praiseworthy, and, in the opinion of this reviewer, successful attempt to tell what aspects of experience the newer theories deal with—and even to explain their proposed solutions in words that he who has forgotten (or never knew) their differential equations may yet understand. The book should inspire those who can to go further in their exploration in this most exciting of intellectual territory; for them Barnett adds at the end of his account a “Reader's List,” as a kind of Baedeker to guide them.

He begins with an account of the origins, around the turn of the century, of the quantum theory, whose principal domain is the microscopic world of electrons and protons, and the other primary or secondary units into which the physical content of the universe can be broken down. Here the trend of greatest philosophical interest is found in the surrender of classical concepts of causality and determinism, resulting in the attribution to these units of the apparently contradictory properties of both particles and waves.

Turning then to the other great field, of relativity, Barnett gives a good non-technical account of the origins of the special theory. Here the theme of the trend toward abstraction is supported by the special relativistic requirement that the old picture of a physical world extending in three dimensions and enduring in time be surrendered in favor of a world existing in a four-dimensional space-time. Which results in the well-known curious behavior of (other people's!) clocks and measuring rods, and in the rejection of the classical Newtonian notion of absolute simultaneity.

Following the path taken by Einstein from 1905 to 1915 in his attempts to extend the relativity of observers moving with constant velocities to those which are accelerated, Barnett renders as painless as possible the transition to the general theory of relativity. This

theory, dealing as it does with the macroscopic aspects of the physical universe, leads in turn to the cosmological problem of the nature of the physical universe as a whole. And thus smack into the theory of the expanding universe, so much of which was developed here at Caltech in the investigations of the late Dr. Tolman, and in the observations of Dr. Hubble and his associates at the Mt. Wilson Observatory—and on which we confidently expect much new light to be shed by the new Palomar Observatory. In a very few pages Barnett describes the current attempts of Gamow and Whipple and others to introduce into this relativistic frame an evolutionary cosmogony of the birth and being and death of stars and nebulae.

Barnett has now a quantum-theoretic description of the microscopic aspects of the universe, and a relativistic account of the macroscopic; he pins the hope of reconciling these two apparently disparate aspects of reality on Dr. Einstein's lifelong search for a unified field theory which will encompass both gravitation and electricity, both nebulae and neutron, in one single universal frame. Mr. Barnett has done him and science a genuine service in presenting this excellent and generally understandable account of the search and of the successes which have so far come out of it—even though from Dr. Einstein's point of view they may be but by-products gleaned on the way. Best wishes to Dr. Einstein on his 70th birthday; may it be crowned by the final success which his long search deserves!

THE ROAD TO REASON

by Lecomte du Nouÿ

Longmans, Green, and Co., New York 254 pp. \$3.50

by P. S. Epstein

Professor of Theoretical Physics

IT IS GENERALLY AGREED that the moral education of our youth does not keep pace with the scientific. This fact has become one of the gravest social problems of our time, and is usually attributed to the waning influence of religion, which serves as the foundation of morality in our Western civilization. What the author of this book craves and what he calls “The Road to Reason” is a more balanced world view in which the equilibrium between science and religion would be reestablished.

However, the way in which Lecomte du Nouÿ tries to attain his goal will hardly meet with the approval of critical scientists. The bulk of the book is devoted to an attempt at depreciating modern science, which is accused by him of a failure to give “understandable explanations” of atomic phenomena; to define “the difference between life and death”; to explain “the origin of life.”

The first of these accusations may be treated briefly here, although it accounts for a large part of the book. It does not mean much to say that the explanations

given by the modern quantum theory are "mathematical and unsatisfactory to the understanding," since Lecomte does not take the trouble to define the criterion of **understanding** and **explaining**. His discussions evince a vague kind of uneasiness in the face of the revolutionary character of modern science, especially of the principle of indeterminacy. This attitude was fairly common in the popular scientific writings of from fifteen to twenty years ago, but it is now antiquated, because the profundity and logical consistency of the new point of view has been recognized even in the popular press.

More definite and detailed are Lecomte's criticisms of modern science in connection with the problem of the **origin of life**. He puts the question whether one of the simplest building stones of living matter, a protein molecule, could have originated in nature by pure chance. He cites the French writer Charles-Eugene Guye, who published in a popular scientific book an estimate of the probability of the formation of such a molecule. As calculated on purely geometrical lines, the probability comes out so extremely small that it amounts to a practical impossibility. Hence, our author concludes that life could not have originated without supernatural interference.

According to the publisher's blurb, the late Pierre Lecomte du Nouÿ held the degrees of Ph.D. and Sc.D. He must have been well versed in some branches of science. But his qualifications did not include an understanding of statistical mechanics, any more than a knowledge of quantum theory, or else he would have

known that the frequency of occurrence of a physical system is not determined by its absolute geometric probability. Indeed, the pertinent probability is that which prevails under certain subsidiary conditions, of which the most important is that it must correspond to the smallest possible internal energy of the system. In the cases where such a calculation can be completely carried through, the energy condition turns out to be so important that it often entirely reverses the result. States which are extremely improbable as long as this condition is neglected prove to be the only possible ones when it is taken into consideration.

Thus Guye's calculation has very little relation to the actual problem. In the present state of our knowledge we cannot say whether life on this planet could have originated by chance or not; the answer must be left to the future. Lecomte's contention that a natural origin is impossible is an example of the very intransigent dogmatism with which he reproaches the scientists.

Equally unrewarding are the passages of the book which touch upon religion. The author admits that its recent decline is at least in part due to the shortsightedness of the religious leaders, who, underestimating the power and usefulness of science, bitterly fought its progress instead of using it as their tool. But the reader would look in vain for any practical suggestions as to how religion could reconquer the lost ground. On the whole, it is fair to say that Lecomte's book does not bring the problem of the "Road to Reason" any nearer its solution.

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