

### The Ghost in the Machine: Artificial Intelligence and Gendered Thought Patterns

Sue Curry Jansen  
Cedar Crest College/Muhlenberg College  
Allentown, Pennsylvania

#### Introduction: Constructivism and the Sociology of Science

Gender issues and gendered subjects are the *raison d'être* of feminist research. The social sciences and the humanities have been the primary targets of the feminist critique as well as the principal sites of its revisionary projects.

Until recently objectivist epistemologies insulated the natural and physical sciences against feminist analysis. However the growing influence of constructivist perspectives within the philosophy of science is now making it possible for feminists to raise epistemological questions that were beyond the limits of permission for scholarly discourse a decade ago. This questioning is finally providing grounds for the emergence of a feminist sociology of science.

Constructivism conceives of science as a form of communication — an artifact of language and culture — which is responsive to the interests, priorities, and values of the communities that produce it. Constructivism abandons objectivist theories of knowledge which view science as a hermetically sealed realm of pure cognitive activity. Richard Rorty in his article, "The Contingency of Language," puts the matter very simply when he says science is a conversation which produces talk and texts. This conversation provides us with recipes which are more or less useful in negotiating our relationships with nature.

A constructivist informed feminist sociology of science maintains that women's historical exclusion from the conversations of Western science has generated a body of knowledge that is not only incomplete but also severely deformed by its single-minded embrace of the priorities of instrumental rationality. In sum, the new feminist sociology of science contends that there was nothing natural about the ways in which the natural and physical sciences were conceived and developed, and that there is nothing natural about the ways they continue to exclude women from full participation in their conversations.

The feminist deconstruction of Western science supports the conclusion that subjects secured in logical-mathematical intelligence, like subjects secured by natural languages, are gendered subjects. The evidential warrants for this conclusion are derived from three kinds of inquiries: (1) historical studies of the development of the language, culture, mythos and practices of scientific communities; (2) textual studies, informed by "post-modern" epistemics which investigate the

constituents of plausible explanatory structures in science; and (3) empirical scientific studies themselves, e.g., studies in fields like primatology which embrace new models and paradigmatic assumptions to produce new findings.<sup>1</sup> These inquiries have exposed the gender politics which secure the root metaphors that make the conversations of science possible.

#### Artificial Intelligence: The Ghost in the Machine

My research on artificial intelligence (AI) builds upon these precedents. It assumes that the masculinization of logical-mathematical competences has been reified by the structures, rules, paradigms, models, and methodologies of contemporary science. This reification has endowed Western (male) science with a kind of "phantom objectivity" which has permitted it to ignore the resonances of alternative constructions of reality. By undertaking a case study of the language, models, and disciplinary assumptions of the science of artificial intelligence, I seek to empower wider participation in the conversations of contemporary science.

The assumptions of AI research are relatively simple, and essentially reductionist. AI researchers conceive of the machine, especially the computer, as a metaphor for mind. Within their texts, the program becomes the "prism" of mind, the metonymic surrogate of intelligence.<sup>2</sup> AI researchers construct computer simulations of operations of mind by reducing the constituent cognitive and biological processes to machine recognizable inputs. The modelling process itself can be extraordinarily complex. Simulating the thought that initiates a simple physical movement like raising an arm to press a lever may require identifying, mapping, and modelling hundreds or even thousands of cognitive and neurological messages. Nevertheless AI researchers claim all interesting manifestations of human intelligence can be contained within programs (Minsky, 1987).

The ultimate objective of AI research is to create machines which are "intentional": machines which can think and even reproduce themselves (Dennett, 1981; Minsky, 1981 and 1987). Artificial intelligence, *per se*, does not yet exist. It is still a futuristic vision: a science fiction.

The science of artificial intelligence provides an especially interesting study of the gendering of science because the AI paradigm is secured by explicit claims that its models abstract mind from matter, spirit from substance, program from person. In short, apologists of AI insist that the ghost, the "phantom objectivity," in their machine has been "castrated."

I believe that removing the layers of reification that seem to be concealing the gender of AI can contribute to theoretical advances in critical theory and feminist studies of science as well as humanize and womanize research on AI. Ultimately I believe it can encourage reflection on and development of models of reasoning which can transcend re-

pressive gender-based bifurcations of thought.

