
A JOURNAL
OF THE
HISTORY
of RHETORIC
RHETORICA

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Rhetoric and Artificial Intelligence

Most people have different working definitions for the term "rhetoric," but in a broad sense it may be taken as persuasion or human communication: both the way that human beings order their world and the way they make sense of it to each other. These two aspects are the combination of rhetoric and dialectic that Plato rolled up into one. Artificial intelligence, as it has developed over the last twenty to thirty years, is of considerable importance to the study of rhetoric. The field starts with a radical elaboration of formal logic and moves on to a broad expansion of heuristic procedures that introduce context into formal analysis. The movement parallels Aristotle's separation between logic and dialectic, although for Aristotle dialectic should come before logic rather than the reverse. For rhetoric, artificial intelligence can contribute a great deal on technique and device, and a growing amount on strategy. But as yet there is little or nothing on stance, in other words on the center of rhetoric which is concerned with material interaction.

The lack of commentary on stance from artificial intelligence is odd because in many ways it is fundamentally concerned with rhetoric. Aristotle identified psychology, or the passions, with the field of rhetoric, and it is in psychology that artificial intelligence is making

 Rhetorica, Volume IX, Number 4 (Autumn 1991)

its effective contribution for the moment. More importantly, it is dealing with a problem underlying the methodology of modern science: how to incorporate context into rational reasoning, which is essential for an increasingly technological science. Further, artificial intelligence as a field of study is divided in ways that indicate a rhetorical dilemma more broadly pertinent to twentieth-century epistemology.

Before turning to these contributions of artificial intelligence, I would like to outline my understanding of the relevant aspects of rhetoric, and specifically of the rhetoric of modern science about which AI has so much to say.

Rhetoric. Rhetoric is irretrievably social and historical. It has always insisted upon context. It comes from public oratory and the need to establish grounds upon which to act, to suggest valid actions. The study of rhetoric addresses, first, techniques and devices that are specific to each medium and intrinsically neither coercive nor helpful, although they are often historically "bound" in that we frequently respond to them as if they carried predetermined standards, whereas they are in effect contingent upon epistemology and conventional. Second, rhetoric addresses strategies, which have to do with the construction of the speaker (*ethos*) and audience (*pathos*), and which we study most often under genre or ideology. For example, tragedy, dictamen, newsletters, scientific reports are all strategies—they happen to be examples of verbal strategies, but of course all the media contribute their own strategic relations. Third, rhetoric addresses stance, which has to do with the interaction of rhetor (speaker/writer), audience, and text, in an historically specific medium.

Rhetoric is based fairly simply on the idea that communication is never exact, hence we have to persuade in order to communicate. We can persuade openly by addressing our assumptions, and this is relevant both to rhetor and audience; we can persuade covertly by neglecting to address those assumptions. In either case we have to be confident that within the medium being used there are structures built into the text that will ensure that the assumptions are either re-examined or neglected. However, the converse is also the case: if you take communication to be exact then you do not need persuasion.

History. During the sixteenth and seventeenth centuries, rhetoric in western Europe completely changed its face. At this time a logic isolated from rhetoric was proposed that was rational and

analytical.[1] This may have happened for social reasons because there was an emerging commercial class or group that perceived an education in rhetoric as an instrument of class constraint, which indeed it has often been.[2] It has been suggested[3] that the emerging group underwrote Peter Ramus's attempt to sever logic from rhetoric and then retain logic as the one valid component, generating a mode of pure reasoning. The severance coincides with the development of abstract, typographically presentable geometry, which made possible a self-contained mathematical notation, in turn generating a mode of pure language. This hope for pure reasoning and pure language created an environment in which rhetoric had little chance of working fully. The study of rhetoric was demoted from its status as the one essential skill of any citizen, held by Erasmus and other early humanists,[4] to decoration, manipulation, and eloquence in oral performance.

But, of course, rhetoric itself never goes away: it is always there whether or not it is studied as such. As Peter France has indicated,[5] rhetoric was studied in Scottish universities until the twentieth century. Even in the 1960s students of the arts had to study moral philosophy, rhetoric by another name, for the reasons of necessary enlightenment and educated social discourse that Peter France presented in terms of Adam Smith.[6] In England rhetoric was studied less subtly and with consequently greater loss as the "humanities" or classical education. This education did not foreground the pervasiveness of techniques and devices as such; it recognized the persuasion in poetic metaphor but not in scientific topic. The strategies

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[1]This ground has been covered from different points of view by Walter Ong in *Rhetoric, Romance, and Technology: Studies in the Interaction of Expression and Culture* (New York, 1971), and by Brian Vickers.

[2]The classical education in public schools has been a central location for the transmission of rhetorical skills to a particular class, from the seventeenth century to the twentieth.

[3]A. Grafton and L. Jardine, *From Humanism to the Humanities* (London, 1986).

[4]See in particular the work on humanist educationalists in L. Jardine, above; Nancy Streuver, "Lorenzo Valla: Humanist Rhetoric and the Critique of the Classical Language of Morality," in *Renaissance Eloquence*, ed. J. J. Murphy (London, 1983); and the study by L. Hunter, "From Cliche to Archetype," in *Topos, Commonplace, and Cliche: Toward an Understanding of Analogical Reasoning* (London, 1990).

[5]P. France, from a lecture, "Eighteenth-Century Rhetoric," in the Durham University Archive Series on Rhetoric, 1989–1990.

[6]This is an attitude of rhetoric that has recently been promoted in particular by the Frankfurt School studies on the strategies of the mass media.

of rhetoric split between the literary and the other: between "reports," documents, and so on which were supposedly factual, and the genres of fiction and verse, the gothic, the sentimental, the lyric, etc. The former take the reader/writer relationship for granted while the work of the latter is to foreground it. "Poetic" became the term for work that is rhetorically conscious and where some understanding of and approach to stance can be found.

