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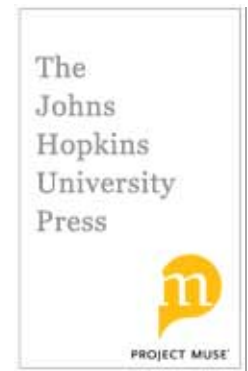
Information Ages: Literacy, Numeracy, and the Computer
Revolution, and: How We Became Posthuman: Virtual Bodies in
Cybernetics, Literature, and Informatics (review)

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Guiana from their place as immutable mobiles, making them instead problem signifiers of British Empire.

Ron Broglio
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Michael E. Hobart and Zachary S. Schiff. *Information Ages: Literacy, Numeracy, and the Computer Revolution*. Baltimore: Johns Hopkins University Press, 1998. xiii + 301 pp. \$29.95 cloth.

N. Katherine Hayles. *How We Became Posthuman: Virtual Bodies in Cybernetics, Literature, and Informatics*. Chicago: University of Chicago Press, 1999. xiv + 350 pp. \$18.00 paper.

There are already several excellent histories of informatics, a term covering the disciplinary matrix of theories, technologies, and cultural relations of information. Despite the chronology implied in their titles, Michael E. Hobart and Zachary S. Schiff's *Information Ages* and N. Katherine Hayles's *How We Became Posthuman* are not histories of this sort, or not simply so. The fascination and success of both these books, to a greater or lesser degree, lies in their reflexive implication of information in the very possibility of history: these are not only histories of information, but instances of informatics as history. Hobart and Schiff offer a much-needed historicizing of the concept of information, while Hayles once again sets the standard for science and technology studies with an informed account of our becoming-virtual. Both books arrive at certain logical impasses, which are less shortcomings than illuminations of the nonintersection of history and information theory.

Information Ages is the more ambitious in historical scope as well as in transdisciplinary ambitions. Written against the grain of proclamations that the contemporary is the "information age," the target is the immediacy of the present: the sense that pretechnological, preinformatic history culminates in our age of information and information technologies. We use information as a metaphor that appears to grasp all that can be known, a "general principle of organized phenomena" (p. 3) from social systems to subatomic quarks. Hobart and Schiff displace this self-understanding for a scheme of "information ages" in the plural. In doing so, they trace the changing semantics of information, establishing the historical a priori for the contemporary information age. The book is driven by classification, already evident in the tripartite schema of the subtitle: three information ages (classical, modern, contemporary), each exemplified by a technology (writing, print, computers), and by certain essential features (wisdom and classification, knowledge and analysis, technique and play). This classifying mode is further reinforced by textbook-like examples of characteristic problems and methods from each information age, whether the basics of Aristotelian logic, differential calculus, or computer programming. This is one of the virtues of the book—which indeed reads as a textbook, relegating scholarly apparatus to a bibliographical essay at the end and focusing on a fluid and persuasive presentation of the narrative of the history of information. No new research is offered; the purpose is synthetic and didactic, a constellation of materials as proof of its history of information.

Interestingly, the impulse to classify is itself a reflection of the information technologies identified with literacy and alphabetization. While Hobart and Schiff point to an increasing abstraction in the history of information, the narrative of information's history begins with an initial abstraction: the doubleness of the written mark, which differentiates itself from itself in the moment of inscription. The history of information is inseparable from that of literacy, and the complexities of numeracy and digitization dealt with later in the book elaborate the initial historical implications of information. For Hobart and Schiff, the history of information is marked by a discontinuity with a preliterate, oral culture where information did not exist. They argue that collective memory in oral cultures remained specific to rites of commemoration, participation, and immanent modes of consensus making. By contrast, a combination of reflection and abstraction with distance or displacement will mark the history of information. Such a fundamental distinction places the origins of information within history, while at the same time relegating the preinformation age to what could not be recorded and recalled—that is, to what is not available as historical information. The history of information is its own reflexive precondition set against this shadowy prehistoric backdrop.

