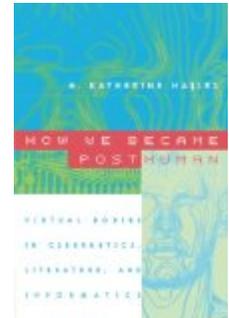**N. Katherine Hayles.** *How We Became Posthuman: Virtual Bodies in Cybernetics, Literature and Informatics.* Chicago: University of Chicago Press, 1999. xiv + 350 pp. $49.00, cloth, ISBN 978-0-226-32146-2.

Reviewed by Craig Keating

The Condition of Virtuality

Some twenty years ago Ihab Hassan spoke of an imminent epochal shift. After 500 years, he argued, "humanism may be coming to an end as humanism transforms itself into something one must helplessly call posthumanism" (247). Katherine Hayles has taken seriously Hassan's prediction. *How We Became Posthuman* is a fascinating account, truly encyclopaedic in its scope, of the developments in science, technology and literature which lend credence to the idea of the posthuman. More than this, it is an attempt to come to terms with how we are being constituted in discourse and in practice as posthuman subjects in an age of "informatics," that is, an age characterized by a "capitalist mode of flexible accumulation," the merging of telecommunications with computer technology, the increasing importance of databanks of information and instant data transmission to patterns of every day life, and the "reconfiguring" of physical habits to mesh with new information technologies (p. 313, note 4). It is also an attempt to deal with some of the important political and philosophical conse-

quences of these developments. In this latter regard the book is not entirely successful. Nonetheless, as a work of great intellectual scope and courage, it is destined to be an indispensable resource for contemporary historians, intellectual and otherwise.

For Hayles, the posthuman consists in the linked notions that consciousness is merely "informational pattern" (2) owing nothing importantly to its embeddedness in the human body or broader discursive contexts and that the seamless articulation of humans and machines or the invention of intellegent machines (information processors not importantly different from humans) are both equally possible. The broad purpose of the book is to follow the emergence of these notions both in three "waves" of cybernetics (both as discourse and technology) and in literary texts that partake of cybernetic theory. Assuming that many readers of this review may be as benighted in matters cybernetic as I and because the chapters on cybernetic theory anchor three distinct sections in the book, it is worthwhile to summarize in more detail the ideas behind these three waves.

The first wave of cybernetics, Hayles argues, coincides with what have become known retrospectively as the Macy Conferences. Out of these meetings, held between 1945 and 1954 and clearly focussed on the prospect of inventing intelligent machines, grew a model of cybernetics predicated on the notion of homeostasis. This concept, familiar to biologists as the capacity of living organisms to maintain steady states regardless of environmental changes, is extended in the Macy Conferences to machines through the concept of an informational feedback loop. Several theoretical moves as regards both information and humans are implied here. First, following the work of the Claude Shannon, whose binary theory of information helped launch the computer revolution, information is reduced to a quantifiable choice, regardless of context.

This innovation becomes important in the development also of some of the artifacts of the first wave of cybernetics, such as an "intelligent" electronic "rat," a machine which, through information feedback in terms of choice from among a given quantifiable set of options, could find its way through a maze. The second, more significant move here is the theoretical construction of humans and machines as fundamentally similar. Both are taken to be, in their essence, information processors. Human consciousness, with its ability to understand the world reflexively in terms of contextualized meaning and not only in terms of information, is dispensed with. As such, human and machine were brought into an "equivalence" that "shaped the kinds of stories that [Conference] participants would tell about the meaning of this equivalence" (63). Importantly, it would also inform the "stories" of human-machine relations in the culture at large.