This history is ludicrously curtailed but may provide some of the historical context for the emergence of modern science in the seventeenth century and its subsequent relationship with rhetoric.[7] I take modern science to be made up of a rational analytical logic and a denotative language. Its logic moves from premise to conclusion, using conclusions as new premises in a reductive pathway;[8] it can also be numerically described and is therefore quantifiable. Its grammar includes an exact syntax, no poetic, a formal latinate rule system that is parallel to mathematical equation. The result is that it communicates in a logic that proceeds toward truth and in a language that can be exact in expression of that truth. Its rhetoric claims that there is no need for rhetoric. It takes its grounds for granted, builds self-defining tautologous worlds within which rules can be employed to achieve specific goals. And it has achieved many helpful ends.

Yet within the history of rhetoric this kind of persuasion is precisely the rhetoric that Aristotle defined as nonrhetorical and that Plato described as irresponsible because it is without context. I need here to take a short look at what Aristotle and Plato have to say about this rhetoric, mainly to indicate that I do not subscribe to the conspiracy theory of modern science. Its approach was around for a long time before the seventeenth century, although certain events exacerbate its development of this particular kind of rhetoric. In addition, it is an approach to rhetoric that artificial intelligence takes even further.

From the start of recorded rhetorics, writers agree that rhetoric is persuasion and that it is persuasion from opinions or belief rather

[7]For a slightly extended account, see the summary in L. Hunter, *Rhetorical Stance in Modern Literature* (London, 1984).

[8]For other versions of this view, see S. Woolgar, "The Ideology of Representation and the Role of the Agent," in *Dismantling Truth: Reality in the Post-Modern World*, ed. H. Lawson and L. Appignanesi (London, 1989). A rhetorical commentary on Woolgar's writing may be found in J. McGuire and T. Melia, "Some Cautionary Strictures on the Writing of the Rhetoric of Science," *Rhetorica* 7 (1989): 87–99.

than from fact, or *a priori*.[9] In other words, rhetoric must always first persuade you of its grounds and only then proceed to argument. Plato distinguishes between persuasion from opinions based on unexamined grounds, or the plausible, and persuasion from opinion based on discussion about and assessment of grounds, or the probable.[10] Both are necessarily social, the first showing a careless attitude to ideological conditions,[11] and the second maintaining a responsible position.[12] Aristotle, however, concentrates only on persuasion from probable grounds. He writes the *Topica* specifically about this kind of logic, arguing that it can be used in dialectics as well as demonstrative argument, except that dialectics will also include the topics of practice: of social aspects in the rhetor/audience interaction, while the demonstrative (or aporistic or sophistic) argument will be exclusive of social contingencies. This distinction opens the door to nonsocial, noncontextual argument.

What these comments amount to is a definition of the relationship between rhetoric and logic. We have persuasion by the plausible, which is an irresponsible evasion of social context, manipulative and coercive: all those things that the popular use of the term now associates with rhetoric. We have persuasion by the probable, incorporating dialectic, which involves a necessary consideration of social practices and interaction. And we have persuasion by the demonstrative, or sophistic or aporistic, which is exclusive of social context by open declaration. The cautious will note that Plato's irresponsible argument by plausibility is parallel to Aristotle's exclusive argument by the demonstrative. The former is unconscious of evasion, or ignorant; the latter is conscious, and its validity, or distinction from the ignorant, depends upon its clear rejection of the social.

It may be worthwhile pointing out here that while the popular notion is of a Plato who fades away into truth, and of an Aristotle who is concerned with the pragmatic world, Plato never suggests that ideal truth is attainable: it is only possible to act toward the social practice of dialectical logic.[13] Neither does Aristotle claim

[9]See L. Hunter (1990).

[10]See L. Hunter (1984).

[11]Plato, *Gorgias* (London: Penguin, 1960).

[12]Plato, *Phaedrus* (London: Penguin, 1973).

[13]The point is worth making in light of the insistent placing of Plato's works in a tradition of Platonist reading dating from earlier periods; for example, H. Dreyfus and S. Dreyfus, "Making a Mind versus Modeling the Brain: Artificial Intelligence

absolute truth for factual observation, but he does provide a reasoning which allows us to argue *as if* there is a set of truths: the key to his proposal is, however, that we may take an opinion as a truthful premise if it is first shown to be acceptable to "all or to the majority or to the wise."[14] Furthermore, in *Rhetorica*, he suggests that science or physics is a distinct field of study just because it operates on the basis of previously established premises, in other words the only basis upon which we may reason as if there were truths is if opinions or beliefs have already been established by the dialectical argument of rhetoric. Rhetoric is an irretrievably social argument in which the moral is far more helpful than the true.[15] The social context always underlies scientific procedures and rhetoric, but by convention science operates *as if* it can take the social and contextual for granted.

Now, this scientific procedure was exacerbated during the seventeenth century by precisely that claim to pure reasoning and pure language that was at work enervating the study of rhetoric. The empirical bias of science, emphasized and reinforced by someone like Bacon, shifted the ground of scientific activity from the disputational schools into private individual practice. Bacon himself was concerned to incorporate rhetoric into the communication of science so that the public could be told about it.[16] In this he was not being patronizing, but recognized that the short-hand club jargon developed by the small scientific community engaged in this private practice would be elitist or esoteric to a broader public. Rhetoric had the job of attempting to relate these new discoveries to contemporary society, otherwise there would be no social interaction or responsibility to the public. What Bacon did not do, perhaps because he had no call to or because he too was deluded, was examine the rhetoric of the private practice of rational empirical discovery. Yet this became essential when empirical discovery was crossed with mathematical analysis, because mathematics, once transferred to the printed page, became a language that tried sharply to decontextualize the empirical. Perhaps this, along with

Back at the Branchpoint," in *The Artificial Intelligence Debate: False Starts, Real Foundations*, ed. S. Graubard (London, 1988).

