scribe physical space. Rejecting the a priori, the naively empirical, and the totally conventionalistic answers, Grünbaum argues that there is a delicate balance between conventional and empirical elements which, when handled with proper care, allows us to formulate genuine empirical questions about the metrical character of physical space. Problems that are to some degree analogous arise for physical time. Also treated in this part is a geometrical paradox dating back to Zeno of Elea in the 5th century B.C. Though less famous than the paradoxes of motion, it is logically prior to them, and it poses profound difficulties in the very concept of an extended continuum.

Part 2, Philosophical Problems of the Topology of Space and Time, centers chiefly upon the causal theory of time and the problem of temporal direction. Grünbaum rejects the opinion that the second law of thermodynamics itself is temporally asymmetric; he argues that only in conjunction with specifiable initial conditions does this law provide a physical basis for the asymmetry of past and future. He claims, moreover, that the laws of classical mechanics, in conjunction with specifiable initial conditions, likewise provide a physical basis for the anisotropy of time.

Part 3, Philosophical Issues in the Theory of Relativity, consists mainly of a chapter devoted to philosophical and historical analysis of the fundamental principles of special relativity. Grünbaum emphatically reiterates Einstein's distinction between the *conventionality* of simultaneity and the *relativity* of simultaneity. The former is the more basic, for it arises within a single inertial frame and does not depend upon relative motion. Indeed, Grünbaum shows that by adopting a logically permissible, though otherwise unappetizing, *definition* of simultaneity, the *relativity* of simultaneity can be made to disappear! This distinction is intimately involved in an understanding of the relations among the following principles: (i) The speed of light is independent of the direction of its travel. (ii) The speed of light is the same in all inertial systems. (iii) Light is a fastest signal. Failure to make the necessary distinctions has led, Grünbaum charges, to widespread historical and logical confusion regarding the special theory. The remaining brief chapters in part 3 deal with specific problems in special and general relativity raised by Milne, Jammer, and Whitehead.

So remarkable is the scope of this book that it is difficult to think of any important philosophical problem of space or time that is not treated, or to find any important contributor whose views are not taken into account. These authors—including such men as Bridgman, Duhem, Eddington, Einstein, Milne, Poincare, Reichenbach, Riemann, Russell, and Whitehead—are discussed with scrupulous care. The book exhibits thorough scholarship and complete mastery of technical detail. Unmatched in breadth and rigor by any other recent book on the subject, *Philosophical Problems of Space and Time* is a significant contribution to contemporary philosophy of science.

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Genetics Yesterday

Genetics and Man. C. D. Darlington. Macmillan, New York, 1964. 382 pp. Illus. $7.50.

Genetics and Man is a revised edition of *The Facts of Life*, first published in 1953. Although the title is changed, less than 10 percent of the first edition is altered: discussion of some new subjects has been included, two concluding chapters have been deleted, but no basic change has been made in the organization. Such revision is surely minimal in view of the almost revolutionary discoveries in molecular genetics and the advances in human genetics during the past decade.

Darlington is at his best in describing the excitement and far-reaching implications of the genetic discoveries made at the turn of the century and during the next few decades. These were exciting times in genetics, but the past decade has been no less exciting; however, this is an excitement in which Darlington apparently does not share. Only 2½ pages are devoted to an elementary discussion of the chemical nature of DNA. No hint is given in this discussion of the great impact that the Watson-Crick model of DNA structure has had on current genetic experimentation. The implications of this model pervade genetics from viruses to man, from the molecular level of biological organization to the population level, and are being used as working hypotheses by many geneticists and cytologists.

Although this revision does not bring the book into step with the times, reading it does give one a deeper appreciation of our current knowledge of inheritance because Darlington places it in its proper historical perspective. This historical summary is only slightly biased by the fact that Darlington has viewed genetics primarily through a microscope. He clearly portrays the reasons why genetic concepts have successfully infiltrated practically all aspects of biological thought. His succinct discussion of the genetic basis of evolution is outstanding.

The second half of the book provides a persuasive argument for viewing many of the problems of man and his society in terms of their genetic and evolutionary components. The coverage is broad, including such topics as race and class, sexual behavior, marriage and divorce, Freudian psychology, immortality, and free will.

There is a great deal of value here for the general biologists, the new generation of geneticists, the social scientists, and the interested laymen who are not familiar with the first edition. One only wishes that Darlington's fertile mind had provided some new meat to chew on in his revision.

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Vermilion Sea Expedition

Marine Geology of the Gulf of California. A symposium (Memoir No. 3). Tjeerd H. van Andel and George G. Shor, Jr., Eds. American Association of Petroleum Geologists, Tulsa, Okla., 1964. vi + 408 pp. Illus. Charts. $12.50.

In 1747 Ferdinand VII of Spain issued a royal decree stating that "California no es isla." For about 100 years prior to that proclamation California was thought to be an island separated from the mainland by the Vermilion Sea, which, regrettably, is now better known as the Gulf of California. This mariner's mirage evaporated in 1698 when Father Kino, a Jesuit priest,