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Author(s): Dennis M Weiss

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Posthuman Pleasures: Review of N. Katherine Hayles' *How We Became Posthuman*

a review of *How We Became Posthuman*, N. Katherine Hayles. (Chicago: University of Chicago Press, 1999); \$49.00.

Dennis M. Weiss,
York College of Pennsylvania

Cover shot: Wired, a magazine of and for the digerati, February 2000.' Poised against an ominous backdrop, 'cybernetics pioneer' Kevin Warwick stands with his shirt sleeve rolled up ready for a fix. But in this case 'the fix' is a superimposed x-ray image disclosing a glass-enclosed microchip surgically implanted in Warwick's left arm. Warwick, the cover announces, is upgrading the human body'starting with himself. 'Cyborg 1.0,' the accompanying article penned by Warwick, outlines his plan to become one with his computer. Writes Warwick: 'I was born human. But this was an accident of fate'a condition merely of time and place. I believe it's something we have the power to change. I will tell you why' (145). Warwick intends to implant a chip in his arm that will send signals back and forth between his nervous system and a computer. For Warwick, being human is merely an accident of time and place, an accident that given the right computing power and the right cybernetics, we might well be able to 'fix.'

1. The posthuman view privileges informational pattern over material instantiation, so that en
 2. The posthuman view considers consciousness as an epiphenomenona, as an evolutionary upstart
 3. The posthuman view thinks of the body as the original prosthesis we all learn to manipulate
 4. The posthuman view configures human being so that it can be seamlessly articulated with int
3. Two months later *Wired* has had a change of heart'speaking only figuratively at this point in time. The cover of the April 2000 edition features a crumpled page, torn perhaps from a dictionary, maybe *Webster's Twenty-first Century Unabridged*. On this discarded page we read: '**human** adj. 1. of, belonging to, or typical of the extinct species *Homo sapiens* 2. what consisted of or was produced by *Homo sapiens* n. an extinct biped, *Homo Sapiens*, characterized by carbon-based anatomy; also HUMAN BEING.' Bill Joy, cofounder and Chief Scientist of Sun Microsystems, has been having second thoughts about the computer revolution and in his article 'Why the Future Doesn't Need Us' explores how it is that 'our most powerful 21st-century technologies'robotics, genetic engineering, and nanotech'are threatening to make humans an endangered species' (238). It's time, Joy thinks, to wake up and smell the Terminator.
 4. Human or posthuman? It's time to take sides! Is human being something to be fixed, to be gotten over? Or, are we an endangered species who ought to be fighting back against the relentless incursion of the silicon brigade? At the close of the twentieth century and the opening of the twenty-first, this may well prove to be the central issue. In *The War of Desire and Technology at the Close of the Mechanical Age* Allucquere Rosanne Stone suggests that we are in

the midst of a paradigm shift from the mechanical age to the virtual age and we now inhabit the cyborg habitat of the technosocial, in which technology is viewed as natural and human nature becomes a cultural construct. The ubiquity of technology, Stone suggests, rearranges our thinking apparatus and calls into question 'the structure of meaning production by which we recognize each other as human' (173). Similarly, Mark Poster argues that in the mode of information a symbiotic merger between human and machine is taking place, 'one,' he writes, 'that threatens the stability of our sense of the boundary of the human body in the world. What may be happening is that human beings create computers and then computers create a new species of humans' (4). In *The Age of Spiritual Machines*, Ray Kurzweil argues, 'the primary political and philosophical issue of the next century will be the definition of who we are' (2). Ed Regis explores our 'transhuman, postbiological' future in *Great Mambo Chicken and the Transhuman Condition*, suggesting that perhaps the human condition is a condition 'to be gotten out of' (175). O. B. Hardison too suggests that the human being is flawed and that the relation between carbon man and our silicon devices is 'like the relation between the caterpillar and the iridescent, winged creature that the caterpillar unconsciously prepares to become' (335).

5. Lest we get caught up in this wave of posthuman euphoria, we need only recall the (paradoxical?) sight of proto-cyborgs, their cell phones, palm pilots, pagers and other personal internet devices strapped to their sides, queuing up to see *The Matrix*. This most recent entry from Hollywood pitting humans against machines imagines a future in which human beings become little more than battery packs for computers, who hold us hostage by generating a virtual reality twentieth century to preoccupy us and keep us busy while they feed off of our bodies' electromagnetic energy. The movie's hero, Neo, is 'the one' who will lead human beings in their revolution against the dominance of machines. *The Matrix* celebrates human emotion, intuition, love, and, especially, our capacity to transcend the limited, inhuman, even anti-human machine. Joseph Weizenbaum, in *Computer Power and Human Reason*, labels obscene any projects that propose to substitute a computer system for a human function that involves interpersonal respect, understanding, and love (269). Weizenbaum argues that there are important differences between humans and computers and we dehumanize human beings by adopting computers as a metaphor for understanding ourselves. Sven Birkerts agrees that we may be on the verge of species mutation but argues that this mutation pits technology against soul. 'My use of soul is secular. I mean it to stand for inwardness, for that awareness we carry of ourselves as mysterious creatures at large in the universe. The soul is that part of us that smelts meaning and tries to derive a sense of purpose from experience' (212). Others, such as Stephen Talbott in *The Future Does Not Compute*, Alan Wolfe's *The Human Difference*, and Hubert and Stuart Dreyfus in *Mind Over Machine*, agree with Birkerts and Weizenbaum that the computer threatens what is most distinctive about humanity.
6. It is amidst this constellation of ideas that N. Katherine Hayles' book *How We Became Posthuman: Virtual Bodies in Cybernetics, Literature, and Informatics* (U of Chicago P, 1999) proves most useful. Hayles challenges the often simplistic human-posthuman dichotomy that motivates much of this work and attempts to articulate a framework in which to rethink the relationship between human beings and intelligent machines. For Hayles, the key battleground isn't over human versus posthuman. It's over what kind of posthuman future we will have. As the title of Hayles' book makes clear, we have already become posthuman. 'Increasingly the question is not whether we will become posthuman, for posthumanity is already here. Rather, the question is what kind of posthumans we will be' (246).

