quent. The same readers may also be startled by the prominence given to values in Sheldon's theorizing about delinquency. Current fashion is to keep what people ought to do at least at arm's length while dealing with the more antiseptic—or is sterile a better word?—questions of how to improve performance. Sheldon would have none of this, and the sword he unsheathes cuts both ways. For him, Dionysian enthusiasm, complete with its impulsivity and take-what-you-can attitude, is at least honest, while those trying to control the revelers only appear to be busy doing good while actually feathering their own nests—competent predators living off the incompetent ones. Perhaps this is why many social workers (and social scientists) prefer to ignore values.

Physique and Delinquent Behavior is a 30-year follow-up of *Varieties of Delinquent Youth* that, following Sheldon's death in 1977, was completed by his colleagues. Face-to-face interviews were conducted in 1960 and 1964, and reviews of state records and telephone interviews constituted the follow-ups for non-Boston residents in 1970, 1973, 1975, and 1979.

Sheldon's characterizations of the boys in 1949 hold up reasonably well, although there are clearly some unanticipated outcomes. For example, two of the delinquent boys classified as having "severe mental insufficiency" (IQ less than 65) end up 30 years later as "normal." Similarly, two of the 18 psychotics and two of 16 "primary criminals" achieved normal status after three decades. Far from impeaching Sheldon's ability as a diagnostician, these regressions toward normality are actually small enough to warrant both Sheldon and his procedures.

The updating of the histories of these delinquent boys is an important contribution, but it is somewhat disappointing that the authors did not evidence greater curiosity and examine the relationships between and among the adolescent and adult variables more thoroughly. It is irritating not to be given, for example, any information concerning the stability of the psychiatric assessments or to know how dependent these and other measures were on the wide variety of life events documented in the biographies. This reviewer took the liberty of utilizing the data provided in one or both books in an attempt to uncover some of these relationships. A few of the more interesting ones are discussed below.

Sheldon had great hopes for the data gathered from the war records of the 115 boys who were inducted into the service during World War II. He felt that the challenge of having to adapt in a military environment might "throw more light on the problem of institutionalization and treatment of delinquency . . . than will all the other aspects of the study." Sheldon's ratings of each boy's "value to the service" were ignored in the follow-up, but on a three-point scale they prove to be the most powerful predictor of the outcome measures, accounting for over 26 percent of the variance in the adult "index of disappointing performance" and over 18 percent of the variance in the "total of five panels of superior performance," a composite measure of success in the economic, social, reproductive, goal-orientation, and aesthetic domains. This finding is particularly interesting because "value to the service" yielded only a low and insignificant correlation with IQ, another good predictor of outcome. These analyses are all based on the 105 (out of 115) boys for whom service data were available and who, except for three suicides, survived and were followed up after age 40.

Another finding raises the issue of how to characterize the sample of 200 delinquents. There are an unusual number of significant correlations between stature and the variables used initially by Sheldon. Gynandrophrenia, mesomorphy, ectomorphy, aesthetic pleasingness of the body, IQ, and the hebephrenic psychiatric component all have highly significant ($p < .001$) correlations with height. Whether this reflects a peculiar mix of delinquent types in the sample or indicates, as some have claimed, that Sheldon's three-variable approach to somatotyping really reduces to thickness and length awaits a more detailed analysis than the one provided in this volume.

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Development and Evolution

Embryos, Genes, and Evolution. The Developmental-Genetic Basis of Evolutionary Change. RUDOLF A. RAFF and THOMAS C. KAUFMAN. Illustrated by Elizabeth C. Raff. Macmillan, New York, and Collier Macmillan, London, 1983. xiv, 396 pp. $34.95.

