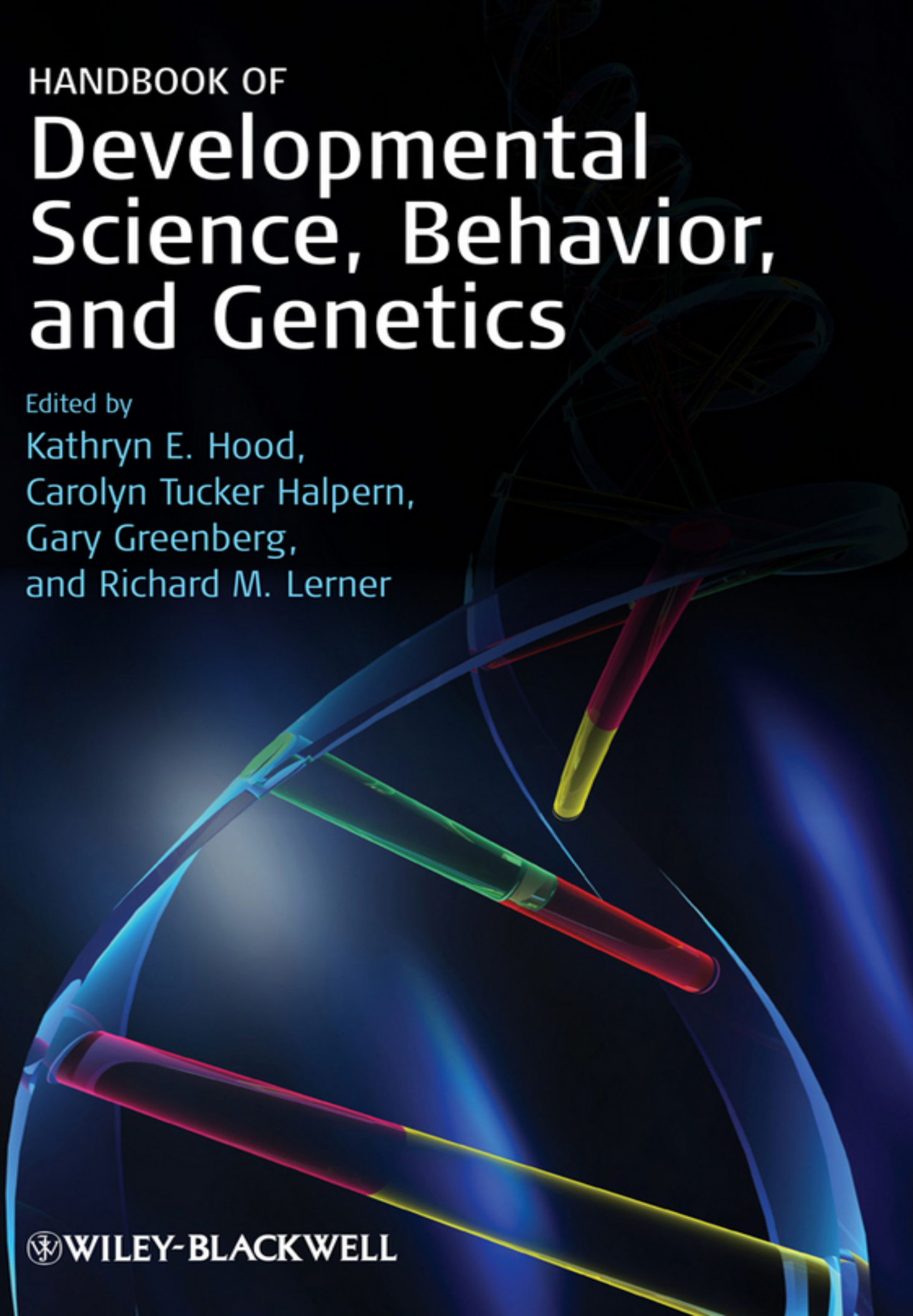
HANDBOOK OF

Developmental Science, Behavior, and Genetics

Edited by
Kathryn E. Hood,
Carolyn Tucker Halpern,
Gary Greenberg,
and Richard M. Lerner



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Part III Empirical Studies of Behavioral Development and Genetics

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Foreword: Gilbert Gottlieb and the Developmental Point of View

Evelyn Fox Keller

Gilbert Gottlieb is widely known for his life-long struggle against the dichotomies between nature and nurture, and more specifically, between innate and acquired, that so hobble our thinking about biological and psychological development. Development, as he so clearly recognized, is an immensely complex process that depends on ongoing interactions between whatever makes up the organism at any given time and its environment; and it simply cannot be understood in terms of separate (or separable) forces, elements, or factors. Decades of his own research on the role of experience in the emergence of animal behavior taught him just how dire was the need for a different explanatory model, and indeed, much of his theoretical work was devoted to the articulation of such an alternative – of an explanatory framework that begins with what he liked to call the "developmental point of view."

