VOLUME 19 NUMBER 4 DECEMBER 1996 An International Journal of Current Research and Theory with Open Peer Commentary

Behavioral and Brain Sciences

Appearing in this issue, with Commentary . . .

Resolving the contradictions of addiction Gene M. Heyman

Innateness, autonomy, universality? Neurobiological approaches to language Ralph-Axel Müller

Second language acquisition: Theoretical and experimental issues in contemporary research Samuel David Epstein, Suzanne Flynn and Gita Martohardjono

Also, Continuing Commentary on

"The representing brain: Neural correlates of motor intention and imagery" (Jeannerod)

"Two functional components of the hippocampal memory system" (Eichenbaum, Otto & Cohen)

"Reintroducing group selection to the human behavioral sciences" (Wilson & Sober)

"Brain evolution and neurolinguistic preconditions" (Wilkins & Wakefield)

CAMBRIDGE

Behavioral and Brain Sciences

Editor

Stevan Harnad

E-mail: bbs@ecs.soton.ac.uk
Behavioral and Brain Sciences
Department of Psychology
University of Southampton
Highfield, Southampton SO17 1BJ
United Kingdom

Managing Editor Henriette Korthals Altes

Production Coordinator Lydia Stein

Chief Copy Editor Anna Clune

Associate Editors Behavioral Biology Jack P. Hailman/U. Wisconsin Hubert Markl/U. Konstanz

Biosocial Behavior Glendon Schubert/U. Hawaii, Manoa

Cognition and Artificial Intelligence Zenon Pylyshyn/U. Western Ontario

Cognitive Development
Annette Karmiloff-Smith/MRC, London

Computational Neuroscience Stephen Grossberg/Boston U.

Evolutionary Biology
Michael T. Ghiselin/California Academy of Sciences

Experimental Analysis of Behavior

A. Charles Catania/U. Maryland, Baltimore County

History and Systems
Julian Jaynes/Princeton
Language and Cognition
Philip Johnson-Laird/Princeton

Language and Language Disorders Max Coltheart/Macquarie U.

Linguistics
Robert Freidin/Princeton

Neurobiology Irving Kupfermann/Columbia Neurobehavioral Genetics

Wim E. Crusio/Centre National de la Recherche Scientífique

Neuropsychology
Jeffrey A. Gray/Inst. Psychiatry, London
John C. Marshall/Radcliffe Infirmary, Oxford

Neurophysiology Sten Grillner/Karolinska Institutet Paleoneurology

Stephen Jay Gould/Harvard

Perception

Bruce Bridgeman/U. California

Richard Gregory/U. Bristol Philosophy Daniel C. Dennett/Tufts Gilbert Harman/Princeton

Philosophy of Science Adolf Grünbaum/U. Pittsburgh Massimo Piatelli-Palmarini/MIT

Primatology
Horst D. Steklis/Rutgers
Psychobiology
Victor H. Denenberg/U. Connecticut

Vision and Artificial Intelligence Stuart Sutherland/U. Sussex Editorial Policy Behavioral and Brain Sciences (BBS) is an international journal providing a special service called Open Peer Commentary* to researchers in any area of psychology, neuroscience, behavioral biology, or cognitive science who wish to solicit, from fellow specialists within and across these BBS disciplines, multiple responses to a particularly significant and controversial piece of work. (See *Instructions for Authors and Commentators*, inside back cover.) The purpose of this service is to contribute to the communication, criticism, stimulation, and particularly the unification of research in the behavioral and brain sciences, from molecular neurobiology to artificial intelligence and the philosophy of mind.

Papers judged by the editors and referees to be appropriate for Commentary are circulated to a large number of commentators selected by the editors, referees, and author to provide substantive criticism, interpretation, elaboration, and pertinent complementary and supplementary material from a full cross-disciplinary perspective. The article, accepted commentaries, and the author's response then appear simultaneously in BBS.

Commentary on BBS articles may be provided by any qualified professional in the behavioral and brain sciences, but much of it is drawn from a large body of BBS Associates who have become formally affiliated with the project.

