

EMBODIED COGNITION

A grasp on human thinking

Elsbeth Stern weighs up two studies probing the idea of the brain as the body's servant.



Rock art in the Cave of the Hands, Argentina, dating to between 9,500 and 13,000 years old.

How has *Homo sapiens* uncovered the laws of nature, invented technology and established culture and institutions? Most scientists' answers to that question have been top-heavy, referring to language, symbolic reasoning and consciousness as unique human abilities on which comprehension, analysis, abstraction and reasoning are based. Since the 1950s, those abilities have increasingly become a focal point for psychological research. Encouraged by progress in informatics, researchers began to create digital models of the processes by which sensory input is selected by the brain, stored in the memory, connected to existing knowledge and used for elaboration. These 'cognitive architectures' were supposed to simulate and predict learning, reasoning, complex problem-solving and decision-making.

This algorithmic focus on mental activities ignores the fact that human beings engage with evolutionary pressures using their entire bodies — a point explored by

psychologist Guy Claxton in *Intelligence in the Flesh*, and by philosopher Colin McGinn in *Prehension*.

Intelligence in the Flesh deals with the unity of mind, brain and body in human information-processing, including higher cognition and academic learning. Claxton argues that humans would think and behave differently if their physiological functioning were different. For instance, there is research that shows how holding a cup of hot coffee or receiving other sensory input through the skin can influence judgement and decision-making (L. E. Williams and J. A. Bargh *Science* 322, 6060–607; 2008), a fact entirely ignored in cognitive theories that confine themselves to visual and auditory input. The brain coordinates information, but it is the "servant, not master of the body", notes Claxton.

McGinn's focus in *Prehension* is the human hand. He is not the first to emphasize that thanks to their bipedal gait, early humans did not need their 'forepaws' for

Intelligence in the Flesh: Why Your Mind Needs Your Body Much More Than it Thinks

GUY CLAXTON

Yale Univ. Press: 2015.

Prehension: The Hand and the Emergence of Humanity

COLIN MCGINN

MIT Press: 2015.

BETTINA STRENSKE/LAWRY

locomotion, freeing them to manipulate the environment with the help of tools. However, McGinn goes further, positing that the multiple opportunities provided by our hands shape our concepts of the mind. Therefore we conceive cognitive processes in manual terms, such as 'grasping an idea'.

Claxton and McGinn value higher-order cognition and academic learning differently. McGinn argues that the close interaction between brain and hand allowed humans to find their evolutionary niche through the discovery of physical tools, as well as mental ones such as language or mathematical symbols. He claims that using the hands for pointing and communicating resembles 'air writing', and thereby facilitated the invention of script. Claxton, by contrast, thinks that cognitive competencies based on symbolic systems such as writing (which he pejoratively labels "Cartesian education" in reference to philosopher René Descartes's idea of mind-body dualism) are overvalued, whereas handicrafts and vocational education are undervalued. A strong focus on academic learning and abstract reasoning does not meet the needs of the majority, he argues — to the point that this form of intelligence is essentially alien to humans. Meanwhile, McGinn posits that it is why our otherwise sparsely equipped species has survived.

There is a bullish flavour to their modes of argument that shows that Claxton and McGinn are aware of how controversial their claims are. In fact, how new and robust is the science in each book? Criticism of the shortcomings of cognitive architectures is no novelty. Since the 1980s, the evolutionary aspects of human behaviour and cognition have become a seminal topic throughout psychology. It is widely acknowledged that humans are challenged by the fact that we are adapted to the world as it existed more than 30,000 years ago. It is fully accepted that we are born endowed with perceptual and behavioural programs that were

adaptive for our earliest ancestors and that still affect our behaviour, information-processing and emotional functioning. So when criticizing a Cartesian view of human learning, the authors are preaching to the converted.

Both books are slippery in their dealings with state-of-the-art research. McGinn almost entirely ignores empirical psychology research and instead provides evidence based mostly on plausibility — for instance, when he claims that humans have privileged access to geometry because they can form circles and triangles with their fingers. There is prominent research confirming his emphasis on the pivotal role of hand-brain interaction in human cognition, including dozens of studies on the importance of gesturing in learning. Psychologist Susan Goldin-Meadow's *Hearing Gesture* (Harvard University Press, 2003) is one. McGinn also refers to the views of developmental psychologist Jean Piaget regarding sensorimotor activity as the foundation of cognition in early child development. Yet for more than 30 years, psychologists have shown that the brains of newborns are endowed with core knowledge that prepares them to represent information about objects, quantities and actions long before they can grasp with their hands.