A developmental point of view requires a "relational" ("coactive" and "bidirectional") view of causality; an appreciation of the continuity between prenatal and postnatal, innate and acquired; the recognition that epigenesis is ongoing, multifaceted, not predetermined but highly dependent on experience (or, to use the term that Gottlieb preferred for describing this process, "probabilistic"), and top-down as well as bottom up. Finally, a developmental point of view requires us to shift our focus from population statistics to the study of individual trajectories for it is only through the study of such

trajectories that one can begin to understand the dynamics of developmental change.

Gottlieb devoted his entire career to fleshing out this perspective, and there is no denying his influence. He leaves behind an impressive body of both experimental results and conceptual proposals, and perhaps most important, a host of students who were deeply inspired by his example, and who, in their own labs, continue in his tradition and carry on his mission. And yet, notwithstanding the magnitude of his influence, shortly before his death, he confessed to a former student that “getting across the developmental point of view has been the largest failure of my career” (Miller, 2007, p. 777). It is impossible for anyone who has struggled with these issues not to sympathize, or to fail to appreciate the magnitude of the obstacles facing any attempt to reconfigure the terms of our analyses.

As we know, Gottlieb was hardly the first to undertake this challenge, nor was he alone even in his own time. As he freely acknowledged, his debt to those who preceded him (especially, to Zing-Yang Kuo: (1898–1970), T. C. Schneirla (1902–1968), and Daniel S. Lehrman (1919–1972)) was immense; indeed, it was on their work that his own went on to build. He was equally appreciative of the contributions of like-minded contemporaries (e.g., Patrick Bateson, Susan Oyama, Richard M. Lerner), as he was of the contributions of a younger generation of colleagues. And I suspect that all of these authors have shared Gottlieb’s frustration, for all of them have confronted the same obstacles, inevitably giving rise to the question of why the difficulties should be quite so intractable. Daniel Lehrman (1970, pp. 18–19) suggested we look to semantic problems for an understanding:

> When opposing groups of intelligent, highly educated, competent scientists continue over many years to disagree, and even to wrangle bitterly, about an issue which they regard as important, it must sooner or later

> become obvious that the disagreement is not a factual one, and that it cannot be resolved by calling to the attention of the members of one group … the existence of new data which will make them see the light … If this is, as I believe, the case, we ought to consider the roles played in this disagreement by semantic difficulties arising from concealed differences in the way different people use the same words, or in the way the same people use the same words at different times; [and] by differences in the concepts used by different workers. (1970, pp. 18–19)

I would go further. It is not just that we use the same words in different ways, that the language of behavioral genetics is hopelessly polysemic, but also that we seem to be trapped by the absence of adequate alternatives. Indeed, the lack of a vocabulary capable of doing justice to the developmental point of view constituted a formidable obstacle for Gottlieb, and his frequent coining of new terms suggests that he was well aware of the problem. The difficulty (as he himself clearly saw) is that introducing a new vocabulary is a far from simple task, and it requires a great deal more than the efforts of a few individuals. Language changes only when the felt need for a new vocabulary becomes truly widespread.

I am persuaded, however, that winds of change are in the air. New appreciation of many of Gottlieb's themes – of the agency of organisms in constructing their environments (see, e.g., Odling-Smee et al., 2003), of the plasticity of development (West-Eberhard, 2003), of the role of phenotypic plasticity in the genesis of evolutionary novelty (Kirschner & Gerhart, 2005), of the deeply contextual character of biological information -- has begun to penetrate the main corridors of contemporary biology. These themes not only both echo and support many of Gottlieb's own arguments, but also extend the "developmental point of

view" into new domains. Signs of change are also evident in studies of the most primitive molecular levels of life. Recent findings in genomics have brought fundamental new challenges to the very concept of a particulate gene, leading a number of molecular geneticists (and others) to call for a more dynamic and relational discourse of genetics for the 21st century (see, e.g., Fox Keller & Harel, 2007; Kapranov et al, 2007; Pearson, 2006; Silver, 2007). I only wish that Gottlieb could have lived to see the creation of the more accommodating home for his work that will, I believe, come with the realization of these signs of change.

