The Handbook of EVOLUTIONARY PSYCHOLOGY

Second Edition

Volume 1: Foundations

Edited by

DAVID M. BUSS

WILEY

CONTENTS

List of Tables

List of Illustrations

The Handbook of Evolutionary Psychology

Second Edition

Volume 1 Foundations

Edited by

David M. Buss

WILEY

Cover design: Wiley

This book is printed on acid-free paper. ♾

Published by John Wiley & Sons, Inc., Hoboken, New Jersey.

Published simultaneously in Canada.

For general information on our other products and services please contact our Customer Care Department within the United States at (800) 762-2974, outside the United States at (317) 572-3993 or fax (317) 572-4002.

Wiley publishes in a variety of print and electronic formats and by print-on-demand. Some material included with standard print versions of this book may not be included in e-books or in print-on-demand. If this book refers to media such as a CD or DVD that is not included in the version you purchased, you may

download this material at http://booksupport.wiley.com. For more information about Wiley products, visit www.wiley.com.

Library of Congress Cataloging-in-Publication Data:

Handbook of evolutionary psychology (Hoboken, N.J.)

The handbook of evolutionary psychology / edited by David M. Buss. — 2nd edition.

volumes cm

Includes bibliographical references and index.

Contents: Volume 1. Foundations — volume 2. Application.

ISBN 978-1-118-75588-4 (cloth) — ISBN 978-1-118-76399-5 (set) — ISBN 978-1-118-75602-7 (pdf) — ISBN 978-1-118-75597-6 (epub)

1. Evolutionary psychology. 2. Human evolution. I. Buss, David M. II. Title.

BF698.95.H36 2016

155.7—dc23

2015008090

DEDICATION

To Charles Darwin

FOREWORD

Steven Pinker

For many years after I decided to become a psychologist I was seriously frustrated by my chosen field, and fantasized about a day when it would satisfy the curiosity that first led me to devote my professional life to studying the mind. As with many psychology students, the frustration began with my first class, in which the instructor performed the ritual that begins every Introduction to Psychology course: disabusing students of the expectation that they would learn about any of the topics that attracted them to the subject. Forget about love and hate, and family dynamics, and jokes and their relation to the unconscious, they said. Psychology was a rigorous science that investigated quantifiable laboratory phenomena; it had nothing to do with self-absorption on an analyst's couch or the prurient topics of daytime talk shows. Accordingly, the course confined itself to “perception,” which meant psychophysics, and “learning,” which meant rats, and “the brain,” which meant neurons, and “memory,” which meant nonsense syllables, and “intelligence,” which meant IQ tests, and “personality,” which meant personality tests.

When I proceeded to advanced courses, they only deepened the disappointment, by revealing that the psychology canon was a laundry list of unrelated phenomena. The course on perception began with Weber's law and Fechner's law and proceeded to an assortment of illusions and aftereffects familiar to readers of cereal boxes. There was no there there —no conception of what perception *is* or of what it is for. Cognitive psychology, too, consisted of laboratory curiosities analyzed in terms of dichotomies like serial/parallel, discrete/analog, and top-down/bottom-up (inspiring Alan

Newell's famous jeremiad “You can't play twenty questions with nature and win”). To this day, social psychology is driven not by systematic questions about the nature of sociality in the human animal but by a collection of situations in which people behave in strange ways.

But the biggest frustration was that psychology seemed to lack any sense of *explanation*. Like the talk-show guest on *Monty Python's Flying Circus* whose theory of the brontosaurus was that “the brontosaurus is skinny at one end; much, much thicker in the middle; and skinny at the other end,” psychologists were content to “explain” a phenomenon by redescribing it. A student rarely enjoyed the flash of insight that tapped deeper principles to show why something *had* to be the way it is, as opposed to some other way it could have been.

My gold standard for a scientific explanation was set when I was a graduate student—not by anything I learned in graduate *school*, mind you, but by a plumber who came to fix the pipes in my dilapidated apartment and elucidated why they had sprung a leak. Water, he explained, obeys Newton's second law. Water is dense. Water is incompressible. When you shut off a tap, a large incompressible mass moving at high speed has to decelerate quickly. This imparts a big force to the pipes, like a car slamming into a wall, which eventually damages the threads and causes a leak. To deal with this problem, plumbers used to install a closed vertical section of pipe, a “pipe riser,” near each faucet. When the faucet is shut, the decelerating water compresses the column of air in the riser, which acts like a shock absorber, protecting the pipe joints. Unfortunately, this is a perfect opportunity for Henry's law to apply, namely that gas under pressure is absorbed by a liquid. Over time, the air in the column dissolves into the water, filling the pipe riser and rendering it useless. So every once in a while a plumber has to bleed the system and let air back into the risers, a bit of preventive maintenance the landlord had neglected. I only wished that psychology could meet that standard of explanatory elegance and show how a seemingly capricious occurrence falls out of laws of greater generality.