7. At the center of Hayles' text is a complex recounting of the history of cybernetics and the construction of the currently dominant view of the posthuman common to Kurzweil, Hardison, Warwick, and robotics researchers such as Hans Moravec. In *Mind Children* and *Robot*, Moravec imagines a future in which it would be possible to liberate the mind from its biological substratum, transplanting it, layer by layer, into a computer. Moravec suggests that a person's identity would be preserved in such a process because the essence of a person, his/her self-identity, is the pattern and the process going on in one's head and not the machinery supporting that process. The final stage of this process comes when we move the mind into cyberspace itself, completely freed from any body-image, achieving the ideal of a 'truly bodiless mind,' nothing but pure mind. *How We Became Posthuman* argues that this dominant image of the posthuman recuperates the worst aspects of liberal humanist subjectivity, especially the erasure of human embodiment. By separating information and materiality, marginalizing materiality, and making information, patterns of ones and zeros, the essential characteristic of information processing devices, mechanical and human alike, the cybernetic view of the posthuman perpetuates a long tradition in Western thought of downplaying the materiality of the body. *How We Became Posthuman* is meant, as Hayles puts it, as a rememory: 'putting back together parts that have lost touch with one another and reaching out toward a complexity too unruly to fit into disembodied ones and zeros' (13).
8. But Hayles' critique of the cybernetic view of the posthuman is neither motivated by the memory of some unadulterated, natural humanity nor by the triumph of Western humanism.' Indeed, part of the problem of the conception of the posthuman common to techno-enthusiasts is that it shares too many points with the human, as least the version of the human that Hayles concentrates on, liberal humanist subjectivity, which she identifies with possessive individualism and the emphasis on ownership, autonomy, and individuality (3). Hayles attempts to articulate an alternative vision of the posthuman that isn't corrupted by the last vestiges of liberal humanist subjectivity. We should not fear the posthuman, Hayles argues, for it opens up the possibility of new ways of thinking about what being human means (285).

If my nightmare is a culture inhabited by posthumans who regard their bodies as fashion accessories rather than the ground of being, my dream is a version of the posthuman that embraces the possibilities of information technologies without being seduced by fantasies of unlimited power and disembodied immortality, that recognizes and celebrates human finitude as a condition of human being, and that understands human life is embedded in a material world of great complexity, one on which we depend for our continued survival. (5)

9. *How We Became Posthuman* tells three interrelated stories. The first has to do with the reification of information, how information 'came to be conceptualized as an entity separate from the material form in which it is thought to be embedded' (2). Hayles' rich history and detailed reading of the manuscripts of the Macy Conferences on Cybernetics, a series of interdisciplinary conferences that brought together leading researchers in cybernetics, computational theory, neurophysiology, psychology and other disciplines, details how a specific conception of information, Shannon and Wiener's decontextualized theory of information which formalized information as an objective, mathematical quantity entirely divorced from meaning, came to influence researchers' work in a variety of fields, often far-removed from the abstract realm of information theory. The second story Hayles tells concerns the cultural and technological construction of the cyborg. Having conceived information as something

that could be calculated as the same value regardless of the context in which it was embedded, it was a short move, as Hayles explains, to seeing information as a free-floating entity that 'can flow between carbon-based organic components and silicon-based electronic components to make protein and silicon operate as a single system' (2), thereby giving birth to the cyborg. Hayles' third story relates the transformation of the human into the posthuman. Hayles offers the following characterization of the posthuman (2-3):

10. It is this particular construction of the posthuman that is central to Hayles' examination of the history of cybernetics as a discipline. Hayles' analysis reconstructs three waves in this history and attempts to show how certain choices that were made were neither inevitable nor preordained. The development of cybernetics follows a particular pattern of change that is distinct from either Kuhnian paradigm shifts or Foucauldian epistemic shifts. Hayles adopts the concept of seriation from archaeological anthropology to explain the pattern of overlapping innovation and replication in the constellation of ideas that characterized each wave of cybernetics. From one wave to the next, there are no sharp breaks or discontinuities. Rather, as Hayles explains, 'some of the ideas composing it are discarded, others are modified, and new ones introduced. Like the attributes composing an artifact, the ideas in a constellation change in a patchwork pattern of old and new' (15). A review essay such as this must fail to do justice to the depth and rich detail of Hayles' analysis of these waves of cybernetics. Allow me to briefly indicate the three distinct waves or constellations of ideas and indicate some of what Hayles' analysis focuses on.
11. The first wave of cybernetics, which Hayles dates from 1945 to 1960, took homeostasis as a central concept. At the center of the first wave of cybernetics is the constellation of ideas that constructed information, neuron, and cybernetic devices as similar. The key ideas in this constellation were contributed by Claude Shannon's work on a theory of information, Warren McCulloch and Walter Pitts' model of neural functioning, according to which neurons function analogously to information-processing systems, John von Neumann's work on computers that processed binary code, and Norbert Wiener's elaboration of this cybernetic paradigm into a cosmological philosophy embracing animals, humans, and machines. Also key to this constellation of ideas were the artifacts built to model these processes, including the electronic rat and homeostat. Some of Hayles' best work is her probing analysis of the transcripts of the Macy Conferences, where this constellation of ideas was first elaborated and coalesced into a new way of looking at human being. 'Henceforth, humans were to be seen primarily as information-processing entities who are essentially similar to intelligent machines' (7). Both are characterized by their efforts to maintain steady states in a chaotic environment (homeostasis) through the use of feedback loops.
12. While first-wave cybernetics operated according to a traditional view of scientific objectivity whereby observers are outside the system being observed, the concept of feedback, central to the story of control and command in cybernetics, undermines this stance. As Hayles explains, 'The objectivist view sees information flowing from the system to the observers, but feedback can also loop through the observers, drawing them in to become part of the system being observed' (9). It is this recognition that led to second-wave cybernetics which Hayles dates from 1960 to 1980 and revolves around reflexivity, making the observer part of the system. Hayles' narrative concentrates on the work of Humberto Maturana and Francisco Varela in developing their theory of autopoiesis. As Hayles explains, autopoietic systems are informationally closed systems which respond to their environment in ways determined by their self-organization. 'Their one and only goal is continually to produce and reproduce the

