Book Reviews

Evolution after Darwin. vol. 3, *Issues in Evolution.* Sol Tax and Charles Callender, Eds. University of Chicago Press, Chicago, Ill., 1960. viii + 310 pp. Illus. $7.50.

In November 1959 nearly 50 distinguished scientists were gathered at the University of Chicago to discuss the impact of evolutionary thought on every field of endeavor, from astronomy to the control of our own destinies. The meeting was planned to celebrate the centenary of the publication of Darwin's *Origin of Species.* As a preliminary to their discussion, the specialists prepared and submitted 42 papers (later published as volumes 1 and 2 of *Evolution after Darwin*) bearing on the subject of evolution. The papers, circulated in advance to participants, were referred to a committee of 80 from the University of Chicago and were utilized by the committee in outlining a summary. During the celebration, the points of the summary were the basis for discussion by five panels: "The Origin of Life," "The Evolution of Life," "Man as an Organism," "The Evolution of Mind," and "Social and Cultural Evolution." Finally, 40 of the specialists were assigned to the panels. Most of the original papers were quite broad reviews of particular fields, and the contributors were apparently chosen to complement one another.

The operation, in keeping with the times, was complete with scientific "breakthroughs." (The indexer did not share this space age enthusiasm, so for "Breakthrough, *See* Transformation.") One can only admire the effectiveness with which the records of the Darwin celebration answer Sol Tax's question: "After one hundred years of Darwinian theory, where do we stand?" The third volume of *Evolution after Darwin* provides a simplified answer in the committee's outline of the major evolutionary issues, or conclusions (based on papers found in the earlier volumes), and in the panelists' explanation of the outline. I use *explanation* because the panelists apparently found the majority of the discussion topics to be agreeable generalizations that might need illustration or elaboration; the topics very rarely provoked discussion.

Transcripts of discussions are easily criticized, and the most stimulating discussion rarely shines under a reader's quiet scrutiny. The five panels seriously took up the task of surveying the full spectrum of evolutionary thought and, consequently, had little time for argument. Two of the panels provided some discussion by bringing together diverse groups of individuals badly in need of intellectual intercourse. Biologists, psychiatrists, and anthropologists discussed the evolution of mind, and anthropologists and biologists considered social and cultural evolution. Here there was no common ground of orthodoxy, and the discussions ranged widely to consider unsolved problems and to compare the research methods used by different workers as well as the analyses of their research.

The discussion of the origin of life was the most disappointing of all. R. W. Gerard, alone, went into the flights of romantic imagination that can reveal illuminating generalizations. Despite Gerard, the problem was presented as one in which progress is slow and difficult but, nevertheless, as an area in which there is wide agreement.

The one divergent opinion came from H. J. Muller who insisted that life should be defined as things with the genetic properties of deoxyribonucleic acid and that all else is lifeless. Many problems can be solved with this definition:

Muller: "My answer is that those who define life as I do will admit that the most primitive forms of things that deserve to be called living have already been made in the test tube by A. Kornberg."

With the origin of life explained, the second panel took up the evolution of life. Any biologist unfamiliar with current views on natural selection will find this an easily read, highly informative discussion. Regrettably some evolutionists (mostly systematists, I suspect) are not familiar with current views; it is a measure of their need that Ernst Mayr found it necessary to say that pleiotropy is "taken for granted by geneticists but not fully understood by some evolutionists."

The discussion focused very largely on the ways in which genetic modification of stocks appears; the panel consisted of the men who have contributed most extensively to the consolidation of our present ideas on speciation. No other group could have summarized our present-day-stand as well, or with such authority.

Part of our knowledge of mechanisms has come from the comparative study of organisms, and the purely descriptive or historical approach to particular phylogenies is exemplified in the third panel's consideration of man as an organism.

