Neurohistory Is Bunk?

The Not-So-Deep History of the Postclassical Mind

By Max Stadler*

ABSTRACT

The proliferation of late of disciplines beginning in "neuro"—neuroeconomics, neuroaesthetics, neuro–literary criticism, and so on—while welcomed in some quarters, has drawn a great deal of critical commentary as well. It is perhaps natural that scholars in the humanities, especially, tend to find these "neuro"-prefixes irritating. But by no means all of them: there are those humanists (evidently) who discern in this trend a healthy development that has the potential of "revitalizing" the notoriously bookish humanities. Neurohistory (or "deep" history) is a case in point, typically being dismissed (if registered at all) by historians while finding more sympathetic consideration elsewhere. While it sides with the former position, this essay attempts to develop a more complex picture. It will suggest that defiant humanists may underestimate the extent to which they are already participating in a culture profoundly tuned toward a quasi-naturalistic construction of the mind/brain as an embodied, situated, and distributed thing. The roots of this construction will be traced into the popular, academic, and technological discourses that began to surround the "user" in the 1980s, with special emphasis on the concomitant assault on "cognitivism." What is more, the very same story—insofar as it demonstrates the complicity of the "postclassical" mind with our own man-made and "digital" age—will serve to complicate the neuro-optimists' vision of human nature exposed by a new kind of science.

> I might have exaggerated the impact of information technology on social theory.
> —Bruno Latour (1996)

AS A SIZABLE HISTORIOGRAPHY ATTESTS, historians of science certainly cannot be faulted for having ignored the late-modern success story of the brain—"surely the rising star of body parts," as Elaine Showalter perceptively noted as far back as the 1980s. Since then, the brain has become increasingly popular with historians, who turned to

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charting its rising star over the last couple of centuries.[1] They have been less eager to grind their teeth on the so-called neurosciences—a rather more recent, post-1970s phenomenon (with the result that little is known, historically speaking, about *their* rising star); and fewer still, of course, have considered taking their reputedly revolutionary teachings on board: *applying* neuroscience, that is, somehow, to history.

Perhaps, then, it's about time one jumped on the bandwagon. "Keeping biology in its place," after all, only used to be "progressive," as even the Foucauldians ponder of late.[2] If historians of science still find the prospects of a "neurohistory" irritating (and I assume they do), they might nevertheless take it as an invitation, to paraphrase the neurohistorian Daniel Smail, to bring their expertise to bear on the "psychological assumptions" that they are poised to be making anyway.[3] I am not, then, going to promote "neurohistory" here; but neither will I be wasting a lot of time problematizing (or historicizing) efforts in that direction. What interests me is a slightly different story line. It has to do with the kinds of naturalistic assimilations that are, as I shall suggest, already well under way.

Indeed, no one in the profession could claim to be seriously offended by the suggestion that, say, cognition is fundamentally "embodied" and "distributed"—to cite what is easily the major mainstay of those "postclassical" views on the mind I wish to discuss here—or, for that matter, by the sort of psychology that has been coalescing since the 1980s around the proliferations of personal computing. Situated, externalized, massively parallel, and distributed—we tend to construe such visions of the mind (or of cognition or, indeed, of science) in terms of intellectual progress or the good influence, perhaps, of ethnographers; far less so in the context of the definite convergences around 1980 of psychologists, evolutionary thinkers, human–computer interaction specialists, and (not least) the ideologues of personal computing. And yet, it was arguably here where, at the time, a vision of the mind was emerging that was as "embodied" and "distributed" as it must have been palpable to any actor involved.

As we shall see, with the era of personal computing impending, the notion that minds are not naturally incorporated, localized, and augmented must have appeared increasingly foreign: remnants of some "classical," chess-obsessed, and rationalistic age of cognitive science, an age when ideas, plans, and representations simply were "something located in the actor's head."[4] Closer to home, those years also saw the definite loss of appeal of such problems as, say, the "logic of discovery" or "rational reconstructions." These too had to give way to the problems of practice, to embodied skills, and, most of all, to the peripherals of science (instruments, visual media, etc.). No doubt about it: only seemingly exceptional is the case of the (only seemingly) disembodied scientist Stephen Hawking, "Incorporated"—someone who "think[s] by means of a 'prosthetic' of diagrams," speaks

[1] Elaine Showalter, "Review of *Medicine, Mind, and the Double Brain*, by Anne Harrington," *New York Review of Books*, 11 Oct. 1987. For a discussion of the historiography see Max Stadler, "The Neuromance of Cerebral History," in *Critical Neuroscience: A Handbook of the Social and Cultural Contexts of Neuroscience*, ed. Suparna Choudhury and Jan Slaby (Oxford: Wiley-Blackwell, 2012), pp. 135–158. For the epigraph see Bruno Latour, "Social Theory and the Study of Computerized Work Sites," in *Information Technology and Changes in Organizational Work*, ed. W. J. Orlinokowski *et al.* (London: Chapman & Hall, 1996), pp. 295–307, on p. 305.

[2] See Nikolas Rose, "The Human Sciences in a Biological Age," *ICS Occasional Paper Series*, 2012, *3*(1):1–24, on pp. 2, 6. This essay has recently been published more formally: Rose, "The Human Sciences in a Biological Age," *Theory, Culture, and Society*, 2013, *30*:3–34.

