NEURAL AND MENTAL EVOLUTION

ORIGINS OF THE HUMAN BODY, BRAIN, BEHAVIOR, CONSCIOUSNESS, AND CULTURE

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This book is available to the public on our website, brainmindevolution.org. It is now complete, including the extensive Bibliography of cited references.

PREFACE

The modern approach to the study of mental evolution was initiated by Charles Darwin with his book, *The Expressions of the Emotions in Man and Animals* (1872). However, it took decades before the subject of mental evolution became a widely accepted scientific theory. While Darwin provided a solid and enduring foundation for the theory of organic evolution, he could not muster the necessary evidence for his belief in mental continuity between animals and humans. Being aware of his inadequate background in psychology and neurobiology, he passed his notes on mental evolution to George John Romanes, who was doing research on the nervous system of jellyfish and other lower invertebrates. As a prolific writer, Romanes published several books on the subject of mental evolution, including *Mental Evolution in Animals, with a Posthumous Essay on Instinct by Charles Darwin* (1883), and *Mental Evolution in Man: Origin of Human Faculty* (1888). In looking for continuity between the animal and human mind, Romanes focused on presumed shared "instincts" between the two. And in regard to "intelligence," he sought evidence in animals for rudiments of such human faculties as language, tool making, aesthetic sentiments, and moral sense. Romanes' effort was not successful because the psychological framework he used was not a felicitous one and because there was little scientific evidence in his days to put the subject of mental evolution on a solid foundation. His work was rejected by the founders of experimental psychology and comparative psychology as an anecdotal enterprise.

Thanks to more than a century of intensive research by psychologists, neurobiologists, paleontologists, archeologists, anthropologists and historians, the theory of mental evolution is accepted today by most scientists. Research by animal and human psychologists, behavioral biologists, cognitive scientists, linguists, and others, allows us to make clearly formulated comparisons between the behavioral and mental faculties of animals and humans. Likewise, the advances made by anatomists, embryologists, physiologists, neurochemists, neuropsychologists, clinical neurologists, and others, provide a solid foundation for comparisons between the structure and functions of the nervous system of animals and humans. Finally, paleontologists, archeologists, physical and cultural anthropologists, and economic, social and cultural historians have amassed a wealth of indirect and direct evidence about the mental evolution of man himself, one that began with ape-like ancestors with a brain and technical skills not much exceeding that of tool-using chimpanzees to modern man with a very large brain and a complex civilization.

The aim of this book is to reconstruct the evolutionary origins of the human body, brain, mind, and culture in terms of a series of "legacies." That heritage began as protozoans emerged lacking differentiated sense organs and a nervous system but displaying goal-seeking behavior, as witnessed by their extant survivors. This we interpret as indirect evidence that protozoans are sentient beings. The emergence of sentience was followed by a long selection process that culminated, in the vertebrate line, in the evolution of monkeys and apes with large brains, manual dexterity, and indirect evidence of the emergence of tacit awareness. The next stage began with biped hominins who could use their freed hands to produce simple stone tools, and it culminated in the evolution of anatomically modern humans with greatly enlarged brains, elaborate tools, and a rich folk culture. Human mental evolution, from implicit awareness to

reflective consciousness was, we will argue, language mediated, and it received a great boost when writing was invented and civilizations emerged. That led to a progressive growth in man's practical and theoretical knowledge, and the human effort to understand what transpires in the external world. The book is divided into three parts, with 12 chapters. Part I is called *Historical Background* (chapter 1); Part II, T*he Animal Mind* (chapters 2-8); and Part III, *The Human Mind* (chapters 9-12).

Chapter 1 briefly reviews several ideas and theories entertained by ancient, modern, and contemporary philosophers about the mind's origin, nature and significance. These ideas are considered in terms of three fundamentally different conceptualizations, mind (a) as a supernatural force, (b) as an epiphenomenon, and (c) as a life-sustaining and life-enhancing organic process. We advocate the latter approach as one resting on solid empirical foundation and promising future advances in our effort to better understand human nature and conduct.

