

Cambridge University Press

0521791960 - The Evolution of Reason: Logic as a Branch of Biology

William S. Cooper

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The Evolution of Reason

Formal logic has traditionally been conceived as bearing no special relationship to biology. Recent developments in evolutionary theory suggest, however, that the two subjects may be intimately related. In this book, William Cooper presents a carefully supported theory of rationality in which logical law is seen as an intrinsic aspect of the process of evolution. This biological perspective on logic, though at present unorthodox, suggests new evolutionary foundations for the study of human and animal reasoning.

Professor Cooper examines the formal connections between logic and evolutionary biology, noting how the logical rules are directly derivable from evolutionary principles. Laws of decision and utility theory, probabilistic induction, deduction, and mathematics are found to be natural consequences of elementary population processes. Relating logical law to evolutionary dynamics in this way gives rise to a unified evolutionary science of rationality.

The Evolution of Reason provides a significant and original contribution in evolutionary epistemology. It will be of interest to professionals and students of the philosophy of science, formal logic, evolutionary theory, and the cognitive sciences.

William S. Cooper is Professor Emeritus at the University of California, Berkeley.

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Foreword

This book is about how logic relates to evolutionary theory. It is a study in the biology of logic. It attempts to outline a theory of rationality in which logical law emerges as an intrinsic aspect of evolutionary biology, part of it and inseparable from it. It aspires to join the ideas of logic to evolutionary theory in such a way as to provide unified foundations for an evolutionary science of Reason.

An understanding of modern evolutionary explanation and sympathy with its aims has been assumed throughout. A prior acquaintance with the elements of symbolic logic and probability theory has been assumed as well, and some familiarity with decision theory would be desirable. Beyond that, it is my hope that philosophers of science, logicians, evolutionists, cognitive scientists, and others, will find the exposition readable.

The mathematics has been kept to a minimum. The exception is an important appendix which sets forth in mathematical detail a critical portion of the underlying formal development. My effort has been to make the theory as clear as possible, both conceptually and mathematically, with the heavier math kept separate for those who might wish to study the theory in greater depth.

The work owes much to many people. Of special note is the fact that one of the evolutionary models receiving attention (Model 5) resulted from a collaboration with Professor Robert Kaplan, now of Reed College, to whom I am deeply indebted for numerous evolutionary insights. I am grateful to Professors Ernest Adams, Bill Maron, Steven Stearns, and several referees for their valuable suggestions and criticisms of the manuscript. The book consolidates the results of earlier investigations which benefited at various stages from the comments of George Barlow, Mario Bunge, Roy Caldwell, Christopher Cherniak,

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Berkeley, January 2000

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