[3] Daniel Lord Smail, *On Deep History and the Brain* (Berkeley: Univ. California Press, 2008), p. 8.

[4] Lucy Suchman, *Plans and Situated Actions* (Palo Alto, Calif.: Xerox, 1985), pp. 4–5. On the "classic" age of cognitive psychology see Jamie Cohen-Cole, *The Open Mind: Cold War Politics and the Sciences of Human Nature* (Chicago: Univ. Chicago Press, forthcoming).

by means of a synthesizer, and pursues his apparently pure science only by way of a necessarily impure mind, a mind "distributed throughout the laboratory."[5]

Or such is to be suggested by my little essay: that—quite irrespective of biology properly kept in its place—defiant humanists may underestimate the extent to which they are already participating in a culture profoundly tuned toward a certain—"postclassical"—construction of the mind/brain. It's the not-so-very "deep" history of the latter—not neurohistory's promise of biohumanistic "congruency" or of "new styles" of thought—that I shall argue deserves the attention of historians of science.[6] Indeed, it is perhaps not entirely coincidental that California played an important role in rethinking the Mind *as well as* Science. Bruno Latour's influential musings in *Science in Action*, notably, were a product of the area, just as were important strands in the story of what turned out to be a "massively parallel" and "distributed" mind—a notion then crystallizing in San Diego or, to be precise, somewhere between the local Department of Cognitive Science, the Naval Personnel Research and Development Center, and Xerox PARC, in Palo Alto ("the Science Studies group at the University of California, San Diego, is about 200 meters from the Cognitive Science Building!"—as Latour, at least, was well aware).[7]

I will not be tracing these roots all the way to San Diego, but I will be looking toward the new objects of psychological theorizing that were taking shape in the 1980s: a story of "users" and the evolution of their (software) technologies (see Section II). What is more, only a little detour through the more popular outgrowths of such "postclassical" departures is required in order simultaneously to complicate the neurohumanistic vision of a "deep" history exposed by the superior wisdom of natural science. It is more likely, as Section I argues, that one is dealing here—in the words of the literary agent John Brockman (of whom we shall hear more)—with a more questionable kind of "new natural philosophy, founded on the import of complexity, of evolution."[8]

I. THE NEW NATURAL PHILOSOPHY

As regards neurohistory so-called—or what is, "necessarily, a deep and global history"—its postclassical credentials might not seem so self-evident. To enter the territories of the postclassical mind, however, one could do worse than dwell just a little bit longer on Smail's project or, more illuminatingly, on its cognate terms, "deep history" and "big history"—ventures that, according to the psychologist Steven Pinker, he himself, Smail, and Jared Diamond have all been pursuing (fortunately so, because "the malaise of the humanities is related to their isolation from the sciences").[9]

[5] Hélène Mialet, *Hawking Incorporated: Stephen Hawking and the Anthropology of the Knowing Subject* (Chicago: Univ. Chicago Press, 2012), p. 7 and *passim*. Mialet's study/subject, I hasten to add, is only a particularly vivid example of what I take to be quite consensual views on the nature of science.

[6] Smail, *On Deep History and the Brain* (cit. n. 3), pp. 84, 124–125 ("congruency"); and Nikolas Rose and Joelle M. Abi-Rached, *Neuro: The New Brain Sciences and the Management of the Mind* (Princeton, N.J.: Princeton Univ. Press, 2013), p. 23 ("new styles").

[7] Bruno Latour, "Cogito Ergo Sumus!" *Mind, Culture, and Activity*, 1995, *3*:54–68, on p. 60. See also Ronald N. Giere and Barton Moffat, "Distributed Cognition: Where the Cognitive and the Social Merge," *Social Studies of Science*, 2003, *33*:301–310.

[8] John Brockman, *Third Culture: Beyond the Scientific Revolution* (New York: Simon & Schuster, 1995), p. 20.

[9] Daniel Smail, "An Essay on Neurohistory" (2010), Sect. I, http://cnx.org/content/m34243/latest/; and Steven Pinker, "The Humanities and Human Nature," in *Creating Consilience: Integrating the Sciences and the Humanities*, ed. Edward Slingerland and Mark Collard (Oxford: Oxford Univ. Press, 2012), pp. 45–55, on p. 53.

Browsing the footnotes to the "new neurohistory," it is hard to escape the impression that its informants were recruited—or recruited themselves—from the realm, mainly, of evolutionary psychology and, hence, from a clique of scientists who made waves in the 1990s as the "Third Culture."[10] Managed by the aforementioned Brockman (the "literary superagent who represents pretty much all of today's big brains"), these figures will be vaguely familiar: their best-selling portfolio conspicuously centers on gadgets and evolution (cosmic and otherwise) as well as brains and minds—the Richard Dawkinses, Howard Rheingolds, and Marvin Minskys of this world.[11] As for the prefix "big" (history): it too leads smoothly, via Smail's critique of history's Eurocentric focus, to a peculiar intellectual amalgam of sociobiology and complexity thinking and, hence, to such "stunning illustrations" of the "complete history of the universe, from the Big Bang to the Internet," as are supplied at TED gatherings, thanks to Bill Gates's enthusiastic support, by the social-historian-of-Soviet-Russia-turned-prophet-of-universal-complexity David Christian.[12]

In brief, one would on closer inspection seem to be dealing with a historical program that in its intellectual allegiances is very much indebted to the aforementioned "new natural philosophy, founded on the realization of the import of complexity, of evolution"; or, if you are so inclined: indebted to the spontaneous philosophy of this neoliberal "digital age." These late modern narratives of human nature, that is, are noteworthy not least for the confluence of evolving gadgetry and complex, adapting minds—of the "deep" past and technological futures—within them. There may exist more vivid examples than neurohistorians' pursuit of, say, the "psychotropic effects" of "practices, institutions, and commodities."[13] But such confluence is, as we shall see, one conspicuous ingredient indeed as regards the making of the postclassical mind (and, for current purposes, its most significant).