The rarity of homonid fossils, and the uncertainty about dating these fossils, leaves us with a sketchy knowledge of the details of human evolution and supports considerable debate over interpretations. Very little attention was paid to the disputes, for the discussion revolved around the kinds of data that can be derived from fossils. L. S. B. Leakey demonstrated the precision and care that must be exercised in the interpretation of comparative anatomy. In order to cover the ground, the discussion had to move swiftly; a complex descriptive problem such as this cannot be effectively outlined by a panel.

At about the mid-point, the panels had completed the survey of the most active and productive areas of evolutionary thought. Generalizations about natural selection and an example of a phylogeny had been discussed. Leslie White, in his discussion on the last panel, clearly distinguished the two approaches. The "particularizing process, in which events are considered in terms of their uniqueness" is, of course, the study of histories or phylogenies and is quite different from the "generalizing process which deals with phenomena as classes" and which allows one to propose explanatory principles and processes. A phylogeny, when well enough established by sound data, could be called a fact, but no matter how valu-

able and unique an explanatory principle is, it will never be anything other than a sound model.

Anyone who sees a point to this distinction will be disturbed to find the second panel asserting "Biologists . . . take the *fact* of evolution for granted, as a necessary basis for interpreting the phenomena of life." It would be sounder and more truthful to say that natural selection provides the only available rational explanation for the phenomena of life and convinces us that evolution did occur. In view of our present understanding and knowledge of evolution, I feel that challenging religions and the state of Tennessee with the "fact of evolution" puts one at the level of an irrational minority that does not merit the notice of any of the Darwin centennial celebrants.

Evolutionary Vision

Sir Julian Huxley's introductory address anticipated problems that came up during the last half of the panel discussions. To Sir Julian "evolutionary vision" reveals an "evolutionary landscape" with "alarming monsters in our evolutionary path." Such monstrous problems as superscientific war, overpopulation, the rise and appeal of communist ideology, and the preoccupation with means rather than ends are, I think, supposed to be resolvable with evolutionary vision, and, I believe, the clue to it all was given in the fourth panel when Sir Julian said that "during the course of evolution on this planet quality has somehow arisen out of quantity and the subjective has arisen out of the objective." My evolutionary myopia doubtless does an injustice to such ideas.

The particulars behind the biologists' concern revolved around the disastrous consequences of current population trends and breeding systems. (Muller: "everyone is helped to live according to his need and to reproduce according to his greed.") Any desirable control must mean a change, and a very prompt change at that, in modern culture, but this will have to be a conscious, directed alteration of culture. The biologists seemed to be convinced that genuine knowledge of the nature and principles of cultural evolution could, perhaps, permit a wise and humane control to be exercised over our evolution.

Toward the end of the third panel's discussion, C. H. Waddington outlined a most fascinating view of a sociogenetic system by asking how and why information obtains value and is transferred in society. An answer to this question was not suggested, but the question must be answered before the details of cultural evolution can be compared with organic evolution.

The mere analysis of behavioral elements is a young science in which the investigator's use of words still beclouds some issues. This is best indicated by a long quotation from the transcript of the fourth panel:

Huxley: But from my behavior you would deduce that I see a difference in color between this carpet and your clothes?

Tinbergen: Right there we are in the middle of semantic difficulties.

Huxley: That is to evade what is to me an obvious fact.

Tinbergen: It is an obvious fact to you, the subject who sees it; it is not an obvious fact to me. The obvious fact to me is that you react differently to the two colors and that you tell me so, which is part of your reaction.

Huxley: I must say I disagree with you. I think we have to believe that animals do perceive some difference of quality in colors, for instance.

Gerard: But do you call this a belief, or do you call it a fact?

Huxley: I think we have to believe that it is a fact, as we have to do with many other scientific conclusions.

