

THE NATURE OF THE UNIVERSE

by Fred Hoyle
Harper & Brothers,
New York, \$2.50

*Reviewed by Robert S. Richardson
Mount Wilson and Palomar
Observatories*

ABOUT 1945 a mysterious group of individuals known to the world only as THEY decided that women's clothes should undergo a radical revision called the New Look. Women were informed that they could either adopt the New Look and be in style or resist and be old fuddy-duddies.

After reading *The Nature of the Universe* I experienced much the same reaction that many women felt when the New Look was thrust upon them. The book, which developed from a series of broadcasts delivered about two years ago, deals with the New Cosmology (the capitals are the author's). In this case, THEY consists of Fred Hoyle of Saint John's College, Cambridge, England, and his associates. Without explicitly saying so it is implied that unless you adopt the New Cosmology you are definitely a back number.

Apparently THEY have discussed the nature of the Universe at great length, weighed the various alternatives in the balance, and decided that it *must* function in a certain manner. Why? Well, because there just simply isn't any other way that it *can* function.

The style in which the book is written constitutes both its strength and its weakness. Hoyle writes with such fervor that it would be a dull reader indeed who was not lifted up and carried along with him. In effect, he says, here is a subject that is tremendously important to me, and he holds your attention because

you feel that he could not write with such enthusiasm unless the subject were important to you, too. In seven short chapters he tells you about the origin and destiny of the solar system, stars, galaxies, and the Universe. In such a brief space these subjects can barely be touched upon, yet you arrive at the end a trifle breathless and dizzy but still feeling that you have been somewhere and retained a good deal regarding the significance of the places you have visited.

On Speculation

The irritating thing about the book is the arbitrary way in which material of a highly speculative nature is presented. An uninformed reader would certainly gain the impression that astronomers are generally agreed upon the majority of the statements made.

For example, on page 26 of the first edition Hoyle says, "When you look at the heavens, how many of the stars you see have planets encircling them and on how many of these planets might living creatures look out on a very similar scene? To give a numerical estimate I would say that rather more than a million stars in the Milky Way possess planets on which you might live without undue discomfort."

Now aside from the sun, we do not *know* that there is a single star in the Universe with a planet encircling it on which we might live in comfort. Often we find it hard to live in comfort on the planet of the only star that we do know anything about.

Some of Hoyle's remarks, besides being arbitrary in tone, are curiously worded. Thus, in describing a brand new theory of the origin of the lunar craters by Gold, which "is almost

certainly correct," he speaks of the "lower parts of the moon." This is the first time that most of us were aware that our satellite had any such appendages. (Incidentally, have Proxima and Alpha Centauri been displaced from their position as the nearest stars to the sun at 4.3 light years? On page 53 it is stated that light takes about three years to travel to us from the nearest stars.)

The most interesting concept in the New Cosmology is the continuous creation of matter, an idea which it is said represents the ultimate goal of the book. This assumption is needed to account for the fact that the Universe consists almost entirely of hydrogen. For unless hydrogen is being created continuously to replace that converted into helium it would all have disappeared long ago. Hence the Universe is under the necessity of creating hydrogen in somewhat the same way that the government is compelled to keep issuing new greenbacks to replace those that are worn out.

This spontaneous creation of matter out of nothing sounds incredible at first, but, as Hoyle remarks, is it any less palatable than other ideas of the creation of matter such as the big bang hypothesis, for instance?

The Word

The last chapter contains Hoyle's strictly personal views on the general philosophic issues that come out of his survey of the Universe. Here he never hesitates to meet difficult questions head-on. He neither hedges nor does he discuss them in such generalized terms that they cease to have any practical meaning. Instead he gives with simplicity and candor his ideas on man's place in the Universe, the cosmology of the Bible, and survival after death.

The Nature of the Universe was originally published in the United States in *Harpers Magazine*, where already it has attracted wide attention. The book can be recommended as by far the most interesting popular commentary on cosmology that has appeared recently, if it is read with reservations. Hoyle believes that the conception of the Universe described in this book is correct in its main essentials: that our conception of the Universe 500 years hence

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will still bear an appreciable resemblance to that of the Universe of today.

The New Look survived about two years. Will the New Cosmology have a longer lifetime?