Take the case of evolutionary psychology, whose not-so-negligible influence on the project of giving "depth" to history has been noted above. It is arguably a specialty that, despite its ostensibly "deep" inclinations, from its very beginnings would seem to have had a heavy stake in the digital present. Still pondering their own "emergence" in the early 1980s, its protagonists already featured in places such as the (then newly minted) Santa Fe Institute (SFI), the famed mecca, established with a little aid from Citi Corporation, of "complexity" thinking. There, at last, they seem to have found an audience for their nascent biological-cum-technological "synthesis": the proposition that, as far as the mind was concerned, "actual (computational) performance"—the manipulation of "real objects

[10] See Angela Cassidy, "Evolutionary Psychology as Public Science and Boundary Work," *Public Understanding of Science*, 2006, *15*:175–205.

[11] The description of Brockman comes from the *Guardian*'s 2012 list of "top celebrity-tweeters." Many more names could be added to the list of Brockman's clients—by 1992, he reportedly "handle[d] upwards of 200 authors": Michael White, "Eureka! They Like Science," *Sunday Times (London)*, 13 Dec. 1992, http://www.brockman.com/press/1992.12.13.sundaytimes.html.

[12] See http://www.ted.com/talks/david_christian_big_history.html; one of the biggest fans indeed turned out to be Bill Gates ("really blew me away"). On big history see www.bighistoryproject.com, which is "designed to bring big history to life for high school students." Smail was similarly impressed, long before adopting the "neuro" prefix; see Daniel Lord Smail, "In the Grip of Sacred History," *American Historical Review*, 2005, *110*:1337–1361. For a view from the history of science see Nasser Zakariya, "Is History Still a Fraud?" *Historical Studies in the Natural Sciences*, 2013, *43*:631–641.

[13] Smail, *On Deep History and the Brain* (cit. n. 3), p. 161. See also Slavoj Zĭzĕk, "Cultural Studies versus the 'Third Culture,'" *South Atlantic Quarterly*, 2002, *101*:19–32, esp. pp. 21–22.

in the external world"—couldn't be had without stipulating particular parallel and distributed forms of computational implementation as well.[14]

This was a reference, significantly, not to the depths of time but to the new vistas of contemporary artificial intelligence research (the "new" AI) and to what was likewise emergent in those days as "cognitive ergonomics," "user psychology," or "cognitive engineering." Still, until very recently, as the evolutionary psychologist John Tooby noted on the occasion of "Emerging Syntheses in Science" (the 1984 SFI "founding" workshop), psychologists hadn't been "forced to get too specific about how [such] performance was actually achieved." But matters such as the manipulation of external objects were no longer so easily ignored. Hitherto enchanted by logic theorem solvers and the like—but oblivious as to the workings of (real) "brains," "parallel subcognitive events," and "everyday practical actions"—cognitive scientists were finally waking up from their "Boolean dream" (in Douglas Hofstadter's poignant formulation). There was in the making, as Hofstadter had optimistically ventured already in 1982, "a radically different model of cognition largely based on parallel subcognitive events."[15]

Its principal object was, as we shall see below, the "user"—and thus, indirectly, the personal microcomputer, which in itself was the cause of much excitement, of course. Brockman's good pal, the physicist Heinz Pagels, waxed enthusiastic in *The Dreams of Reason: The Computer and the Rise of the Sciences of Complexity* (1988) (wasting little effort on concealing the new economy behind it): "the emphasis on parallel networks, the importance of non-linear dynamics and selective systems, the new understanding of chaos, experimental mathematics, the connectionist's ideas, neural networks, and parallel distributive processing . . . they portend a new synthesis of science that will overturn our traditional way of organizing reality."[16] What Pagels, despite his contempt for the sterile, traditional "architectonic of the sciences," preferred to withhold was just how much this kind of biomorphic synthesizing was indebted not only (or simply) to universally available, personal tools of "simulation" but also, and more likely, to the vast industrial R&D programs in information technology that the United States, Japan, Britain, and the European Union committed to in the early 1980s. Above all, these converged on the belief that the future belonged to "alternative," parallel hardware technologies, intelligent software, and advanced man/machine interfaces; the merely "serial" von Neumann machines were a thing of the past.[17]

There are, in other words, reasons to be suspicious as regards the late-capitalist natural philosophy of "complexity" at stake here. Brockman himself, for one, never made much of a secret of *his* "vision of the new world—a hip cybernetic society, with millions of computer converts hunting and pecking their way to electronic bliss." Or so it was said back in 1983, when Brockman ("this self-described epistemologist") managed to broker a staggering $1.3 million deal for Stewart Brand's *Whole Earth Software Catalogue*, thereby "rewriting the rules of the software publishing industry." "For new computer users

[14] See John Tooby, "The Emergence of Evolutionary Psychology," in *Emerging Syntheses in Science*, ed. David Pines (Redwood, Calif.: Santa Fe Institute, 1988), pp. 67–76, on pp. 71–72.