It would be an error to consider this to be typical of the discussion or of the panel; I use it only to show the extremes of the philosophical approaches to behavioral science. Both men helped to present a very well-rounded summary of the discoveries of ethologists and aided the panel in outlining our present knowledge of complex mental activity. That the view is not yet evolutionary is a reflection on the problems facing behaviorists, not on their achievements. The panel provided a very brief but interesting consideration of comparative behavior and an especially provocative glimpse of the rare cases of transfer of heuretically developed behavior in animals.

On the last panel, an array of biologists and two cultural anthropologists (Julian Steward and Leslie White) entered into some pretty heated discussion with representatives of the main stream of cultural anthropologists. The point being considered was whether it is valid to generalize about principles underlying cultural change. Even though particularization was distinguished from generalization, there seemed to be little appreciation of the fact that these two valid and necessary approaches are, in the end, complementary. This account is useful as a record of a face-to-face debate between very different schools of thought, but as evidence of the dissipation of energy through misunderstanding, it is discouraging.

It is always easy to criticize the lack of vision and progress outside one's own field, and the biologists, agonized over our population growth and genetic mismanagement, find it even more difficult not to criticize social scientists for their inability to suggest devices for cultural management. Unfortunately Julian Steward's remarks, which were directly concerned with causation, are inserts that were not delivered to and debated by the panel, for they show the views of an anthropologist who shares the prejudices of biologists.

In the ancillary remarks, Sol Tax gives the impression that the purpose of the celebration was to bring cultural anthropologists and biologists together in the hope of stimulating more interchange of ideas and attitudes. Perhaps biologists were too quick to attach significance to the similarities of biological and cultural evolution, and at times they were certainly naïvely enthusiastic about scientific, cultural midwifery as an alternative to political chicanery. This does not alter the fact that the search for generalizations and principles in the mass of anthropological data would appear to merit wider consideration; the Darwin celebration made strenuous efforts to bring this about.

Roughly a third of the volume is taken up with tag ends. Evolutionary views of modern theologians, early Chinese, and up-to-date Roman Catholics are essayed. The introductory address, concluding remarks, and transcripts of two television programs; some pictures that only an advertisement could call a photographic essay; an index to all three volumes; and Sol Tax's personal reminiscences of the disorder behind the order of the celebration are all included. Now those who did not attend can sit back with a full account of the affair and no worries as to which queue correlates with a round punch, a triangular punch, or no punch in their ticket; those who respond to meetings as I do will prefer the book.

By itself the third volume of *Evolu-*

tion after Darwin is anomalous and will not serve the needs of either the specialist or the general reader. The first two volumes, on the other hand, can stand alone as technical essays, but something quite intangible and very useful is added to their content when the panel discussions are read as an introduction to or a survey of the field. The very attenuated comments of the panelists focus ideas that are easily missed in the mass of detail in the technical papers, and the panel's generalities are shown to be derived from a much more diverse set of ideas than is implied.

Summary of the Celebration

When all three volumes are taken together, one's perspective is improved. There is still only brief consideration of the origin of life, but the evolution of life, so neatly and precisely sketched by the panel, is shown to be an immensely exciting, growing area of research. The bare outline of man as an organism becomes recognizable, in the second volume, as descriptive and comparative functional biology of the highest order. The diverse approaches used in considering the evolution of the mind were quite clearly covered in the papers, but the panel made it clear that the approaches must sometime converge. Finally, the logical essays of the second volume make the disunity of the panel on social and cultural evolution appear to be the result of an almost ritualistic defense against early Darwinian excesses, which is now giving way in the face of more sophisticated attempts at generalization.

The foolhardy attempt to summarize 1002 pages of technical papers with 174 pages of panel transcripts resulted in a good survey that can be usefully employed in conjunction with the first two volumes. And there was still time to consider the human implications of evolution which are of such great concern to us all.

It is a measure of considerable enthusiasm when I must agree with dust-jacket prose and say *Evolution after Darwin* is, in fact, "the most comprehensive and intensive examination ever made of the impact of Darwin's ideas." The three volumes do just honor to the occasion of the Darwin Centennial Celebration and to the thinking that Charles Darwin set in train.

