"Discovery of first optical pulsar," "Discovery of quantized circulation in superfluid," "Measurement of nuclear reaction time using 'blocking effect,'" "Discovery of muon-induced fusion," "Discovery of two kinds of neutrinos," "Transition radiation from ultrarelativistic particles," "Apollo 11 laser ranging retro-reflector (LR^3) experiment," and "Search for hidden chambers in the pyramids using cosmic rays." Each offers explanatory notes for nonspecialists, a personal account of the episode by one of the participants, a reproduction of the original paper or papers with, in some cases, ancillary papers, and, where appropriate, a summary of subsequent developments.

The episodes selected for this issue are varied not only in content and style but also in their significance to the development of physics. Among them are discoveries of the most basic sort and some that are intriguing excursions. Some have the flavor of spontaneous inspiration, others report years of directed, highly organized team effort. One describes an effect discovered with low energy electrons in 1919 and apparently forgotten, suddenly becoming important for the identification of particles produced by the highest energy accelerators of today. Another demonstrates the novel use of a solid state phenomenon to permit the timing of nuclear reactions, a story illustrating the value of being alert to developments that are peripheral to one's focus of interest. The episodes illustrate, as well, the flow of ideas and people back and forth across national borders.

The personal accounts relate in a few pages and with varying degrees of completeness the ups and downs of research, why certain paths were taken and not others, what order-of-magnitude reasoning led to estimates of feasibility and design, and how information passes through the informal channels of acquaintanceship. Some hints of the personal relationships among the workers come through, but nothing to resemble the revelations of *The Double Helix*.

The temptation to flamboyance is kept under good control, although in the quantized circulation episode one is led by the subtitle to expect drama that does not materialize. Moreover, Vinen's long paper and his brief addendum referring to two later experiments that validated his work are followed, with inadequate explanation, by a paper that makes no reference to any of the foregoing.

Teachers often try to enliven their courses with stories such as are told in this compilation. To match the variety and assemble all of the relevant background material offered here is a large task. If Maglich's initial selection distresses some for its omissions, he offers the opportunity to nominate favorites for future issues. He is setting out to perform a unique service for physics students and teachers. His initial effort shows promise of success.

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Turbulent Flow

Statistical Fluid Mechanics. Mechanics of Turbulence. Vol. 1. A. S. MONIN and A. M. YAGLOM. Translated from the Russian edition (Moscow, 1965), as revised by the authors. John L. Lumley, Ed. M.I.T. Press, Cambridge, Mass., 1971. xii, 770 pp., illus. $22.50.

If ever a field needed a definitive book, it is the study of turbulence; if ever a book on turbulence could be called definitive, it is this book by two of Russia's most eminent and productive scientists in turbulence, oceanography, and atmospheric physics. Readers who have struggled to make sense of some previous attempts at translation of this important book will appreciate the great improvement in clarity in the M.I.T. Press version. It seems likely that much of the credit for this clarity should go to John L. Lumley, who did the technical editing.

The authors define their purpose in the preface to the English edition. It is to restore some balance to fluid mechanics, which classically has been devoted to the description of individual laminar flows despite the fact that virtually all of the fluid one encounters in nature or in engineering practice is in a state of turbulent motion. Laminar flows are considered as rather exotic special cases of the general condition of turbulence, and their treatment should be "as an introductory chapter to the theory of real turbulent flows."

To spread this view beyond the circle of turbulence specialists, who probably hold it anyway, the authors have tried to summarize the majority of the fundamental work and ideas of modern turbulence theory. The result is encyclopedic. The list of references is 51 pages long and includes virtually every paper of major significance in the field up to about 1968–1970. The authors even identify the source (discovered at some point between the 1965 and the present versions) and give an additional line of the frequently quoted but never referenced turbulence poem by Richardson (1922) beginning "Big whorls have little whorls. . . ."

Despite the length of the book, it is apparent that all the material has been subjected to careful evaluation, and a high standard of scientific merit is consistently maintained in the writing. Critical comment and comparisons are frequent. An attempt at editing is made by relegating some of the lower-priority material, such as description of semiempirical theories of turbulence, characteristic functionals, and details of experimental techniques, to small print. Generally speaking, however, the authors have included in generous detail everything they consider relevant or important. The result is a bit overwhelming, and few will have the persistence or breadth of interest to read all of the book, but few in the field would not benefit from the attempt.

The authors take nothing for granted, and in case the reader doesn't know how to do laminar flow problems examples are given at the beginning of the book. Basic equations are derived and explained, and a very thorough treatment of stability theory is given as the basis for the development of turbulence as the Reynolds number increases and more degrees of freedom of the flow are excited. The style and treatment of the material will be familiar to readers of Landau and Lifshitz's book on fluid mechanics.

In the second chapter, sufficient probability theory is developed to permit an adequate understanding of some of the subtle difficulties which beset the mathematical description of turbulence and to distinguish between the confusing variety of averages used. Reynolds equations for turbulent fluxes of momentum and heat are developed in the usual detail and are exhaustively compared with available data and various semiempirical turbulence theories developed over the years. Effects of compressibility, Coriolis forces, and stratification are introduced.