[15] *Ibid.*; and Douglas Hofstadter, "Waking up from the Boolean Dream," rpt. in *Metamagical Themas* (New York: Basic, 1985), pp. 631–665, on pp. 639, 665.

[16] Heinz Pagels, *The Dreams of Reason: The Computer and the Rise of the Sciences of Complexity* (New York: Simon & Schuster, 1988), p. 13; see also Pagels, ed., *Computer Culture: The Scientific, Intellectual, and Social Impact of the Computer* (New York: New York Academy of Sciences, 1984).

[17] On this see esp. Alex Roland and Philip Shiman, *Strategic Computing: DARPA and the Quest for Machine Intelligence, 1983–1993* (Cambridge, Mass.: MIT Press, 2002).

these days," as the *Catalogue* announced, "the most daunting task is not learning how to use the machine but shopping."[18] This is a science publishing saga fairly well known. Brockman "dazzled" the publishing world a second time in 1989, landing his first scientific coup with the Santa Fe complexity guru Murray Gell-Mann; indeed, he is a character who seems to have sprung right off the pages of Fred Turner's *From Counterculture to Cyberculture.*[19]

Brockman is courted by the likes of Brian Eno and Hans-Ulrich Obrist; his self-fashioning, carefully crafted, certainly can't fail to impress the hip. Reportedly, his first copy of Norbert Wiener's *Cybernetics* was handed to him, back in the 1960s, by none other than John Cage; it was "Marshall" (McLuhan), meanwhile, who turned him on to the ideas of J. Z. Young, the British brain scientist and cybernetician (someone "highly stimulating"—unlike the "usual scientist," as the BBC noted approvingly as far back as 1948). It's Young to whom Brockman attributes his favorite (posthuman-ish) slogan: "We create tools and mould ourselves through our use of them."[20]

Not yet so hostile to "literary" culture as he would be by the time of his infamous *Third Culture* manifesto, Brockman himself took to writing in those days, producing books not easily deciphered but yielding "a super head trip" (according to early fellow-traveler John Lilly, of "human biocomputer" fame). Other counterculturists were full of praise, too; and certainly Brockman had a talent for turning his penchant for the likes of Wiener, Young, Heinz von Foerster, and W. Grey Walter into slogans such as "Man is dead. . . . Man was nothing but a model, a technique."[21]

If all this didn't go down so well with the traditional culture—"futuristic gibberish, replete with the various jargons of communications theorists and computer gurus," as one 1969 review opined—Brockman fared a great deal better in creating a market for such "jargons" (wisely, he had previously obtained an MBA). By the early 1970s, accordingly, Brockman had begun reinventing himself as a literary agent, specializing in New Agey, "oddball California scientists." The (short-lived) magazine *Realtime*, which he coedited with Edward Rosenfeld, covered similar ground, offering short snippets of texts ranging from John von Neumann's *The Computer and the Brain* to Alvin Toffler's *Future Shock.*[22]

In embryonic form, then, here was the kind of "new natural philosophy" that Brockman would become justly famous for. And if that was still a matter of catering to subcultural niches, perhaps it isn't too difficult to see how its fortunes might have gradually changed for the better—or, at least, how it began to hit the mainstream, "the middle-aged, the

[18] Stephen Hall, "Hard-Sell Software," *United Airlines Magazine*, Aug. 1983, http://www.brockman.com/press/1983.08.United.html ("electronic bliss"); "Superagent John Brockman," *Popular Computing*, 1984, *3*(10): 71–78, on p. 71 ("rules"); and Stewart Brand, *Whole Earth Software Catalogue* (Garden City, N.Y.: Doubleday, 1984), p. 2.

[19] In fact, he might well have featured more prominently in Turner's book, having been on very good terms with Stewart Brand. See Fred Turner, *From Counterculture to Cyberculture* (Chicago: Univ. Chicago Press, 2006).

[20] Notes on J. Z. Young, undated memo, ca. 1948, File "Prof. J. Z. Young, Talks 1946–1959," BBC Archives, Reading, U.K. ("highly stimulating"); and "The Man Who Runs the World's Smartest Website," *Observer*, 8 Jan. 2012, pp. 12–15 (slogan). For a recent example of the fascination with Brockman see "The Wise Guy," *Dazed and Confused*, Jan. 2012, *3*:106–109.

[21] See John Brockman, *By the Late John Brockman* (New York: Macmillan, 1969), p. 23; see also Brockman, *Afterwords* (Garden City, N.Y.: Anchor, 1973).