AI research is intrinsically interesting to a feminist sociology of science for several reasons. First, if AI models are gendered, they represent a contemporary rather than historical example of the masculinization of science. Unlike studies of Baconian and Cartesian bifurcations of thought, examination of the AI paradigm offers an opportunity to study the gendering of science in process.<sup>3</sup> Second, constructivist philosophers of science urge analysis of scientific discourse, particularly the poetics and narrative structures of scientific texts. AI texts are an especially rich source for exploring the mythos of the scientific imagination since AI is an artifact of scientific vision, not a coding of empirical realities. The frequent use of birthing metaphors by male scientists to describe their attempts to create AI should be especially interesting to students of gender and science. Third, if the cognitive processes captured by AI programs model actions Western cultures ascribe to males — e.g., behaviours embedded in formal systems of rules such as chess-playing, resolving mathematical problems and logical puzzles, etc. — a feminist sociology of science might identify actions usually ascribed to females and suggest ways in which models of these activities might be constructed. Or, if these actions are not amenable to the modelling process, it might conceive of new ways of conceptualizing thought processes. Fourth, feminist researchers and activists support policies promoting gender equity in computer, mathematical, scientific and technical education. Exposing hidden gender-based curriculums within the paradigms of science itself should therefore contribute to these efforts.

I employ two strategies in exposing the hidden curriculums of AI research: I examine the assumptions of the AI modelling process and compare its salient traits to the traits Carol Gilligan identifies in *In A Different Voice* (1982), as constituents of male modes of reasoning; and I examine the gendering of the language, metaphors, and mythos of AI texts. I make no claims of universality for the gender-based traits identified by Gilligan. To the contrary, I assume that the traits she tags as masculine resemble the traits modelled by North American AI researchers precisely because both sets of researchers share the assumptions of white, middle- or upper-middle-class, North American, academic language and culture, and that they both draw on these resources in articulating their respective research programs. Similarly, I make no claims that my own discourse transcends these cultural constraints, only that it is cognizant of them.

It is relatively easy to identify the salient traits of AI models because the AI community has produced many programmatic essays describing these traits. AI models are constructed from the following assumptions about logical inference and cognitive processing: (1) thinking is primarily instrumental — it involves problem-solving; (2) problem-solving entails rule-governed decision-making; (3) decisions are made by weighing identifiable alternatives; (4) the alternatives weighed in decision-making can be expressed in propositional language; (5) propositional language can be translated into the categories of machine languages; (6) rules for inferring relations among alternatives can be: (a) identified, (b) expressed in propositional language, and (c) translated into machine language; and (7) rules used for inferring relations among alternatives can be used to ask questions which can generate new knowledge.

Gilligan identifies a similar configuration of the mode of

reasoning and problem-solving that she identifies as the "morality of rights." The morality of rights is based upon the following assumptions: (1) thinking is goal-oriented; (2) there is a hierarchical order of (universal) rules which guides decision-making; (3) decisions are made by identifying available means and applying the rules to identify the appropriate (moral/utilitarian) choice; (4) available means can be articulated; (5) articulation of means involves resolution of ambiguities; (6) the hierarchy of rules is used to infer relations among alternatives; and (7) the rules are used as templates for understanding new, unusual or ambiguous situations. Principles of justice, equality, and fairness are formalized in the rules; decision-making is an attempt to realize the rewards of these social values.

Gilligan contrasts this mode of reasoning with a second pattern which she calls "the ethic of responsibility." The ethic of responsibility is embedded in "web-like relations" rather than hierarchies or formal rules; it emphasizes contextual reasoning and equivocation, stresses care, attachment, affiliation, and interdependence, conceives of power as nurturance, embraces principles of equity and non-violence, and defines self in relationships with others. Both of these modes of reasoning are systematic, internally consistent, and rational, but they frequently lead to different decisions.

Gilligan's studies show that both modes are present in each sex but among the well educated young Americans she studied, these forms of reasoning are gendered: males usually engage the morality of rules when faced with moral dilemmas while females usually invoke the ethic of responsibility.