COSMIC RAYS

by Louis Leprince-Ringuet
Prentice-Hall, New York, \$6.65

*Reviewed by Carl D. Anderson
Professor of Physics*

PROFESSOR LE PRINCE-RINGUET'S fascinating little book *Cosmic Rays* is intended for readers who are not specialists in cosmic ray research. It assumes little more knowledge on the part of the reader than do most of the so-called popular books on science. Within its 270 pages, however, it does present a clear and interestingly written introduction to the whole subject of cosmic rays. Its outline is in general historical,

and while the subjects treated include such highly theoretical and abstract matters as special relativity and meson field theory, it is for the most part a qualitative description of notable pieces of experimental work selected by the author from the very extensive history of research in cosmic rays. The properties of the elementary particles of matter—protons, neutrons, mesons, electrons, etc.—are discussed in some detail.

For a completely authoritative book on a scientific subject it is written in a lively and personal style. The book will reward the reader with some very definite impressions. He will realize, for example, the magnitude of present-day research in cosmic rays, and what an extensive, important and complex subject it is. He will appreciate how many important advances in our basic understanding of atomic and nuclear physics have resulted from cosmic-ray research. In some measure this

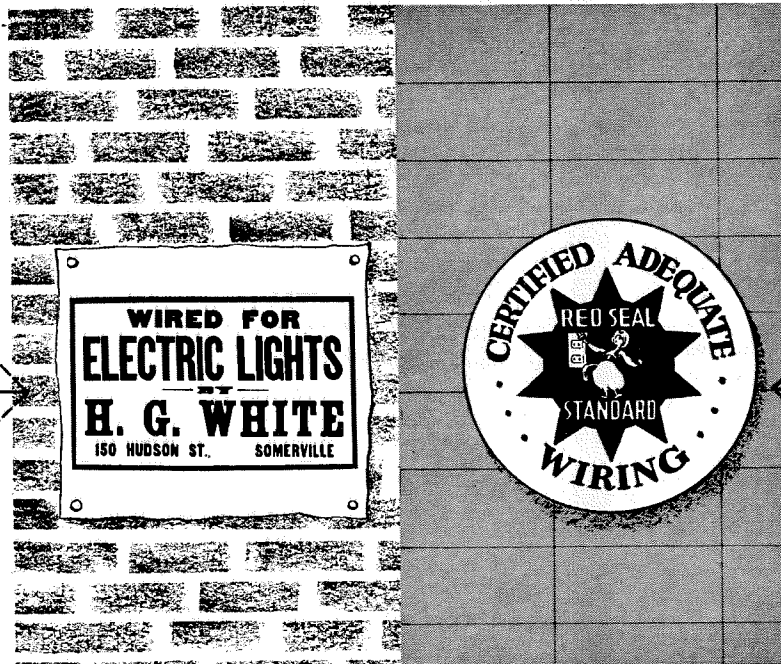
book will reveal to the reader that research in physics is dramatic and fascinating, and that at times it can be as exciting and adventuresome a pastime as any exploration in a far-away jungle.

One of the book's most appealing features is the large number of illustrations, including many dozens of track photographs of the particles of cosmic rays made in cloud-chambers and in photographic emulsions, and many laboratory scenes in mountain locations or in balloons and airplanes.

The author is himself a distinguished French scientist, professor at l'Ecole Polytechnic, and a member of the select French Academy of Science. At the present time he leads the largest and most active group in France engaged in cosmic-ray research. He has made many important contributions to our knowledge of cosmic rays and nuclear physics.

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The book seems to contain only very few errors, and those that were discovered were all trivial. For example, Plate 10.5 on page 153, titled "The first photograph obtained of a meson trajectory (1931)," is attributed to a German physicist, whereas many inmates of the Norman Bridge Laboratory will readily recognize this photograph as a distinctly local product of the year 1931.

THE RETURN OF CHRISTOPHER

by Margaret Echard
Doubleday and Company,
New York, \$3.50

Reviewed by Harvey Eagleson,
Professor of English

THE FIRST REASON why Miss Echard's latest novel should be reviewed for *Engineering and Science* is that the hero, Christopher Gayle, attends Caltech, and it is of interest to Caltech men to see their school presented in fiction. The second reason for reviewing the book here, however, is more serious and important than the first, for the problem presented in the novel is one which troubles every thinking man in contemporary life. What can I believe? In the light of modern education, particularly scientific education which has so rapidly changed our concept of the universe in which we live, in the chaos of modern life with its overwhelming problems of economics, war and conflicting ideologies, what can I believe? What should my standards of judgment be? What can I find which will sustain me against the the impact of the "slings and arrows of outrageous fortune"?

