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**Theories on the Nature of Life.** *Giovanni Blandino, S.J.* Philosophical Library, New York, 1969. xiii+374 p. \$6.00.

As indicated in the title, the author analyzes theories on the nature of life. It appears that Father Blandino's effort is oriented largely towards a Catholic audience, both clerical and scientific. His discussions often reflect an Aristotelian-Thomist flavor. However, this is not to say that many of his topics are not of general interest.

The first two-thirds of the book are concerned with the views of such men as Bernard, Bertalanffy, Dobzhansky, Driesch, Haldane, Huxley, LeComte Du Nouy, Loeb, Needham, Oparin, Simpson, etc. (Surprisingly, he ignores Teilhard de Chardin.) Undoubtedly, many "modern" biologists will not be greatly "turned on" by this array of oldsters, whose thinking essentially represents the pre-molecular-biology era. The general approach is more philosophical than biological, and relatively little experimental data are employed to reinforce arguments. Only passing mention is made of nucleic acids, and essentially nothing is said about protein synthesis or its control mechanisms. Some unfamiliar terms, such as "gamia", "dynamic regularity", and "instrumental objective finalism", are employed without clear definition. It is possible that part of the difficulty is due to the inherent problems of translation (from Italian). This first portion of the book (entailing the views of many scholars) undoubtedly represents a substantial effort on the part of the author and it may serve as a valuable historical reference on the traditional arguments of vitalism vs. mechanism. However the reading is heavy and may discourage some from getting to the last third of the book, where the author presents his own theory of life and which is much more valuable and interesting.

Blandino's central theme is that, on the basis of probability theory, the evolution of living organisms could not have occurred by natural selection and chance alone. Mathematical calculations are presented which, he claims, indicate that the amount of time required to evolve an organism under purely random processes is so great as to be absurd ( $10^{808,687}$  trillion years!). Evolution is directed, not by a vital substance or by external systems, but rather by built-in "preferential laws" (which, of course, could entail a Supreme Intelligence). These "oriented laws lower the improbability even if they do afford a certain margin of chance." He attempts to define preferential laws as "differential mutation and differential vitality" (i.e. in favor of new genotypes obtainable by new mutations). Although his exposition on preferential laws leaves much to be desired, his mathematical challenge to "chance" evolution cannot be ignored. In this day when mathematical modeling and computer simulation of biological phenomena are coming into vogue, it seems highly appropriate that a more penetrating analysis be made of the role of chance in evolutionary processes.

MORRIS G. CLINE

## BOOK REVIEWS

**Coal Mining Effect on Busseron Creek Watershed, Sullivan County, Indiana.** *Don M. Corbett and Allen F. Agnew.* Water Resources Research Center, Indiana University, Report of Invest. 2. 1968. 234 p. Free.

Acid mine waters have been a problem in many coal-mining areas, in Ohio and in other states. It was the problem of acid mine waters in Busseron Creek, which occurs just south of Terre Haute, Indiana, and is tributary to the Wabash River, that precipitated a problem, whose solution is embodied in this report. The report records more or less systematic discharge and chemical data (temperature, conductivity, alkalinity, acidity, hardness, and several individual cations and anions—Cl, Ca, Mg, Fe, Mn, SO<sub>4</sub>) for 13 of 35 stations investigated. These data revealed that the acid-mine-water problem was localized, that it came mainly from old mines and old mine-waste piles, and that it was of major proportions mainly during "flushouts" (the results of intense rains during periods of low stream flow). The project was a result of the joint efforts of the U. S. Geological Survey, USDA Soil Conservation Service, U. S. Federal Water Pollution Control Administration, Indiana Department of Natural Resources, Indiana University Water Resources Research Center, and Indiana State Board of Health. In addition, the work was partly financed by three large coal companies, though the detail with which the history of the project, and its results, are documented precludes any modification in interpretation of the source of the acid waters.

This thick paper-bound book is an interesting, detailed documentary for anyone concerned with problems of acid mine waters and their effect, day by day and in relation to hydrologic and watershed conditions, on a stream system. The book will cause problems in referencing, because the title on the cover (that given above) is different from that given on the title page inside ("Hydrology of the Busseron Creek Watershed, Indiana, with special reference to Surface Mining for Coal, and S.C.S. Reservoirs, as they affect Water Quality"). However, this does not detract from the value of the publication as a detailed account of the effect of acid mine waters on one fairly small stream system.

JANE L. FORSYTH

**Historical Geology of the Antillean-Caribbean Region.** *Charles Schuchert.* Hafner Publishing Co., New York and London (Reprint of 1935 ed.) 1968, xi+811 p. \$15.00.

This is a reprint publication of the first volume of a series of three planned by Professor Schuchert to synthesize the work of a lifetime of accumulating data on the stratigraphy of North America in order to compile his paleogeographic maps (only two were published). The second volume was on the Eastern and Central United States. The third, planned for New England, the Maritime Provinces, and Eastern Canada, was never completed. His paleogeographic maps were published after his death.

In this volume, Professor Schuchert considers the stratigraphy in a completely geologic context. The book contains four parts: Section I, entitled Introduction and Summary, describes the tectonic elements of the Antillean-Caribbean region and interprets its diastrophic history and paleogeography; Section II describes the three marine basins, the Caribbean, Antillean, and Gulf of Mexico; Section III discusses the biogeography; and Section IV (the longest and most detailed part, about 700 pages) describes the stratigraphic sections of the lands by countries and states. The paleogeography is illustrated by 16 maps at the end of the text.

Even at the time when the book was written, Schuchert was faced with the problem of condensing a large mass of material. That he did not please all readers with either content or interpretation is the fate of anyone who attempts such a huge task. This was the first work of its kind for the area, and no other has been so inclusive. Exceptions to his ideas were noted in the reviews of the first edition. Most of his material is now out of date, particularly that on marine geology, which in Schuchert's day was based on little more than submarine topography. However, he brought together the information available at the time, digested and interpreted it, and in so doing gave us an example of the principles of stratigraphy which he used. The work is of value as a first step in the knowledge of the general geology of the region. The book, mostly of an encyclopedic nature, and based largely on excerpts and quotes, has a distinctly attractive feature in the author's recognition of the individuals on whose works he depended. To those interested in the history of geology, the notes on these individuals, mainly on their early works, with accompanying portraits, are of special interest.

Although most of the information in the book is principally of historical interest, having been superceded by a much greater amount of modern work, this is a convenient source for a selected bibliography of the older references for the area. The book is well printed and is priced modestly for its size. Its availability will be of most value to new libraries and to individuals with a special interest in the Antillean-Caribbean area.

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