[14]Aristotle, *Topica*, trans. E. Forster. (Cambridge, MA: Yale Univ. Press, 1950).

[15]This use of "truth" puts to one side the possibility of a "true" as "reliable" or "dependable," and focuses on "true" being "as the case is," exact and accurate.

[16]See, for example, Bacon's discussion of the "idols of the tribe," or his specific comments on the role of rhetoric in *The Advancement of Learning*.

the growing influence of decontextualized demonstrative logic, makes it not so surprising that the related twin of plausible rhetoric comes to the fore as the coercive, manipulative definition for rhetorical argument in general.

Hobbes thought that mathematical patterns and structures might also be able to clean up verbal language. He set up the hopes of the Royal Society pronouncement from Thomas Sprat about scientific language using one word to refer to one thing.[17] As Peter France notes, more sensible people, such as Locke, Hume, and Smith, recognized that science needed a public discourse. In any event, much of it was conducted orally in the scientific associations, and followed the oratorical delivery patterns of classical rhetoric. We need to remember that science was basically a hobby practiced by members of the upper classes, many of whom had attended humanities classes in public schools and had imbibed a classical education in rhetoric.[18] But with the advance of technology, or applied science, in the late eighteenth and nineteenth centuries, this responsibility to public discourse fades. As it fades, so scientists increasingly begin to speak only to each other and to technologists, not to a general public.[19] Their "models," their tautological worlds, acquired the status of neutral fact. Although it has been argued that modern science has always demanded this status,[20] I have come to think that it is technological application with its particular requirements for commercial exploitation that pushes the wider scientific discourse into claims of neturality.

It's one of those cultural turns that in retrospect appears inevitable, that Einstein's work on how the observer interrelates with the observed, and the several extensions of these suggestions,[21] radically challenged the basis of neutral observation and expression of "fact" just as it was entrenching. But no one would deny the technological advances that such models or modeling make possible,

[17]T. Sprat, *The history of the Royal Society of London, for the improving of natural knowledge* (London: J. Martyn, 1667).

[18]See, for example, some of the discussions of pedagogical technique in *Epistemological and Social Problems of Science in the Early Nineteenth Century*, ed. H. Jahnke and M. Otte (London, 1981).

[19]This kind of separation is still very much with us. See P. Medawar, "Is the Scientific Paper a Fraud?" in *Science in Schools*, ed. J. Brown, A. Cooper, T. Huton, F. Toates, and D. Zeldin (Milton Keynes, 1986).

[20]For example, I followed Ong on this approach until quite recently (see L. Hunter, 1984), and many writers on the discourse of science support this view.

[21]For example, see Heisenberg's proposal of "uncertainty relations."

and the status of modern science remained safe. It is another cultural irony that Russell and Whitehead were at the same time working on their formalization of symbolic logic, which provided the necessary bridge between mathematics and rational logic that would permit a formal symbolic logic to become the analogy for the neutral, and later "natural," language expressions of experience and event.

Together, the work on relativity and on symbolic logic forms a background to the development by twentieth-century science of isolated worlds, islands of time and space where the observer does *not* intervene, and where formal logic can operate in a context-free environment. It is a kind of doublethink: you know that it is only an invented artificial island, but you forget this in order to accept the validity of the logic and language which aim at getting truth by way of the procedure of hypothesis to proof. It is important to point out that these isolated islands are not *paradigms:* Thomas Kuhn's *The Structure of Scientific Revolutions,* which emerged from the late 1950s, suggested that science usually operated within ideological constraints to produce "normal" science,"[22] but that at significant moments there were broad shifts, scientific revolutions to build upon a new paradigm within a new ideological set. These isolated islands of modern science are, rather, a plurality of hypothetical worlds, plausible or possible worlds. The validity of their structure is based upon games theory, which was elaborated upon in the 1930s by Johan Huizinga and then extended in the 1940s and 1950s by, among others, Wittengstein, although in a rather different way. For artificial intelligence, which emerges as a discipline exactly during this period, games theory becomes an important element.

Artificial Intelligence

The history of rhetoric has always been concerned both with what people have explicitly studied within communication, and with the rhetoric of the *way* that they have done so. In the following, I will try to address both what AI says it does, and how it says what it does. In broad terms, artificial intelligence can be said to

[22]Thomas Kuhn, *The Structure of Scientific Revolutions* (Chicago: Univ. of Chicago Press, 1962).

deal with problem-solving events and with knowledge representation, although each overlaps onto the other. The discussion of these topics takes place in a public arena, the commercial world, in teaching, in research, and in other locations, and this essay cannot look at all of them. Many public presentations are mediated by journalists, reviewers, and interviewers. While their interpretations are significant, they often distort the way AI represents itself, so I shall put them reluctantly to one side. These interpretations by the public media are important to the discussion and the essay could have been entirely concerned with them. Just so the commercial presentations, which are more interested in use and technology, in implementation rather than in any analysis, are again important but I shall not be pursuing their implications. The following will concentrate on writing for teaching purposes and, to a lesser extent, on writing for purposes of research.

It is tempting to rehearse the Hobbes-Sprat-Locke-Hume-Smith chronology, most of which has been outlined by Peter France.[23] These were the thinkers who believed they could do without rhetoric in philosophy, although their writing is necessarily rhetorical. Yet, despite Hobbes, they knew they could not do without it in public discourse. These same thinkers and writers laid out the basis for what we now study as cognitive psychology: What is intelligence and how does it work.[24] This is the question posed by Alan Turing when he proposed the "Turing test" in the 1940s. The Turing test basically consists of the following proposition: if you ask a machine questions and from its answers cannot tell the difference between those answers and what you would expect from a human being, then the machine could be said to be "intelligent." The debate over whether a machine can act intelligently has since become quite complex, and has generated numerous arguments over "strong" and "weak" AI.[25] But in a sense these arguments are a red herring, and

[23]P. France, above.