The solution offered by Miss Echard in this novel is a return to orthodox Christianity. At least that is the solution of her hero, Christopher. It is Christianity to which he "returns". Whether it is Miss Echard's personal solution is another matter. One of the best qualities of her novel is its complete objectivity. She presents her characters with sympathy and understanding, but she never manipulates them to her own ends. She says in effect, "I give you one solution to the problem of modern life. I do not claim it is the only solution, or mine. This story is one man's experience. You may take it or leave it."

The story of the novel is in itself not too important. Although the reader's interest is maintained throughout, it is not because of sensationalism or novelty in the plot. In fact the principal interest in the novel's story is that it is so typical of American life and experience. Every male reader will find bits of his own life and thinking recorded in Christopher's. One of the remarkable features of Miss Echard's novel is that she so vividly and accurately projects herself into a *man's* experience.

Christopher is reared in a small American town, Albemarle, which could be any American small town with its comfortable middle class life, its social prejudices, local scandals, gossip, and play. This setting Miss Echard presents as realistically and as well as it has been done in any American novel. We have had many fictional pictures of small town life in America, notably Sinclair Lewis's *Main Street*, but as in that novel most of these pictures

have emphasized the disagreeable aspects to the sacrifice of the agreeable, of which there are many. Miss Echard chooses a middle ground and as a result the life she portrays is nearer to that which most of us have experienced.

Christopher's family environment is strictly and rigidly religious. As he grows older he revolts against this attitude. He drifts away from his home and friends, attends Caltech, marries, becomes a teacher, is involved in World War II. But always he is dissatisfied, feels something lacking in himself and his life. At the end of the war he returns to his home in Sierra Madre and grapples with his problem. Having found his solution in Christianity and the desire to enter the ministry, he is again affected with doubt.


"Everything for which I prayed, every step which it seemed God had led me to take, appeared to be an expression of my own egotism," he confesses to an old friend.

To which his wise advisor, Dr. Muncie, replies, "You've spent your life seeking an object for your complete devotion. Having found it, you are inflamed with the deadliest of all passions: the urge to give yourself without hope of reward. Suddenly the whole idea is presented to you in a different light. You are made to question your motives, not because you distrust them, but because, for the first time, you realize that you are going to *receive* more than you feel you deserve . . . My dear boy, you might as well get used to jolts of that nature. You'll never be able to do anything for God that you're not embarrassed for the compensation."

Christopher accepts ordination

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and the book ends as he preaches his first sermon on *I Corinthians*, second chapter, second verse. "For I determined not to know anything among you, save Jesus Christ, and him crucified."

Miss Echard attempted a difficult task in this novel and succeeded. She avoided the pitfalls of sentimentality and bigotry which are latent in her subject. She has written a fine novel and created an excellent piece of Americana, presenting as it does a kind of life which may all too soon disappear from the American scene.

GEOGRAPHY IN THE TWENTIETH CENTURY
 Edited by Griffith Taylor
 Philosophical Library,
 New York \$8.75

Reviewed by Richard Jahns
Professor of Geology

PREPARED AS a "study of the growth, fields, techniques, aims and trends of geography," this volume represents the joint efforts of twenty authors. It is at once a careful sampling and a skillfully edited summary of geographical thought during the past half century, and as such is a unique and valuable contribution. More than 600 pages of data and sober discussion could well be pretty deadly stuff, but the potential reader need not be frightened away from this book by its somewhat encyclopedic aspect, even though he will quickly recognize most of the chapters as both comprehensive and authoritative. Not only is the general approach philosophical rather than merely descriptive, but much of the writing itself is lucid and pleasantly tidy. Many provocative ideas and arguments, presented in a wide variety of forms, are bound to raise questions in the reader's mind, particularly if he is an engineer or

scientist with normal interest in the techniques of converting data into sound answers. He may react favorably or he may react unfavorably to some of the arguments, but he assuredly will react!

The book comprises three sections, the first of which deals with the development of geography as a science, together with its philosophical basis and the several schools of thought that evolved at various times in different parts of the world. The introductory chapter, provided by Griffith Taylor, the editor, is extraordinarily broad in scope, and sets a strong pace for the rest of the book. Among its most attractive features is a succinct discussion of the old but not-yet-dead "theocratic" view of geography, in which the well-being of man is held to be the basic aim of an omniscient providence; the later and now-very-active "geocratic," or environmental view, which places emphasis upon physical factors as the chief control of human activities and development; and the "we-ocratic," or possibilist view, in which man is favored as master of his own geographic destinies and the natural landscape is subordinated to the "cultural landscape." These points of view are later treated in detail by George Tatham, who also contributes an historical chapter on geography in the nineteenth century. Other chapters summarize the development of geography in France, Germany, Czechoslovakia, and Poland. Interestingly enough, an attempt was made by the editor to obtain contributions from Russian and Jugo-Slav scientists, but no satisfactory contact could be made.

