DIALECTICALLY MATERIALIZING ELEMENTARY PARTICLES

PHILOSOPHICAL PROBLEMS OF ELEMENTARY PARTICLE PHYSICS. I. V. Kuznetsov and M. E. Omel'yanovskii, Eds. Transl. from Russian by A. Sen and R. Sen. 294 pp. Israel Program for Scientific Translations, Jerusalem, 1965. Published in the US by Daniel Davey & Co., New York. $15.25.

by Laurie M. Brown

. . . M. F. Shirokov expressed surprise at the fact that debate continues around many problems of modern physics which seemed completely solved. . . . Yet, in Shirokov's opinion, there is nothing to discuss, everything is clear. For example, it is clear that the statistical character of quantum mechanics refers to the individual particle and not to the ensemble . . . and so forth.

A. I. Kompaneets spoke strongly against the principle of complementarity and denied that Bohr's philosophical evolution was progressive.

I. B. Novik criticized the statements made by Kompaneets and stressed that it was wrong to revert to the nonargumentative criticism prevalent earlier with reference to eminent foreign scientists. This style has caused much damage in philosophical works and has engendered dissatisfaction and even exasperation among scientists. At the present time life required positive philosophical endeavor and creative participation of philosophy in the development of science.

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One cannot say that owing to such-and-such philosophical considerations nature must obey certain regularities. Such a tendency was apparent. . . . But nature owes us nothing. On the contrary, nature is the touchstone of our knowledge, of our physical and philosophical assertions. Hence every rational physical idea, however much it might seem to contradict familiar conceptions, must be assimilated by scientific philosophy.

These four quotations are from the volume under review and are taken from the appendix, a summary report of the "Theoretical Conference on Philosophical Problems of Elementary Particle Physics," held in April 1962 in Moscow, which was attended by 250 Soviet physicists and philosophers. About half of the articles in this book are based upon reports delivered to the conference. Among the authors are such well known physicists as V. B. Berestetskii, V. Ya. Fainberg, V. A. Ambartsumyan, and D. I. Blokhintsev. The quotations are not intended to suggest the contents of these articles, but rather (if the expression may be excused) their dialectical flavor. This aspect alone, that is, the confrontation of the ideas of modern physics with general philosophical ideas, gives a glimpse into thought and struggle on the Soviet side of the world, and makes interesting reading for the "positivistic" Western scientist, even when the ideas themselves are not particularly stimulating.

In addition, the patient reader will discover articles that are well conceived and provocative. One example is the article of I. V. Kuznetsov, which points out that invariance requirements and symmetry principles imposed in elementary-particle theory take on greater importance (and tend to increase in number) precisely as more and more *asymmetry* is revealed in the internal structure of the objects under investigation. Whereas, at one time we might have thought of an elementary object as a mass point, or perhaps a small hard sphere, we must now think of it as inscribed with various quantum numbers and charges and bearing vectors of several spaces. A second example is that of I. A. Akchurin, entitled "The theory of elementary particles and information theory," which argues the case for modern physicists to know more modern mathematics. Stressing the close relationship of Newton's mechanics to the calculus, of Maxwell's theory to partial differential equations, of relativity to geometry and tensor analysis, and of quantum mechanics to infinite-dimensional Hilbert space, Akchurin notes that in the past half-century mathematics has made tremendous advances which have yet to be applied in physics. He discusses the problem of the "information content" of a given mathematical space, and speculates that the very large information content re-

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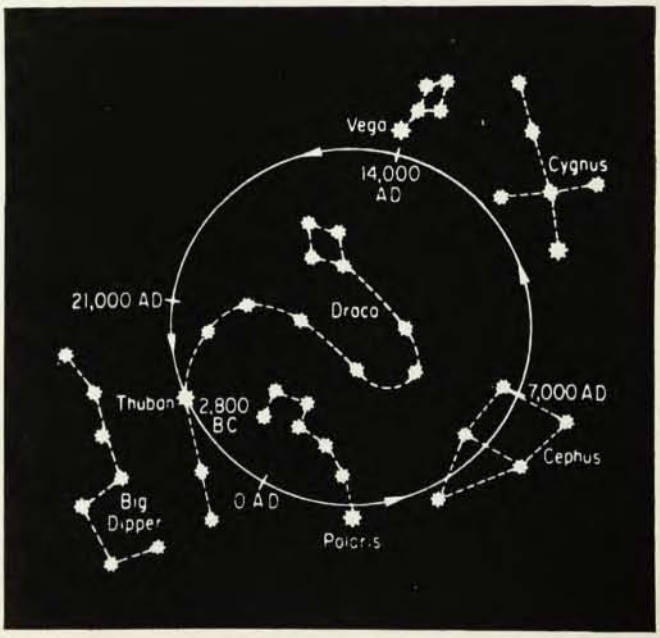
From the concrete to the abstract in the painting of Piet Mondrian.

