
BOOK REVIEWS

Our Brain as Stone Age Computer

DOI: 10.1017/S1355617708080223

Evolutionary Cognitive Neuroscience. 2007. Steven M. Platek, Julian P. Keenan, & Todd K. Shackelford (Eds.). Cambridge, MA: MIT Press, 616 pp., \$65.00 (HB)

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Clinical neuropsychologists are most interested in the ‘what’ of brain function. Neuropsychological assessment requires only a working knowledge of functional localization and the tests best suited to capture that specialization. The ‘why’ of cortical specialization is not necessary for good clinical work. The edited volume *Evolutionary Cognitive Neuroscience* is entirely devoted to the ‘how’ and ‘why’ of brain specialization based on the fact (not ‘theory’) of natural selection. Editors Steven Platek, Julian Keenan, and Todd Shackelford are well qualified to organize and write this book; they devoted their careers to understanding neuropsychological functions as evolved mechanisms designed to solve recurrent survival and reproduction problems of our evolutionary past. In this view, our brains are Stone Age computers.

The first three chapters introduce the heresies of evolutionary psychology (EP). Chapter 1 concisely summarizes the premises, middle theories, and inferential methods of EP. Of greatest interest is the premise of domain-specificity: Neuropsychological mechanisms evolved to solve specific adaptive problems recurrent since hominids’ emergence on African savannahs. These problems do not include *Australopithecus* solving the Wisconsin Card Sorting Test, but do include finding a mate and high fat foods, managing social exchange of resources, spotting social cheaters, and remembering the best food locations. Robin Dunbar (Chapter 2) develops the argument that *homo sapien’s* explosive brain growth was driven by selection pressures generated by an earlier adaptation: Sociality. Dunbar refutes Stephen Gould’s (politically appealing) argument that large brains are just a byproduct of body size. But large brains are metabolically expensive, consuming up to 25% of calories and Dunbar argues there must be net benefits justifying this cost, such as a need for many specialized social-cognitive processors. Shilpa Patel and colleagues (Chapter 3) briefly review evolutionary neuroscience methods. These include neurogenetics, functional neuroimaging, and naturalistic observation. The reader learns of a recently discovered allele controlling

brain growth that emerged just 5,800 years ago. Clearly, our brain growth is still under selection pressure.

Section II contains four chapters focusing on brain development and ontogeny. Valerie Stone (Chapter 4) examines how comparative neuroanatomy and primate neural ontogeny are rich sources of inference about what mental abilities were selected for (e.g., the necessity of long-term bonding behaviors). Stone’s frequent use of the term “executive brain” refers not to prefrontal cortex but to the ratio of neocortex + striatum to brain stem volume. Stone’s list of abilities she believes most uniquely human (like recursion, planning) may already be out of date, as recent studies imply some birds are capable of foresight (Zimmer, 2007). William Hopkins of the Yerkes Primate Lab summarizes his work on handedness and hemispheric specialization in chimpanzees (Chapter 5). He convincingly marshals converging behavioral and morphological evidence that most ape species are predominately right handed; only *Pongo* (orangutan) appears strongly left handed. Rush-ton and Ankney (Chapter 6) exhaustively review the relation between brain size and intelligence. Despite the common belief that brain size has nothing to do with IQ in humans, the authors show increasingly stronger correlations between IQ and brain size as one moves from indirect measures (e.g., head circumference) to direct measures (MRI brain volume, purified measures of *g*). The authors recognize that correlation does not prove causation, but their review of various adoption studies allows them to eliminate some causal pathways of the pure cultural type. The Lori Marino chapter (#7) is a well-written treat: *Brain and Cognition in Cetaceans*. The author integrates fascinating facts about whales and dolphins, including a unique neocortical histoarchitecture: cetaceans lack both cellular Layer IV and prefrontal cortex. Yet, recent (albeit limited) research shows dolphins capable of executive-cognitive tasks such as uncertainty monitoring and self-awareness. Marino reasonably concludes that cetaceans distribute and represent incoming information much differently but are

still capable of complex cognition; there is more than one evolutionary path to complex problem solving.