[22] "By the Late John Brockman," *Kirkus Reviews*, 15 Sept. 1969; Frank Rose, "Slipped Disk: Did Agent John Brockman Push His Software Too Hard?" *Manhattan, Inc.*, Oct. 1985, http://www.brockman.com/press/1985.10.manhattaninc.html; and John Brockman and Edward Rosenfeld, eds., *Realtime 1: A Catalog of Ideas and Information* (Garden City, N.Y.: Anchor, 1973).

middle-income, the middle of the road."[23] Somewhat tellingly, Rosenfeld, erstwhile author of *The Book of Highs* (1973), would go on to launch *Intelligence*, a newsletter devoted to the cause of neural network technologies. "In essence, we are parallel processors," Rosenfeld would declare by 1984—while still counting "barely 24 companies doing some work in the field" (in 1988, the count had climbed to 175—at least according to Rosenfeld's psychological-cum-market insights).[24] Brockman, meanwhile, moved via selling software—Stewart Brand's *Whole Earth Software Catalogue*, notably, as well as the software guru Tara Singh Khalsa's *Typing Tutor*—to selling Science on the grand scale. It was a mission made easy thanks to the extensive networks of visionaries Brockman had been building up along the way—from Esalen in the 1970s to "excellent" dinner parties with upstart software millionaires a decade later.[25]

Most notably, Brockman had launched the "Reality Club" in 1981, together with complexity enthusiast Pagels. A New York City–based dining venture, it provided the blueprint for much of what was to follow: "The Reality Club [was] not just a group of people," as Brockman explained. "I see it as the constant shifting of metaphors, the advancement of ideas, the agreement on, and the invention of, reality."[26] Contributors to the club included everyone from complexity wunderkind Stephen Wolfram to AI booster Pamela McCordock, author of *The Fifth Generation: Artificial Intelligence and Japan's Computer Challenge to the World* (1983). Advanced, accordingly, were only certain ideas—such as "Why My Company Is Called 'Thinking Machines'" or the story of brains, qua "massively parallel computers," implementing a "greatly speeded-up version" of biological evolution (i.e., thinking).

II. POSTCLASSICAL COMMONPLACES

If a certain slant in all this—the marriage, as it were, of deep time and digital futures—is palpable, one might still wonder about its import. Surely there is nothing blameworthy in visionary thinking itself or in making money off it; and surely, too, Brockman *et alia*'s influence only reached so far. But that, as this section suggests, would be seeing the "new natural philosophy" as a cause of rather than an element in the various ways in which the complex, massively parallel, and distributed nature of brain, mind, and cognition has in fact become enmeshed with the man-made, market-driven present—including its resonances with our own practice-enchanted discourses of and about science. The latter are, as I have already insinuated, perhaps not so wildly at odds with what emerged at the close of the twentieth century as so many techno-psychological commonplaces.

To see this, let us at least briefly attend to how such "postclassical" views on cognition may themselves have been a product of those new cyber-economic realities (a dimension the kind of "natural philosophy" described above brilliantly serves to obscure, of course). The case for "cognition as a biological phenomenon," after all, was also, inherently, a "question of design"—or so it sounded, as blood-and-soil-stained European philosophers began to be reread, influentially enough, through the lens of personal computing: "Inter-

[23] Sally Vallongo, "New Age Experience Enters Mainstream," *Pittsburgh Post-Gazette*, 10 Feb. 1989, p. 20. More broadly, see Turner, *From Counterculture to Cyberculture* (cit. n. 19).

[24] "Conversations with Harold Hudson Channer," Manhattan Neighborhood Network, 12 Dec. 1984, http://www.youtube.com/watch?v=PGLy0TuCc4w; and Charles S. Parker and Thomas Case, *Management Information Systems* (New York: McGraw-Hill, 1993), p. 504.

[25] John Dvorak, "Inside Track," *InfoWorld*, 1983, *5*(47):112.

[26] John Brockman, *Reality Club* (New York: Lynx, 1988), p. 7.

actionism," not "Mentalism," now pointed the way forward.[27] Indeed—at the risk of sounding a bit crude (à la Boris Hessen)—the demise of the so-called classical take on the mind very much coincided with the coming of the personal computer—or, in the parlance of the day, "intelligence amplifiers."

A suggestive notion, such mind amplification now emerged as a quite popular metaphor (if not tangibly in offices and homes). Most famously, perhaps, it was touted in Brockman associate Howard Rheingold's *Tools for Thought: The People and Ideas Behind the Next Computer Revolution* (1985), which prominently featured such figures as SRI's Douglas Engelbart, pioneering thinkers who had long held that "culture" spelt evolving "means for externalizing some of the symbol-manipulation activity."[28] This was old news, of course, surprising no one familiar with the contemporary deluge of pertinent information: *The Microelectronics Revolution: The Complete Guide to the New Technology and Its Impact on Society*, *The Age of Miracle Chips: New Microtechnology Will Transform Society*, *Electronic Mini-Marvel That Is Changing Your Life*, and on and on. "The expansion of information gathering and information processing as computers extend the reach of the human brain," as *Scientific American* chimed in, had already wrought a "momentous social change."[29]

And while some feared a "dehumanizing eruption of data," there was also, of course, hope for salvation: assorted easy-to-use word processing and "Business Graphics" applications, for example, promised mind augmentation to all, supplying everyone with his or her own little personal center of calculation. These were commodities routinely advertised as so many faculties of the mind, *externalized*: "Your personal computer can serve this mind-extension role and still balance your books."[30]

Meanwhile, as the newfangled specialists of "user" psychology still debated the finer details of such mind-extension roles—the relative merits, say, of such things as "icons" versus command-line input (visual versus symbolic thinking, actually)—the outcome was in any case the same: to bring the "interface" to the masses. And increasingly, of course, this would have meant the "graphical" interface—a wonderful thing indeed, "open[ing] the floodgates to potential nontechnical system users" while unleashing the creativity hitherto locked up in the nonlinear, nonserial, and nonlogical right hemisphere of the brain: "patterning[s] of ideas and images gathered in a simultaneous constellational picture."[31]