organization that defines them as systems. Hence, they are not only self-organizing but also are autopoietic, self-making' (10).

13. The third wave of cybernetics, stretching from 1980 to the present, Hayles identifies with artificial life and focuses on the development from self-organizing systems to emergent systems. Proponents of artificial life attempt to mirror the evolution of life in the computational world, creating computer programs that instantiate evolutionary processes and constructing from the bottom up robots and neural nets exemplifying human behavior and neural patterns that emerge from the complex interaction of the simple elements of the system. As Steven Levy explains,

Artificial life'is devoted to the creation and study of lifelike organisms and systems built by humans. The stuff of this life is nonorganic matter, and its essence is information: computers are the kilns from which these new organisms emerge. Just as medical scientists have managed to tinker with life's mechanisms in vitro, the biologists and computer scientists of a-life hope to create life *in silico*.' (5)

14. Hayles links to each of these three waves of cybernetics a discussion of contemporaneous science fiction. The combination of science and literature has been central to Hayles' previous works, including *The Cosmic Web: Scientific Field Models and Literary Strategies in the Twentieth Century* (Cornell UP, 1984) and *Chaos Bound: Orderly Disorder in Contemporary Literature and Science* (Cornell UP, 1990). Literary texts, Hayles argues, 'actively shape what the technologies mean and what the scientific theories signify in cultural contexts' culture circulates through science no less than science circulates through culture' (21). *How We Became Posthuman* includes excellent and insightful discussions of Bernard Wolfe's *Limbo*, the great works from Philip K. Dick's middle period (including *The Simulacra*, *We Can Build You*, *Do Androids Dream of Electric Sheep*, and *Ubik*), William S. Burroughs' *The Ticket that Exploded*, and four contemporary explorations of virtuality: Greg Bear's *Blood Music*, Cole Perriman's *Terminal Games*, Neil Stephenson's *Snow Crash*, and Richard Powers' *Galatea 2.2*. Hayles convincingly argues that these texts display the passageways that enabled the narrowly focused, abstract constellation of ideas composing each wave of cybernetics to circulate more widely in the general culture (21). Hayles' readings of these complex texts persuasively demonstrate her thesis that 'the literary texts often reveal, as scientific work cannot, the complex cultural, social, and representational issues tied up with conceptual shifts and technological innovations' (24).
15. Central to Hayles' critique of the cybernetic view of the posthuman are two issues: its reliance on abstract models that marginalize the complexity of reality and the recuperation of liberal humanist subjectivity in posthuman subjectivity. In her critique of the role of abstraction in cybernetics, especially as it relates to the materiality/information separation, Hayles identifies a common move in cybernetics which she identifies as the Platonic backhand and the Platonic forehand. The Platonic backhand, common to most forms of theorizing, works by inferring from the complexity of the world simplified abstractions. The Platonic forehand, Hayles argues, is a more recent move requiring the assistance of powerful computers to reach fully developed forms: 'The problem comes when the move circles around to constitute the abstraction as the originary form from which the world's multiplicity derives. Then complexity appears as 'fuzzing up' of an essential reality rather than as a manifestation of the world's holistic nature' (12).
16. Hayles' analysis of the three waves of cybernetics returns regularly to the manner in which embodied reality is made into a messy instantiation of a clean and orderly abstract form.

She demonstrates how models developed in one area are transformed into multipurpose metaphors that are used to forge connections between distinct disciplinary areas. Shannon's original theory of information, as an example, was, Hayles argues, appropriate in its context but when taken out of context and appropriated by other disciplines, was mistakenly taken to be fully commensurate with human thought.

Transforming the body into a flow of binary code pulsing through neurons was an essential step in seeing human being as an informational pattern. In context this transformation can be seen as a necessary simplification that made an important contribution to neurophysiology. Taken out of context, it is extrapolated to the unwarranted conclusion that there is no essential difference between thought and code.' (61)