[24]Indeed, the chronology has been reconstructed for cognitive psychology and artificial intelligence; see J. Haugeland, *Artificial Intelligence: The Very Idea* (London: The MIT Press, 1985).

[25]J. Searle, in 1980, proposed the "Chinese room" experiment to counter some of the implications of the Turing test; see "Minds, Brains, and Programs," *Behavioural and Brain Sciences* 3 (1980). This debate has been pursued by a number of writers, notably S. Harnad in "Minds, Machines, and Searle," *Journal of Experimental and Theoretical Artificial Intelligence* 1 (1989); and by Searle himself and P. M. and P. S. Churchland in *Scientific American* 262 (1990).

displace us from more immediate concerns.[26] In any event, the Turing test is not really a test for machine intelligence but a test for what human beings are willing to recognize as intelligence. The test works with at least two approaches. The first is that of performance, where one asks the behaviorist question of "does it act like a human being," does it say the expected thing? The second and more interesting approach, which asks whether the underlying activity generating that performance has any parallels with human thought, is the cognitive question.

One of the main questions noted by AI people in the 1950s and 1960s was whether it was possible to get machines to solve problems that humans usually solve, and this developed into a field that came to be known as "expert systems." From the start, AI turned to the premise that thought is "symbol manipulation"[27] or "cognitive activity can be described as symbol manipulation."[28] Because it arose within the computing science environment, symbol manipulation meant mathematical logic, or, for those events difficult to code numerically, formal logic and the predicate calculus of if/then logic.[29] Therefore, it immediately acquired an exact language with a rational and analytical logic just like scientific rhetoric. But, because thought was made to correspond to symbol manipulation, which in turn corresponds to mathematical language and formal logic, the very material of AI was exactly made up of exploring the structures, strategies, and effect of this rhetoric. In a significant way the early research of AI is a metacriticism of scientific methodology.

Problem-solving AI has by definition an end or a goal built into its structure. It wants to achieve something that a human expert would otherwise have to achieve. Mathematical and formal logic can only achieve goals within the restricted set of grounds they are

[26]Most participants in this debate agree that any resolution of the debate is so far in the future that current argument must be purely speculative. I personally read the conceptual debate as a red herring, although the ethical debate over the social and political (and biological) rights of technological objects that behave like humans is interesting and of course provides much of the subject matter for contemporary science fiction and fantasy.

[27]Haugeland, 4.

[28]T. O'Shea, "IKBS: Setting the Scene," in *Intelligent Knowledge-based Systems: An Introduction*, ed. T. O'Shea, J. Self, and G. Thomas (London, 1987), 11.

[29]The predicate calculus and formal logic form the cornerstone of every artificial intelligence textbook, even, for example, the more generalist *Principles of Artificial Intelligence*, by N. Nilsson (New York, 1982).

part of. That we are often unaware of the tautologous structure of these operations only underlines both the ease with which we accept them and their profoundly ideological basis. In a descriptive language familiar to much AI, N. Nilsson summarized the procedure by presenting the predicate calculus as a language with an explicit syntax, generating legitimate expressions or "well-formed formulas"—rendered as *wffs*—by working from ground *wffs* that are "true" tautologously.[30] Both "validity" and "satisfaction" depend upon our interpretative acceptance of the truth of these grounds.[31]

In rhetorical terms, the points you want to make are being expressed in a representational language that maps symbol directly onto object and allows you to make an argument that proceeds from accepted grounds to truthful ends. Also in rhetorical terms, to achieve this end you have to insist first on the acceptance of the grounds, most effectively doing so by excluding all others and creating an isolated system; second, on the exactitudes of representation; and third, on the necessity for or desirability of a goal, an end, a truth. In other words, you need to hide the probable or possible definitions at the base of your argument; you need to deny its rhetorical process.

Such a procedure achieves considerable ends: it is structured to do so. The commercial exploitation of such structures in expert systems is a pragmatic guide to the success of such a rhetoric, as is the wider technological exploitation of scientific desire. But it has its drawbacks: it is difficult to change; it is often rigid and made clumsy by the restrictions of its logic; above all, it is decontextualized. The AI community recognized these drawbacks very quickly.

For example, there is Joseph Weizenbaum who, in 1976, describes with uncanny accuracy Huizinga's theory of games,[32] which he never mentions so we must assume is not consciously referring to, and is as beset as Huizinga by the dark implications. Weizenbaum says, "the only certain knowledge science can give us is

[30]Nilsson, 145.

[31]Interestingly, this is also the basis of the rhetorical theory of argumentation put forward by C. Perelman and L. Olbrechts-Tyteca in *The New Rhetoric: A Treatise on Argumentation*, trans. J. Wilkinson and P. Weaver (London, 1971). The theory is open to many of the same drawbacks and extensions of the artificial intelligence approach.

[32]As outlined in J. Huizinga, *Homo Ludens: A Study of the Play Elements in Culture* (London, 1949; first published, 1944).

knowledge of the behaviour of formal systems, that is, systems that are games invented by man."[33] In order to practice, the scientist must suspend general disbelief, "must believe his working hypothesis, together with its vast underlying structure of theories and assumptions" (p. 15), because "scientific demonstrations, even mathematical proof, are fundamentally acts of persuasion" (p. 15). To do so the scientist must simplify reality through abstraction, and "abstraction means leaving out of account all those empirical data which do not fit the particular conceptual framework within which science at the moment happens to be working" (p. 127). He also notes that computing must adopt a formal language that is precise and unambiguous. Weizenbaum's commentary describes the need for a neutral language and exact reasoning, and in doing so also outlines the limitations: he adds, "the power of computers is merely an extreme version of a power that is inherent in all self-validitating systems of thought" (p. 130).