An extensive treatment of turbulence in a thermally stratified medium is given which demonstrates the physical principles and similarity scaling adequately, but which is somewhat slanted toward atmospheric turbulence over land. Effects of humidity on buoyancy

are important in the atmosphere over the ocean and may oppose or enhance the effects of temperature. Also, because temperature differences are much smaller over the ocean, it frequently becomes necessary to distinguish between actual and potential temperatures and densities in the stability analysis—a point touched on very lightly in this treatment.

Finally, the equations of turbulence and particle dispersion in a Lagrangian frame of reference are developed. The Lagrangian treatment will no doubt be receiving increased attention as problems of atmospheric and water pollution are faced.

To summarize, this book along with the forthcoming second volume will fill a long-standing need for a comprehensive book on turbulent flow. The two volumes have become the standard reference on the subject in the Soviet Union. It seems likely that the translation will assume this role in English-speaking countries as well.

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Microorganisms

The Biology of Mycoplasmas. PAUL F. SMITH. Academic Press, New York, 1971. xii, 258 pp., illus. $14.50. Cell Biology.

The mycoplasmas (originally called pleuropneumonia-like organisms or PPLO) have been studied both by people who want to grow them for study because of their pathogenicity and small size and by people who want to get rid of them because they are common tissue culture contaminants. The small size and fastidiousness of these organisms made it difficult to grow cultures, quantitate cell viability, and examine viable cells by light microscopy. Because of these technical problems, many early (that is, before the mid-1960's) workers in the field neglected some basic controls in their studies. Cells for biochemical and microscopic analyses were rarely assayed for viability, so we do not know whether many of the data in the literature were collected from living cells or dead ones. The microscopists, at least, should have been aware of the problem, since the vesicles shown in most published electron micrographs (and called cells) obviously show little or no cytological preservation. As might be expected, a cell biology based on studies of cell debris tends to be full of bizarre forms. This explains the exotic biology ascribed to the mycoplasmas in much of the literature.

Paul Smith's book was written to serve as a general introduction to the mycoplasmas. The text is divided into six sections: on the origin of mycoplasmas, the structure of the mycoplasmal cell, the dynamics of reproduction and growth, the relationship of structure and function, the interaction of mycoplasmas with their environment, and the significance of mycoplasmas as cells. Half of sections 2 to 4, which cover the cells' biochemistry and structure, is concerned only with lipids and membranes, the other half covering all of carbohydrate, nucleic acid, and protein biochemistry and structure. This imbalance reflects both the historical development of mycoplasma studies and the author's field of interest.

Though the book is an adequate review of the field, certain reservations must be expressed. The conflicting points of view and diversity of data in this field are dispassionately presented, with little attempt to interpret or explain the inconsistencies to the general reader. This may serve to make the data seem even more confusing than they are. A number of errors and generalizations also confuse the discussion; for example, the mycoplasma membrane is up to 40 percent of the cell's dry weight, not 60 to 70 percent as stated (p. 224); multi-hit and multi-target kinetics are not mentioned, while clumping is used to explain nonexponential radiation inactivation of the cells (p. 188); and the Donetta cell chromosome is 350 μm long, not 350 nm as stated (p. 55).

Smith mentions, but does not use, the most recent taxonomic nomenclature, which tends immediately to date the book. More important, the controversy he discusses on the size of the minimal cell and the mode of mycoplasma replication has recently been resolved (Ciba Symposium on Pathogenic Mycoplasmas, in press). In fact, since we now know that the mycoplasmas are larger than was originally believed and that the small forms seen earlier were cell debris, the biology of the mycoplasmas seems much less complicated.

Smith's book is recommended as a comprehensive introduction to the mycoplasmas. It will probably serve as a bench mark, documenting the development of our knowledge of these cells and leading up to the recent expansion of this field into new areas of cellular and molecular biology, such as the identification of plant mycoplasmas and mycoplasma viruses.

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Biological Psychiatry

The Biochemistry of Functional and Experimental Psychoses. HANS WEIL-MALHERBE and STEPHEN I. SZARA. Thomas, Springfield, Ill., 1971. xviii, 406 pp., illus. $18.50. American Lectures in Living Chemistry.

Freudian thought has dominated most psychiatric research in this century, the behavioral sciences having reigned supreme. Yet the only major psychiatric disorder to be eliminated during the same period, general paresis due to syphilis, yielded to techniques of the biological sciences. During the past two decades interest has shifted back to biological psychiatry. Its practitioners include physiologists, pharmacologists, experimental psychologists, biochemists, and clinicians. Of these, biochemists have had the greatest impact on our new thinking about "functional" psychiatric disorders. Two factors provided the impetus to this rebirth of biological psychiatry. First was the introduction of effective chemicals for the treatment of psychiatric disorders, especially the antischizophrenic drugs, exemplified by reserpine and chlorpromazine. Second was the discovery of the remarkable potency of lysergic acid diethylamide (LSD-25) in altering the functions of the mind. The antipsychotic drugs have not cured schizophrenia, nor has the model psychosis from LSD-25 unraveled its biochemical basis. Still, we think much more of genes and amines in seeking to explain schizophrenia than we do of dreams and schemes of the unconscious. The impertinent question "Is Freud dead?" no longer seems so.

The explosive increase in scientific literature concerned with the biochemical approach to mental illness has become exceedingly difficult to follow. Varying levels of sophistication are represented, and rapid advances in chemical techniques often make yesterday's new discovery obsolete tomorrow. Frequently the literature is contradictory