17. The McCullough-Pitts neuron is another example in which a simplified model is used to 'forge connections between relatively simple neural circuits and the complexities of embodied experience' (57). Hayles persuasively demonstrates the power of analogy as the main rhetorical trope in Wiener's *The Human Use of Human Beings*, arguing that cybernetics, as a discipline, could not have been created without analogy (91). Analogy and metaphor are also the central ingredients in the narratives of artificial life that underwrite the claim that computer codes are alive and that computer programs replicating in computers are living organisms. Hayles' analysis of the rhetoric of artificial life enthusiasts demonstrates how, as she puts it, 'analogy is not incidental or belated but is central too the program's [of artificial life] artifactual design' (228).
18. It is precisely these analogies, metaphors, and narratives that permit the researchers in cybernetics, artificial intelligence, and artificial life to elide the difference between disembodied information and embodied materiality. The abstract models, mechanisms and rhetorical tropes appropriate to the rarefied theorizing of the science lab are mistakenly taken to objectively represent reality and anything that doesn't fit the model, including embodiment, complexity, ambiguity, particularity, and specificity, what Hayles sometimes refers to as the 'prolix noise of materiality,' (22) is seen as marginal and inessential.
19. Hayles also persuasively argues that this cybernetic vision of the posthuman recuperates many of the worst aspects of liberal humanist subjectivity, which she suggests is deeply entwined with projects of domination and oppression (5). Hayles draws on C. B. Macpherson's analysis of possessive individualism in identifying liberal humanism with the claims that the individual is the proprietor of his own person or capacities and the human essence lies in freedom (3). She later identifies as the values of liberal humanism 'a coherent, rational self, the right of that self to autonomy, and a sense of agency linked with a belief in enlightened self-interest' (85-86). Perhaps the central paradox in cybernetic versions of the posthuman is its simultaneous deconstruction of some aspects of liberal humanism and its recuperation of still others. The posthuman subject is an amalgam of biological and mechanical parts, 'a material-informational entity whose boundaries undergo continuous construction and reconstruction' (3), undermining any clear distinction between self and non-self.

When system boundaries are defined by information flows and feedback loops rather than epidermal surfaces, the subject becomes a system to be assembled and disassembled rather than an entity whose organic wholeness can be assumed. (160).

19. Thus the posthuman presents an opportunity to deconstruct the natural self that has been the ground of liberal humanism. But as Hayles' analysis of Wiener's first-wave version and Maturana's second-wave version of cybernetics makes clear, these deconstructive tendencies were actively resisted and both men crafted theories preserving autonomy, individuality, and impermeable boundaries. Wiener tries to control the potential of cybernetics to dissolve the subject by reinstating it within the circle of liberal humanist assumptions. Similarly, Hayles argues that Maturana's autopoietic theory both contests and reinscribes liberal humanist subjectivity, preserving the autonomy and individuality characteristic of liberal humanism.
20. Hayles' dream, as we have seen, is to articulate a version of the posthuman purged of these vestiges of liberal humanism while simultaneously ensuring that human embodiment is not erased. While Hayles never explicitly spells out this alternative version of the posthuman, the outline of her vision can be gathered from her more positive remarks and attending to the views of those with whom she seems to be in agreement. Central to this alternative version of the posthuman is a framework for understanding embodiment and a distributed, emergent version of subjectivity.
21. A central component of the positive vision of *How We Became Posthuman* is Hayles' framework for understanding embodiment and moving beyond the information/materiality dichotomy. As she says, she hopes to 'mix things up enough so that the emphasis falls not on the separation of matter and information but on their inextricably complex compoundings and entwinings' (23). Hayles adopts a framework for understanding the body with strong connections to the work of Hubert Dreyfus (his phenomenologically-based critique of artificial intelligence), Pierre Bourdieu (his concept of 'habitus'), Mark Johnson's discussion of 'the body in the mind,' and Paul Connerton's discussion of ritual in *How Societies Remember*. Her framework, presented in chapter eight 'The Materiality of Informatics', presents the body/embodiment and inscription/incorporation as two axes constituting a field in which bodies may take shape. By 'the body' Hayles understands an idealized form, an abstract, general, normative conception of the decontextualized body. It is this body that disappears into information. 'Embodiment' refers to the specific, contextual particularities of given bodies, the individual articulations of the body, with which it is in continual interaction.

Whereas the body is an idealized form that gestures toward a Platonic reality, embodiment is the specific instantiation generated from the noise of difference. Relative to the body, embodiment is other and elsewhere, at once excessive and deficient in its infinite variations, particularities, and abnormalities. (196-97)

23. Incorporating practices are actions 'encoded into bodily memory by repeated performances' until they become habitual (199). Hayles cites as an example a person waving good-bye. The wave is an incorporated practice that cannot be separated from its embodied medium. You can abstract a sign from the gesture, representing it in a different medium, but then the gesture has been transformed into an inscription, which denotes the level of discourse. Embodiment is to incorporation as the body is to inscription.

Incorporation emerges from the collaboration between the body and embodiment, between the abstract model and the specific contexts in which the model is instantiated. In contrast to inscription, which can be transported from context to context once it has been performed, incorporation can never be cut entirely free from its context. (200)

24. To go with this framework for understanding embodiment, Hayles accepts a cybernetic view of the self. The self should no longer be identified with the conscious mind but as an emergent

property, the outcome of autonomous agents acting together. She cites approvingly the work of Francisco Varela, Sherry Turkle, Allucqu're Roseanne Stone, Rodney Brooks, and the evolutionary psychology of Barkow, Cosmides, and Tooby, in support of a decentered, distributed notion of the self. Hayles portrays herself as a 'posthuman collectivity':

Speaking for myself, I now find myself saying things like, 'Well, my sleep agent wants to rest, but my food agent says I should go to the store.' Each person who thinks this way begins to envision herself or himself as a posthuman collectivity, an I transformed into the we of autonomous agents operating together to make a self. The infectious power of this way of thinking gives 'we' a performative dimension. People become posthuman because they think they are posthuman. (6)

25. Among these autonomous agents, the conscious mind is merely a small subsystem 'running its program of self-construction and self-assurance while remaining ignorant of the actual dynamics of complex systems' (286). Conscious agency, control, mastery are not the essence of human identity, but 'merely the story consciousness tells itself to explain results that actually come about through chaotic dynamics and emergent structures' (288).
26. Hayles then uses these accounts of embodiment and distributed cognition to help us understand our relationship to the posthuman and to intelligent machines. On the one hand, because we are embodied, there is an essential difference between human beings and intelligent machines:

Human being is first of all embodied being, and the complexities of this embodiment mean that human awareness unfolds in ways very different from those of intelligence embodied in cybernetic machines. 'There is a limit to how seamlessly humans can be articulated with intelligent machines, which remain distinctively different from humans in their embodiments' (283-84).

