In the late 20th century with the millennium upon us, the distinction between human beings and machines is blurred. Popular culture seems to confirm Jean Baudrillard's contention that it is no longer necessary to write science-fiction since we now live it. Consistent with this assertion is the widespread belief that we are on the verge of the "post-body," "post-biological," or "post-human." This view has been a subject of analysis both for psychologist Sherry Turkle and science historian J. David Bolter who refers to the late-20th-century human as "Turing's Man." Theorists such as Arthur and Marilouise Kroker argue that the body is already obsolete. According to the Krokers, bodies have become expendable in the late 20th century as the economy collapses and culture implodes. In practice, the concept of obsolescence as applied to humans is a form of social Darwinism: it posits the survival of those with the economic means to finance their continued existence.

In her most recent book, *How We Became Posthuman: Virtual Bodies in Cybernetics, Literature, and Informatics*, Katherine Hayles does not offer certainties or conclusions; she presents questions and suggestions fashioned in a looping manner that flow from concept to artefact with parataxis at the heart of her argument. Her account is frequently gnomic and tantalising, both suggestive and enlightening; she raises issues of great importance, both from a philosophical and political standpoint, in today's informatic age.

The chapters are structured like a seriation chart to which she makes reference in relation to the history of cybernetics from the Macy Conferences in the 1950s to the present. In the history of cybernetics, ideas were rarely made up out of a whole cloth. Rather, they are fabricated in a pattern of overlapping replication and innovation, a pattern that Hayles calls "seriation" (a term appropriated from archaeological anthropology). The three main movements or "waves" of cybernetics are homeostasis (1945-1960), reflexivity (1960-1985) and virtuality (1985 to the present). Within archaeological anthropology, changes in artefacts are customarily mapped through seriation charts. One constructs a seriation chart by parsing an artefact as a set of attributes that change over time. Hayles uses the example of "lamps." A key attribute of lamps is the element that gives off light. The first lamps, dating back thousands of years, used wicks for this purpose. Later, with the discovery of electricity, wicks gave way to filaments. Considered as a set, the figures depicting changes in the attributes of an artefact reveal patterns of overlapping innovation and replication. Some attributes change from one model to the next, while others remain the same.
The conceptual shifts that took place during the development of cybernetics display a seriated pattern reminiscent of material changes in artefacts. Conceptual fields evolve similarly to material culture in part because concept and artefact engage each other in continuous feedback loops. An artefact materially expresses the concept it embodies, but the process of its construction is far from passive. A glitch has to be fixed, a material exhibits unexpected properties, an emergent behaviour surfaces—any of these challenges can give rise to a new concept, which results in another generation of artefacts, which leads to the development of still other concepts. According to this rationale, one should be able to trace the development of a conceptual field by using a seriation chart analogous to those used for artefacts.

Hayles makes her intentions clear as of the first chapter. Her book is not just a historical examination of the cybernetic episteme: it explores the complex interplays between embodied forms of subjectivity and arguments for disembodiment throughout the cybernetic tradition. She asks a number of fundamental questions. How has information lost its body? How did it come to be conceptualised as an entity separate from the material forms in which it is thought to be embedded? How did the cyborg emerge as a technological artefact and cultural icon in the years following World War II? How is a historically specific construct, the human, giving way to a different construct, the posthuman?

Central to the construction of the cyborg are informational pathways connecting the organic body to its prosthetic extensions. This presumes a conception of information as a disembodied entity that can flow between carbon-based organic components and silicon-based electronic components to make protein and silicon operate in a single system. When information loses its body, equating humans and computers is easy, for the materiality in which the thinking mind is instantiated appears incidental to its essential nature. The idea of the feedback loop implies that the boundaries of the autonomous subject are up for grabs, since feedback loops can flow not only within the subject but also between the subject and the environment. From Norbert Wiener on, the flow of information through feedback loops has been associated with the deconstruction of the liberal humanist subject, the version of the "human" with which the posthuman is concerned.