Gregory Bateson once defined information as “*difference which makes a difference*” (Gregory Bateson, *Steps to an Ecology of Mind* [New York: Ballantine Books, 1972], p. 453). Hobart and Schiff stay close to Bateson and to the etymology of information as schematizing phenomena, “pulling” or “dragging” something out of experience by “drawing away from” it (p. 4). Thus, the quantification and mathematization brought about by the repetition and regularity of print, along with the resulting surfeit of texts, led from the stability of the classical taxonomies to a “rupture of classification” (p. 87). Each of Hobart and Schiff's historically specific classifications of information is both the outcome and the subject of a process of reflection, abstraction, and displacement. As a result, they no sooner contextualize information into an “age” or other classification than they demonstrate its displacement and decontextualization. In the end, they inform us that *Information Ages* is about information as “a type of abstract thinking, but not (how can we say it otherwise?) taken in the abstract, for information is historically grown” (p. 264). This sounds good, but the parenthesis signals the pressures created for information as a “historical creation of the human mind” (as the book's dust jacket claims). While Hobart and Schiff deserve credit for countering certain eschatological tendencies of post-McLuhanite accounts of information, the quasi-phenomenological discovery of information's “historicity” (p. 266) is a solution by *fiat*, positing something at the heart of information that always remains beyond information. The “historical creation” of information is thus a kind of aftereffect of this difference that makes a difference. As its historicity, information's tendency toward abstraction can be described within a “nexus” (p. 264) of material technologies, but it cannot be analyzed. It simply comes to pass and continues to do so.

But information's historicity can be qualified in other ways. The category of embodiment is the chief difference between *Information Ages* and *How We Became Posthuman*. For Hayles, information does not exist as an abstract pattern but in terms of material infrastructures. The task is to sort specific material embodiments from narratives of information's abstraction. Hayles describes a much narrower historical field than Hobart and Schiff: their claims for specificity are supplemented by her precise focus on postwar cybernetics, where the dynamics of control and emergence, virtuality and embodiment, give a nuanced sense of the

processes of abstraction at work in information. She tells three “interrelated stories”: (1) “how *information lost its body*,” (2) “how the *cyborg was created as a technological artifact and cultural icon* in the years following World War II,” and (3) “how a historically specific construction called the *human is giving way to a different construction called the posthuman*” (p. 2, italics Hayles’s). These stories must be seen less as interrelated strands than as superimposed registers of the same matrix, of “cybernetics, literature, and informatics.”

Hayles’s history of cybernetics and the cybernetic organism is valuable in itself. Starting from the Macy Conferences—those Star Chambers of cybernetic theory—she offers the clearest account yet of the transformation of Norbert Wiener’s science of control and communication into the second-order cybernetics of self-organization, and subsequently into the third-order cybernetics of autopoietic systems. She shows how decisions early in the history of cybernetics created the preconditions for emergent sciences such as artificial life—corresponding roughly to Hobart and Schiff’s final age of information “play”—leading to her larger, epistemic story of the construction of the posthuman. Attention should be paid to the “we” of Hayles’s title. The ambiguity of the term vacillates between incorporation and distancing: the reader is gathered into the posthuman body politic, but also asks “who me?” “We” has a certain technical autonomy that exemplifies Hayles’s discursive point. As she makes clear, the posthuman is not a choice to be taken or rejected: the very representational potential of digital media in itself already implies a virtualization of the body in the interface between viewer and machine. We are already posthuman, and the concern is rather with how subjectivity is being constructed, so as “to keep disembodiment from being rewritten, once again, into prevailing concepts of subjectivity” (p. 5).