Second-wave cybernetics arises out of the central lacuna of its earlier cousin--which is to say out of questions concerning reflexivity. Even during the Macy Conferences the question of how to take into account observers as part of the system being observed was an issue. But it is largely ignored in favour of notions which, in reifying information, simplistically resolved problems of engineering cybernetic devices. Yet some participants, among whom Gregory Bateson is arguably the most well known, would not let the question lie. The upshot was the notion of autopoiesis, whose progenitors were Francisco Varela and Humberto Maturana. Autopoiesis goes beyond homeostasis in arguing that organisms respond to their environments not in any objective way (i.e. on the basis of what is observed "out there") but in ways encoded and polarized to the needs of the organism as a living system. This was most famously substantiated in Varela's and Maturana's experiment of implanting receptors in the visual cortex of a frog. From this they discovered that the frogs could only see rapid movement of small objects like flies. The conclusion they drew was that the frog does not observe reality but constructs it. Autopoiesis is important to second-wave cybernetic theory to the extent that the theoretical focus shifts to how the component elements of a given system work together to replicate that system.

These advances set the stage for third-wave cybernetics whose concern was not simply with how systems, including machines, replicated themselves, but with how the tendency of systems to reproduce themselves could serve as the "springboard to emergence" (11), which is to say, how systems, even non-human ones, evolve. This brings us to the computer generated world of virtual reality and Artificial Life. Artificial Life is the research program devoted to the construction of disembodied "organisms." Some of these organisms are computer programs which feedback output as input and use the opportunity of deviations within this looping process to "evolve" in new and unpredictable ways. One such program is Tierra, devised by Thomas S. Ray of the Santa Fe Institute (a center devoted to the study of Artificial Life),

who has programmed in deviations which allow the program to develop on its own.

Another such "organism" is Genghis, a six-legged robot designed by MIT researcher Rodney Brooks. Moving beyond the electronic rat of the first-wave of cybernetics and incorporating elements of the autopoietic thrust of second-wave cybernetics, each leg of Genghis is "programmed to stabilize itself in an environment which includes the other five" (237). No particular movement is programmed in advance. There is no direct or indirect external control. At least theoretically, Genghis is a machine that can both think for itself and do without humans. The idea that to this extent Genghis might be considered a living organism not importantly different that a human being is substantiated in the comments of a leading Artificial Life researcher, Christopher Langton: "The p[r]inciple [sic] assumption made in Artificial Life is that the 'logical form' of an organism can be separated from its material basis of construction, and that 'aliveness' will be found to be a property of the former, not of the latter" (231).

And it is this proposition--that what is essentially characteristic of human beings is consciousness taken to be a form of information not importantly connected to its carbon-based or silicon-based substrates--that for Hayles, remains a disturbing constant throughout the three waves of cybernetics and the basis of her reflections on the political and philosophical consequences of the posthuman. Arguably more disturbing for Hayles are the literary texts which are grounded in cybernetics and which have allowed "the stories coming out of narrowly focused scientific theories to circulate more widely through the body politic" (21). It is through these works that the posthuman subject is constructed in an arguably more effective way. For as we become, according to Hayles, more like "cyborgs" in our everyday existence (i.e. in the way that we interact with intelligent machines and in the way that humans are actually articulated in physical way with intelligent ma-

chines like artificial joints or electronic pacemakers), cybernetic notions at play in popular culture (through novels like Philip K. Dick's *Do Androids Dream of Electric Sheep?*, its cinematic adaptation, Ridley Scott's *Blade Runner*, or even such sanitized popular fare as *The Six Million Dollar Man*) structure our experience the world and ourselves in a thoroughly posthuman way.

But Hayles does not see the rise of the posthuman as a necessarily negative development. If the disembodiment of information, the constitution of human consciousness as alike to information, and the fundamental similarity between machines and humans all "evoke. . .terror" by calling forth fears of our gradual dehumanization and the conquest of humans by machines, the notion of the posthuman also "excites pleasure" (4), she argues, insofar as it is fecund with the possibility of radical political change. The posthuman of cybernetics deconstructs the subject of liberal humanism by disrupting the notion of a self (as identity, will and agency) that is self-identical ("owing nothing to society" (3), in C. B. MacPherson's phrase) by reducing consciousness to information having no important relation to its material instantiation. For Hayles, the terrifying aspects of the posthuman derive from this notion.