Qualified professionals are eligible to become BBS Associates if they have (1) been nominated by a current BBS Associate, (2) refereed for BBS, or (3) had a commentary or article accepted for publication. A special subscription rate is available to Associates. Individuals interested in serving as BBS Associates are asked to write the editor.

Copying This journal is registered with the Copyright Clearance Center (222 Rosewood Dr., Danvers, MA 01923). Organizations in the U.S.A. who are also registered with the CCC may therefore copy material (beyond the limits permitted by sections 107 and 108 of U.S. Copyright Law) subject to payment to the CCC of the per-copy fee indicated in the code on the first page of the article. This consent does not extend to multiple copying for promotional or commercial purposes. ISI Genuine Article Service, 3501 Market Street, Philadelphia, PA 19104, is authorized to supply single copies of separate articles for private use only. For all other use, permission should be sought from the Cambridge or New York offices of the Press.

Subscriptions Behavioral and Brain Sciences (ISSN 0140-525X) is published quarterly in March, June, September, and December. The subscription price for *institutions* of Volume 19 (1996) is US \$230.00 net in the U.S.A., Canada, and Mexico; UK £156.00 in the rest of the world; for *individuals* US \$92.00 net (£60.00); for BBS Associates and for students (in the U.S.A., Canada, and Mexico only) with proof of eligibility with order US \$51.00 net (£38.00). Subscription price includes surface postage.

Single parts cost US \$60.00 net (£40.00) plus postage. *Institutional* orders may be sent to a bookseller, or, in the U.S.A., Canada, and Mexico direct to: Cambridge University Press, 40 West 20 Street, New York, NY 10011-4211; in the U.K. and rest of the world to: Cambridge University Press, The Edinburgh Building, Shaftesbury Road, Cambridge CB2 2RU, England. *Individuals* must order direct from the Press. Periodicals postage paid at New York, N.Y., and at additional mailing offices. **Postmaster:** Send address changes in the U.S.A., Canada, and Mexico to *Behavioral and Brain Sciences*, Cambridge University Press, Journals Dept., 110 Midland Ave., Port Chester, NY 10573.

Advertising Inquiries about advertising should be sent to the Journals Advertising Department of the Cambridge or New York Office of Cambridge University Press.

^{*}Modelled on the 'CA Comment' service of the journal *Current Anthropology*.