Hayles examines the theorization of information as a context-free pattern. The neat development of cybernetics is displaced for a story of resistance and contestation, the forward movement of informatics described by Hobart and Schiff slowed by this inertia of embodiment. *How We Became Posthuman* convincingly shows that informatics gains theoretical coherence only through a metaleptic rhetoric that abstracts from data and then presumes the priority of the abstraction. Hayles’s strategy is to reembed and reembody informatics by showing that the dominant account both recuperates and reacts to alternative theories in a kind of social feedback loop, preparing the way for subsequent developments. Part of the richness of the book is a flexible approach that gathers many theoretical tools while tying itself to none. Wanting to balance the complexity of historical materials with the discontinuity of paradigms, Hayles adapts concepts from archaeological anthropology to characterize attributes and elements that both change and remain stable through time, allowing a unique clarification of innovation and anachronism in a wide range of cultural artifacts. Applied to cybernetics, this approach makes visible the bracketings and exclusions that transform embodied reality into abstract information. The deviation of specific material structures from their abstract representations is the mark of embodied information, but this visibility of embodiment raises certain questions. Respecting the informatic preconditions of discourse and rigorously distinguishing the contextuality of embodiment from normative criteria means that embodiment is never shown as such: it is only posited, yet remains always available as what has been excluded. To read the marks of embodiment is paradoxical, at the least.

In the problematic of cultural self-understanding, literature has always been culture’s best bet, and it turns out that posthuman culture is no exception. Hayles examines what she calls “information narratives”: Bernard Wolfe’s *Limbo*, several

Philip K. Dick novels, Neal Stephenson's *Snow Crash*, Greg Bear's *Blood Music*, Richard Powers's *Galatea 2.2*, and Cole Perriman's *Terminal Games*, along with brief readings of other science fiction texts. The readings are perceptive, but of greater interest is the basic claim for literary texts in theorizing virtual bodies. The least of these claims is that literature helps to reflect and thus fill in the historical contexts of scientific theories. More interesting is the claim that literary texts "display the passageways that enabled stories coming out of narrowly focused scientific theories to circulate more widely through the body politic" (p. 21). This could be read as follows: literary texts do not simply thematize what scientific discourse has already achieved, but display what could not otherwise be displayed. By insisting on the role of representation in the economy of scientific and cultural discourses, Hayles preserves a highly specific function for literary texts. The vehicle of this function is narrative, where "chronological thrust, polymorphous digressions, located actions, and personified agents" make it a "more embodied form of discourse than is analytically-driven systems theory" (p. 22). Narrative, as a literary mode, displays its own deviancy from disembodied information: it displays the momentum of history, and in doing so, is just such a historical moment. In the end, this book implies a phenomenology of human life as "embedded in a material world of great complexity, one on which we depend for our continued survival" (p. 49). In the medium of literary texts we grasp the non-conceptuality of embodiment. In this referentiality, the disembodiment of information proves the embodiment of reality.

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Shirley C. Strum and Linda Marie Fedigan, eds. *Primate Encounters: Models of Science, Gender, and Society*. Chicago: University of Chicago Press, 2000. xv + 635 pp. \$35.00.

Primate Encounters proceeds from the assumption that sharing research commitments transforms what could be a polarized field of "science wars" into a generative space ripe for the more mutually beneficial, ongoing engagements that its editors term "science encounters." With this volume, anthropologists Shirley C. Strum and Linda Marie Fedigan pursue an ambitious plan of forming the basic unit of such encounters: new multidisciplinary models or "teams." They form and set such teams to work on questions of how gendered bodies and other configurations of the self and the social have shaped the sciences and cultures of primatology, to which both women already have contributed their own independent and extensive fieldwork and publications. Their approach to this project self-consciously attempts to remedy not just their own sense of scholarly isolation but also a more widespread crisis of identity within primate studies. In spite of their seemingly assured future through consistent funding, multigenerational research projects, and intense popular interest, such studies have failed to consolidate as a distinct academic discipline. For reasons that this book helps to clarify, practitioners of primatology housed in various academic fields—including anthropology, ethology, psychology, sociology, biology, and philosophy—often feel compelled to meet at the shifting intellectual crossroads of science studies. Drawing strength from this last area, presented here as an intersecting, emergent, and similarly contested interdiscipline, Strum and Fedigan have assembled contribu-