27. Embodiment is such that it is essential to our nature as either humans or posthumans and we need not fear the posthuman as completely erasing that which is distinctively human about us. On the other hand, understanding subjectivity as emergent and distributed, has implications for rethinking the articulation of humans with intelligent machines. Hayles imagines an environment in which technology compensates for the 'bottleneck' of human attention and we give up conscious agency and turn over the power to make sophisticated judgments to intelligent machines, who can manage in this environment more accurately than humans. Cognition and decision making would be distributed between humans and nonhuman agents. Humans become part of a distributed system.

No longer is human will seen as the source from which emanates the mastery necessary to dominate and control the environment. Rather, the distributed cognition of the emergent human subject correlates with 'the distributed cognitive system as a whole, in which thinking is done by both human and nonhuman actors.' When the human is seen as part of a distributed system, the full expression of human capability can be seen precisely to *depend* on the splice rather than being imperiled by it. (290)

28. We can extend our functional capabilities as we expand the parameters of the cognitive system we inhabit, extending embodied awareness in ways that wouldn't be possible without electronic prostheses (291).

29. What are we to make of this alternative vision of the posthuman? Shall we stand with Hayles on the side of the posthuman, exhilarated at the prospect of the possibilities of coupling with machines, finding pleasure in extending our awareness in the splice with the machine? I'm not so sure. Hayles has undoubtedly done a great service in her careful and probing reading of cybernetics, both fact and fiction. Her critique of how 'information lost its body' is persuasive and presents a cautionary tale that ought to be necessary reading for today's techno-enthusiasts and visionaries. Where *How We Became Posthuman* falters is in its articulation of an alternative posthuman view to that of cybernetics. As she summarizes her account of the posthuman, Hayles emphasizes its key points:

In this account, emergence replaces teleology; reflexive epistemology replaces objectivism; distributed cognition replaces autonomous will; embodiment replaces a body seen as a support system for the mind; and a dynamic partnership between humans and intelligent machines replaces the liberal humanist subject's manifest destiny to dominant and control nature. (288)

30. Allow me to examine several points key to this account: reflexive epistemology, embodiment, and distributed cognition.
31. Hayles argues that a key factor in the shift from first-wave to second-wave cybernetics was reflexivity, the issue of how to take into account the role of the observer constructing the system. She demonstrates how objections from figures such as Frank Fremont-Smith, Lawrence Kubie, and Gregory Bateson revolved around the necessity of incorporating reflexivity into the system. This becomes a defining feature of second-wave autopoietic theory. Hayles cites approvingly what she refers to as Maturana and Varela's 'epistemological revolution' (131). The 'cybernetic epistemology' characteristic of second-wave cybernetics emphasized that living systems operate within the boundaries of an organization that closes in on itself and leaves the world on the outside' (136). Perception, Hayles explains, is not fundamentally representational. 'Certainly there is something 'out there,' which for lack of a better term we can call 'reality.' But it comes into existence for us, and for all living creatures, *only through interactive processes determined solely by the organism's own organization*' (136, italics in the original). The posthuman, Hayles suggests, undermines the realist, objectivist epistemology characteristic of first-wave cybernetic, for reflexivity destabilizes objectivist assumptions (220). And she is in fact critical of Maturana for failing to adhere more strictly to this non-objectivist framework in the development of his thought, for reinscribing conventional realist assumptions of scientific discourse (135).
32. But Hayles herself seems to fall victim to this same problem. In discussing posthuman subjectivity, Hayles suggests that conscious agency and control is an illusion. 'The very illusion of control bespeaks a fundamental ignorance about the nature of the emergent processes through which consciousness, the organism, and the environment are constituted' (288). She cites approvingly Varela's contention that the self is merely a story consciousness tells itself, but it is a false story we tell ourselves to block out the fear and panic that would ensue if we realized there is no essential self. 'Opposed to the false unity and self-presence of grasping consciousness is true awareness, which is based on actualizing within the mind an embodied realization of the person's ongoing processes' (156). Consciousness, Hayles suggests following Varela, is a cognitive balloon that must be burst 'if humans are to recognize the true nature of their being' (156). She refers to earlier forms of subjectivity as the 'mistakes of the past' (288). And Hayles' appropriation of distributed cognition is premised upon

cognitive science disclosing the true nature of the self and deconstructing the falsity of unified, liberal subjectivity. She seems to suggest that evolutionary psychology presents us with a scientific, and therefore correct, view of human nature that gives us access to the universal structures of human behavior.

Although human behavior varies across a wide spectrum of actualization, it nevertheless has an underlying universal structure determined by evolutionary adaptations. Thus a *science* of evolutionary psychology is possible, for the existence of a universal underlying structure guarantees the regularities that any science needs in order to formulate coherent and consistent knowledge. (242, italics in the original)