It's not that psychologists never tried to rationalize their findings. But when they did, they tended to recycle a handful of factors like similarity, frequency, difficulty, salience, and regularity. Each of these so-called explanations is, in the words of the philosopher Nelson Goodman, “a pretender, an impostor, a quack.” Similarity (and frequency and difficulty and the rest) are in the eye of the beholder, and it is the eye of the beholder that psychologists are responsible for explaining.

This dissatisfaction pushed me to the broader interdisciplinary field called cognitive science, where I found that other disciplines were stepping into the breach. From linguistics I came across Noam Chomsky's criteria for an adequate theory of language. At the lowest level was observational adequacy, the mere ability to account for linguistic behavior; this was the level at which most of psychology was stuck. Then there was descriptive adequacy, the ability to account for behavior in terms of the underlying mental representations that organize it. At the highest level was explanatory adequacy, the ability of a theory to show why *those* mental representations, and not some other ones, took root in the mind. In the case of linguistics, Chomsky continued, explanatory adequacy was rooted in the ability of a theory to solve the problem of language acquisition, explaining how children can learn an infinite language from a finite sample of sentences uttered by their parents. An explanatory theory must characterize Universal Grammar, a part of the innate structure of the mind. This faculty forces the child to analyze speech in particular ways, those consistent with the way human languages work, rather than in any of the countless logically possible ways that are consistent with the input but dead ends in terms of becoming an expressive language user (for example, memorizing every sentence, or combining nouns and verbs promiscuously). As a result, a person's knowledge of language is not just any old set of rules, but ones that conform to an algorithm powerful enough to have acquired an infinite language from a finite slice of the environment.

Artificial intelligence, too, set a high standard of explanation, largely through the ideas of the vision scientist David Marr. A theory of vision, he suggested, ought to characterize visual processing at three levels: the neurophysiological mechanism, the algorithm implemented by this mechanism, and crucially, a “theory of the computation” for that domain. A theory of the computation is a formal demonstration that an algorithm can, in principle, compute the desired result, given certain assumptions about the way the world works. And the desired result, in turn, should be characterized in terms of the overall “goal” of the visual system, namely to compute a useful description of the world from the two-dimensional array of intensity and wavelength values falling on the retina. For example, the subsystem that computes the perception of shape from shading (as when we perceive the contours of a cheek, or the roundness of a ping-pong ball) relies on a fact of physics that governs how the intensity of light reflecting off a surface depends on the relative angles of the illuminant, the surface, and the observer, and on the physical properties of the surface. A perceptual algorithm can exploit this bit of physics to work backward from the array of light intensities, together with certain assumptions about typical illuminants and surfaces in a terrestrial environment, and thereby compute the tangent angle of each point on a surface, yielding a representation of its shape. Many perceptual phenomena, from the way makeup changes the appearance of a face to the fact that turning a picture of craters upside down makes it look like a picture of bumps, can be explained as by-products of this shape-from-shading mechanism. Most perception scientists quickly realized that conceiving the faculty of vision as a system of neural apps that supply the rest of the brain with an accurate description of the visible environment was a big advance over the traditional treatment of perception as a ragbag of illusions, aftereffects, and psychophysical laws.

Language and perception, alas, are just two out of our many talents and faculties, and it was unsatisfying to think of the eyes and ears as pouring information into some void that constituted the rest of the brain. Might there be some comparable framework for the rest of psychology, I wondered, that addressed the engaging phenomena of mental and social life, that covered its subject matter systematically rather than collecting oddities like butterflies, and that explained its phenomena in terms of deeper principles? The explanations in language and vision appealed to the *function* of those faculties: in linguistics, acquiring the language of one's community; in vision, constructing an accurate description of the visible world. Both are extraordinarily difficult computational problems (as yet unsolvable by artificial intelligence systems) but ones that any child can perform with ease. And both are not esoteric hobbies but essential talents for members of our species, affording obvious advantages to their well-being. Couldn't other areas of psychology, I wondered, benefit from an understanding of the problems our mental faculties solve; in a word, what they are *for*?

When I discovered evolutionary psychology in the 1980s through the work of Donald Symons, Leda Cosmides, and John Tooby, I realized my wait was over. Evolutionary psychology was the organizing framework—the source of “explanatory adequacy” or a “theory of the computation”—

that the science of psychology had been missing. Like vision and language, our emotions and cognitive faculties are complex, useful, and nonrandomly organized, which means that they must be a product of the only physical process capable of generating complex, useful, nonrandom organization, namely natural selection. An appeal to evolution was already implicit in the metatheoretical directives of Marr and Chomsky, with their appeal to the function of a mental faculty, and evolutionary psychology simply shows how to apply that logic to the rest of the mind.