Formerly the prerogative of the less sizable population of "human operators" in such realms as industrial "automation," the (digital) interface, once democratized, turned into a palpably "cognitive" problematic. (Or, more cautiously, it did so a great deal more decidedly than any control room or machine tool—emblems of so many Cold War–era

[27] See esp. Terry Winograd and Fernando Flores, *Understanding Computers and Cognition: A New Foundation for Design* (Norwood, N.J.: Ablex, 1986), p. 4. See also Philip Agre, *The Dynamic Structure of Everyday Life*, Technical Report 1085, MIT Artificial Intelligence Laboratory, 1988.

[28] Douglas Engelbart, "Augmenting Human Intellect," SRI Summary Report AFOSR-3223, Oct. 1962.

[29] Eli Ginzberg, "The Mechanization of Work," *Scientific American*, 1982, *247*(3):66–75, on p. 66. By 1987, some six thousand relevant entries had made it into works such as Elia Zureik and Dianne Hartling, eds., *The Social Context of the New Information and Communication Technologies: A Bibliography* (New York: Lang, 1987).

[30] Glenn F. Cartwright, "And Now for Something Completely Different: Symbionic Minds," *Technology Review*, 1980, *83*(1):68–70, on p. 70 ("dehumanizing eruption of data"); and Wayne Pendley, "Organizing Programs as Mind Extension Tools," *Whole Earth Software Review*, 1984, *3*:28–29, on p. 29.

[31] W. C. Kimmerly, "Restricted Vision," *Datamation*, Nov. 1982, *28*:152–160, on p. 156. More broadly, see Margarete Pratschke, "Windows als Tableau: Zur Bildgeschichte grafischer Benutzeroberflächen" (Ph.D. diss., Humboldt Univ., 2010).

problems of "human factors engineering"—had ever done.)[32] At the same time, there were developments highlighting the fundamentally bodily and artifactual dimension of such *extended* cognitions—pointing, organizing, visualizing, and so forth. Embodied in every trackpad, "Fitts's Law"—dating back to a more martial age of ergonomics—might ring a bell, as might the significance of "muscle memory" (apropos the consistent display of information on a screen) or such long-forgotten items as VisiCalc™, Dataform™, or Ideas and Visual Memory™. Mind extension, in brief, was very much a question of making it happen, but it was a process that seemingly could no longer be contained within the vocabulary of "classical" cognitive psychology.

Retrospectively, one may doubt the veracity of such visions—"we value machines that mimic, enhance, accelerate thought," as Brand remarked in introducing his *Whole Earth Software Catalogue*—but what clearly, and irrevocably, transpired here, as both a psychological category and a marketing strategy, was the "user": a palpably parallel, distributed, and situated mind. "Chess programs," meanwhile, lost their scientific appeal, for they clearly were "not shedding much light on human intelligence."[33] Conversely, on such occasions as Interact' 84—the First International Conference on Human–Computer Interaction—the mood was celebratory: "the number of professional human factors specialists working in the U.S. industry is estimated to have increased between two and three times since 1980," it was cheerfully noted. A grand experiment in "naturally occurring human–computer interaction" was unfolding before the eyes of design-minded psychologists. And indeed, as RAND veteran Allen Newell, now of the Applied Information-Processing Psychology Project at Xerox PARC, had ventured a year earlier, the whole thing—the discovery of the "user"—perfectly fit the spirit of the times: "the problem appears to have the right mixture of industrial application and symbol manipulation to make it a "real world" problem."[34]

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It was, no doubt, "real world" in many ways—even as Newell *at alia* themselves would shortly be challenged on exactly these grounds. Their popular (if rather classical) GOMS model of the user thus was not quite real world enough—not sufficiently "parallel"—to be of much use to either psychologists or designers. Or this, in any case, was the perspective that tended to win out. Unquestionably, it was about time, as another Xerox employee, the budding anthropologist Lucy Suchman, suggested, to acknowledge the messy realities of cognition: its "situated" nature, in other (and now familiar) words. The prevailing rationalistic ideology of the mind as some kind of "European navigator" would, as Suchman

[32] The history of ergonomics/human factors research remains to be written. For some pointers on the early days of machine psychology see Edward Jones-Imhotep, "Maintaining Humans," in *The Construction of Social Science in Cold War America*, ed. Mark Solovey and Hamilton Cravens (New York: Palgrave, 2012), pp. 225–243; and Sharon Ghamari-Tabrizi, "Cognitive and Perceptual Training in the Cold War Man-Machine System," in *Uncertain Empire*, ed. Joel Isaac and Duncan Bell (Oxford: Oxford Univ. Press, 2012), Ch. 12.

[33] Brand, *Whole Earth Software Catalogue* (cit. n. 18), p. 2; and Hofstadter, "Waking up from the Boolean Dream" (cit. n. 15), p. 636 ("chess programs"). Regarding the "user" see, e.g., Paul Tate, "The Ergonomic Sell," *Datamation*, 1984, *30*:198.9–198.12; and B. Shackel, "IBM Makes Usability as Important as Functionality," *Computer Journal*, 1986, *29*:475–476.