Chapter 2 traces the mind's putative emergence in protozoans (like amoeba and ciliates) and its early evolution in primitive metazoans (like hydra and jellyfish) and agnathans (like hagfish and lamprey). The attempt is based on what we currently know about their anatomy, physiology, and behavior. We postulate that protozoans displaying goal-seeking behavior are sentient beings but, since they lack sense organs, cannot be aware of the external world. We call this putative primordial mental faculty, protopathic sentience. We attribute the ability to experience primordial sensations to jellyfish with simple eyes and a peripheral nervous system. While they can detect, for instance, obstacles in their path on the basis of luminosity differences, they lack the necessary neural mechanisms to perceive what objects look like on the basis of their shape or texture. Perceptual ability may have begun to emerge in extinct jawless fishes that, as judged by the anatomy of extant lampreys, had well-developed eyes and a brain mechanism, the optic lobe, to process the visual information.

Chapter 3 focuses on the anatomy, behavior and putative mental faculties of cartilaginous and bony fishes, and chapter 4 provides a brief discussion of amphibians and terrestrial reptiles. We provide evidence that fishes have all the necessary visceral, sensory, and motor mechanisms, and the requisite brain mechanisms, to experience emotions like pain and pleasure, fear and rage, and perceive what external objects look like. However, we argue that the perception of fishes devoid of limbs with digits to palpate objects is phenomenal rather than substantive in nature, that is, provides awareness about the surface appearance of things but not their structural properties. The major evolutionary contribution of quadruped amphibians and reptiles has been the various adaptations for terrestrial living.

Chapter 5 deals briefly with the anatomy and behavior of primitive mammals from insectivores to prosimians. We track in these quadrupeds the evolution of a new brain mechanism, the expanding neocortex, and such new behavioral manifestations as intensive care of the young, the ability to learn from experience by associative mechanisms, and interact with one another socially. The shift in arboreal prosimians to the visual guidance of behavior relative to insectivores, which rely more on olfaction, is considered of great significance regarding human mental evolution.

Chapters 6 and 7 provide a detailed discussion of somatic, neural, behavioral, and mental advances in monkeys. We identify in monkeys such anthropoid traits as the prolonged care of a single offspring; the expansion of the simian neocortex, with a multiplication and elaboration of different neencephalic circuits and networks; and the ability to manipulate objects with dexterous fingers under visual guidance. Among emotional advances displayed by monkeys are displays of exuberance and gregariousness. Their perceptual advance is marked by great curiosity and the ability to appreciate the substantive property of objects they manipulate. Their cognitive advances include enhanced learning and reasoning ability, and the ability to categorize things on the basis of their structural and functional properties.

Chapter 8 ends the discussion of mental evolution in the primate line with a review of somatic, neural and mental advances in chimpanzees, man's closest extant relatives. We describe the evidence that they use tools, solve difficult behavioral problems, and may be aware of themselves as agents of behavior. We also discuss the controversy regarding their linguistic abilities. In summary, chapters 2-8 describe our animal heritage, what we will refer to as our protozoan, cnidarian, agnathan, piscine, amphibian, reptilian, mammalian, simian, and pongid legacies. We then turn to the evolution of humans.

Chapter 9 reviews our current understanding of the course of man's somatic, neural, mental, and cultural evolution, beginning with upright human-like apes (Sahelanthropus and Ardipithecus) and ape-like humans, the early australopithecines, and ending with the Paleolithic and Neolithic ages of modern humans. The early hominids had scarcely larger brains than chimpanzees, and left behind no evidence that they could produce stone tools by flaking. They were followed by the late australopithecines and *Homo habilis* with larger brains, who produced simple stone tools and embarked on a career of aggressive scavenging and hunting. They, in turn, were replaced by *Homo erectus* with expanding brains, who produced elaborate stone tools, made fire, and were able to colonize Eurasia. These hominins were replaced by archaic humans, and then by anatomically modern *Homo sapiens* with still larger brains. Cultures emerged with institutions and value systems – marriage and kinship rules, gender roles, social status, etiquette, moral and religious beliefs, aesthetic norms, and so forth – that played increasing roles in the guidance of individual and collective behavior. Following the extinction of the large game they hunted, modern humans began to domesticate animals and plants and adopted a sedentary way of life. This stage was followed in some regions by the replacement of rural societies by larger social and political units.

Chapter 10 briefly reviews what we currently know about the formation of civilizations along river banks and trade routes in the Near East. A new economic, social and political order was established where toiling masses were subjugated by kings, nobles and priests claiming divine rights for their privileged status. The system was enforced by a standing army and managed by a literate class of administrators and engineers. While industry, commerce, and the fine arts flourished, the authoritarian regimentation stifled free thinking and intellectual growth. We follow that by a short account of two early social experiments to create societies run by a free citizenry. Greek seafarers and merchants, settling in harbors along the Mediterranean, were forming independent city states that they themselves administered. Emphasizing logical discourse in running their affairs led to the rise of philosophy and that began to replace the

traditional mode of mythological thinking. Inspired by the Greeks, the Romans used military might and political tools to impose a law-based rational order in the same geographic area, and beyond. Both experiments failed, but left an enduring legacy.