The prism of mind captured by AI programs closely parallels the modes of reasoning Gilligan describes as the morality of rules and which she ascribes to males. Conversely, the traits Gilligan associates with the ethic of responsibility are traits that AI modellers do not, and perhaps cannot, capture in their programs. This would seem to support the conclusion that AI is a reification of male-gendered modes of thinking.

Analysis of the programmatic texts and talks of AI scientists also supports the conclusion that AI is gendered. Some of the mythologizing of AI is deliberate. Thus, for example, in *God and Golem, Inc* (1964), Norbert Wiener contributed to this mythos by asserting that machines which can learn, reproduce themselves, and coexist with humankind pose profound theological questions. He claimed AI scientists were creating life. Wiener's predecessors have richly embellished this claim. Images of male birth have served as metaphors for scientific discovery since Francis Bacon penned *The Masculine Birth of Time* in 1602.<sup>4</sup> In AI discourse, however, metaphors of male birth assume a startling level of literalness. The following conversation between two AI scientists is reported by Sherry Turkle: Don Norman says, "I have a dream to create my own robot. To give it my intelligence. To make it mine, my mind. To see myself in it. Ever since I was a kid." Roger Schank responds, "So who doesn't? I have always wanted to make a mind. Create something like that. It is the most exciting thing you could do. The most important thing anyone could do." Another scientist, Gary Drescher, tells Turkle, "We have the right to create life, but not the right to take our act lightly" (Turkle 1984, p. 262). The gender of the minds AI scientists want to make is seldom in doubt. AI discourse demonstrates: (1) a strong preference for metaphors which equate mind with masculin-

ity; and (2) a preference for masculine pronouns when describing AI and robotics.

Some AI scientists claim that the breakthrough which will permit them to create AI will constitute "the next step in human evolution" (Edward Fredkin quoted by Turkle 1984, p. 242). They even acknowledge the possibility that AI may render humans obsolete: that like the dinosaurs we might disappear leaving behind a "society" of interacting and self-generating computer systems (Minsky, 1987). Hans Moravec, the author of *Mind Children* (1987), seems to welcome the second Fall of Man:

All of our culture can be taken over by robots.  
It'll be boring to be human ... We can't beat  
the computers. So it opens another possibil-  
ity. We can survive by moving into other  
forms ... (quoted by Hirsch, 1987, p. 8).

In his neo-Freudian reinterpretation of the Oedipal complex, Norman O. Brown recasts the Oedipal desire to possess the mother sexually as a fantasy of "becoming father of oneself" (Brown quoted by Bordo 1986, p. 456). In some AI discourse, the fantasy seems to involve becoming the father of one's own destruction. In AI mythos, fantasies of immortality assume unusual, perhaps even pathological, forms. Unlike Bacon who saw knowledge issuing from a chaste marriage between man's mind and nature (which he conceived as feminine), cybernetic metaphors locate the genesis of knowledge in the marriage of men and (male) machines. AI mythos eliminates the woman from the Baconian metaphor of conquest, but it does not empower a rebirth of Plato's homoerotic vision. To the contrary, it replaces Eros with wires and chips.

Constructivist models of science do not permit us to dismiss or trivialize the mythos of science. They conceive of science as a form of communication which names nature; its mission is to translate the unknown into the known by creating theories and models which both construct and contain nature (Keller, 1985).

Constructivists think names matter: they believe metaphors fuel the engines of scientific discovery. Jerome Bruner describes the metaphors of science as "crutches" that help us to scale the mountain of abstraction; however once up the mountain, scientists "throw them away (even hide them) in favour of formal, logically consistent theory that (with luck) can be stated in mathematical or near-mathematical terms" (1986, p. 48). Nevertheless metaphoric crutches continue to empower scientific vision; they put poetry in the paradigms, colour the language of scientific discourse, and guide inquiry.

Analysis of AI texts suggests that the metaphors of AI discourse are strongly gendered, and that their gender is male. Trying to imagine a Frances Bacon, Renée Descartes, Edna Fredkin, Miriam Minsky, or Hannah Moravec giving voice to the metaphors and metatheories cited in this paper provides us with a simple litmus test for testing the gender of AI. Can we imagine any woman claiming that giving birth to a child made of wires and chips instead of blood and marrow is "the most important thing anyone could do"?