Contents Volume 19:4 December 1996

Heyman, G. M. Resolving the contradictions of addiction				
Open Peer Commentary		MacCoun, R. J. Is melioration the addiction theory of	700	
Ainslie, G. How do people choose between local and global bookkeeping?	574	choice? McFarland, D. Who is at risk for addiction?	586 587	
Bergman, J. & Miczek, K. A. The ameliorating addict: An illusion reviewed	575	McKim, W. A. Positive reinforcement, the matching law and morality	587	
Berridge, K. C. & Robinson, T. E. Control versus causation of addiction	576	Meisch, R. A. & Spiga, R. Relationship between melioration and the controlling variables	588	
Branch, M. N. Matching and melioration as accounts of reinforcement and drug addiction	577	Mitchell, S. H. & Baum, W. M. Maximization should sometimes lead to abstinence	589	
Fantino, E. The behavioral economics of addiction: A comprehensive alternative	578	Nevin, J. A. Stimulus factors in addiction Orford, J. Addiction is not as puzzling as it seems	590 591	
Foss, J. A scientific fix for the classical account of addiction	579	Perring, C. Addiction requires philosophical explanation, not mere redescription	592	
Higgins, S. T. Behavioral choice theory can enhance our understanding of drug dependence and other		Plaud, J. J. In search of the relevant behavioral variables	593	
behavioral disorders Hinson, R. E. Who determines the value of drug-taking	579	Robinson, T. E. & Berridge, K. C. The pursuit of value: Sensitization or tolerance?	594 595	
behavior? Cultural considerations for a theory of behavioral choice	580	Schelling, T. C. The contradiction unresolved Shizgal, P. The Janus faces of addiction Suita B. M. Matching of contributes addiction the contradiction to addiction the contributes of the contribute of the con	595 596	
Houston, A. I. Melioration and addiction Hyman, S. E. Addiction: Taking the brain seriously	581 582	Swift, R. M. Matching observation to addiction theory Vuchinich, R. E. Addiction as choice? Yes. As melioration? Maybe, maybe not	597	
Kirby, K. N. Future directions for the melioration model of addiction	583	Vyse, S. A. Heyman's steady-state theory of addiction	598	
Laibson, D. I. An economic perspective on addiction and matching	583	Author's Response		
Logue, A. W. Self-control and impulsiveness: Resolution of apparent contradictions in choice		Heyman, G. M. Which behavioral consequences		
behavior McCauley, C. Understanding addiction: Conventional rewards and lack of control	584 585	matter? The importance of frame of reference in explaining addiction	599	
Müller, RA. Innateness, autonomy, approaches to language	unive	rsality? Neurobiological	611	
Open Peer Commentary		Lieberman, P. Neuroanatomical structures and		
Bickerton, D. An innate language faculty needs neither modularity nor localization	631	segregated circuits Newmeyer, F. J. Müller's conclusions and linguistic	641	
Bullinaria, J. A. & Chater, N. Double dissociation, modularity, and distributed organization	632	Poeppel, D. Neurobiology and linguistics are not yet	641	
Corballis, M. C. How to grow a human Corina, D. Sign language and the brain: Apes, apraxia,	632	unifiable Pulvermüller, F., Mohr, B. & Preissl, H. Biology of language: Principle, predictions, and evidence	642 643	
and aphasia Friederici, A. D. Autonomy of syntactic processing and	633	Rivera-Gaxiola, M. & Karmiloff-Smith, A. It's a far cry from speech to language	645	
the role of Broca's area Copnik, M. Familial language impairment: The	634	Schoenemann, P. T. & Wang, W. SY. Evolutionary principles and the emergence of syntax	646	
evidence Graham, S. & Poulin-Dubois, D. Speaking of	635	Sinha, C. Autonomy and its discontents Smith, N. A polyglot perspective on dissociation	647 648	
language: Thoughts on associations Grodzinsky, Y. Neurobiological approaches to language: Established and following	636	Stromswold, K. Genes, specificity, and the lexical/functional distinction in language		
Falsehoods and fallacies Hauser, M. D. & Sakata, J. A worthy enterprise injured by overinterpretation and missengesentation	637	acquisition Walker, S. F. Is human language just another	648	
injured by overinterpretation and misrepresentation Jacobs, B. & Larsen, L. Pluripotentiality, epigenesis, and lumpage acquisition	638 639	neurobiological specialization?	649	
and language acquisition Kemmerer, D. Innateness, autonomy, universality, and the neurobiology of regular and irregular inflectional	wa	Author's Response		
morphology	639	Müller, RA. The epigenesis of regional specificity	650	