Chapter 11 will be put on the website in the next few months. That deals with the development of the mindset and ethos in Western Civilization, beginning with the Dark Age and followed by the Age of Faith during the early, high, and late Middle Ages. Chapter 12 will discuss the Age of Reason, beginning with the Enlightenment, the Industrial and the Scientific Revolutions.

Joseph Altman
April 25, 2011
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COMMENTS 12/29/2016

Joseph Altman completed Chapter 12 in 2014 and decided to write an additional Chapter 13 on the psychology of human individual differences and the tensions created between individuals and societies. He died on April 19, 2016 before Chapter 13 was completed. But much of it was done and just needed to be packaged in an organized and logical progression of topics. I spent several months reading through what he left behind and got some very good help from his daughter, Magda Elizabeth Altman, with removing repetitions and polishing sentences and paragraphs. Chapter 13 is now complete as well as the extensive Bibliography. Everything is available online in pdf format and I welcome all readers to explore these chapters. We have much to learn from Altman's creative insights about the human mind.

Shirley A. Bayer
December 29, 2016

Table of Contents

PART I: HISTORICAL BACKGROUND

CHAPTER 1

SUPERNATURAL, MATERIALISTIC, AND BIOLOGICAL THEORIES OF THE MIND

PART II: THE ANIMAL MIND

CHAPTER 2

FROM SENTIENCE TO SENSATION: MENTAL EVOLUTION FROM PROTOZOANS TO AGNATHANS

CHAPTER 3

THE EVOLUTION OF BODY, BRAIN, BEHAVIOR, AND MIND IN JAWED FISHES

Basic Affects and Phenomenal Awareness in Limbless Vertebrates

CHAPTER 4

THE EVOLUTION OF BODY, BRAIN, BEHAVIOR, AND MIND IN QUADRUPED AMPHIBIANS AND REPTILES

Terrestrial Vertebrate Adaptations

CHAPTER 5

THE EVOLUTION OF BODY, BRAIN, BEHAVIOR, AND MIND FROM BASAL MAMMALS TO PROSIMIANS

The Dawn of Substantive Perception

CHAPTER 6

THE EVOLUTION OF BODY AND BRAIN, AND OF SENSORY AND MOTOR PROCESSING IN MONKEYS

Hand-Eye Coordination, Manual Dexterity, and Substantive Perception

CHAPTER 7

THE EVOLUTION OF HIGHER LEVEL NEURAL AND MENTAL FUNCTIONS IN MONKEYS

Motivational, Affective, Mnemonic, and Cognitive Advances

CHAPTER 8

THE EVOLUTION OF BODY, BRAIN, BEHAVIOR AND MIND IN CHIMPANZEES

Further Advances in Tacit Awareness

PART III: THE HUMAN MIND

CHAPTER 9

THE EVOLUTION OF BODY, BRAIN, BEHAVIOR, CULTURE, AND MENTALITY FROM THE PALEOLITHIC TO THE NEOLITHIC

Emergence of Reflective Consciousness

CHAPTER 10

TECHNICAL, SOCIAL, CULTURAL AND MENTAL EVOLUTION FROM THE ARCHAIC MIDEASTERN TO THE CLASSICAL GREEK AND ROMAN CIVILIZATIONS

Towards the Liberation of Consciousness

CHAPTER 11

TECHNICAL, SOCIAL, CULTURAL AND MENTAL EVOLUTION FROM THE DARK AGE THROUGH THE MIDDLE AGES OF WESTERN CIVILIZATION

Banishment of the Freedom of Consciousness

CHAPTER 12

SCIENTIFIC AND TECHNICAL ADVANCES, AND POLITICAL, ECONOMIC AND SOCIAL DEVELOPMENTS FROM THE EARLY MODERN AGE UNTIL THE PRESENT

The Promotion and Resistance to Universal Rationalism

CHAPTER 13

HUMAN PERSONLITY DIFFERENCES AND INDIVIDUAL ASSIMILATION IN MODERN SOCIETIES

Realizing Individual Potential in Imperfectly Structured Societies

BIBLIOGRAPHY