### Conclusions: Changing the Course of Science

If AI is gendered, it has profound implications for AI research. First, the architects of AI claim to separate mind

from matter, and cognitive processes from biological processes. If AI is gendered, this claim is false. Second, the architects of AI claim their simulations of cognitive processes are secured by rules which are projections or extensions of innate structures of mind. Gender is socially constructed, a process and product of history and culture. Gender relations are power relations. If AI is gendered, the fundamentalist claims of the architects of AI are suspect. These claims appear to reify gender-based power relations. Third, the architects of AI claim that all operations of mind can ultimately be captured by AI: that the program is the prism of mind. Gender-based power relations assign and cultivate cognitive skills along gender lines; the more powerful gender is expected to perform the more highly valued cognitive skills. If AI is gendered, the prism of mind captured by its simulations will be socially structured: it will reproduce and reinforce gender-based power relations. To date, the prism of mind programmed by architects of AI has modelled cognitive skills that industrial societies value and impute to males (especially well educated males like the architects of AI). Fourth, the architects of AI claim AI is the next step in human evolution. If the prism of mind constructed by AI is a reification of male-gendered cognitive processes, the next step in human evolution may represent the ultimate step in "the symbolic annihilation of women."<sup>5</sup> Fifth, some architects of AI claim AI is "intentional." If the prism of mind constructed by AI is a reification of male-gendered modes of thinking, the intentions of the architects of AI warrant serious scrutiny. AI may represent the most subtle and sophisticated form of sexism ever conceived by the minds of men.

Because AI discourse provides feminist sociologists of science with a laboratory for studying the gendering of science in process, it affords an opportunity for both research and critical intervention. It may also offer an opening for feminist intervention and redirection of the course of science. Such intervention may ultimately lead to the return of the repressed parts of mind. It may bring us closer to realizing the telos of Susan Bordo's salutary prophesy: "The historical identification of detachment, distance, and clarity has disclosed its limitations, and it is necessary (and inevitable) that feminine modes should now appear as revealing more innovative, more humane, and more hopeful perspectives" (1986, p. 456).

Failure to seize the opportunity to interrupt the conversations of AI scientists may, however, deliver us to a future which is even more repressive than the present. AI is still a science fiction, but the promises of AI scientists are powerful ideological tools. They are used to cultivate public acceptance of the "information society," a new, post-liberal, world system of capitalism that expands and rigidifies existing social and economic inequities. The social structuring of the information society is already oppressing women, particularly Third World women. It is also eliminating or de-skilling the jobs of working-class men throughout the world. If AI is gendered, the power to amplify gender- and class-based oppression is being built into the hard-wiring of the circuitry of the information society. Unless feminists interrupt the conversations of AI scientists before the wiring of the new order is complete, we may once again lose our voices.

### Notes

1. Some essential sources are Evelyn Fox Keller, *Reflections on*

*Gender and Science* (New Haven: Yale University Press, 1985); Susan Bordo, "The Cartesian Masculinization of Thought," *Signs* 11, 3 (1986), pp. 439-456; *Feminist Approaches to Science*, Ruth Bleier, ed. (New York: Pergamon Press, 1986); Sandra Harding, *The Science Question in Feminism* (Ithaca: Cornell University Press, 1986); *Writing Culture: The Poetics and Politics of Ethnography*, James Clifford and George Marcus, eds. (Berkeley: University of California Press, 1986).

2. I borrow this usage of the term "prism" from Sherry Turkle, *The Second Self: Computers and the Human Spirit* (New York: Simon and Schuster, 1984). Turkle's work is the definitive sociological study of the computer culture. She is suspicious of the imperialism of AI claims, but does not impute a gender politic to AI language or assumptions.

3. Keller and Bordo have done the definitive work in this area.

4. Keller explores Bacon's metaphors in her ground breaking work, *Reflections on Gender and Science*.

5. This term is borrowed from Gaye Tuchman, "The Symbolic Annihilation of Women by the Mass Media." Introduction to *Hearth and Home*, Tuchman, Arlene Daniels, and James Benet, eds. (New York: Oxford University Press, 1978), pp. 3-38.

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