quired in quantum field theory, where the number of particles is indefinite, may require for description a much more general space, as is suggested already by Feynman's path-integral formulation of quantum field theory and by the theory of dispersion relations, to choose only two examples.

It may be relevant to pause here and put the question whether there *exists* a philosophy of elementary particles, as opposed to elementary particle theory itself. Is this merely a distinction without a difference? Most physicists of my acquaintance hold to the position that every physicist is his own philosopher. In practice this usually means that he thinks that one or another widely used approach is especially promising this year, be it quarks, bootstraps, analytic continuation in the mass, or what have you. But the idea of a commitment to any philosophical system, he finds quite unnatural and repugnant. Modern theory usually adopts an easy opportunism, applying its forces against the weak parts of the membrane which separates us from the secrets of nature and it is intended to lead to rupture, or "breakthrough." As this possibly unfortunate metaphor may suggest, the procedure has nothing much to do with philosophy. However, there is a reflective, creative, constructive ground to physical theory, and on this ground it may meet with philosophy—though not always happily. At the end of a physics colloquium on the philosophy of science, the speaker, a young philosophy instructor, was asked, "What have physicists to learn from philosophers?" The modest answer, "Nothing; but philosophers have much to learn from physicists," won him the approval of the audience. (Of course, the next year the philosophy department fired him.) The editors of this volume are aware, as they show in their foreword, of the profound distrust that physicists display toward tentative and speculative suggestions. An eminent physicist once remarked to me, "The trouble with far-out ideas is that there is so much territory far-out." However, as the editors note, "The fact that this book is the first of its kind in the literature explains, to some extent, its inherent defects."

Among the less excusable defects are the mistakes which several authors (I must assume they are philosophers) make in their physics. On page 87, it is suggested that all weakly decaying elementary particles "become stable when the strong interaction is 'turned on'." When one reads this kind of nonsense, it strongly suggests that the rest of the article is also a waste of time, and it is. On page 134, there is the sentence: "The discovery of the antiproton (and later the antineutron) overthrew the assumption, which had a certain foundation (smacking of classical atomism), that the existing heavy elementary particles (proton and others) always remain heavy particles and cannot transform into lighter particles (and conversely light particles always remain light particles)." While this sentence may not be totally false, it is about 99% misleading (as well as being almost unreadable). Among the other defects of the collection of papers, is a tendency to repetitiveness. The inexhaustableness of nature at providing novelty at ever deeper levels of experience, is apparently exceeded only by the inexhaustability of dialectical materialists in remarking upon it. One may also be excused from paying careful attention after the third exposition, in essentially identical terms, of parity violation and CP invariance and what may be learned from them.

On the positive side, the nonspecialist will find interesting articles on "The structure of elementary particles," by D. I. Blokhintzev and on "Modern astronomy and the physics of the microworld," by V. A. Ambartsumyan. And for anyone who is fascinated by the problem of what really lies at the heart of matter (and this presumably includes all physicists) this book provides some ideas which will be new and will provoke thought, if not in agreement then in rebuttal.



PRECESSIONAL PATH of the north pole among the stars. From: Exploring the Physical Sciences.

Emphasis on development of some major concepts

EXPLORING THE PHYSICAL SCIENCES. By W. J. Poppy and Leland L. Wilson. 376 pp. Prentice-Hall, Englewood Cliffs, N.J., 1965.

by Jacques E. Romain

In this introductory general course in physical science, meant as a one-semester college course, no attempt is made, of course, to cover the whole domain of physics. The topics selected, which seem appropriate, were chosen so as to place the primary emphasis on the development of some major concepts. They fall into three broad categories: "Space" (earth, solar