

An artist's impression of the kind of social group in which early humans may have lived.

SOCIOBIOLOGY

The distributed brain

Herbert Gintis salutes the follow-up to a study on sociality and hominin brain size.

Sociobiology was born in 1975, when biologist Edward O. Wilson published the volume that gave the field its name. There are many social species, and we can gain insight into human sociality by comparing it with sociality in other animals.

Several factors have propelled sociobiology to prominence in the behavioural sciences. Perhaps most important was the waning of a major impediment: the idea that linking human behaviour to genetics fuels racist ideology. Furthermore, as researchers learned about the lives of birds, primates and insects, the concept of social structure as a general biological category arose. Finally, the value of interdisciplinary research such as sociobiology became apparent in many areas in which complex systems cannot be understood using the conventional field categories.

Sociobiology in *Homo sapiens* is especially complex because of the enormous part played by culture in human evolution, which is explored in gene-culture coevolutionary theory. In *Thinking Big* — a follow-up to the edited volume *Social Brain, Distributed Mind* (Oxford University Press, 2010) — Robin Dunbar, Clive Gamble and John Gowlett explore the growth of the brain from early

hominids to modern *Homo sapiens*, which has a ratio of brain to body mass three times that of other primates.

Large brains are very costly. Increased cranial capacity required the restructuring of the human birth canal and led to birth before the fetus is fully matured. This in turn led to prolonged and collective child-rearing. In the average adult human, the brain represents about 2% of body weight, but consumes about 20% of calories. What could the counterbalancing advantages of large brains be?

The conventional answer has been skillful tool use. We now know, however, that hominin brain growth preceded by more than half a million years the emergence of material culture — visual art, hafted tools, crafted containers and written language, all of which began to appear some 70,000 years ago. Richard Byrne and Andrew Whiten's *Machiavellian Intelligence* (Oxford University Press, 1988) insightfully shifted the focus from technical to social skills, suggesting that a sharp wit conferred fitness by enabling

Thinking Big: How the Evolution of Social Life Shaped the Human Mind

CLIVE GAMBLE, JOHN GOWLETT AND ROBIN DUNBAR

Thames and Hudson: 2014.

individuals to deceive and manipulate. In this view, the large brain is the product of an arms race that is a drain on species-level fitness. Given the intense competition among hominins to fill the hunter-gatherer niche, this theory of human hypercognition seems implausible: the energy wasted in mutual deception would reduce human fitness, favouring small-brained competitors.

In *Thinking Big*, Dunbar, Gamble and Gowlett supply a more credible theory with their "social brain hypothesis". They describe the major findings of the ambitious 7-year project 'Lucy to Language: The Archaeology of the Social Brain', which involved more than 30 researchers and 5 UK universities, and was backed by the British Academy, the national funding body for humanities and social sciences. The authors show that there is a strong correlation between relative neocortex volume and mean social-group size in monkeys, apes and humans. They attribute this to the fact that the complexity of group interactions increases with group size. A large brain gives individuals the means to forge strong social ties that enhance their personal fitness and the group's social cohesion; in particular, a large neocortex

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supports a “theory of mind”, whereby individuals can form mental representations of the beliefs and intentions of others. This enables them to enter into complex agreements and coalitions, and to track multiple social relationships through time and space.

Social Brain, Distributed Mind is rather more detailed. It brings together an array of archaeologists, anthropologists, geographers, psychologists, palaeontologists, historians and philosophers involved in Lucy to Language, who together construct a plausible “cognitive anthropology” that defends the social brain hypothesis, while exploring the idea that the human mind is not confined to individual brains, but lives in a social network of minds across which cognition is distributed. They thus handle the problem of brain growth long preceding the emergence of material culture.

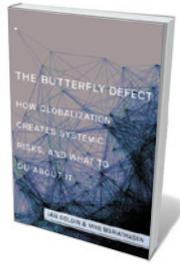
The contributors argue that long before material culture, early hominins developed a “material memory system” in the form of tokens and containers. This linked the mental power of many individuals, and led to a transition from knowledge acquisition and learning based on personal discovery to cognition based on social interaction and sharing. With distributed cognition, knowledge lies not only in the individual, but also in the social roles and iconic artefacts that link minds. For instance, humans have formed ‘fission–fusion’ social groupings in which kin relationships are maintained across subgroups, both males and females migrate to marry, and complex, powerful, fitness-enhancing familial alliances are sustained.