This is a very appropriate time for the publication of a book such as this one. Recent years have witnessed a renewed interest in the role of development in evolution. The organism is viewed no longer as a black box tracking environmental change but rather as having internal structure and organization that constrain its responses to selective pressures. This book by Raff and Kaufman is quite different in its approach from other recent volumes on this issue. Gould's *Ontogeny and Phylogeny* (which was, perhaps, critical in sparking the rediscovery of developmental biology by evolutionists) has a historical emphasis and is largely restricted to heterochrony, or changes in phylogeny due to alterations in timing and rates of development. The methodology in heterochronic studies is essentially comparative, and the mechanisms of gene regulation and pattern formation are not discussed. *Evolution and Development*, edited by Bonner, has the traditional lack of focus of multiauthored volumes. In contrast, Raff and Kaufman, developmental geneticists by training, undertake the task of distilling the large amount of current literature on regulatory genetics and discussing its implications for evolutionary biology.

At the end of the first chapter the authors state their belief that "the time has come to take the final step in the modern synthesis: to fuse embryology with genetics *and* evolution" (p. 24). But a synthesis is not delivered. In the final chapter the authors appear to imply that the field is not ready: "Our ability to synthesize what has gone before in this book is severely limited by a currently poor understanding of the way in which genes direct morphogenesis of even simple metazoan structures and of the nature of high-level genetic regulatory interactions" (p. 336). Nevertheless, the book is unique and valuable as a review of knowledge bearing on how developmental changes can affect evolutionary processes.

The first chapter attempts to place the subject in a historical context. The authors' approach, emphasizing the genesis and control of morphological organization, is placed in the tradition of Huxley (on allometry), D'Arcy Thompson, de Beer, and Goldschmidt (to whom the book is dedicated). The discussion of the relationships between development and evolution as perceived by Haeckel and Von Baer is somewhat superficial. The reader should refer to the excellent and more thorough reviews by Gould (*Ontogeny and Phylogeny*) and by Russell (*Form and Function*) and to the pertinent papers in *The Evolutionary Synthesis*, edited by Mayr and Provine. The chapter improves in its discussion of the relation between developmental genetics and evolution.

The next two chapters are a review of the literature on evolutionary mechanisms from a paleontological and neonto-

logical perspective. The background information presented on topics such as punctuated equilibrium, "molecular clocks," and speciation models will be useful to molecular biologists who are not evolutionists. The next two chapters are a review of cytoplasmic organization and tissue interaction in embryogenesis. This is followed by a chapter on heterochrony. Next, the authors examine the genetic basis of these processes. Perhaps the best chapter in the book, which contains more original information, is "Homoeosis in ontogeny and phylogeny." In it the authors bring the large body of literature on homeotic mutants in insects to bear on the issue of the evolution of arthropods by progressive specialization of an initially segmented archetype. The book is completed with a review of the various molecular models of gene regulation.

The main points of the book appear to be (i) that we should expect morphological evolution to be discontinuous; (ii) that regulatory rather than structural genes are involved in generating major changes in morphological organization (the authors regard regulatory genes as acting like homoeotic mutants, by controlling switches among developmental pathways—see p. 338); and (iii) that morphological evolution is governed by a relatively small number of regulatory genes (p. 343). These are controversial issues having to do with some basic properties of evolutionary processes.

The main drawback of the book is the lack of satisfactory integration among the topics covered. For example, there is no explicit discussion of the relationships between microevolution and macroevolution, a topic of much current interest, which was central to Goldschmidt's ideas and concerning which developmental biology can make some contributions. Neither do we find a discussion of the consequences of the perspective offered for populational models based on natural selection operating on random genetic variation. Another example can be found in the discussion of heterochrony. A key assumption of the heterochronic approach is that developmental programs are conserved through phylogeny and most morphological change is the product of regulation of timing and rates on a resilient ontogeny. This assumption is not stated, nor is its validity addressed.

The authors' major effort appears to have gone into compiling empirical evidence rather than into trying to extract basic properties of regulatory systems and incorporate them into a more comprehensive theoretical framework. But although the synthesis has not been made, the key components have been identified. Raff and Kaufman should be commended for undertaking the brave task of breaking new ground and for bringing together data from a wide range of disciplines. Different parts of the book will be informative to different audiences, and I believe it will strengthen the budding dialogue between developmental and evolutionary biologists.

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