[34] B. Shackel, ed., *INTERACT 84* (Amsterdam: Elsevier, 1985), p. v; Robert E. Kraut *et al.*, "Command Use and Interface Design," in *Human Factors in Computing Systems*, ed. Ann Janda (Amsterdam: Elsevier, 1984), pp. 120–124, on p. 120; and Stuart K. Card *et al.*, *The Psychology of Human-Computer Interaction* (Hillsdale, N.J: Erlbaum, 1983), p. 3.

cautioned, at any rate be detrimental to the business of properly designing "interactive" machines.[35]

Of course, no ingredient in the making of this real world problem was entirely new: not the naturalistic narrative of man's technological prostheses; not the hostile attitude toward "rationalism"; and certainly not psychology's entanglements with the more practical affairs of life. But trends such as connectionism and "massively parallel" computers, as is well known, now began to mesh nicely with the gradual cognitive turn of the "wet" sciences of the mind. The "radically different model of cognition largely based on parallel subcognitive events," which Hofstadter saw evinced by the investigations under way in San Diego by the so-called Parallel Distributed Processing Research Group, is a notable example. (See Figure 1.) The fledgling science of evolutionary psychology, as we have already heard, could also weigh in on the problems that were elicited by this latest mind-extending step in technological evolution—say, behavioral plasticity or, quite simply, the "remarkable expansion of intelligence." Others, meanwhile, began to widen the ambit of the new personal "information appliances" to include *everything*—notably so *The Psychology of Everyday Things* (1988), by the cognitive scientist and industry consultant Don Norman (and yet another minor classic hailing from San Diego). Indeed, even the philosophers took note, now turning to pondering the bankruptcy of "cognitivism"—among them the computer-savvy "California school" of phenomenologists and Andy Clark in Sussex, always a Third Culture favorite.[36]

CONCLUSIONS

It would be tempting at this stage to turn to views, also taking shape in the 1980s, as to how one might, say, "turn mentalist explanations [of science] into the history of immutable mobiles"; of how, in more concrete terms, the history of science really was the history of "innovations in picture making, equations, communications, archives, documentation, instrumentation, argumentation." Indeed, these views of the nature of science would seem to betray more than a merely coincidental likeness to the parallel emergence of the psychology of the "user"; and not a few STS pioneers would seem to have kept a keen ethnomethodological eye on the "massive" surge of information technologies at the time, as well as the "dispute over cognitivism" unfolding at its fringes.[37] But it would

[35] John M. Carroll and Robert L. Campbell, "Softening up Hard Science," *Human-Computer Interaction*, 1986, *2*:227–249; and Suchman, *Plans and Situated Actions* (cit. n. 4), pp. 4–5. GOMS is an acronym for "goals," "operators," "methods," and "selection rules."

[36] David E. Rumelhart *et al.*, *Parallel Distributed Processing: Explorations in the Microstructure of Cognition* (Cambridge, Mass.: MIT Press, 1986); Tooby, "Emergence of Evolutionary Psychology" (cit. n. 14), p. 70; Don Norman, *The Psychology of Everyday Things* (New York: Basic, 1988); and Andy Clark, "Being There: Why Implementation Matters to Cognitive Science," *Artificial Intelligence Review*, 1987, *1*:231–244.

[37] Bruno Latour, "Visualisation and Cognition," in *Knowledge and Society: Studies in the Sociology of Culture Past and Present*, Vol. 6, ed. Henrika Kuklick (Greenwich, Conn: JAI, 1986), pp. 1–40, on p. 26; and Steve Woolgar, "Reconstructing Man and Machine: A Note on Sociological Critiques of Cognitivism," in *The Social Construction of Technological Systems*, ed. Wiebe E. Bijker, Thomas P. Hughes, and Trevor J. Pinch (Cambridge, Mass.: MIT Press, 1987), pp. 311–328, on p. 317 ("dispute over cognitivism"). See also the 1986 "Postscript" in Latour and Woolgar, *Laboratory Life: The Construction of Scientific Facts*, 2nd ed. (Princeton, N.J.: Princeton Univ. Press, 1986), pp. 273–286, on p. 280: "The particular branch of philosophy—epistemology—which holds that the only source of knowledge are ideas of reason intrinsic to the mind, is an area whose total extinction is overdue. . . . We hereby promise that if anything remains to be explained . . . we too will turn to the mind!" On information technologies see also, e.g., Paul N. Edwards, "Border Wars: The Science, Technology, and Politics of Artificial Intelligence," *Radical America*, 1986, *19*:39–50. What I have generously glossed over here, of course, is the somewhat more militant and politicized dimension of this story, represented