The positive aspects of such an epistemological strategy are found in the way that such thinking sharply indicates the limitations of the tautological world. A model is useful because at some point it fails, and in that failure it makes a comment upon the real. The strategy is also positive for the way that it provides metaphors for thinking about things in new ways. But on the other face of these activities are the negative aspects that arise from setting up truth as an achievable goal. Such success gives the games-player, the programmer, a sense of enacting power, in other words a sense that the tautological world is the actual world, and that there is no failure, no limitation. As a result, the game rules become laws that effectively shut down new ways of thinking.[34]

Now Huizinga in the 1930s sets up games as social systems, clubs, necessary coteries with end-directed rhetorical strategies, and he happily makes science parallel with this activity. Yet after World War II he recognizes that his club culture exactly described the rhetoric of Nazi propaganda, and his conclusion to the 1949 edition of *Homo Ludens* voices anxieties similar to Weizenbaum's on the tendency for such worlds to become total. Weizenbaum adds the further terror that computers may be being made with the aim

[33]J. Weizenbaum, *Computer Power and Human Reason: From Judgement to Calculation* (London: Penguin, 1976), 14.

[34]Weizenbaum, 115.

of replacing human beings.[35] This of course is the popular misconception, yet it is surprising how often one finds this aim implicitly asserted in serious artificial intelligence literature. From a rhetorical perspective, the problem with these games is that they become conventional; they produce a hidden rhetoric that is dangerous because if we cannot assess it, we do not know how to deal with it.

A less prophetic and certainly less political analysis is made by John Haugeland. In a book specifically related to artificial intelligence, he documents the history of materialist thinking on cognitive psychology to the end of the eighteenth century.[36] The commentary picks the history up again in the twentieth century with the emergent field of artificial intelligence, conveniently leaving out the nineteenth century as "idealist," yet in the process also leaving out Marx, who supplies the one thing Haugeland's argument is trying to move toward: context. Haugeland reiterates the necessity for computationally based reasoning to abstract its arguments to the point where electronic and physiological structures, machines, and bodies are on the same footing (p. 5). Because reality is mathematical in such abstraction, it needs a formal system to describe it. The formal system is isolated like a game, it has a digital language where the token equals the thing or referent, and it has a rational logic of deterministic algorithms. After much intense analysis, the commentary concludes that this reasoning only works in axiomatic or tautological systems like mathematics (pp. 107–9). Furthermore, it only appears to work in computing, first, because of the scientific conventions that underlie computing strategies, and second, because there is no context and therefore no audience.

It is exactly at this point, Haugeland argues, that artificial intelligence can step in and try to deal with the computation of interpretable or semantically significant events. In an effort to address context, he suggests heuristics; he discusses General Problem Solvers, expert systems, stereotypes, frames, as methodologies that have been put forward for contextualizing formal logic. However, since he has been at such pains to prove that heuristic procedures and other methodologies can be reduced to deterministic algorithms (pp. 83 or 117), there are drawbacks to his discussion.

The description in Haugeland's commentary illustrates a claim

[35]In fact, Weizenbaum says "man," not "human beings." The discourse of AI is repetitively sex-specific; one questions the significance of the exclusion.

[36]Cited above.

from Hubert Dreyfus that when the AI community had pushed the limits of formal logic as far as they could go in the mid-1970s, they turned instead to looking at ways in which context, what they blithely refer to as "commonsense," could be introduced.[37] In many ways this was the turning point away from Huizinga's theory of the ideological basis of games for large social structures to an interpretation of Wittgenstein's comments on games as individual strategies or designs.[38] In the process there has been a general "turn" to questions of "natural" language. Weizenbaum suggests that the shift was based on a belief that computer programs failed because the language of formal logic is limited, hence if we use natural language there would be more potential for success. But the question became: how to describe natural language in computational terms?

Luckily, Noam Chomsky had spent the better part of the 1960s arguing for innate, biologically determined grammatical structures which could provide an alternative to formal logic.[39] It was important for AI that Chomsky claimed biological determinism for his grammar, because it provided a firm foundation for the basic assumption that thought itself, or the brain processes in cognition, is symbolically structured as an essential. To quote from Yorick Wilks, Wittgenstein convinced "a generation, already intoxicated with the power of formal logic, that logic was not necessarily the structure underlying thought and language"[40] and Chomsky went on to provide "a systematic structure of forms that were not those of formal logic, . . . some real systematic alternative candidate as the real structure of language" (p. 152).

Chomsky had also taken the separation between deep structure and surface structure, that was made but wisely not defined by Wittgenstein, to develop transformational grammar. Despite the fact that Chomsky's grammar was itself noncontextual, AI found that it could use transformational grammar as a means of moving from the innate to the contextual by developing semantic net-

[37]Haugeland, 197. H. Dreyfus, "From Micro-Worlds to Knowledge Representation: AI at an Impasse," reprinted in *Mind Design: Philosophy, Psychology, Artificial Intelligence*, ed. J. Haugeland (London, 1981), 201.

[38]L. Wittgenstein, *The Blue and Brown Books* (Oxford, 1952).

[39]I am most grateful to Lesley Jeffries for discussions of these issues.

[40]Quoted in J. Ennals, ed., *Artificial Intelligence: State of the Art Report* 15 (1987): 152.

works.[41] Indeed, many of the discussions of structure in AI research between 1975 and 1985 turned to concepts of generative and transformational grammars. Another influential direction also emerging during the 1970s was Minsky's development of "frames."[42] The strategy resembles a simplified version, simplified presumably for computational reasons, of Gerard Genette's theories of narratology; and it too aims primarily at introducing context via the concept of stereotyped knowledge.

