Questions in Embryology

Essays in the History of Embryology and Biology. JANE M. OPPENHEIMER. M.I.T. Press, Cambridge, Mass., 1967. 384 pp., illus. $12.50.

For many years Jane M. Oppenheimer, professor of biology at Bryn Mawr College, has been writing and delivering thoughtful papers on the history of embryology. An embryologist herself, she is one of the few scholars who have attempted to wrestle with the complex history of embryology in the 19th and 20th centuries. Those historians and biologists who are already familiar with her contributions will rejoice to find that her papers have at last been brought together under a single cover. Those who have yet to discover her writings will now have an opportunity to do so. The fact that she is exploring a dimly lit byway makes this collection especially welcome.

Included in the volume are 13 essays and a postscript. The first essay deals almost exclusively with Embryological Concepts in the Twentieth Century, and from here the essays wend their way backward in time, alighting seriatim at such key figures and historical problems as Harrison, Boveri, Roux, inherent problems of experimentation, Haeckel, embryology and Darwin, the specificity of the germ layers, von Baer and causal analysis, and John and William Hunter, until finally they terminate with William Gilbert: Plant Grafting and the Grand Analogy. Oppenheimer has purposefully run history in reverse; "the design of the volume is . . . intended to conduct us from what we know best toward what we see only more dimly" (p. vi). Well over two-thirds of the book, however, stays within the range of the 19th and 20th centuries, and it is within this scope that she makes her most valuable contributions.

When a historian of science reads a historical account written by a professional scientist, he instinctively expects to find the "layer cake" tradition in the interpretation of past events. In other words, a survey of a specific discipline is too often viewed as a linear progression of positive achievements leading unswervingly to the current and hence correct state of affairs. One of the most valuable assets of Oppenheimer's essays is that she avoids this all-too-compelling pitfall. Perhaps only in The Non-specificity of the Germ-Layers does she portray a smooth progression, and it is worth noting that this essay, by far the oldest in the volume, was written in 1940. In the other essays Oppenheimer is concerned with specific problems in a given historical setting. To what extent could Darwin have been influenced by von Baer's fifth scholium? What was the conceptual relevance between Gilbert's plant grafting and his *De magnete*? Were there causal concepts buried in the descriptive details of von Baer's *Entwicklungsgeschichte* (1828–37)? What sort of questions were Haeckel, Roux, Harrison, and others asking about embryos, and to what extent were the answers dictated by the form of the questions? In fact, the reader can almost envision Oppenheimer treating history itself as a developing embryo (embryos don't develop rectilinearly!); she knows full well that each stage has its own function and responds according to the manner in which it is provoked.

It would be a mistake, however, to view this volume as a full survey of 19th- and 20th-century embryology. These are essays written at different times and for different purposes, and as such they collectively present their own historical fallacy. An essayist, after all, can ask exactly the questions that interest him at the moment and can disregard everything else. So if I may offer a single criticism of an important contribution, it is that Oppenheimer has confined herself to problems that are of current concern to embryologists. Thus one finds a valuable discussion of von Baer's "causal analysis" but no critique of his relationship to *Naturphilosophie*; one finds a careful discussion of the relation between Harrison's hanging-drop experiment and his concern for the origin of symmetry but no elaboration of the contemporary controversy over the origin of the nerve fibers; and one finds a full discussion of the assumptions made by Haeckel which should interest modern embryologists yet an intentional disregard of Haeckel's biogenetic law.

But Oppenheimer has handled those problems of her own choosing with a fine historical touch, backed by extensive reading into the primary sources and by insights that only an experienced embryologist could have. Her fifth essay, on Analysis of Development: Methods and Techniques, is the high point in this respect. Future historians of embryology will do well to consider carefully what Oppenheimer has to say, for, in my estimation, these essays form the necessary starting point for any further work in the history of embryology.

This volume of reprinted essays is handsomely produced, but sadly for the public of students who should use it, it is far overpriced.

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Biochemistry of Psychotic Phenomena

Amines and Schizophrenia. A symposium held in Atlantic City, April 1965. HAROLD E. HIMWICH, SEYMOUR S. KETY, and JOHN R. SMYTHIES, Eds. Pergamon, New York, 1967. 300 pp., illus. $11.50.

The lack of success in finding a single cause for schizophrenia despite a search of more than half a century has led most workers in the field to feel that this illness or group of illnesses is probably the result of a complex interaction between genetically and environmentally determined factors. One attempts to explain how psychological and metabolic events might lead to the disordered associations and to the autism and ambivalence that are characteristic of the illness. Presumably, the function or organization of neural elements must be disordered for these behavioral manifestations to occur.

Although the psychotomimetic drugs produce a true psychosis only in latently psychotic individuals, they do, in different individuals at different times, produce mental changes which include some of the symptoms of schizophrenia. Hence it is possible that endogenous compounds similar to these might be involved in the symptomatology of some forms of schizophrenia.

In 1952 Smythies, Osmond, and Harley Mason suggested that, since mescaline was a trimethoxy derivative of the normal metabolite dopamine, aberrant *O*-methylation might be responsible for some symptoms of schizophrenia. Later discoveries that *N*-methylated indoleamines are also psychotomimetic led to the more general hypothesis that aberrant transmethylation of catecholamines and indoleamines might be a basic biochemical mechanism in schizophrenia.