Just as important, the appeal to function in evolutionary psychology is itself constrained by an external body of principles—those of the modern, replicator-centered theory of selection from evolutionary biology—rather than being made up on the spot. Not just any old goal can count as the function of a system shaped by natural selection, that is, an adaptation. Evolutionary biology rules out, for example, adaptations that work toward the good of the species, the harmony of the ecosystem, beauty for its own sake, benefits to entities other than the replicators that create the adaptations (such as horses that evolve saddles), functional complexity without reproductive benefit (e.g., an adaptation to compute the digits of pi), and anachronistic adaptations that benefit the organism in a kind of environment other than the one in which it evolved (e.g., an innate ability to read, or an innate concept of “carburetor” or “trombone”). Natural selection also has a positive function in psychological discovery, impelling psychologists to test new hypotheses about the possible functionality of aspects of the mind that previously seemed functionless. For example, the social and moral emotions (sympathy, trust, guilt, anger, gratitude) appear to be adaptations for policing reciprocity in nonzero sum games; an eye for beauty appears to be an adaptation for detecting health and fertility in potential mates. None of this research would be possible if psychologists had satisfied themselves with a naïve notion of function instead of the one licensed by modern biology.

Evolutionary psychology also provides a motivated research agenda for psychology, freeing it from its chase of laboratory curiosities. An explanatory hypothesis for some emotion or cognitive faculty must begin with a theory of how that faculty would, on average, have enhanced the reproductive chances of the bearer of that faculty in an ancestral environment. Crucially, the advantage must be demonstrable by some independently motivated causal consequence of the putative adaptation. That is, laws of physics or chemistry or engineering or physiology, or some other set of laws independent of the part of our psychology being explained, must suffice to establish that the trait is useful in attaining some reproduction-related goal. For example, using projective geometry, one can show that an algorithm can compare images from two adjacent cameras and calculate the depth of a distant object using the disparity of the two images. If you write out the specs for computing depth in this way—what engineers would specify if they were building a robot that had to see in depth—you can then examine human stereoscopic depth perception and ascertain whether humans (and other primates) obey those specs. The closer the empirical facts about our psychology are to the engineering specs for a well-designed system, the greater our confidence that we have explained the psychological faculty in functional terms.

A similar example comes from the wariness of snakes found in humans and many other primates. We know from herpetology that snakes were prevalent in Africa during the time of our evolution, and that getting bitten by a snake is harmful because of the chemistry of snake venom. Crucially, these are not facts of psychology. But they help to establish that something that *is* a fact of psychology, namely the fear of snakes, is a plausible adaptation. In a similar manner, robotics can help explain motor control, game theory can explain aggression and appeasement, economics can explain punishment of free riders, and mammalian physiology (in combination with the evolutionary biology of parental investment) makes predictions about sex differences in sexuality. In each case, a “theory of the computation” is provided by an optimality analysis using a set of laws outside the part of the mind we are trying to explain. This is what entitles us to feel that we have explained the operation of that part of the mind in a noncircular way.

In contrast, it's not clear what the adaptive function of music or religion is. The popular hypothesis that the function of music is to keep the community together may be true, but it is not an *explanation* of why we like music, because it just begs the question of why sequences of tones in rhythmic and harmonic relations should keep the group together. Generating and sensing sequences of sounds is not an independently motivated solution to the problem of maintaining group solidarity, in the way that, say, the emotion of empathy, or a motive to punish free riders, is part of such a solution. A similar problem infects the “explanation” that people are prone to believe in incredible religious doctrines because those doctrines are comforting—in other words, that the doctrines of a benevolent shepherd, a universal plan, an afterlife, and divine retribution ease the pain of being a human. There's an element of truth to each of these suggestions, but they are not legitimate adaptationist explanations, because they beg the question of *why* the mind should find comfort in beliefs that it is capable of perceiving as false. In these and other cases, a failure to find an adaptationist explanation does not mean that no explanation is forthcoming at all. Religious belief may be a by-product of adaptations (such as a capacity to mentalize and free-rider detection mechanisms) that are demonstrably useful for solving *other* adaptive problems.

Evolutionary psychology is the cure for one last problem ailing traditional psychology: its student-disillusioning avoidance of the most fascinating aspects of mental and social life. Even if evolutionary psychology had not provided psychology with standards of explanatory adequacy, it has proved its worth by opening up research in areas of the human experience that have always been fascinating to reflective people but that had long been absent from the psychology curriculum. It is no exaggeration to say that contemporary research on topics like sex, attraction, jealousy, love, food, disgust, status, dominance, friendship, religion, art, fiction, morality, motherhood, fatherhood, sibling rivalry, and cooperation has been opened up and guided by ideas from evolutionary psychology, even if the initial ideas did not always prove to be correct. At the same time, evolutionary psychology is changing the face of theories in more traditional areas of psychology, making them into better depictions of the real people we encounter in our lives, and making the science more consonant with common sense and the wisdom of the ages. Before the advent of evolutionary thinking in psychology, theories of memory and reasoning typically didn't distinguish thoughts about people from thoughts about rocks or houses. Theories of emotion didn't distinguish fear from anger, jealousy, or love. And theories of social relations didn't distinguish among the way people treat family, friends, lovers, enemies, and strangers.