What such movements indicate, and I would not want to suggest that formal logic was being dismissed for it is still the primary strategy of AI,[43] is an acknowledgment of the complexity of representation through language, and therefore of the complexity of the representation of knowledge that results from the need to include context. We may see a similar discussion going on in the development of nonmonotonic logics in their search for temporal and spatial contexts.[44] In AI research we can watch a swing toward far more subtle considerations of the question of knowledge representation, which of course is necessary to its counterpart, problem-solving. Yet in 1986 the aim is still toward "explicit structured representation of the underlying rules of human expertise."[45]

Again, the AI community quickly recognized the limitations of natural language representations, and has performed the same metacritical exercise for the scientific aims of a form of linguistics as it did for modern science as a whole, although neither metacritical commentaries have been foregrounded. For example, Drew McDermott has spoken eloquently of the limitations of using tools based on natural language patterns, but perceives the fact that these are a main tool for linguists as an advantage.[46] This is despite the irony that few linguists exactly use Chomsky's grammars, precisely because they are so decontextualized.

[41]See the section, "Natural Language," in *Computers and Thought: A Practical Introduction to Artificial Intelligence*, ed. M. Sharples, D. Hogg, C. Hutchinson, S. Torrance, D. Young (London, 1989).

[42]M. Minsky, "A Framework for Presenting Knowledge," in *Mind Design*.

[43]D. Waltz, in "The Prospects for Building Truly Intelligent Machines," in *The Artificial Intelligence Debate*, above, suggests that new procedures for associative memory "can provide a very powerful heuristic method for jumping to conclusions, while traditional AI can be used to verify or disconfirm such conclusions" (200).

[44]R. Turner, *Logics for Artificial Intelligence* (Chichester, 1984).

[45]W. Black, *Intelligent Knowledge-based Systems* (Wokingham, 1986–1987), p. x.

[46]D. McDermott, "Artificial Intelligence Meets Natural Stupidity," in *Mind Design*, 154.

Recognition of context has meant a recognition of games-design as opposed to game-rules for specific applications. It has become a way of defining a very small "possible" world into which some elements of context may be introduced without destroying the system with over-complexity. In other words, games-design is about creating a discourse within which context can be partially formulated. It is not about creating a discourse that deals with the impossibility of formalizing context. The distinction is significant, for while it has been a major step forward to move from techniques or device to strategy, what games-design does not take on board is the ease with which such strategies shift into the fixities of formal ordering over time. One of the clearest outlines of this shift may be found in J. Fodor's cheerful commentary on AI as "methodological solipsism" or tautological worlds.[47] He notes that formal logic does create the tautologous worlds typical of solipsism; just so do the designs that incorporate predictable context slip through habit into formality. As Haugeland suggests, all these heuristics can be reduced to algorithms. Fodor goes so far as to outline explicitly the necessary limits of mental representation as a methodological solipsism that *has* to exclude reference, semantics, and truth. Dreyfus argues that even if you could translaté a formal description of the world via rules, even if you could specify a context, it would only be one context and would immediately change.[48] He concludes that AI is committed to ignoring the noncognitive, specifically if it is committed to ignoring our bodies (p. 204).

This warning comment from Dreyfus, with others such as Weizenbaum's suggestion that there is a need to understand human reasoning as a function of physiological bodies,[49] indicates a direction that AI has recently taken into connectionism and neurobiology and physiology. As if once more on the search for the formalization of thought in a symbolic representation, AI has turned to the human body and particularly the physical brain, although other parts of the body are studied for robotics, hoping to find grounds for cognitive psychology in the place that appears to resist it the most. In doing so, AI has generated connectionist representation which is supposedly even less formal than grammar, but is, importantly, still modeled on a biological determination and hence still holding out the promise of a specific answer to questions about thought.

[47]J. Fodor, "Methodological Solipsism Considered as a Research Stragegy in Cognitive Psychology," in *Mind Design*.

[48]H. Dreyfus, 197.

[49]Weizenbaum's example is of mother-child bonding, which is culturally significant but which detracts somewhat from this physiological argument.

The recent collection of essays from *Daedalus* on the new field of connectivism indicates the utopic desires that have been placed upon design. For example, S. Turkle enthusiastically outlines the way that "computers provide sciences of mind with a kind of theoretical legitimation that I call 'sustaining myths'."[50] In a cheerful Fodorian tone, Turkle interprets the "mathematical culture [of computer science] that relies heavily on defining things in terms of themselves" (p. 264) as a positive myth, legitimating self-analysis and referential epistemology of "objects." The interpretation underwrites the desire for game-rules in much AI, and completely inverts its metacritical possibilities into the fixity of "sustaining myths."

However, other contributors to this collection indicate a general recognition of the limitations of design. J. Cowan and D. Sharp outline the traditional AI strategy as one that is not context-sensitive. In contrast, the designer of the neural nets of connectivism only needs "informal understanding of the complexities of the desired behavior."[51] Yet despite this, "All progress to date in the soft-wiring of nets to perform intelligent tasks rests on prior analysis by a designer of the context-dependent tasks to be performed. The intention and the meaning are supplied by the designer" (p. 114).

The most helpful if typically contradictory discussion is that by H. Dreyfus and S. Dreyfus, in which they identify the ability of AI to provide the forum for the invention of small possible worlds with Husserl's attempts at "top-level sameness" resulting from a shared belief system.[52] They go on to examine Heidegger's challenge to this context-free rationalism and his proposals for "circumspection" and social construction. While this latter may provide the motivating analogy for the development of neural nets so that they "may show that . . . we behave intelligently in the world without having a theory of that world," in practice, to avoid ambiguity, neural network modelers "design the architecture of their nets so

[50]S. Turkle, "Artificial Intelligence and Psychoanalysis: A New Alliance," in *The Artificial Intelligence Debate*, ed. S. Graubard (London: MIT Press, 1988), 241–42.

[51]J. Cowan and D. Sharp, "Neural Nets and Artificial Intelligence," in *The Artificial Intelligence Debate*, 113.