How plausible is the idea that we have big brains because we evolved to live in large groups, putting heavy cognitive demands on our ability to forge close social bonds with large numbers of individuals? My own view is that hunting required a high level of coordinated decision-making, and that the presence of lethal weapons undermined our ape ancestors’ characteristic social-dominance hierarchy, which was based on the physical prowess of the alpha male. This created a leadership void that could be filled not by appeal to physical strength, but rather by social persuasiveness and then a subtle ability to form effective coalitions.

The result was a political structure in which linguistic facility and cognitive skills were rewarded with enhanced reproductive fitness. The social brain, then, helped our ancestors to operate successfully in a proto-democratic framework. ■

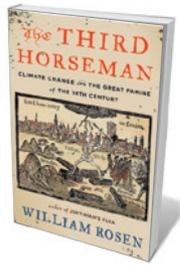
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Books in brief



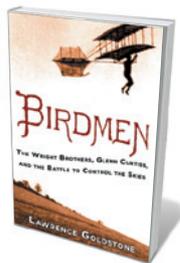
The Butterfly Defect: How Globalization Creates Systemic Risks, and What to Do about It

Ian Goldin and Mike Mariathasan PRINCETON UNIVERSITY PRESS (2014)
In a nod to chaos theory’s butterfly effect — in which tiny perturbations unhinge big non-linear systems — this treatise explores globalization’s built-in risks. Economists Ian Goldin and Mike Mariathasan analyse systemic vulnerabilities leading to cyber-attacks or pandemics, and look at the ecological risks integral to globalization. The sustainable management of such tangled interdependency, they argue, demands governance reform, including the setting up of research-led bodies to tackle big issues such as climate change.



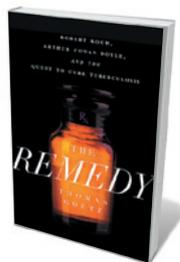
The Third Horseman: Climate Change and the Great Famine of the 14th Century

William Rosen VIKING (2014)
A kink in Europe’s climate during the fourteenth century indirectly triggered a seven-year cataclysm that left 6 million dead, William Rosen reveals in this rich interweaving of agronomy, meteorology, economics and history. The Great Famine ended the explosion in agricultural productivity of the 400-year Medieval Warm Period, which affected mainly North Atlantic civilizations. Rosen deftly delineates the backstory and the perfect storm of heavy rains, hard winters, livestock epidemics and war leading to the catastrophe.



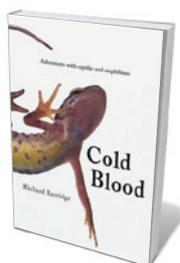
Birdmen: The Wright Brothers, Glenn Curtiss, and the Battle to Control the Skies

Lawrence Goldstone BALLANTINE BOOKS (2014)
The daredevil scientists and engineers who forged the field of aeronautics spring vividly to life in Lawrence Goldstone’s history. Wilbur Wright is famed for cracking the conundrum of powered, controlled, heavier-than-air flight through leaps of intuition and reasoning. Less known is his and brother Orville’s feud with ace flyer and motor designer Glenn Curtiss. Goldstone never stints on the science in tracing the trio’s patent wars and struggles to monopolize the industry over a decade of dazzling innovation.



The Remedy: Robert Koch, Arthur Conan Doyle, and the Quest to Cure Tuberculosis

Thomas Goetz GOTHAM BOOKS (2014)
What does germ theory have to do with evergreen fictional sleuth Sherlock Holmes? Science writer Thomas Goetz reveals all in this history of the hunt to cure tuberculosis (TB), centring on young physician Arthur Conan Doyle’s 1890 trip to Berlin to report on bacteriologist Robert Koch’s TB remedy, tuberculin. Conan Doyle rightly doubted its efficacy. But, impressed by Koch’s postulates that particular organisms cause diseases, he intensified his focus on the scientific method and the hunting of other insidious villains in fiction.



Cold Blood: Adventures with Reptiles and Amphibians

Richard Kerridge CHATTO AND WINDUS (2014)
Nature writer Richard Kerridge fed, as a child, on accounts of black rhinoceroses, red river hogs and mandrills. His native Britain lacked such faunal glories — or so he thought, until he discovered the glistening hordes of amphibians and reptiles lurking in grass, bogs and leaf litter. In this mix of natural history, memoir and thoughts on the “cultural functions of wild animals for human beings”, captured moments such as the golden flash of a palmate newt delight the reader as much as they did Kerridge’s childhood self. [Barbara Kiser](#)