For many reasons, then, the second edition of this *Handbook* represents a significant milestone in the science of psychology. The theoretical rigor and empirical richness showcased in these chapters have more than fulfilled evolutionary psychology's initial promise, and they demolish lazy accusations that the field is mired in speculative storytelling or rationalizations of reactionary politics. The chapters don't, of course, summarize a firm consensus or present the final word in any of the areas they cover. But in topics from parenting to fiction, from predation to religion, they deliver subtle and deep analyses, genuinely new ideas, and eye-opening discoveries. *The Handbook of Evolutionary Psychology* is far more than a summary of the state of the art of evolutionary psychology. It is the realization of the hope that psychology can be a systematic and explanatory science of the human condition.

ACKNOWLEDGMENTS

The creation of this *Handbook* owes a special thanks to friends and colleagues who offered suggestions about coverage, provided reviews of individual chapters, and helped me on the long journey. For the first edition of the *Handbook* (2005), these include Sean Conlan, Leda Cosmides, Martin Daly, Todd DeKay, Randy Diehl, Diana Fleischman, Steve Gangestad, Martie Haselton, Sarah Hill, Joonghwan Jeon, Barry X. Kuhle, Steven Pinker, David Schmitt, Todd Shackelford, Don Symons, John Tooby, Jerry Wakefield, and Margo Wilson. Their contributions carry over to this second edition.

Cristine Legare played a key role for the current edition of the *Handbook*. In addition to generous feedback on several chapters, she was instrumental in convincing me to broaden the scope of the *Handbook* to include topics such as cultural evolution, social group cognition, learning over ontogeny, and religion—domains of huge importance to human affairs.

Dan Conroy-Beam deserves singling out for special and enormous thanks. He helped me shepherd this *Handbook* at all stages of the 3-year process: decisions about key contributors, providing key reviews of a dozen or so chapters, tracking the status of each chapter, and offering key suggestions about final organization. I owe Dan a great debt.

Many scholars generously provided external reviews of draft of one or more chapters: Bill von Hippel, Anne Campbell, Pascal Boyer, Daniel Nettle, Ray Hames, Joe Henrich, Ryan McKay, Coren Apicella, Alyssa Crittenden, Willem Frankenhuis, Todd Shackelford, H. Clark Barrett, Kristina Durante, David Rakison, Elizabeth Cashdan, Steve

Gangestad, Dave Schmitt, Cristine Legare, Randy Nesse, Jonathan Gotschall, Josh Tybur, Dominic Johnson, Aaron Sell, Gad Saad, Robert Kurzban, Jerone Wakefield, Kelly Asao, and Rebecca Burch. I am much in their debt.

An editor could not ask for a more superlative team than those at John Wiley & Sons. Patricia Rossi's unflagging enthusiasm for the *Handbook* provided the inspiration needed to bring the project to fruition, and Rachel Livsey and Amanda Orenstein helped enormously in the final stages.

I owe a special thanks to Steven Pinker for furnishing the foreword, Don Symons for writing a special essay for the section on mating, Martin Daly for providing an introduction to the section on parenting and kinship, and Richard Dawkins for furnishing the afterword. Most important, I thank the authors who provided the 52 chapters that form the core of the *Handbook*. Within their domains of expertise, they help the next generation of scientists by showing the light and the way.

CONTRIBUTORS

Jan Antfolk

University Researcher in Psychology

Abo Akademi University

Turku, Finland

Coren L. Apicella

Department of Psychology

University of Pennsylvania

Philadelphia, Pennsylvania

Ruben C. Arslan

Georg Elias Müller Institute of Psychology

Georg August University Göttingen

Göttingen, Germany

Drew H. Bailey

School of Education

University of California, Irvine

Irvine, California

Pat Barclay

Department of Psychology

University of Guelph

Guelph, Ontario, Canada

H. Clark Barrett

Department of Anthropology

University of California, Los Angeles
Los Angeles, California
Nicolas Baumard
Département d'Études Cognitives
École Normale Supérieure
Paris, France
David F. Bjorklund
Department of Psychology
Florida Atlantic University
Boca Raton, Florida
Carlos Hernández Blasi
Departamento de Psicología
Universitat Jaume I
Castellón, Spain
Pascal Boyer
Department of Psychology
Washington University, St. Louis
St. Louis, Missouri
David M. Buss
Department of Psychology
University of Texas, Austin
Austin, Texas
Anne Campbell
Psychology Department
Durham University