[52]H. Dreyfus and S. Dreyfus, "Making a Mind versus Modeling the Brain: Artificial Intelligence Back at the Branchpoint," in *The Artificial Intelligence Debate*.

that they transform inputs into outputs only in ways that are in the hypothesis space. Generalization will then be possible only on the designer's terms" and the net cannot "adapt to other contexts" (p. 38). But, to conclude, Dreyfus once again turns to the body, and warns that the nets, to achieve the utopic wish-fulfilments of their modelers, "must share our needs, desires, and emotions and have a humanlike body with appropriate physical movements, abilities, and vulnerability to injury" (p. 39). It is generally agreed that should neural nets be able to be modeled to such sophistication, it will not happen for a very long time. In AI terms, the nets have already failed, although as a metacritical study of neurobiology they still have an immense amount to contribute.

Virtually all the research writing in AI is aware of the limitations of formalizing, computational abstraction. As a genre it can speak with profound understanding and eloquence of the problems and restrictions. Nevertheless, the community is still striving after a neutral or pure representative language, after a logic that will cope with testing hypotheses, and after a restricted definition of the world. The research still believes in the possibility of an expression or representation that will be adequate, will achieve a truth. Therefore it is still denying rhetorical necessity, which is itself based on denying the possibility of end-truths and concentrating on contingency and on working at valid action in the face of this. Despite the immense contribution to rhetorical studies, particularly on the activity of so-called "neutral" or pure languages and logic, AI discusses them as failures rather than as necessities. This underlines the residual desire for just those neutralities and places the research in the position of plausible, coercive rhetoric rather than the openly demonstrative. But we need to look at the possibility that this is due to the kind of rhetoric that is used within relatively closed communities anyway, where much goes unstated because it is tacitly understood.

As indicated above, I am not going to discuss the popular public or commercial presentations of AI, where I think those desires emerge quite forcefully as fear or gratification. However, the other presentation in the educational field is, of course, the textbook. What I have been discussing is a fairly prevalent intellectual debate within the AI research field. It indicates some of what members of the research community say to each other about the promises and limitations of their work. But what, it might be worth asking, do they say to their students? Do they want to hide or discuss the implications of an approach to problem-solving in

terms of tautological worlds, and to knowledge representation as exact and accurate? Textbooks, as P. Winston says at the start of his widely used textbook *Artificial Intelligence*, are very different from the research field. But exactly how do they differ? With students, who are by definition coming into the community from the outside, one cannot take tacit understanding for granted. Winston's own book, a product of the 1970s, is formally based and makes considerable claims for the extent of problem-solving.[53] N. Nilsson, in 1982, is more concerned with a generalization of the broad range of AI methods, but at the same time shows rather more overtly the aim at "control" that AI desires. His tripartite summary of production systems, data operations, and control, refocused as declarative, procedural, and control knowledge, are familiar to many AI textbook introductions.[54] Just as familiar is his placing of the formal symbolic logic of the predicate calculus at the center of his scheme.

Moving on chronologically to the mid-1980s, we find D. Michie and R. Johnston's *The Creative Computer* (1984)[55] and E. Charniak and D. McDermott's *Introduction to Artificial Intelligence* (1985)[56] making similar claims, but with a growing awareness of complexity that moves them to approach the issues with significantly different rhetorical strategies. Michie and Johnston present AI as providing knowledge or "the capacity to give correct answers to questions." In other words, knowledge is information, not wisdom,[57] in the classical construction of modern scientific rhetoric. The book claims, possibly with irony, that the central challenge is the construction of a mechanical logic of commonsense meaning (p. 17), because computers must be made more like humans not only so that they can be treated as servants rather than slaves, but also so that they can be better controlled.

To effect this movement to commonsense logic, the book starts out with a radically different and potentially valuable approach that provides a series of examples from art which are redrawn in order to give computation access to creativity: artistic, religious, political, and emotional. Yet their "creativity" is merely association

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[53]P. Winston, *Artificial Intelligence* (London, 1984).

[54]Nilsson, 17.

[55]D. Michie and R. Johnston, *The Creative Computer: Machine Intelligence and Human Knowledge* (London: Penguin, 1985).

[56]E. Charniak and D. McDermott, *Introduction to Artificial Intelligence* (Wokingham, 1985).

[57]W. Ong, above.

(p. 32); thinking is simplifying, or "lying" (p. 92). The redrawing goes in for hierarchies of creativity which set the small, domestic creativity against the artist as hero (p. 129). This version of "art" makes no comment whatsoever on aesthetic theory, on representation as necessarily deceitful, or on writing in specific as interactive (p. 156), of the alphabet as a medium;[58] let alone any reference to reader-response theory, psychoanalytic concepts of the subject, the ideological construction of cultural artifacts, or the debate surrounding structuralism. As presented here, the concept of "art" is grossly naive. For example, in a discussion of classic versus romantic aesthetics, these writers are writing under the delusion that romanticism engages in innocent perception (p. 161):[59] A little knowledge is a dangerous thing, and a little knowledge of art is more dangerous than one might suppose. The book's introduction concludes by worrying that philosophical questions may confuse our commitment to "exploit" the potential in AI for power and control (p. 113). Indeed, the entire text is underwritten by metaphors of exploitation, pornography, colonialization, and heroism.[60] It is possibly not surprising that many AI writers use the narrative structures and vocabulary of the literature of science fiction and fantasy, often drawing on these books for analogies;[61] but they seem unaware both of the double-edged rhetorical activity of the genre[62] and of the current domination of its exploitative strategies.

In contrast, Charniak and McDermott, in writing an all-encompassing textbook that has more in common with earlier teaching texts, are unexpectedly but also superficially more conservative.[63] Even these writers, highly intellectual and subtle philosophers, choose to introduce AI to the student as "mental faculties through computational methods,"[64] saying that the "brain at some level is computation." The book goes on to present a central con-

[58]See, for example, the alphabetic breakdown in bp Nichol, *The Martyrology* (Toronto, 1976), and R. Kroetsch, *The Sad Phoenician* (Toronto, 1979); Canadian literature is particularly rich in graphical and typographical experiment.