33. Hayles returns to this point later in her concluding chapter where she comments again on reflexivity. She observes that the reflexivity that looms large in cybernetics also inhabits evolutionary biology. 'The models proposed by evolutionary biologists have encoded within them cultural attitudes and assumptions formed by the same history they propose to analyze; as with cybernetics, observer and system are reflexively bound up with one another' (284). She specifically cites in this regard the evolutionary psychology of Barkow, Cosmides, and Tooby as an example of how information technologies shape contemporary worldviews. But she goes on to discount the impact of this point on evolutionary psychology, suggesting that their view of the body captures its essential nature: 'Nevertheless, these reflexive complexities do not negate the importance of the sedimented history incarnated within the body' (284).
34. The discourses of cognitive psychology, evolutionary psychology, and biology are key underpinnings of Hayles' alternative account of the posthuman. Yet, she doesn't sufficiently attend to the status of these discourses nor critically examine her own relationship to the system she is observing, from which all historical contingency has been erased. While criticizing Wiener and Maturana for adhering too closely to the realist, objectivist discourse of the sciences, Hayles seems to fall victim to the same problem. Her key distinction between the true awareness of the distributed self and the false unified self would seem hard to maintain in light of the reflexive epistemology she adopts.
35. Equally key to Hayles' account of the posthuman is a clear understanding of embodiment and certainly the account of her framework in the eighth chapter of *How We Became Posthuman* is worthwhile and important for its emphasis on the particularities of embodiment and its discussion of incorporating practices. Yet Hayles doesn't adhere as closely to this framework as she should and both her earlier and later discussions of the body complicate it. While in chapter eight Hayles observes a clear distinction between the body and embodiment, throughout the text she freely interchanges a variety of terms, including 'body,' 'embodiment,' 'flesh,' and 'materiality.' This unnecessarily complicates her framework for thinking about the body. Consider, for instance, her discussion in the concluding chapter of the body in evolutionary psychology.

From an evolutionary biologist's point of view, modern humans, for all their technological prowess, represent an eye blink in the history of life, a species far too recent to have significant evolutionary impact on human biological behaviors and structures. 'The body is the net result of thousands of years of sedimented evolutionary history, and it is naïve to think that this history does not affect human behavior at every level of thought and action. (284)

36. What does she mean by 'the body' in this context? Recall that Hayles contrasts the abstract 'body' with the specificity and particularity of 'embodiment.' Here, her discussion of the history of the body would seem to elide that distinction altogether. This discussion is further complicated by fact that it implies a rather static view of the body, a view undermined by earlier comments Hayles makes. While discussing the connections between the body and technology, for instance, Hayles seems to suggest that the body is in fact quite malleable:

When the body is revealed as a construct, subject to radical change and redefinition, bodies of knowledge are similarly apt to be seen as constructs, no more inevitably than the organic form that images them. (85)

37. Again, the meaning of 'the body' in this context is not clear. In her discussion of her own experience of virtual reality [VR], Hayles again implies a more malleable body, potentially at odds with her account of the body in evolutionary psychology.

Working with a VR simulation, the user learns to move his or her hand in stylized gestures that the computer can accommodate. In the process, the neural configuration of the user's brain experiences changes, some of which can be long-lasting. The computer molds the human even as the human builds the computer. (47)

38. More endemic to Hayles' discussion of embodiment is the manner in which it reinscribes the very kind of dualism it is meant to overcome. Hayles' account of the posthuman is motivated in part by an effort to see the human being as an holistic phenomenon. She criticizes conceiving of information as a thing separate from the medium instantiating it as an imaginary act that constructs a holistic phenomenon as an information/matter duality (13). She cautions that the distinctions between body/embodiment and inscription/incorporation are merely heuristics for things in constant interaction (193). She refers to the holistic nature of human experience (245). Her presentation, however, regularly reinforces the idea that these are indeed two dichotomous things. She suggests that bodily practices have a physical reality that can never be fully assimilated into discourse (195). The body's competencies and skills are distinct from discourse (199). 'Abstract pattern can never fully capture the embodied actuality, unless it is as prolix and noisy as the body itself' (22). She connects embodiment to noise, unruly materiality, flux, and refers to the resistant materiality that marks our experiences as living as embodied creatures (29). She refers to embodied experience as 'noisy with error' (98). Embodiment is inherently destabilizing, a threat to hegemonic cultural constructs (197). It always deviates in some measure from its abstract representations (199).
39. The resistant materiality of the body seems to coincide, for Hayles, with the resistant materiality of the world, and often she fails to distinguish the materiality of embodiment and the world's materiality. Randomness, she suggests, is 'the creative ground from which pattern can emerge' (286).

If pattern is the realization of a certain set of possibilities, randomness is the much, much larger set of everything else, from phenomena that cannot be rendered coherent by a given system's organization to those the system cannot perceive at all. (286)

40. Hayles' rhetoric suggests the body or materiality as some brute force existing outside of discourse and resistant to the abstractions of discourse.' It is as if there is almost something like a state of flux, chaos, randomness from which the order of the material world and the body emerges and yet which is resistant to that order. Forms emerge from this chaos unthinkable in

its complexity. Hayles' explication suggests a dichotomy between discourse and embodiment, pattern and randomness, plenitude and form that is unlike the holistic phenomena for which she earlier argued. The difficulty here is that Hayles would like to devise a framework giving us a way of talking about the body responsive to its construction as discourse/information and yet not trapped within it (193). In trying though to convey the manner of the interaction of these polarities, Hayles does little more than the cyberneticists she criticizes, adopting an abstract, almost mystical language of cybernetic models, recursive feedback loops, unified fields, mutating surfaces, multiple coding levels, randomness, and emergence and allows these metaphors to carry a lot of the baggage of her theory.