Section III presents the heart of evolutionary psychology: Exploring links between ancient fitness problems (e.g., reproduction) and the neuropsychological mechanisms that help solve them. Russell Fernald (Chapter 8) addresses biological correlates of social status through an unusual but well-developed literature: The social behavior of the African cichlid fish (*A. burtoni*). The author shows how social status and adult models influence the nervous system control of testicular size and attendant aggression level. The chapter also speaks directly to the neurobiology of deception: Less dominant males change their markings to better resemble female cichlids, allowing feeding opportunities in the territories of dominant males. The main teaching of this chapter is that social environment is also a source of selection pressure, a point made long ago by Konrad Lorenz. Facial recognition has been a good topic for both evolutionary and clinical neuropsychologists since Hamilton (1964) coined the term *kin selection* to revolutionize natural selection theory, and authors Platek and Thomson (Chapter 9) show how ancient problems such as paternity certainty and male parental investment influences facial processing. The authors cite an fMRI study showing male prefrontal cortex activating only when viewing children's faces resembling the respondent's face; female prefrontal cortex activated irrespective of personal resemblance. Most neuropsychological tests deal with "cold" cognitions, but Fisher and Thomson (Chapter 10) heat things up by asking whether antidepressant drugs disable the evolved cognitive machinery controlling mating behavior. The authors review the neurochemical systems underlying male-female attachment, and try to show how serotonin inhibits the process. Although the hypothesis is intriguing, the authors rely solely on clinical anecdotes. David Newlin (Chapter 11) attempts to link reproductive behavior to substance use disorders with his SPFit theory (Self-perceived survival and reproductive fitness). This is the view that the corticomesolimbic dopamine system evolved not for "reward" of operant behaviors but for motivating basic survival and reproductive behaviors; the "self-perceived" portion refers to an individual's internal representation of the goal states of survival and reproduction. This chapter was difficult to follow because SPFit theory has too many working parts based on even more foundational premises; the theory could benefit greatly from simplification.

Section IV links the two cornerstones of cognitive psychology, spatial cognition, and language, to sex differences. A major premise of EP is that sex differences are reproduction strategies (termed "ultimate causation"), and each strategy is associated suites of different cognitive abilities (termed "proximate causation"). David Andrew and colleagues (Chapter 12) review the considerable literature showing sex differences in spatial ability, both at morphological and cognitive score levels. The reader learns the many factors that influence hippocampal volume such as hormones, species mating system, territorial range, and genetic defects. The authors fur-

ther ask what real world challenges these dimorphic differences addressed (e.g., the "hunting versus foraging" hypothesis). Ruben Gur and colleagues (Chapter 13) try to emphasize the *why* and *how* of spatial ability differences in EP terms, but cover the same topics and research, making this chapter redundant with Chapter 12. Michael Corballis (Chapter 14) tackles language evolution. Corballis makes clear the origins of grammatically complex language are murky and he maintains a disciplined speculative voice. The broad questions he raises include language as a simple by-product of a large brain versus causation by specific genetic mutations, such as the *FOXP2* gene, whose absence results in congenital Broca's aphasia. Corballis speculates that mirror neuron (those that fire when we observe others act) patterns came to represent abstractions of action, which were eventually vocalized. In my view, mirror neurons may explain our capacity for vicarious learning, but begs the question why complex utterances evolved for us to copy.

The five chapters of Section V cover the big topics of self-awareness and social cognition. Laurie Santos and co-authors advance the case that nonhuman primates have Theory of Mind (ToM) capacity. The authors fairly and objectively document the copious evidence against apes' having ToM, but based on well-designed studies, they argue apes can use knowledge of other players' visual state-of-mind to compete for resources. Focquaert and Platek (Chapter 16), *Social Cognition and Self-Awareness*) provide a philosophical exposition on the evolution of self-awareness. They integrate autism, ToM, neuropathological, and primate data to argue that human capacity to attribute mental states and self-awareness co-evolved. In the most provocative chapter in this book (17), Simon Baron-Cohen advances an assortative mating theory of autism. He argues autism results from mating of persons with compulsive cognitive styles, termed "high systemizers". Pediatric neuropsychologists may be reminded of psychoanalyst Bruno Bettelheim's now discarded causal theory of "cold professional parents", but Baron-Cohen's scientific stature justifies at least temporary suspension of disbelief for a fair reading. Sean Stevens and colleagues discuss how focal brain injury affects the regulation of self-deception in Chapter 18. The authors offer various neurobehavioral syndromes (asomatognosia, delusional misidentification) and errors of normal cognition (false remembrance, positive self-bias) as evidence for evolved self-deception mechanisms. A puzzling omission in this otherwise fine chapter is consideration of *failures* in self-deception and detection of social cheating. In my view, persons with prefrontal damage show evidence for increased gullibility and naiveté. Stephen Kosslyn writes the only chapter championing the dominant role of culture (Chapter 19); he introduces the concept of *social prosthetic systems* to address the plastic properties of human behavior that cannot be genetically preprogrammed. This is the notion that we use other people to extend our cognitive capacities or goals. A logician would call Kosslyn's argument self-sealing (unfalsifiable). More troubling is that Kosslyn did not cite evolutionary biologist Richard Dawkins, even though

Kosslyn's idea is clearly derivative of Dawkins' theory of "the extended phenotype".

