Nobel prize winners, Oersted winners, professors, some famous and some unknown. There seems to be no well-established pattern here. There is nothing to support the theory that eminent research physicists are not good teachers of physics (nor that they are superior teachers).

Some of the most interesting facets of the study were the unusual circumstances that led men into physics. Some of them are:

"Probably because I took physics in a class of 300 and got the best grade. Possibly also because it was my easiest subject."

"Called to teach physics due to shortage in World War I."

"Had an uncle very active in botany. Admired him but hated botany. Majored in physics."

"Married a graduate physicist. Had to learn his language." (Woman)

"Dr. ——, instructor in math (noting my sex), exclaimed: 'You, a major in math? Get over into physics where you belong!' "

It becomes apparent then that there is no specific or easy road to lead men down the path to physics. But there are guideposts that point definitely toward the field of physics. In the early life of the physicist the parents' encouragement of wide reading habits, the supplying of home tools, gadgets, and literature, coupled with a willingness to let the youngster investigate and experiment, are important. The atmosphere of inquiry definitely is essential.

Early education years, to be most fruitful, are spent in environments neither so sparsely nor heavily populated that opportunities to investigate are either impossible or discouraged. From the many comments it appears that often the instructors in the rural areas are not well prepared nor do they have sufficient literature for use by inquiring young minds. On the other hand, the very large schools tend to discourage the inquirer by the very size of the classes in which the student finds himself. Apparently the teacher is often better prepared but lacks the opportunity in such large classes to understand the individual as thoroughly as the teacher in the medium-sized cities. There is a superior climate which pervades the middle brackets.

Since so many of the physicists decide to go into physics in their early college years, it is obvious that the teaching of first-year college physics and the laboratories by instructors who are top-notch is certain to produce more physicists. Many a prospective physicist is lost because of the dullness of the first college course in physics in colleges having a tendency to place these classes in the hands of graduate assistants or second rate instructors who may not be adept in making physics an interesting subject. This practice is very costly and tends to eliminate many who would pursue physics if their first taste of it on a college level were satisfying. In all phases of this study there is abundant evidence that colleges can produce many more physicists if they will assign their superior teachers to first-year physics classes. Will the colleges do it?

Books

Die Ionosphäre, ihre Bedeutung für Geophysik und Radioverkehr. By Karl Rawer. 189 pp. P. Noordhoff N. V., Groningen, Holland, 1953.

Investigation of the earth's atmosphere above about 70 kilometers is the subject of the present book. Ionospherics is a capital example of a field of inquiry drawing its information and procedures from a great many scientific disciplines and, reciprocally, feeding its results back to their sources with highly beneficial effect. Beginning with the pioneering work of Appleton and of Breit and Tuve in the nineteen twenties, ionospheric research has ingeniously availed itself of the tools and methods developed by such diverse sciences as communications engineering, astrophysics, chemistry, terrestrial magnetism and rocket research.

Dr. Rawer has written a compact, informative account of the development of his subject and of the research tools that are contributing to this development, including his own important additions to the literature. The author is the scientific director of the *"Service de Prévision Ionosphérique Marine"* of the French navy.

In the foreword, the author points out that when a branch of pure science enters the realm of application, there is always the danger that pressures thus brought to bear from the practical side will tend to make the science narrow and one-sided in its further outlook. Happily, in the investigation of the ionosphere the opposite has occurred: in the decade since the first steps toward practical application were taken, the need for improved methods of predicting short-wave communication conditions has actually led to a broadening of the conceptual basis of the science. Satisfactory conclusions have been reached in connection with a number of phenomena, but for certain others a multitude of new observations has overthrown earlier concepts, only to pose entirely new problems.

In the first of its five main sections, the book deals with various methods of observation, of which echo sounding remains the most significant. This portion of the work also discusses spectroscopic observations of the aurora and of the light of the night sky, as well as possible information to be gotten from meteors and noctilucent clouds and from balloon and rocket ascensions.

The second section describes the main observational results so far obtained, dealing with such topics as electron density as a function of altitude, the composition of the atmosphere, and pressure and temperature variation.

A third division, devoted to the theory of the ionospheric layers, discusses methods of production and dissipation of ionization, while a following section describes the regular and sporadic changes in the ionosphere and seeks to establish their causes.