Claxton cherry-picks from psychology and neuroscience literature. When he attacks conventional school education, he provides anecdotal evidence about unhappy children, but ignores evidence-based attempts to improve schooling — for instance, by bringing everyday experience into the teaching of science

“Human beings engage with evolutionary pressures using their entire bodies.”

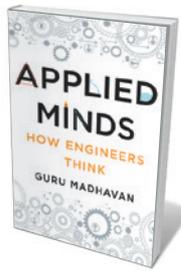
and mathematics. Claxton's claim that performance in intelligence tests is unrelated to factors important in real life is not reflected in

state-of-the-art research, such as the more than 100 publications based on studies of the Lothian Birth Cohort, headed by psychologist Ian Deary of the University of Edinburgh, UK. Intelligence, Deary has shown, is not only significantly related to educational and professional outcome, but is also a factor in positive well-being, health and longevity.

Intelligence in the Flesh and Prehension are eloquently written, refreshing and entertaining. But Claxton and McGinn fight many straw men, and often fail to provide evidence for provocative statements. ■

Elsbeth Stern is a psychologist and professor of teaching and learning research at the Swiss Federal Institute of Technology in Zurich. e-mail: elsbeth.stern@ifv.gess.ethz.ch

Books in brief



Applied Minds: How Engineers Think

Guru Madhavan W. W. NORTON (2015)

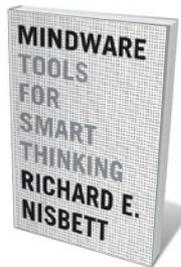
Engineers are titans of real-world problem-solving, yet are strangely invisible, notes biomedical engineer Guru Madhavan. In this riveting study of how they think, he puts behind-the-scenes geniuses such as Margaret Hutchinson, who designed the first penicillin-production plant, centre stage. And, in a feat of reverse engineering, he shows how engineers' methodology — rigorous analysis, testing and orientation towards solutions — is bedded in modular systems thinking, a mindset strong on visualizing structure, designing under constraints and weeding out weak goals in trade-offs.



A River Runs Again: India's Natural World in Crisis, from the Barren Cliffs of Rajasthan to the Farmlands of Karnataka

Meera Subramanian PUBLICAFFAIRS (2015)

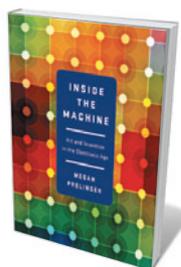
In the middle of India's boom, malnutrition among Indian children is rife. Journalist Meera Subramanian, in search of sustainable solutions for the subcontinent's 1.2 billion people, criss-crossed it to meet scientists and citizens grappling with familiar dilemmas such as child marriage and polluting cooking stoves. Subramanian's analysis is fresher when she takes on the inefficiencies and worse of 'big aid', and her mapping of the micro solutions — such as village rainwater collection — suited to a country of small enterprises.



Mindware: Tools for Smart Thinking

Richard E. Nisbett FARRAR, STRAUS & GIROUX (2015)

How do we decide whether theories are sound or knowledge is only conjectural? Social psychologist Richard Nisbett has drilled into decision-making to produce this “cognitive tool kit” of principles and ideas to aid the process. Inspired by the “seamless web” of science — the interdisciplinary seepage of methods and facts — he draws on economics, psychology and logic for a rich haul. Expect insights in areas ranging from the role of conformism in energy use to the differences in Eastern and Western thinking, and tools from basic statistics to the multipurpose heuristic KISS (keep it simple, stupid).



Inside the Machine: Art and Invention in the Electronic Age

Megan Prelinger W. W. NORTON (2015)

When electronics took off in the 1930s, US technology companies were suddenly forced to convey 'invisible science' visually. A bold brigade of commercial artists began to tackle the physics and components with creative brio — but this flowering withered in the 1960s, when the workings of electronics had been absorbed into the culture. For this unusual and compelling study, cultural historian Megan Prelinger has gathered a trove of superb examples. Some are patently influenced by abstract artists such as Wassily Kandinsky, others by surrealism, concrete poetry and science-fiction illustration.



Mess: One Man's Struggle to Clean Up His House and His Act

Barry Yourgrau W. W. NORTON (2015)

Nineteenth-century philosopher Ralph Waldo Emerson wrote, “Things are in the saddle, / And ride mankind”. A thought resonant in a consumerist era, it might also be seen as a comment on hoarding, a condition now associated with obsessive-compulsive disorder. In a memoir mixing sorrow and hilarity, self-confessed clutterer Barry Yourgrau records how he jettisoned junk and traumatic memories by joining Clutterers Anonymous, poking at relevant neuroscience and working his way towards a rapprochement with things. [Barbara Kiser](#)