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The lives of the brain: *Human evolution and the organ of mind*

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Book Review

Humans are generally curious about their origins, and most cultures have stories relating to this concern. Now we know that our species originated in Africa, approximately 200,000 years ago. Six million years earlier, an ape-like ancestor, who walked on two legs and had new eating habits and reduced dentition, led to subsequent hominin species that gradually acquired a very large brain of unprecedented functional capacity. In The Lives of the Brain, John S. Allen — a neuroanthropologist at the Dana and David Dornsife Cognitive Neuroscience Imaging Center and Brain and Creativity Institute at the University of Southern California — captures this history and expands on what we know about the human brain. The scope and scholarship of this book is impressive. Allen discusses relevant contributions from the past, such as those of 100 years ago by W.E. LeGros Clark and G. Elliott Smith on comparative aspects of brain anatomy, covers the major contributions of researchers over the last 60 years, and includes the most recent results and conclusions of current investigators. There is much to learn, even by the experienced investigator, from reading this book, which is also a treat for any science-loving reader. Each chapter deals with a different topic and a surprising number of subtopics. For example, an early chapter introduces us to the brain and its basic […]

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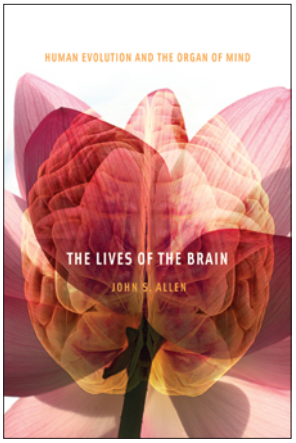

The lives of the brain

Human evolution and the organ of mind

John S. Allen
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Humans are generally curious about their origins, and most cultures have stories relating to this concern. Now we know that our species originated in Africa, approximately 200,000 years ago. Six million years earlier, an ape-like ancestor, who walked on two legs and had new eating habits and reduced dentition, led to subsequent hominin species that gradually acquired a very large brain of unprecedented functional capacity. In *The Lives of the Brain,* John S. Allen — a neuroanthropologist at the Dana and David Dornsife Cognitive Neuroscience Imaging Center and Brain and Creativity Institute at the University of Southern California — captures this history and expands on what we know about the human brain. The scope and scholarship of this book is impressive. Allen discusses relevant contributions from the past, such as those of 100 years ago by W.E. LeGros Clark and G. Elliott Smith on comparative aspects of brain anatomy, covers the major contributions of researchers over the last 60 years, and includes the most recent results and conclusions of current investigators. There is much to learn, even by the experienced investigator, from reading this book, which is also a treat for any science-loving reader.

Each chapter deals with a different topic and a surprising number of subtopics. For example, an early chapter introduces us to the brain and its basic neuroanatomy, but it also covers early, and now discarded, theories of brain evolution, the recognition that neocortex is not really new, and the debate over the value of the lunate sulcus as a marker of the border of the primary visual cortex in the endocasts of the brains of now extinct hominins. In this chapter, Allen is more optimistic than some of us would be in concluding that the classic Brodmann areas of the brain "can be readily identified as homologous units across primate species." Progress in understanding brain evolution would have been much greater if this were the case, and many present day controversies would have been resolved.

In the same chapter, Allen discusses the growth of comparative neuroscience over the past several decades, methods of determining the functional divisions of the brain, including informative studies of patients with lesions, and Wilder Penfield's electrical stimulation studies of human cortex. He concludes with the reflection that most neuroscientists today do not study brains directly but representations of brains on computer screens. Such has been the impact of functional brain-imaging techniques.

Other chapters are equally broad and varied. A chapter on brain size contains a nice history of early investigations, a review of the cranial capacity of fossil hominins, the problem of giving birth to a baby with a large brain, and a discussion of the relative roles of brain size increases compared with changes in brain organization in human brain evolution. Subsequent chapters on brain evolution range from discussion of the modified position of the foramen magnum with the evolution of bipedality, the degeneration of the human olfactory system, the recently published views on the functions of spindle cells of the human brain, the lunate sulcus debate, and frontal lobe evolution. Allen also draws examples of brain evolution from nonhuman species. Thus, he draws attention to the larger hippocampus for the memory of hidden food in food-storing birds. A chapter on the plastic brain considers the relative roles of genetic and environmental factors in brain development and brain plasticity as a result of learning and experience. Molecular and genetic aspects of brain development and evolution are covered further in a subsequent chapter. Elsewhere, we are told about the energy costs of the brain and how changes in diet were necessary in order to allow the evolution of big human brains. We are reminded that humans live a very long time compared with other primates and given reasons why a long life may have been selected for in human evolution. We are reassured by the evidence that human brains can be expected to function fairly well for at least 70 years, although some regressive changes are expected. A thoughtful chapter on the evolution of language covers the last 20 years of intensive research and debate, as well as earlier contributions. For those outside the field of linguistics, this chapter provides a good introductory background.

At the book's conclusion, Allen clearly feels that there has been great recent progress in understanding the evolution and organization of the human brain, but there is so much more to learn. He concludes that the large human brain reflects the evolution of many different cognitive adaptations. Perhaps most important is the ability to look into the future and reflect on the past, a cognitive ability that is said to be unique to humans. We can do both while reading this book.