with features of the environment resemble the earlier, purely descriptive phases of taxonomy and ecology, before these fields were integrated into a neo-Darwinian theory that weighs each phenomenon for its adaptive implications. The social sciences are seen as the last branches of biology waiting to be included in this synthesis. Moreover, ethology and comparative psychology, generally seen as the central, unifying fields of behavioral biology, "are destined to be cannibalized by neurophysiology and sensory physiology from one end and sociobiology and behavioral ecology from the other."

Reviews have so far not produced widespread protests against the threat of being cannibalized. However, the book has been accused of reinvigorating Social Darwinism. I find this charge grossly misleading. The term Social Darwinism has a well defined historical meaning: a premature extrapolation from organic to social evolution, whose rationalization of political and economic exploitation was based on the confusion of an analogy with a scientific law and on the oversimplification of the evolutionary process as selection only for aggressive competition ("Nature red in tooth and claw"). In fact, *Sociobiology* emphasizes quite a different set of themes: the essential role of co-operation in social behavior, the discovery of mechanisms (group selection and kin selection) that account for its evolution, and the inevitable interplay of co-operation and aggression in all advanced social species, not only varying with species and with individuals but also responding, in predictable fashion, to specific environmental pressures and to the size and kinship of the interacting group. To equate this rich intellectual mine with the poverty of Social Darwinism is no more justifiable than to equate modern medicine with phlebotomy.

I find little to criticize in this superb volume. Though the author emphasizes the predictive value of mathematical formulations, he might still have acknowledged the more general contributions of such pioneers of neo-Darwinism as Dobzhansky, Mayr, Simpson and Haldane. And though the ultimate aim is continuity between social and biologic sciences, the author may be underestimating the possibility of establishing important generalizations within a single level of organization — for example, Sherrington's insights into the integrative action of the nervous system did not depend on reduction to the level of cells or of molecules.

The largest problems appear in the last chapter, on man. In calling attention to the evolutionary aspects of such diverse human attributes as language, ethics and war, and in aiming at maximal generality, the author engages in extraordinarily long-range predictions. Thus, "The transition from purely phenomenological to fundamental theory in sociology must await a full neuronal explanation of the human brain," and "A genetically accurate and hence completely fair code of ethics must wait for the new neurobiology." At first glance such statements resemble the optimistic scientism of an earlier era, which expected the scientific method to solve not only problems about the objective world of nature but also human problems that involve subjective values. On the other hand, it would be rash to try to predict how far neurobiology — applying the scientific method not directly to questions of values but to the structures in us that create them — can eventually encompass the subtleties of human behavior. Since the book as a whole exhibits an extraordinary intelligence and perspective, Wilson's ultimate vision may well be simply extremely farsighted.

Whether this vision turns out to be hyperbole or distant reality, it should not hinder readers from recognizing the value of an evolutionary perspective in clarifying more modest aims: for instance, to recognize the problem of reconciling the goals of social equality and equity with the existence of wide biologic diversity in the human species, and to approach the problem of aggression in terms of regulation rather than of elimination. Above all, people have feared that evolution, in displacing earlier transcendental foundations for a moral consensus, must lead to unlimited moral relativism. But evolution can also provide an alternative foundation, for the deep-seated drive for perpetuation of the genes and the inescapably social nature of the species place boundaries on the range of viable ethical principles.

None of these ideas, of course, are entirely new — Freud recognized them all. What sociobiology provides is a firm scientific basis for selecting among alternative general views of human nature. Moreover, the need is increasing. Novel ethical and political problems crowd upon one as a result of alterations in such sociobiologic parameters as population density, availability of resources and communication between neighboring groups. And as Wilson emphasizes, these problems are being faced with a limbic system inherited from the Pleistocene.

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Sociobiology: The new synthesis. By Edward O. Wilson. 697 pp., illustrated. Cambridge, Massachusetts: Harvard University Press, 1975. $20.00.

In recent decades the behavioral and social sciences have abandoned an earlier interest in genetic aspects of human behavior and have focused almost exclusively on environmental factors. One reason is that the necessarily imprecise and indirect methods of evolutionary and behavioral genetics have contrasted with the spectacular methodologic advances in other branches of biology. However, the results of such advances in molecular genetics will now surely promote public acceptance of man's evolutionary origin and its implications. Quantitative comparisons of DNA sequences have provided direct evidence for the evolutionary continuity of the living world, and detailed analyses of the mechanisms of hereditary continuity and variation have filled in the major gaps in the evidence for Darwin's theory.

The time thus seems ripe for this book, whose aim is to identify the evolutionary roots of social behavior through a rigorous, systematic approach, based on tests of predictions, not on "philosophical retrospection." The field would include the ecologic pressures that have selected for various patterns of social behavior, the relevant parameters in population genetics and the adaptive or maladaptive function of traits based on genes inherited from an earlier era. "When the same parameters and quantitative theory are used to analyze both termite colonies and troops of rhesus macaques, we will have a unified science of sociobiology."

The author has made a remarkably successful start in establishing this new field. Indeed, the bold and comprehensive nature of the volume reminds one of *The Origin of Species*. Observations collected from the entire animal kingdom are organized into a broad conceptual synthesis, and generalizations are supported by numerous specific examples. The double-size pages incorporate material from over 2000 references, mostly in population genetics, ecology, and ethology. (Even information theory is included in some detail, for the essential feature of a society is "reciprocal communication of a cooperative nature.") The style is informed with flashes of irony and with loving care for language, and the pointillist drawings and novel format add to the book's attractions. However, the general reader will face a large task, for though the compact introductory chapters cover some of the important principles, others are left for the later, detailed exposition of evolutionary and social mechanisms. A synoptic version, therefore, would surely find a wide audience.

The author is not diffident in criticizing the social sciences. In his view their empirical correlations of particular phenomena

A Primer of Water, Electrolyte and Acid-Base Syndromes. Fifth edition. By Emanuel Goldberger, M.D., F.A.C.P. 604 pp., illustrated. Philadelphia: Lea and Febiger, 1975. $12.00.

ENVIRONMENTAL AND PUBLIC HEALTH

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