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Preface and Acknowledgments

The Handbook of Developmental Science, Behavior, and Genetics commemorates the historically important and profound contributions made by Gilbert Gottlieb across a scholarly career spanning more than four decades. Gottlieb was preparing this handbook when his untimely death in 2006 brought his work on this project to a halt. However, with the permission and support of the Gottlieb Family, the editors of this work have decided to complete Gottlieb's "last book," which was designed to bring together in one place cutting-edge theory, research, and methodology affording a modern scientific understanding of the role of genes within the integrated and multi-level (or "fused") developmental system, that is, the system constituted by the levels of organization – ranging from the inner biological (e.g., genetic, hormonal, or neuronal) through the designed and natural physical ecological and historical – comprising the ecology of organism development.

Gottlieb's career was dedicated to providing rigorous experimental evidence to bear on such an integrative approach to understanding the dynamics of organism and context relations that provides the fundamental process of development. His work, – and those of other colleagues in comparative and developmental science – for instance, Z. Y. Kuo, T. C. Schneirla, Ethel Tobach, Jay Rosenblatt, Daniel Lehrman, Howard Moltz, and George Michel – was the major scientific basis for rejecting the reductionism and counterfactual, "split" conceptions (of variables purportedly linked alone to nature- or to nurture-related processes) used in other approaches to understanding the links among genes, behavior, and development, for example, as found in behavioral genetics (or in other reductionist accounts of the role of biology in development, for example, sociobiology or evolutionary psychology).

Accordingly, the scholarship that Gottlieb envisioned having in this handbook – and the scholarship we as editors who have tried to implement his vision hope we have presented – offers readers the cutting-edge of theory and research from developmental-systems-predicated scholarship in biological, comparative, and developmental science. Together, this work underscores the usefulness of the synthetic, developmental systems approach to understanding the mutually influential relations among genes, behavior, and context that propel the development of organisms across their life spans.

Our aspiration is that the scholarship that we present in this *Handbook* will constitute a watershed reference work documenting the current ways in which psychological, biological, comparative, and developmental science are framed and, as well, advance a developmental systems approach to understanding the dynamics of mutually influential organism-environment relations. Represented as organism ↔ context relations, these relations constitute the basic unit of analysis in comparative and developmental science. In addition, from the theoretical and empirical approaches championed by Gottlieb, these organism ↔ context relations constitute the basis of change across the life spans of all organisms. We owe to Gilbert Gottlieb the clarity of theoretical vision and the standard for rigorous empirical work that has enabled this dynamic, developmental perspective to frame the cutting edge of contemporary scientific inquiry about the role of variables from all levels of organization, from genes through history, in constituting the fundamental, relational process involved in the development of all organisms across their respective life spans.

There are numerous other people to whom we owe enormous thanks for their contributions to this *Handbook.* Clearly, we are deeply grateful to the colleagues who

contributed to this work, both for their superb scholarly contributions and for their commitment to working collaboratively to honor the work and memory of Gilbert Gottlieb. Without the excellent scholarship they contributed to this *Handbook* we could not honor the memory of Gilbert Gottlieb – as scientist, colleague, and friend – as thoughtfully, thoroughly, and richly as we are now able to do.

We also thank the two superb managing editors at the Institute for Applied Research in Youth Development – Leslie Dickinson and Jarrett Lerner – for their editorial work. Their commitment to quality and productivity, and their resilience in the face of the challenges of manuscript production, are greatly admired and deeply appreciated. Kathryn E. Hood is pleased to acknowledge the generous hospitality of the Center for Developmental Science at Chapel Hill, which long has welcomed visiting scholars such as Gilbert Gottlieb. Carolyn Halpern is grateful to her co-editors for their scholarship and insights, and to Gilbert Gottlieb for his mentorship and collaboration. Gary Greenberg is grateful to his wife Patricia Greenberg for her unstinting and continued support and encouragement and for understanding his long hours at the computer. Richard M. Lerner is grateful to the John Templeton Foundation, the National 4-H Council, the Philip Morris Smoking Prevention Department, and the Thrive Foundation for Youth for supporting his work during the development of this project.

Finally, we owe our deepest and most enduring debt to Gilbert Gottlieb, to whom we most obviously wish to dedicate this *Handbook.* Gilbert Gottlieb was one of the pillars of 20th century comparative psychology. His intellect, generosity, and kindness are warmly remembered and sorely missed.

Kathryn E. Hood

Carolyn Halpern

Gary Greenberg

Richard M. Lerner