As its premise, Hayles's work contests the materiality/information separation by complicating the leap from embodied reality to abstract information. She accomplishes this by pointing to moments when the assumption involved in this move was contested by other researchers in the field. The point of highlighting such moments is to make clear how much had to be erased to arrive at such abstractions as bodiless information. Of course, abstraction is an essential component in theorizing, for no theory can account for the infinite multiplicity of our interactions with the real. But when we make moves that erase the world's multiplicity, we risk losing sight of the variegated leaves, fractal branchings and particular bark textures that make up the forest.

In the posthuman, we encounter a host of fictional speculations (from Bernard Wolfe's Limbo to the novels of Philip K. Dick) and theoretical hypotheses about the total transformation of the human body that occurs through its interpolation in the nascent information networks. Contiguous with these claims, we find another set of observations on
the entrenchment of existing bodily stereotypes in the electronic media. At successive
moments in their development, digital media have contributed to the destabilization of an
established sense of "reality." But, at the same time, these new media are used to simulate
signifying objects, the bodies and the worlds they are rendering obsolete.

One of the main areas examined in the posthuman from the perspective of
dematerialization is the epistemic shift toward pattern/ randomness from presence/absence.
This shift affects human and textual bodies on two levels at once, as a change in the body
(the material substrate) and as a change in the message (the codes of representation). The
connectivity between these changes can be seen in Hayles's examination of contemporary
fiction and information technologies.

But what happens to the experience of embodiment, which Hayles refers to as a "blind
spot" in literary studies? The blind spot she refers to is most evident when literary and
cultural critics confront the fields of evolutionary biology. "From an evolutionary biologist's
point of view, humans with 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 behaviours and structures" (284). This question defines what is at stake culturally
in the development of these new technologies. Both contemporary theory and popular
culture attempt to narrativise this mutation in the relation between mind and body, perhaps
most visible in cyborg imagery, as feminist and cultural theorist Donna Haraway has argued
in "A Cyborg Manifesto." AI researcher Hans Moravec has envisioned a way to make the
Cartesian metaphor of the mind divorced from the body a literal reality by taking the human
mind out of the brain in what he calls the "postbiological." He describes how it will someday
be possible for human mental functions to be surgically extracted from the human brain and
transferred to computer software through a process he calls "transmigration." The useless
human body and its brain tissue would then be discarded, while human consciousness
would be downloaded in computer terminals, or for the occasional outing, in mobile robots.
In his most recent book Robot: Mere Machine to Transcendent Mind (Oxford Press, 1998),
he discusses the prospects of machine intelligence overtaking human intelligence in less
than 50 years. Despite the extreme nature of his ideas, Moravec is no isolated mad scientist:
his vision of separating mind from body has been endorsed by Marvin Minsky, the MIT
professor of Science and Technology. Minsky's integration of human intellect and emotions
evokes theories of holistic medicine. His writings, however, do not argue for the preservation
of human life; they contemplate its extinction. According to this view, the mind takes over
qualities associated with the body, presumably making the latter obsolete.

Hayles tells of another story about the collapse of the mind-body dualism and its outcomes:
what disappears are not material bodies but an abstract notion of the body as the
naturalising ground of a unitary and universalising notion of the self. The disappearance of
"the body" is then followed by a reconstruction or reconfiguration of embodiment, and only
the alternative models of historical experience generated by that reconstruction deserve the
name of "posthuman."

The narrative structure of How We Became Posthuman is also revealing. Hayles has
selected literary texts-stories that focus on scientific theories-that merit wider currency in the
body politic. As the chapters on scientific developments demonstrate, culture circulates through science as readily as science circulates through culture. The heart that keeps this circulatory system flowing is narrative - narratives about culture, narratives within culture, narratives about science, narratives within science. In her account of scientific developments, Hayles has sought to emphasise the role that narrative plays in articulating the posthuman as a technical-cultural concept. She has done so by looking, for example, at artificial intelligence as a narrative field (in chapter 9).