But as she compelling argues, this notion is made possible in large part by the sharp distinction made within the liberal humanist tradition between mind and body. The exciting possibilities inherent in the posthuman are those that speak to overcoming the disembodiment of knowledge in both posthumanism and humanism. For Hayles, we must accept the posthumanist and anti-humanist notion that we are not in possession of our consciousness, but that this is so precisely because consciousness is embodied. Following the arguments of evolutionary psychologists Jerome Barkow, Leda Cosmides, and John Tooby, she argues for the "holistic nature of human experience" (245). This fact is manifested in emotions or "feelings," which, she argues, "are how the body

communicates to the mind information about its structures and continuously varying states" (245). Indeed, she goes further, following Antonio Damasio, in arguing that the "'basic topic'" of representations in the mind are those of "'an organism anchored in the body'" and that therefore "[h]uman mind without human body is not human mind" (246).

For Hayles, posthumanism leads us to the conclusion that the human is inevitably situated within the "emergent processes through which consciousness, the organism and the environment are constituted" and is not simply a consciousness "in control." This latter notion, of the "liberal humanist subject's manifest destiny to dominate and control nature" (288), is a myth that promoted the social dominance of elites in history. If there is something pleasurable deriving from the posthuman, it is its demystification of this central pillar of established power.

The intellectual odyssey that Hayles charts in bringing the reader to this conclusion is veritably Homeric and, as I suggested at the outset, it is this amazing scope of her book and the fascinating world of our contemporaries in the science of cybernetics that is here disclosed that recommends it. It seems to me, however, that the strength of some of the book's central claims may well need critical examination. This is particularly true of the claim that "we" have "become" posthuman. This claim is grounded in a post-structuralist approach that sees discourse as constitutive of subjectivity. It is an approach to which this reviewer is very sympathetic. However, in *How We Became Posthuman* the constitutive effects of the discourses under discussion are taken virtually as given with very little effort to show that they actually apply in this case. And some work as to be done here. For while many of us will have heard of some of the movies and novels she looks at, many others are, by her own admission, phenomena of literary undergrounds. Thus one wonders whether they actually serve the function she wants them to play as the conduit by which cybernetic ideas can come to circulate more broadly.

Similarly, the proportion of the world's population that actually uses computers (let alone telephones or faxes) is, also, by her own admission, very small. With limited access both to the literary discourse of the posthuman and to the kind of human-machine interactions these discourses putatively structure in a posthuman way, Hayles' insistence that we nonetheless not underestimate the importance of the experience of virtuality seems without justification. And even in those instances where she wants to talk more specifically about the people who use newer technologies and read the scientific and literary works she does, her evidence seems to be largely anecdotal in character. This seems to reduce the notion, central to post-structuralism, of the constitutive effects of discourse into a pat formula rather than one that can be demonstrably shown to apply in this instance. Similarly, the "informatics" of the book's title (conditions very similar in nature to the postmodern conditions whose rise David Harvey and Frederic Jameson lament) are asserted to be the important conditions in which the posthuman emerges. Yet there is little attempt to substantiate these claims.

But it is in regard to Hayles' attempts to vindicate the notion of the embodied character of human consciousness (surely one of her central concerns) that her book is at its weakest. For the reader is given no good reason to support this proposition. We are only presented with a very brief passage that outlines the arguments of the aforementioned evolutionary psychologists, arguments which make this reviewer almost as nervous as those of cyberneticists. This being said, one cannot but recommend this book to anyone who takes seriously the task of understanding in-depth our own times and the ways in which our technologically advanced, modern (or is it postmodern?) condition is being altered by the stories we tell ourselves.

If there is additional discussion of this review, you may access it through the network, at
https://networks.h-net.org/h-ideas

Citation: Craig Keating. Review of Hayles, N. Katherine. *How We Became Posthuman: Virtual Bodies in Cybernetics, Literature and Informatics.* H-Ideas, H-Net Reviews. September, 2000.

URL: https://www.h-net.org/reviews/showrev.php?id=4517