acquisition: Theoretical and experim			677
Open Peer Commentary Archibald, J. Guilfoyle, E. & Ritter, E. Functional categories in L2 acquisition: Evidence of presence is not necessarily presence of evidence Bhatt, R. M. & Hancin-Bhatt, B. Transfer in L2 grammars Bickerton, D. A dim monocular view of Universal-Grammar access Birdsong, D. Full access to the evidence for falsification Bley-Vroman, R. What we have to explain in foreign language learning Borer, H. Access to Universal Grammar: The real issues Carroll, S. E. Parameter-setting in second language acquisition – explanans and explanandum Clahsen, H. & Muysken, P. How adult second language learning differs from child first language development DeGraff, M. UG and acquisition in pidginization and creolization Eubank, L. Methodological problems with Epstein, Flynn, and Martohardjono's research Freidin, R. Adult language acquisition and Universal Grammar Gregg, K. R. UG and SLA: The access question, and how to beg it Grewendorf, G. Does second language grow? Hale, K. Can UG and L1 be distinguished in L2 acquisition? Hale, M. Competence and performance in language acquisition Harrington, M. L2 access to UG: Now you see it, now you don't	714 715 716 717 718 718 720 721 723 724 725 726 727 728 730 731	Kanno, K. In support of the early presence of functional categories in second language acquisition Li, P. Why don't L2 learners end up with uniform and perfect linguistic competence? Liceras, J. M. To "grow" and what "to grow," that is one question Lieberman, P. Universal Grammar and critical periods: A most amusing paradox MacWhinney, B. Language is learned Newmeyer, F. J. Some incorrect implications of the full-access hypothesis O'Grady, W. Syntactic representations and the L2 acquisition device Otero, C. P. Language growth after puberty? Schwartz, B. D. Now for some facts, with a focus on development and an explicit role for the L1 Sharwood Smith, M. A. Metalinguistic ability and primary linguistic data Sorace, A. On gradience and optionality in non-native grammars Sprouse, R. A. Appreciating the poverty of the stimulus in second language acquisition Thomas, M. "Full access" and the history of linguistics Torrego, E. Towards characterizing what the L2 learner knows Vainikka, A. & Young-Scholten, M. Partial transfer, not partial access White, L. UG, the L1, and questions of evidence Authors' Response Epstein, S. D., Flynn, S. & Martohardjono, G. Universal Grammar and second language acquisition: The null hypothesis	749 740
Continuing commentary			
On Jeannerod, M. (1994) The representing imagery. BBS 17:187-245.	brain:	Neural correlates of motor intention and	759
Grant, S. C. & Schmuckler, M. A. Alternative origins of motor images Kohl, R. M. & Fisicaro, S. A. Response intention and imagery processes: Locus, interaction, and contribution to motor learning	759	Rossetti, Y. & Rode, G. In search of nonvisual motor images	762
	760	Author's Response Jeannerod, M. Motor representations: One or many?	760
On Eichenbaum, H., Otto, T. & Cohen, N. hippocampal memory system. BBS 17:449			766
Colombo, M. & Gross, C. G. Hippocampus, delay neurons, and sensory heterogeneity Crusio, W. E. The hunting of the hippocampal function Moscovitch, M. Recovered consciousness: A proposal for making consciousness integral to neuropsychological theories of memory in humans and nonhumans Mumby, D. G. Sequential processing of "items" and	766 767	Toates, F. The hippocampus seen in the context of declarative and procedural control	77.1
	768	Authors' Response Eichenbaum, H., Otto, T., & Cohen, N. J. The hippocampal system: Dissociating its functional components and recombining them in the service of	
"relations"	770	declarative memory	772

on Wilson, D. S. & Sober, E. (1994) Reint sciences. BBS 17:585–654.	roduc	ng group selection to the human behavioral	777
Barresi, J. Group selection and "the pious gene" Jones, D. Varieties of group selection	777 778	Waller, M. Genier than thou	781
Lamb, M. E. What is selected in group selection?	779	Authors' Response	
Palmer, C. T., Fredrickson, B. E., & Tilley, C. F. Group selection or categorical perception? van de Wetering, S. Authoritarianism as a group-level	780	Wilson, D. S. & Sober, E. More on group selection and human behavior	782
adaptation in humans	780		
On Wilkins, W. K. & Wakefield, J. (1995) Brain evolution and neurolinguistic precondition BBS 18:161-226. Lynch, M. P. And what of human musicality? Tobias, P. V. The dating of linguistic beginnings Westergaard, G. C. The lithic technology of Cebus Tobias, P. V. The dating of linguistic beginnings Westergaard, G. C. The lithic technology of Cebus			
apella and its implications for brain evolution and the preconditions of language in Homo habilis	792	neuroninguisae preconditions	793

Erratum

In BBS 17:3 (1994), p. 500, the title of the response by H. Eichenbaum, T. Otto, and N. J. Cohen, should have been "The hippocampal memory system and its functional components: Further explication and clarification," as it appeared in the Contents of that issue.

THE CEREBRAL CODE

Thinking a Thought in the Mosaics of the Mind William H. Calvin

"In an age when brain science is becoming increasingly fragmented and specialised, Calvin is a *rara avis...*, he provides a broad overview on the functions of the brain and a bold and novel conjecture about the most highly evolved yet enigmatic of all biological organs—the human cerebral cortex." — V.S. Ramachandran, UCSD A Bradford Book • 248 pp. \$22.50

BEING THERE

Putting Brain, Body, and World Together Again Andy Clark

"...moves ahead of the current state of the field to anticipate the next stages of cognitive science, a science of the embodied mind, and mind embedded in the world. An excellent and unique book."