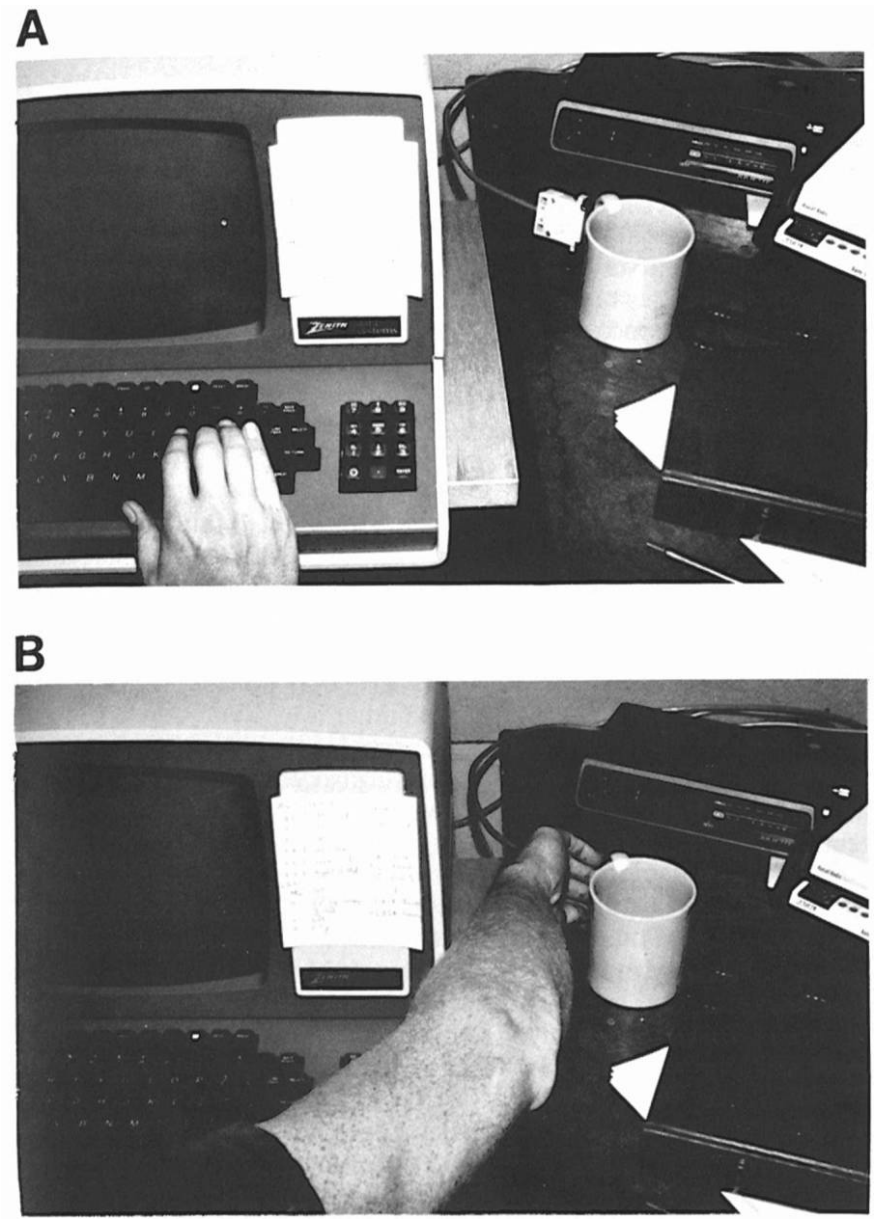

Figure 1. *"An everyday situation." From David E. Rumelhart* et al., Parallel Distributed Processing: Explorations in the Microstructure of Cognition, *Vol. 1:* Foundations (*Cambridge, Mass.: MIT Press, 1986), Figure 1. (Reproduced with the kind permission of MIT Press.)*

by the likes of David Noble; see, e.g., David F. Noble, *Forces of Production: A Social History of Industrial Automation* (New York: Oxford Univ. Press, 1986). It would have complicated my narrative but, for present purposes, merely substantiates the salience of information technology at the time; indeed, a case could be made that the emphasis on "practices" (skills, tacit knowledge, embodiment, etc.) was a response *not least* to the perceived threats of microcomputers ca. 1980 (deskilling and the like). For a popular example see Hubert Dreyfus and Stuart Dreyfus, *Mind over Matter: The Power of Human Intuition and Expertise in the Era of the Computer* (New York: Free Press, 1986).

require a different sort of paper, needless to say, really to substantiate any such affinities. More cautiously, therefore, let us come back to our ostensible subject matter: the "new neurohistory."

In this connection, what my little essay means to suggest is that, whatever one's inclinations, the case may not be a simple matter of being either for or against this "new neurohistory," of leveling accusations that history is being oblivious to science (or finding neurohistorians embracing it too eagerly), or—what I take to be the default reaction—of ignoring the problematic altogether, perhaps by reassuring ourselves with the idea that, despite all the neuro-newspeak, we have been there and done that already (a stance historians are prone to). Because—or this is what I have tried to convey—the kind of "new natural philosophy" at stake here is a phenomenon too historically specific to our own times to warrant such responses. It too is a phenomenon that might begin with the more comic aberrations, easily scoffed at or downplayed—such as Brockmanite "science historians" flattering the TED crowds with talk about how the Internet is a "growing organism"—but that might end closer to home—somewhere, say, in the very commonly shared assumptions regarding the mind, cognition, and their essentially embodied and distributed nature.[38] I hope this much has been made plausible here, in an admittedly sketchy story of the "postclassical" mind: that the problem might be less one of catching up with the present and its progress, as the pro-neuro agitators tend to have it, and more one, instead, of trying to stand back a little. Rarely is the advance of knowledge so simple and transparent, after all—a mere question of opting in or opting out.

[38] See http://www.ted.com/talks/george_dyson_at_the_birth_of_the_computer.html (2003).