Though far from proved, this hypothesis has accumulated support in the past decade. Dimethoxyphenylethylamine was isolated from the urine of schizophrenics in 1962, and these results have been both confirmed and denied. Two laboratories found that feeding methyl donors to schizophrenics caused an exacerbation of symptoms. New psychotomimetics have been synthesized, and these typically contain an *N*-methyl group.

This volume represents an effort by the major investigators in this country and abroad to evaluate established results and to delineate existing problems and directions for future research. The meeting was organized by the three editors, whose laboratories have made significant contributions to this line of research. The chapters, representing individual presentations at the meeting, are grouped more or less logically, and an edited discussion follows each group of three to five chapters. The discussions are particularly valuable when results reported in the papers conflict, as they do on the question of the existence and meaning of dimethoxyphenylethylamine in urine of schizophrenics.

The papers are of high quality; hypotheses and results are set forth cautiously and discussed critically. The papers present previously unpublished material or summaries of several years' work by a laboratory. Four clinical papers concern 3,4-dimethoxyphenylethylamine. Since one of the authors is unable to find this compound in the urine of schizophrenics on a plant-free diet, its origin, methods for its analysis and identification, and the enzymatic methods for its production are discussed vigorously. In another group of clinical papers the metabolism of tryptophan in normal and psychotic subjects and its relationship with methionine are discussed.

The remaining papers deal with animal research, analytical methods, or theoretical material. Smythies discusses the effects of mescaline and its derivatives on conditioned avoidance responses; and Himwich, the effects of psychotomimetic *N*-dimethylamines on the electroencephalograms from different regions of the brain in rabbits. Straughn presents interesting data showing that norepinephrine, serotonin, and dopamine have a depressing effect on limbic neurons. Szara discusses relationships between the structure and action of methylated tryptamine derivatives and also offers an extremely interesting computer-based theoretical model of brain function, suggesting ways in which the model might be altered by drugs or in schizophrenia to produce psychological deficits. Holmstedt presents work on the separation and analysis of psychoactive amines by gas chromatography. Baldessarini describes a novel method for the assay of *S*-adenosylmethionine and shows its alteration with drugs; and Snyder correlates electronic configuration and hallucinogenic potency. Kety offers a succinct summary of the proceedings, emphasizing the heuristic value of the transmethylation hypothesis.

The volume has an excellent bibliography and index and is thus valuable not only to psychiatrists, pharmacologists, and biochemists who are superficially interested in this subject, but also to active researchers. However, specific psychological deficits produced by psychotomimetics and the degree to which they produce a condition resembling schizophrenia are hardly touched. Similarly, the specific nature of the exacerbations produced by methyl donors is not described, nor are the acquisition of tolerance to psychotomimetics and its implications for an endogenous toxic hypothesis even considered.

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Coastal Waters

Estuaries. A symposium held at Jekyll Island, Georgia, March–April 1964. GEORGE H. LAUFF, Ed. AAAS, Washington, D.C., 1967. 773 pp. illus. $27.

This is a collection of 71 papers presented at a conference held "to provide an opportunity for the exchange of ideas between the various disciplines and individuals interested in estuarine research, to summarize the present knowledge of the natural characteristics of estuaries, and to delineate the direction of current research efforts." A supplemental bibliography contains references through 1966.

As a point of departure, an attempt is made to define estuaries, and their relations to the oceans and continents are discussed. Circulation patterns and their effects on the salinity and temperature structure of estuaries are explained. Natural physical and biological processes important in the formation and destruction of estuaries are discussed. Estuarine sediments and sedimentation processes are treated in considerable detail. Next follow descriptions of microorganisms—bacteria, fungi, algae, protozoa, and so on—in estuaries and discussions of primary production, secondary production, the role of organic detritus, biological zonation, and structure of plankton and benthic communities. Physiological problems especially important to estuarine animals are outlined, and specific examples are detailed. The importance of estuaries to fisheries in various parts of the world is pointed out, and potentials for increased production are discussed. The book ends with consideration of detrimental and beneficial interventions by man through pollution, changes in land drainage, alteration of tidal influence, and direct alteration of the biota.

Over one-third of the papers are reviews or treat estuarine phenomena from a generalized perspective; one-third are descriptions of estuaries or estuarine processes in particular localities; the remainder deal with definitions, methodology, description of research programs, and so forth. As a topic is taken up, articles of broad perspective are followed by reports on specific experiments or examples of phenomena from specific geographical regions. The topics unfold in logical sequence and build well toward an integrated picture of the estuarine environment.

Many of the problems taken up from an estuarine perspective are common to other environments. It seems to me that the relevance of the estuarine case to the general one and vice versa is in some cases not explicitly established by the authors. For example, it is not made clear to what extent sedimentation processes, population dynamics, and strategies for management of harvestable biological resources represent problems unique to estuaries rather than particular cases of general problems.

On the average, the exposition is clear, although a few authors tended to be repetitious or were guilty of poor organization, with the result that their papers are longer than the contents justify. A very few non-estuarine ringers seem to have sneaked in—several of the contributions are scarcely relevant. A fair amount of unavoidable repetition occurs, for example when successive biologists outline the same physical process in preparation for explaining its impact on different groups of organisms. Information on many topics is widely scattered among different papers, but an effective subject