RODGER MITCHELL
Department of Biology,
University of Florida

Atlas of European Birds. K. H. Voous. Nelson, New York, 1960. 284 pp. Illus. $15.

The title of this book is literally correct in the old sense of the word *atlas*; it is a volume of maps, one for each of the 419 species of European birds breeding west of the Ural Mountains. Each map is accompanied by a closely written statement that includes the ancestral or inferred faunal placement of the species: for example, the black-winged kite, *Elanus caeruleus*, is given as "in Europe an Ethiopian distribution element," and the white-tailed eagle, *Haliaeetus albicilla*, is given as "palearctic"; this statement includes the geographic range, habitat, chief food, nesting habitat, and movements (including migration). Voous recognizes 24 faunal types—the arctic, holarctic, Siberian-Canadian, Siberian, Chinese-Manchurian, Palearctic, Nearctic, North Atlantic, European, European-Turkestanian, Turkestanian-Mediterranean, Mediterranean, Sarmatic (belonging to the coastal fauna that, in late Tertiary and Pleistocene time, inhabited the shallow, brackish, or salt Sarmatic inland sea, a continuation of the eastern Mediterranean stretching over the present Hungarian Plain, east to the Caspian and Aral Seas), Turkestanian, Paleoxeric, Paleo-xeromontane, Paleomontane, Tibetan, Mongollian-Tibetan, Ethiopian, Indian-African, Of the Old World, Antarctic, and Cosmopolitan. The present placement of five species is given as "unknown," since they provide no indication of the geographical origin of the five: the Manx and the North Atlantic shearwater, the Gannet, the Greater Flamingo, and the Black-winged Kite.

The maps, which are pseudo-Mercator projections, have the breeding range of each species marked in red. Most of the maps extend from the equator to the North Pole, but some—for the Caspian tern, the roseate tern, and others—extend to the South Pole. Two to four maps are placed on a page; this makes it easy to compare the distribution of related species. Thus, on the first page there are four maps (one for each species of the loon), and the specific differences in ranges are immediately comprehensible, with a directness not possible from using the text alone.

The photographs, illustrating 355 of the 419 species, are excellent "shots" from life, which show as much as single pictures can of the habits of each bird. They are not merely "pretty" pictures, but add to the factual content of the book.

This volume is an English translation (made by the author) of the Dutch version (also published 1960) entitled *Atlas van de Europese Vogels*. The English version has a short preface by A. Landsborough Thomson.

Many Palearctic birds are also found in North America, and their distribution maps include their American ranges; hence, the volume will be of interest to provincial bird students in the United States as well as to others not limited by geographical boundaries.

HERBERT FRIEDMANN
U.S. National Museum,
Smithsonian Institution

La Théorie des Gaz Neutres et Ionisés. C. DeWitt and J. F. Detoeuf, Eds. Hermann, Paris; Wiley, New York, 1960. 496 pp. $17.50.

Owing to new experimental techniques and results and to the extensive application of field-theoretical developments in perturbation theory, statistical mechanics is one of the most exciting fields in physics today. This volume is a high-speed photograph of a rapidly advancing field; in it one can find most of the recent ideas touched upon and a good number of the results that have been obtained by the authors represented.

The book consists of nine articles, of varying length (some articles are in French, the others in English), which review results in kinetic theory, equilibrium statistical mechanics, and plasma physics. Montroll summarizes the development of toron diagrams and their application to the perturbation expansion of the partition function. While this work is most successful for discussing equilibrium properties, applications to transport calculations are also described. Montroll also covers in his article the theory of random walks and some ideas from that theory which are applicable to the Ising problem. Van Hove describes his work in the derivation of the Boltzmann equation from the master equation and in the application of diagrammatic techniques to the elucidation of the long-time behavior of ensembles of interacting particles. This work represents a significant step forward in our under-