The two chapters of Section VI are integrative. Kimberley and Wolpe discuss the ethical implications of evolutionary cognitive neuroscience (Chapter 20). The reader of this chapter comes away with a good understanding of the fears generated by EP approaches to cognition, for example, concerns that murderers will not be held responsible for heinous acts. The Editors wrap things up in Chapter 21. They emphasize the importance of cross-fertilization between genetics, cognitive psychology, archaeology, anthropology, and primatology as the fuel driving major theorizing and advances.

Clinical neuropsychology could use the cross-fertilization that EP provides. The oft-repeated truism that "psychology gives itself away" applies yet again. How many readers have heard of psychologist Harry J. Jerison and his Enceph-

alization Quotient (EQ)? This ratio of observed brain to expected brain volume (based on body size) is an analytic tool widely employed in many fields, but not in psychology. *Evolutionary Cognitive Neuroscience* is best suited for academic neuropsychologists or those clinicians at a life-stage where they desire to reflect on theory. I guarantee parts of this book will be unnerving to those who resist certain scientific ideas because of deeply held egalitarian or religious impulses. But science is antidemocratic; good ideas are not proven by a show of hands.

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All the Important Things You Wanted to Know About the Effects of Stroke: Location, Location, Location

DOI: 10.1017/S1355617708080235

The Behavioral and Cognitive Neurology of Stroke. 2007. Olivier Godefroy and Julien Bogousslavsky (Eds.). Cambridge, UK: Cambridge University Press, 664 pp., \$160.00 (HB)

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The Behavioral and Cognitive Neurology of Stroke is a very handy reference book for the bedside or brief office examination of the stroke patient. The initial chapter highlights the need for serial mental status exams during the critical initial post stroke period. The book is then organized by functional sections, each containing several chapters. The sections are organized by neuropsychological processes in the usual "walk around the brain" format. Thus, the reader is offered sections on motor and gestural disorders, aphasia and arthric disorders, hemineglect and right hemisphere syndromes, agnosia and Balint's syndrome, and executive and memory disorders. Of great significance is the inclusion of a section on behavioral and mood disorders, which reviews the clinical domains where the disciplines of psychiatry and neurology overlap. The final section, dementia and anatomical left/right syndromes, extends and integrates the previous sections.

Given the title, the reviewer had expected the sections to be organized by vascular systems, e.g., behavioral and cognitive manifestations of stroke of the anterior communicating artery. However, after the walk about the brain, there is a final chapter, *Right Versus Left Hemisphere Syndromes*, by Isabel P. Martins and colleagues describing the common cluster of neuropsychological findings observed with vessel-specific obstructive strokes. Most chapters are clearly written, succinct, and have the added advantage of containing several tabular sections termed "Key points" which provide a summary of the section's most salient information. Most

chapters describe easy to administer, valid procedures to assess a specific neuropsychological process and contain a brief section, perhaps several paragraphs, highlighting rehabilitative or treatment programs for enhancement of the disorders discussed.

The chapters are generally well researched and well written. Each presents a succinct review of the literature, and offers what is the present common wisdom concerning the phenomenology, the underlying clinical-pathological correlations, and the treatment for each disorder. The chapter on dysarthria by Pascal Auzou is an excellent example of the ability to present a brief, 16 page, but authoritative review of a domain, including an intelligent review of the literature supporting various treatment approaches. Not all the clinical entities lend themselves well to such a tight format. The chapter on depression after stroke, by Carota and Paolucci, is perhaps the best exemplar of such difficulties. The authors struggle to reconcile psychiatry's descriptive diagnostic criteria of disorders of behavior, affect, and thought with neurology's clinical-pathological criteria for such disorders. The two diagnostic models do not allow for a simple agreement as to what constitutes a diagnosis. The authors question the psychiatric distinction between the diagnoses of depression and depression occurring with a chronic medical condition, and the distinction between endogenous versus reactive depression. These distinctions become critical as one attempts to reconcile the conflicting findings in the