The concept of virtual bodies and narrative is examined in the light of narrative itself, particularly its resistance to various forms of abstraction and disembodiment. By turning the technological determinism of bodiless information, the cyborg and the posthuman into narratives about the negotiations that take place between particular people at particular times and places, Hayles replaces a teleology of disembodiment with historically contingent stories about contests between competing factions, contests whose outcomes were far from obvious. Many factors affected the outcomes, from the needs of emerging technologies for reliable quantification to the personalities of the people involved. Though overdetermined, the disembodiment of information isn't inevitable, anymore than it is inevitable that we continue to accept the idea that we are essentially informational patterns.

In this regard, the literary texts that Hayles has selected do more than explore the cultural implications of scientific theories and technological artefacts. Embedding ideas and artefacts in the situated specificities of narrative, the literary texts give these ideas and artefacts a local habitation and a name through discursive formulations whose effects are specific to that textual body. In exploring these effects, Hayles wants to demonstrate, on multiple levels and in many ways, that abstract patterns can never fully capture the embodied actuality, unless they are as prolix and noisy as the body itself. Shifting the emphasis from technological determinism to competing, contingent, embodied narratives about scientific developments is one way to liberate the resources of narrative so that they work against the grain of abstraction that runs through the teleology of disembodiment. Another way is to read literary texts alongside scientific theories. In articulating the connections that run through these two discursive realms, Hayles wants to entangle abstract form and material particularity such that the readers will find it increasingly difficult to maintain the perception that they are separate and discrete entities. In this book, literary texts with their fashionings of embodied particularities are crucial.

What then is the posthuman? The posthuman view, according to Hayles, is suggestive rather than prescriptive. It privileges informational pattern over material instantiation, so that embodiment in a biological substrate is seen as an accident of history rather than an inevitability of life. The posthuman view considers consciousness, regarded as the seat of human identity in the Western tradition long before Descartes, as an epiphenomenon, an evolutionary upstart trying to claim that it is the whole show when in fact it is only a minor side-show. The posthuman view regards the body as the original prosthesis we all learn to manipulate, so that extending or replacing the body with other prostheses becomes a continuation of a process that began before we were born. Above all, Hayles claims that by these and other means, the posthuman view configures human beings so that they can be seamlessly articulated with intelligent machines. In the posthuman, there are no essential
differences or absolute demarcations between bodily existence and computer simulation, cybernetic mechanism and biological organism, robot teleology and human goals.

**In tracing the** dis/continuities between a "natural" self and a cybernetic posthuman, Hayles is not trying to recuperate the liberal subject. Rather, she views the present moment as a critical juncture when interventions might be made to keep disembodiment from being rewritten, once again, into prevailing concepts of subjectivity. She sees the deconstruction of the liberal humanist subject as an opportunity to put back into the picture the flesh that continues to be erased in contemporary discussions about cybernetic subjects. Hence her focus on how information lost its body, for this story is central to creating what Arthur and Marilouise Kroker have called the "flesh-eating 90s."

**The stories told** in *How We Became Posthuman* - how information lost its body, how the cyborg was created as a cultural icon and technological artefact, and how humans have become posthuman - would not have the same resonance or breadth if they had been pursued through literary texts or scientific discourses alone. The scientific texts reveal, as literature cannot, the foundational assumptions that gave theoretical scope and artefactual efficacy to a particular approach. The literary texts reveal, as scientific works cannot, the complex cultural, social, and representational issues tied up with conceptual shifts and technological innovations. By fusing the two, Hayles offers a way of understanding ourselves as embodied creatures living in embodied and disembodied words.

**Hayles sums up** the posthuman as follows: "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 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."

Niran Abbas teaches at Birkbeck College, University of London. He is organizing a conference on the work of Michel Serres which will take place at the University of London on May 29, 1999.

© CTheory. All Rights Reserved