41. The resistant materiality of the body is a necessary element in Hayles' version of the posthuman because it is only that resistance that forestalls the collapse of her account of the posthuman into the cybernetic dream of the transcended body. Hayles is rightfully critical of the posthuman view associated with Warwick, Moravec, Kurzweil and others, where the human body is something to be gotten over, a limitation we can transcend through our union with 'the spiritual machine.' But while emphasizing the finitude and mortality of the embodied human, Hayles too urges that we embrace the splice and extend embodied awareness with electronic prostheses. Hayles argues that the development of the human-computer interface and the increased imbrication of the human into the distributed cognitive system is a 'construction that has been ongoing for thousands of years' (290). But what insures that we don't lose sight of our embodied finitude? What sets limits, if there are any, to this extrusion of awareness through prosthetic devices? What is to prevent the gradual loss of our subjective awareness of our embodiment as it increasingly becomes part of the distributed cognitive system? For Hayles, that limit is seemingly the body's own resistant, prolix, noisy materiality. Rather than overcoming several hundred years of dualism, Hayles has merely reinscribed it at the heart of her theory.
42. The last and I think most significant set of difficulties with Hayles' version of the posthuman has to do with her account of subjectivity. Hayles argues that I should think of myself as a multiagent system whose complexity has evolved from highly recursive processes being applied to rather simple rules. There is no stable, coherent self but only autonomous agents running programs. The self is a small subsystem running its program of self-construction and self-assurance while remaining ignorant of the actual dynamics of complex system. We don't have unambiguous boundaries and shouldn't think of the subject as an autonomous self independent of the environment. Hayles suggests that conscious agency and control are mere illusions, really only a luxury of those few individuals who had the wealth, power, and leisure to conceptualize themselves that way (286). Mastery through the exercise of autonomous will is the story consciousness tells itself and it is a bad story, 'deeply entwined with projects of domination and oppression' (5). There are a number of questions surrounding this view of self and subjectivity.
43. I have earlier suggested that the status of Hayles' own account of the self is rendered questionable by difficulties in her discussion of reflexive epistemology. Here I simply will add that her adoption of models from cybernetics and cognitive psychology is equally questionable. Hayles has criticized the common movement in cybernetics from the messy particularities of embodiment' to abstract models. Yet she herself seems to relish the uncritical adoption of cybernetic models in accounting for her own experiences. 'Speaking for myself, I now find myself saying things like, 'Well, my sleep agent wants to rest, but my food agent says I should go to the store'' (6). She easily adopts the rhetoric of informational technologies to describe the conscious

mind as a subsystem running its program of self-construction (286). Daniel Dennett, a leading proponent of cognitive models, cautions against this kind of appropriation. Writing in *The Mind's I*, Dennett points out that while cognitivist theories abound with 'deliberately fanciful homunculus metaphors' subsystems like little people in the brain 'the actual subsystems are deemed to be unproblematic nonconscious bits of organic machinery, as utterly lacking in point of view or inner life as a kidney or kneecap' (12). While Hayles is rightfully critical of the way in which metaphors and analogies were central to the disciplinary dominance of cybernetic models, she is less critical of her own appropriation of similar metaphors and analogies in the construction of an alternative vision of the posthuman.

44. In her critique of Wiener and Maturana, Hayles chides them for reinscribing within their theories the assumptions of liberal humanist subjectivity, particularly the assumption of an autonomous, bounded self. Absent from these critiques, however, is any effort to question the value of these assumptions. Hayles seemingly rejects them out of hand. She suggests they are deeply entwined in control and domination and a luxury of the wealthy and powerful, but these overly general and sweeping comments are left completely unsupported. Alternatively, a number of theorists have argued persuasively for the value of a core, bounded self. While Hayles takes pleasure in the thought of the dissolving boundaries of the self, Jane Flax suggests a different perspective. Flax observes that object relations theorists offer strong arguments for the importance of a stable, core or 'true' self that while it has many of the characteristics of the postmodernist decentered self has few of its deficiencies. As Flax, a practicing therapist observes,

Borderline patients lack a core self without which the registering of and pleasure in a variety of experiencing of ourselves, others, and the outer world are simply not possible. Those who celebrate or call for a 'decentered' self seem self-deceptively naïve and unaware of the basic cohesion within themselves that makes the fragmentation of experiences something other than a terrifying slide into psychosis.' (218-219)

45. A strongly similar point is made by James Glass in his analysis of multiple personality disorder and postmodernism. Oliver Sacks argues that one cannot live normally, humanly in the world without the integrative power implied by a stable self. Anthropologist Sheri Ortner argues that the denial of the intentional subject, and of agency, works against the interests of women, minorities, postcolonial and other subaltern subjects. Citing the work of Jos' Limon, she argues that in his study of minority populations he writes with great eloquence about the striving for unity and a coherent life among minorities in this country. Limon argues that 'while life for working-class Mexican Americans is indeed full of discontinuity, disruption, and fragmentation, the forms and patterns of their dancing in south Texas dance halls represents a struggle against these things, an effort, however momentary and inadequate, to construct a world of meaning and coherence' (8).
46. It is finally this question of agency in the context of the posthuman that Hayles never adequately addresses. While initially suggesting that 'serious consideration needs to be given to how certain characteristics associated with the liberal subject, especially agency and choice, can be articulated within a posthuman context,' (5) and recognizing that the attribute of agency continues to be valued in the face of the posthuman (279), Hayles ultimately does little more than dissolve conscious agency and choice. Here too we might wonder about limits to the human-computer interface. In the posthuman, the boundaries of the autonomous subject are up for grabs (2), 'the subject becomes a system to be assembled and disassembled rather

than an entity whose organic wholeness can be assumed' (160). Hayles implies that we ought to take pleasure in the coupling that comes in the human-machine interface. The infectious power of this way of thinking, she suggests, excites pleasure (6). Is Hayles' pleasure in the interface sufficient to recommend it to us as a form of life? Wouldn't this pleasure finally depend on whether I chose to become part of a system? Does it not matter who or what is doing the assembling and disassembling? When we do choose to let down our boundaries and do take pleasure in breaching boundaries (in our erotic lives for instance), isn't this because we have chosen to do so, not seen ourselves as subject to the environment?' When I decide to become part of a system perhaps it can be experienced as pleasurable but when I suddenly find myself part of that system and boundaries are being ripped down, then I may just as well experience terror.