The final portion of the book is concerned with the practical question of the role of the ionosphere in the propagation of radio waves. It deals at some length with the problem of prediction of ionospheric conditions.

An unusually extensive list of references to books and papers, embodying nearly three hundred items in several languages, is appended.

Dr. Rawers' book will be interesting to physicists in general for the picture it presents of the scope and importance of a subject so intimately connected with physics itself.

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Atoms, Men and God. By Paul E. Sabine. 225 pp. Philosophical Library, New York, 1953. $3.75.

Dr. Sabine is the son of a Methodist preacher, cousin of Professor Wallace C. Sabine who founded the science of architectural acoustics. He is a onetime professor of physics at Case School of Applied Science, and retired director of the Riverbank Laboratory of Accoustics. This book, which has been fifteen years in preparation, will answer those of Dr. Sabine's friends who have wondered what he was doing in his retirement, other than defense work and the planning of the acoustics of the remodeled House and Senate chambers in our National Capitol.

He addresses himself to the problem "Can I be intellectually honest in believing what, as a Christian, I profess to believe and at the same time accept the teachings of modern science and psychology regarding the nature of man and God and the physical world?" In searching for the answer to this problem the histories of science and of religion are thoroughly reviewed, pertinent facts of chemistry and physics are surveyed, and our knowledge of psychology is explored, an attitude of rational criticism of any proposed philosophic conclusion being maintained throughout. The mechanistic view of the world, which considers all events as the operation of a machine governed by inexorable cause and effect and running down as its entropy increases, is held to be unsatisfactory because it fails to account for the evolution of higher biological species in a process of ordering which is held to run counter to a trend toward disorder. Neither does it account for the existence of *purpose* in the world, the governing of present activity in anticipation of future ends. "Biological science discloses a world in which the mechanically improbable is always taking place. Evolution in time from the elemental to the complex, from the more probable single-celled organism to the highly evolved species with their complicated functional adaptations—this is the direction in which time's arrow points in the living world. Evolution finds causation in the *pull of the future*. Mechanism finds it only in the *drive of the past*." The purposive coordination of these complex processes for the maintenance of the life of the organism defies description in mechanistic terms. Mechanism also fails to explain the origin of life. "The advent of two such substances as chlorophyll and hemoglobin, with their unique chemical and physical properties, must be regarded as a miracle from the purely physico-chemical point of view. It is quite inconceivable that they and with them the ordered relationship found throughout the living world should be the result of blind chance operating in an essentially lifeless concourse of atoms and molecules. Life becomes explicable only in terms of purpose, that is, the coordinated activities of related elements to the accomplishment of a specific end—that end being the maintenance and evolution of life itself."

The Uncertainty Principle "does not give positive evidence in favor of freedom of choice, but by replacing the bond of mathematical certainty between the present and the future, by the flexible tie of statistical probability, it makes freedom a scientifically plausible hypothesis instead of a scientific impossibility."

The chapter on psychology discusses introspection, behaviorism, conditioned reflexes, psycho-analysis and the unconscious mind. "The possibility of a collective unconscious unites the whole human family in a psychical unity that overleaps the barriers of nationality, color and race, and betokens a solidarity that is an essential reality rather than the expression of benevolent sentiment. The sense of individual isolation is not man's highest or final recognition of himself and of his own significance. Faith in the slowly dawning consciousness of the human spirit as an organic unity that, by the long and painful process of evolution, is externalizing the spiritual Will and Purpose of a living Universe—this, it seems, is not incompatible with the trend of constructive thought in modern psychology."

The busy reader will find the principal message of the book in its last chapter entitled "Christianity and Human Evolution." "We have now to tackle the other half of our job of getting a stereoscopic vision of the scientific and the religious by looking at the essentials of Christian faith with the same intellectual detachment as that with which we would scrutinize an economic theory or a philosophy of history. This is by long odds the harder part of the undertaking and the writer can promise only an honest attempt to transcend his own individual bias as one who has a *will to believe*. —The sceptic's position is also grounded in his *will to believe;* he sees religious phenomena as entirely natural phenomena that can be explained in naturalistic, that is to say humanistic, terms without the unnecessary assumption of the existence of God or of any purpose of God in human history.—We propose to follow in the present instance a procedure that has full scientific sanction and maintain that an explanation of the facts of Christian origins can be found in the operation of a process that is at the same time both natural and