The second section of the book comprises four chapters that are concerned with geomorphology, meteorology, climate, and soils, and six chapters that present regional dis-

cussions in the light of these environmental factors. These 227 pages thus deal with the most fundamental elements of geography, and as such serve as the fulcrum of the book. The third section is concerned with aviation; fieldwork; political, social, and racial problems; and other more general topics of broad application. In many respects, such chapters as Geography and Empire, Racial Geography, Geography and Aviation, and Geopolitics and Geopacitics are the most stimulating in the book, but they will not yield a full return to the reader who skips over the material in Parts I and II. A good summary of all three parts is presented by the editor in the introductory chapter (pp. 19-27).

The Line-Up

The selection of contributing authors plainly was a careful one, and such well-known authorities as S. van Valkenburg, S. W. Wooldridge, Isaiah Bowman, L. Dudley Stamp, Charles B. Fawcett, and Ellsworth Huntington are represented by excellent chapters. It should be added that several of the other chapters, the work of younger men, seem fully as good, and include some of the most vigorous writing to be found in the book. Each contributor uses his own analytical approach and mode of presentation, which is at once an advantage and a disadvantage to the reader. Although the over-all balance of treatment is thereby improved, an essentially segmented coverage of so broad a field as geography inevitably leaves sutures and gaps in the final product; these, however, have been held to a minimum by the editor, who has integrated the numerous contributions with considerable success.

Scientists in other fields may be

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somewhat less than favorably impressed by many of the attempts at quantitative treatment of data and concepts, and perhaps especially by the fundamentally subjective approach to some problems. The geographer's fondness for maps, diagrams, and charts is well shown in several chapters, but the intrinsic accuracy of these helpful illustrations rarely is indicated or even suggested. One wonders, for example, about curves that are based upon three control points, and about simple block diagrams that show the relations of several highly complex and imperfectly known variables. One might question, too, the derivations of several formulae on the basis of obviously incomplete data. The geologist will be shocked at some of the over-abbreviated, misleading, or even incorrect definitions of terms in the "concise glossary of geographical terms" that concludes the volume.

Scientific Analysis?

Another question that most readers will ask again and again relates to possible "sampling errors" in most of the geographic analyses. This problem undoubtedly is recognized by many geographers, and John Kerr Rose, in his discussion of

geography in the Federal government, states (pp. 575-576): "Field methods, particularly elementary techniques of survey, which do not adequately consider the problems of representativeness of samples, are of no particular help—a good course in elementary statistical methods would be used many times more frequently." The somewhat "personalized" techniques employed by at least four of the authors raise some doubt in the reader's mind as to just where scientific analysis ends and authoritarianism begins. These men—and the editor himself appears to be one of them—repeatedly call attention to *their own views in apparent attempts to increase the weight of their arguments.*

Relation to Other Sciences

Despite these relatively minor shortcomings, this book is good reading. In particular, the man who deals with the more "exact" areas of science and engineering will gain a better understanding of geography, whose place in science is not easy to determine. In its dominantly physical, or "environmental" facets it is closely related to such well established fields as astronomy, botany, geology, and physics. In contrast, those facets that form the human

side of geography are related to anthropology, economics, history (including politics), and sociology.

The geographer himself is at times somewhat bewildered by the internal complexity of his field, and certainly the attempts of a few geographers to analyze environmental data in rigorous fashion have been blocked again and again by the "human" aspects of the problems. "Human" geography, or the ontography of the late William Morris Davis, characteristically involves data that are elusive, inconstant, and all too often misleading. It is evident that such data are not susceptible to the rigorous treatment ordinarily demanded, for example, by the chemist or physicist, and they introduce maddening uncertainties into most geographic problems. And even in those problems that are perfectly free from ontographic complications, the geographer finds his "environmental" data none too promising. Here he joins the physical geologist, who must lean heavily—and perhaps shakily—upon the doctrine of uniformitarianism, who must be willing to make use of semiquantitative data (even though he is not necessarily content with these data), and who must extrapolate far beyond his area of observed relations.

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