47. The problem motivating these questions has to do with the very starting point of Hayles' analysis in *How We Became Posthuman*, which is premised upon a false dichotomy of sorts. Hayles is clear that her account of the posthuman is a reaction against liberal humanist subjectivity, which takes as the ground of being possessive individualism (34). At the center of *How We Became Posthuman* then is a choice seemingly between two options, either the possessive individualism of Hobbes and Locke or Hayles' version of the posthuman, which takes computation as its ground. The options, though, are somewhat more complicated than Hayles leads on.
48. While Hayles suggests that cybernetics is central to the story of distributed cognition and often refers to 'new models of subjectivity' emerging from cognitive science and artificial life (4), it's not clear that this version of subjectivity is either new or necessarily connected to cybernetics. The view of the self critiqued by Hayles is the self as rational, autonomous, unified, centered, stable, fixed, and unchanging, in other words, the self as described by Descartes in his *Meditations* and his other philosophical works. Melford Spiro has argued that this putative Western self is a straw man and takes issue with the claim that this self represents the dominant tradition in Western thought. Spiro mentions a long list of theorists who have proposed alternative models, a list which includes the pragmatists William James and George Herbert Mead, David Hume's associationist model of the self, the psychoanalytic theories of Erik Erikson and Heinz Kohut, and the philosophical views of Karl Popper, Isaiah Berlin, and Marcia Cavell. In her work *Divided Minds and Successive Selves*, Jennifer Radden, drawing again on Hume and David Parfit's Humean analysis of the self, convincingly demonstrates how a variety of phenomena including *akrasia* or self-deception, ambivalence, and inner conflict have played a central role in Western conceptions of the self. D. W. Murray suggests that the essentialist, subjective selfhood that is often the point of critique is 'outside of formal theology, a recent development, most associated with the rise of the Romanticist literary movement in the late 18th century' (9). Murray suggests that it is not at all clear that there is a single folk model of selfhood in the contemporary Western cultural system (18). Dorothy Holland and Andrew Kipnis, as well, argue that their research on American experiences of embarrassment suggests that there is heterogeneity in Western concepts of the person. These points suggest there are more resources for thinking about the self than the false dichotomy Hayles presents: either possessive individualism or posthuman.
49. Furthermore, while Hayles importantly focuses on both the power of embodiment and narrative in her critique of cybernetics, she fails to explore the manner in which either or both may serve as a basis for the construction of a coherent self-identity. There is a large body of literature in philosophy that explores these issues and further complicates the ease with which

Hayles presents her dichotomy. Indeed there are a number of researchers and philosophers who accept the main thrust of the 'cognitive revolution' in philosophy of mind, psychology, and neurophysiology who still maintain there is a basis for a core, integrated self. Out of consideration of space, permit me to simply mention some worthwhile entries. In *Consciousness Explained*, for instance, Daniel Dennett argues for a view of the self he refers to as the 'Center of Narrative Gravity.'

A self, according to my theory, is an abstraction defined by the myriads of attributions and interpretations (including self-attributions and self-interpretations) that have composed the biography of the living body whose Center of Narrative Gravity it is. As such, it plays a singularly important role in the ongoing cognitive economy of that living body, because, of all the things in the environment an active body must make mental models of, none is more crucial than the model the agent has of itself. (428)

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50. Antonio Damasio's work is similarly informed by recent work in neurophysiology and cognitive psychology and yet retains a complex view of the self and doesn't simply dissolve it as would Hayles. In his recent *The Feeling of What Happens: Body and Emotion in the Making of Consciousness*, Damasio argues for a proto-self, temporary collections of neural patterns which we are not conscious of, a core-self, the transient conscious self that changes from one moment to another, and an autobiographical self, 'constituted by implicit memories of multiple instances of individual experience of the past and of the anticipated future' (174). Damasio argues that stability and boundaries were necessary to the emergence of life and form the basis of the biological development of all three selves (137).
 51. Finally, we might briefly consider Charles Taylor's *Sources of the Self*. Like Hayles, Taylor is very critical of what he terms the punctual or neutral self which he identifies with Locke and contemporary Lockeans such as David Parfit. Like Hayles, he is critical of the abstract, punctual, disengaged self characteristic of one strain of modern thought. But Taylor identifies with a different tradition in modern thought, one he associates to the hermeneutic tradition and to the philosophy of Michel de Montaigne, and which forms the basis for his view of the human being as a self-interpreting animal. Human beings are animals who makes sense of their lives through narrative. 'Making sense of one's life as a story is not an optional extra; our lives exist in this space of questions, which only a coherent narrative can answer. In order to have a sense of who we are, we have to have a notion of how we have become, and of where we are going' (47).
 52. While this is not the place to evaluate these competing notions of the self and subjectivity, minimally it should make clear that Hayles' stark dichotomy between liberal humanist subjectivity and posthuman distributed subjectivity is too starkly drawn. While persuasively demonstrating the elision of materiality in the cybernetic posthuman, in the rush to convince us of the pleasures of her own version posthuman, Hayles finally elides too much herself.

Notes

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Dennis M. Weiss is Associate Professor of Philosophy in the English and Humanities Department at York College of Pennsylvania. He received his Ph.D. in philosophy from The University of Texas at Austin. His interests revolve around philosophical theories of human nature, feminist philosophy, and the digital culture. He is currently working on an edited collection of essays on philosophical anthropology and a text on the meaning of human being in the digital age. He has published a number of journal essays exploring the role of philosophical anthropology in contemporary philosophy, the impact of digital media on human nature, and the significance of the computer culture. These essays critique the 'thin' accounts of human nature prevalent in work on the digital culture from the perspective of the more developed, 'thick' accounts of human nature in the work of philosophical anthropologists such as Michael Landmann, Martin Buber, Jose Ortega y Gasset, Arnold Gehlen, and others.

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