experiment with broadcasting from planetariums and scientific expeditions, but it was too little, too late. By then, the airwaves were being controlled by the national networks, and the networks’ gatekeepers had decided that science couldn’t pay its own way.

The pattern would be repeated in the early years of television, where complex production requirements, expensive sets, and demanding visuals left little room for amateurish productions. As on the radio, the most creative uses of the medium for science popularization came from media behemoths like ABC and Disney rather than scientific institutions.

LaFollette minces no words in referring to the “imaginative failures” of the American scientific establishment in making use of mass media technologies. Commenting on an effort to increase the amount of educational programming on 1930s-era radio, for example, she argues that the scientific organizations’ “inability…to cooperate with each other, their intellectual snobbery and undisguised disdain for the very medium they were supposedly trying to utilize, and their unwillingness to invest significant resources in production of quality programs all hobbled their effectiveness.” LaFollette’s extensive use of archival collections, including meeting minutes and personal correspondence, offers ample support for her damning conclusions. Her criticism is bracing but fair. Now, she argues, podcasts, online video-sharing sites, and blogs are giving scientists another opportunity to communicate directly with the public. The question is: Will they take it?

10.1126/science.1168311

NEUROSCIENCE

Who Are We?

Ralph Adolphs

It is blatantly apparent that humans are quite different from all other animals, in ways both good and bad. But articulating what that difference consists of and uncovering the biology behind it has formed a large and difficult project tackled by biologists, anthropologists, psychologists, and philosophers. Michael Gazzaniga’s Human: The Science Behind What Makes Us Unique provides a masterful overview of what we know, who the key players are, and what the future might hold. The book is at once dense with facts (there are 748 endnotes) and an easy read; it is both entertaining and informative.

Gazzaniga, a professor of psychology at the University of California, Santa Barbara, is the director of the SAGE Center for the Study of the Mind at UCSB. There he has been absorbing the views of scholars in residence who visit for weeks to months, a rich source of information reflected in the book’s contents. Human is organized into four parts: The first describes some of the genetic, cellular, and behavioral ways in which humans may be unique and sets the stage for the subsequent sections, which emphasize cognition and the brain. The second and third parts treat topics ranging from morality to empathy to art and conclude with two chapters discussing consciousness. The fourth part provides a view to the future, exploring such possibilities as brain-machine interfaces and artificial intelligence. Roughly speaking, the book becomes more speculative, and tackles tougher topics, the further one reads.

Although the majority of topics that Gazzaniga discusses in the book are contentious, many of them highly so, his treatment of them is scholarly and balanced. No grand conclusions are drawn, and he does not offer specific theories of his own so much as survey those of others. The book is also highly accessible, quite a feat given its scope and density. Brief interludes provide the science background for those who need it. For instance, the last chapter includes, sandwiched between discussions of fbyborgs (functional cyborgs) and cyborgs, a wonderful 5-page introduction to cellular neurophysiology to help readers understand what follows. Each chapter also ends with a brief conclusion, which summarizes the main points. The author is clearly someone who has written textbooks and knows how to teach.

Perhaps not surprisingly, Gazzaniga favors a modular view of the mind informed by evolutionary psychology, a view he previously advocated in The Social Brain (1) and one in line with people he frequently cites (Steven Pinker, Leda Cosmides, John Tooby; the latter two colleagues of his at UCSB). Modules make fun reading and serve to quantify the exposition. But how do they work together? The penultimate chapter tackles the issue of how various modules coordinate their activity and selectively contribute to the contents of our integrated conscious experience. It begins with a brief reminiscence of how the author once lost consciousness as an intoxicated college student (he was at the time a member of the original Animal House at Dartmouth) and quickly moves on to survey some of the most popular theories and review his own. In one of his early books [(2), co-authored with his student Joseph LeDoux], he introduced readers to “the Interpreter”: a left-hemisphere mechanism that analyzes our actions, integrates the outputs from many modules, and generates a narrative that constitutes our stream of conscious experience. Yet Gazzaniga clearly notes that our ability to consciously experience the world is shared with many other animals, even though the nature of human consciousness may be unique.

So what are the aspects of cognition that make humans unique? Gazzaniga considers a long list: control over our thoughts, emotions, and actions; planning into the future; self-reflection and self-consciousness; language; aspects of imitation and social learning; episodic memory; imagination; creativity; cooperation and altruism; theory of mind; and many more. Trying to find a single theme that ties all these together or subsumes them is daunting. Nor is it clear whether these are differences in degree or in kind. Gazzaniga does not attempt an answer here, although he hints at one in the book’s short Afterword: “Just like other animals, we are constrained by our biology. … But the ability to wish or imagine that we can be better is not a universal species”.

Thus this ability to step outside of ourselves—to view the world and us in it from arbitrarily abstract perspectives—does indeed seem uniquely human, and it cuts across many of the specific abilities in the above list. It makes us responsible for our actions and inactions in a way that other animals are not. It is our burden and yet offers hope for our species and our planet.

Human delivers what the best popular science writing should. Gazzaniga tackles the most difficult questions, provides an expert survey of the field, and, most important, instills a sense of wonder and enjoyment about the subject matter. Lay readers and young scientists alike should benefit, and perhaps our species will too.

References

10.1126/science.1169620