— Dan Lloyd, Trinity College
A Bradford Book • 280 pp. \$25

RETHINKING INNATENESS

A Connectionist Perspective on Development

Jeffrey L. Elman, Elizabeth A. Bates, Mark H. Johnson, Annette Karmiloff-Smith, Domenico Parisi, Kim Plunkett

"This is a landmark publication in developmental psychology, bringing together ideas from cognitive psychology, connectionist modelling, neurobiology and dynamical systems theory." — Dr. Dorothy Bishop, MRC Applied Psychology Unit

Neural Networks and Connectionist Modeling series. A Bradford Book • 475 pp. \$45

MIND

Introduction to Cognitive Science

Paul Thagard

"...an engaging introduction to cognitive science. *Mind* highlights both the core ideas about mental representation that guide the field, and the intellectual challenges that fuel current debates." — Keith J. Holyoak, University of California, Los Angeles

A Bradford Book • 190 pp., 19 illus. \$22.50

ADVANCES IN GENETIC PROGRAMMING, VOLUME 2

edited by Peter J. Angeline and Kenneth E. Kinnear, Jr.

"...shows off the exuberance of the new field [with] useful work on theory, representations, and applications." — BYTE

Complex Adaptive Systems series. A Bradford Book • 538 pp. \$50

WORDS, THOUGHTS, AND THEORIES

Alison Gopnik and Andrew N. Meltzoff

Explains why theories are as fundamental to cognition as words and thoughts are—not only for adults, but also in child cognitive development.

Learning, Development, and Conceptual Change series. A Bradford Book • 350 pp. \$30

Now in Paperback

IMAGE AND BRAIN

The Resolution of the Imagery Debate

Stephen M. Kosslyn

"An excellent and comprehensive volume that reviews the major findings in the study of visual mental imagery." — Science Books & Films

A Bradford Book • 528 pp., 46 illus. \$27.50 paper

The MIT Press

INDIRECT PERCEPTION

Irvin Rock

Argues that visual perception is mediated by psychological inference, so that the mapping between stimulation of the eye and conscious perceptual experience is indirect.

Cognitive Psychology series. A Bradford Book 350 pp., 101 illus. \$35

ELEMENTS OF ARTIFICIAL NEURAL NETWORKS

Kishan Mehrotra, Chilukuri K. Mohan, and Sanjay Ranka

"This most readable book covers all the major network models and provides insightful information on their applications." — Duc Truong Pham, University of Wales Cardiff

Complex Adaptive Systems series.

A Bradford Book • 384 pp., 144 illus. \$55

FROM ANIMALS TO ANIMATS 4

Proceedings of the Fourth International Conference on Simulation of Adaptive Behavior

edited by Pattie Maes, Maja J. Mataric, Jean-Arcady Meyer, Jordan Pollack, and Stewart W. Wilson

Brings together the latest research at the frontier of an exciting new approach to understanding intelligence.

Complex Adaptive Systems series.

A Bradford Book • 600 pp. \$65 paper

Original in Paperback

GROWING ARTIFICIAL SOCIETIES

Social Science from the Bottom Up

Joshua M. Epstein and Robert L. Axtell

How do social structures and group behaviors arise from the interaction of individuals? This book approaches this question with cutting-edge computer simulation techniques.

Distributed for The Brookings Institution 160 pp. \$18.95 paper Growing Artificial Societies is also available on CD-ROM, which includes animations that develop the scenarios described in the text. • CD-Rom \$59.95

Now in Paperback

THE ENGINE OF REASON, THE SEAT OF THE SOUL

A Philosophical Journey into the Brain

Paul M. Churchland

"Churchland has a knack for vivid exposition. He makes his case with clarity, wit, and certainly no shortage of verve." — New York Times Book Review A Bradford Book • 344 pp., 89 illus. \$17.50 paper

To order call **800-356-0343** (US & Canada) or (617) 625-8569. Prices higher outside the U.S. and subject to change without notice.

http://www-mitpress.mit.edu