[59]What do they make of W. Wordsworth's "half create and half perceive," or J. Keats's "negative capability," one wonders?

[60]Examples run throughout the book, but see particularly 13, 94, and 214.

[61]See Turner, 18; or D. Dennett, "Where Am I?" in *The Mind's I: Fantasies and Reflections on Self and Soul*, ed. D. Hofstadter and D. Dennett (Brighton, 1981).

[62]See L. Hunter, *Modern Allegory and Fantasy* (London, 1989).

[63]Textbooks from the period 1985–1989 frequently specialize in and focus on one aspect or another of AI, indicating the growing complexity of the field.

[64]Charniak and McDermott, 6.

tradiction, saying both that axioms will change over time (p. 20) and that "understanding" is the ability to deduce the correct fact (p. 20). What is lacking is any suggestion about the relationship between deduction and axiomatic shift, or any discussion about the social and historical pressures beyond. Later on in the book they attribute inanimate causality to emotion; for example, "guilt" is supposedly natural, and make no mention of ideology (p. 568). This AI textbook makes the familiar claim that the predicate calculus is the most flexible vehicle for capturing context (p. 320). The writers get rid of the objection to the predicate calculus on the grounds that it cannot deal with people being inconsistent by saying that the predicate calculus is all right because people in any case always try to "explain away" inconsistency (p. 344). They get rid of the objection to expert systems on the grounds that they are too powerful by reiterating the fact that these systems have "no great insight" (p. 437). Curious comfort.

When the textbook moves on to discussing language systems, it claims what many AI textbooks claim, that writing is simpler than the oral and therefore more open to computation (p. 175).[65] This is a misunderstanding of the medium that is all the more problematic because the written, or a restrictive set of it, is the medium of the grammars that have been taken up into computation. However, the approach allows for a confident illustration of how the rules of formal logic work well with the designs of declarative sentences in grammar (pp. 582–84), which are mapped onto the designs of performative sentences in speech act theory that simultaneously excludes any discussion of the implications of this double act, or recognition of the intimate compromise designs make with rule-bound systems. The conflated perception of written or oral verbal texts also allows for a simplistic approach to the functions of metaphor and analogy[66] that underlies one of their broadest claims: that AI will be able to provide more, and more frequent, Kuhnian paradigms (p. 650). The mapping of the technique of analogy onto the concept of a paradigm as a model shows no overt comprehension of the understanding of the radical separation between epistemological set and the tautologies of possible worlds. Charniak and

[65]For just one among many recent misunderstandings of the process of writing, that in this instance claims that print did not change the structure of the written, see R. Sokolowski, "Natural and Artificial Intelligence," in *The Artificial Intelligence Debate*.

[66]L. Hunter, "The Computer as Machine: Friend or Foe?" in C. R. R. Turk, *Humanities Computing* (London, 1991).

McDermott are deeply involved in the doublethink: the need to create possible worlds and to simultaneously remember and forget their artificiality. The point here is that if writers such as Charniak and McDermott are not foregrounding the rhetorical necessities to their students, then the discussion about promises and limitations has little chance of reaching the public or commercial world. In some ways it is no wonder that there are misconceptions about power-hungry AI programmers producing a race of humanoids that they will use to control the world.

More seriously, developments in AI have interesting parallels with developments in the humanities and in cultural studies. These latter have also moved from formalities into structuralisms, recognizing the limitations of both. Yet the humanities are based on the belief that exact communication is *impossible*, that knowledge representation can never be accurate. Their response to the contextual limitations of structure and the formal symbolic has been to develop a "poststructuralism" that also looks for patterns in a limited context yet defines them as significant *because* they are limited. Just so, deconstruction attempts to approach context by looking for significance in what is missing, omitted, or inadequately articulated. Either of these approaches can have at least two rhetorical stances: The first takes the limited definition, the what-is-missing or differ*a*nt, as the basis for a game; the second takes these and foregrounds them, both to indicate the inadequacy of merely engaging in a systematic game and to insist upon the contingency, the pressing upon us, of material context.[67]

The reason that these are stances rather than strategies alone is that while the rhetor/writer is either overtly or covertly using the techniques and devices historically specific to a particular strategy, the audience's interaction with the text brings its own strategies to bear upon it. If the writer goes out of the way to foreground inade-

[67]It cannot be emphasized strongly enough that rhetorical stance, an interactive and social process, has nothing to do with D. Dennett's "intentional stance." Dennett's interpretations of philosophy, recently in "When Philosophers Encounter Artificial Intelligence," in *The Artificial Intelligence Debate*, are quite specifically within rhetorical strategy rather than stance. The result here, for example, is a troubling reading of the birds in Plato's *Theaetetus* as a question of possession and command, rather than a reference to the difference between fixed and contextualized data, or information versus knowledge.

quacy yet the audience decides to respond systematically, ther context will be lost. Stance refers to the rhetoric of the text inclusiv of both rhetor and audience. AI at the moment appears to be work ing within the stance of systematic or designed games which, a with all games, is based on hiding its rhetoric in order to control it audience. I suspect that this is so because whereas the humanitie know and work with the inadequacies of representation, AI seem to desire its perfectibility. When it doesn't find such exactitude, a with "natural" language, it simply moves on, does not address the difficulty, sees it as failure rather than as the potential location fo context.[68]

However, AI needs to develop rhetorical awareness particularly since it is contributing not only to the questioning of modern science but also to its extension and the technology that results. AI can and is being used to underwrite the validity of the plurality of possible worlds necessary to the economic functioning of modern technology. Technology needs possible worlds to establish the order, the grounds, that will allow it to fulfill its promises, realize the local desires that people have paid for. These possible worlds are the basis of the "service" society that provides the satisfaction of a specialized need,[69] and they lie at the center of so-called postindustrialism. Their plurality is necessary not only so that many people can profit, providing the illusion of liberty, but also because a large number of small worlds have a better chance of successfully gratifying specific desires: the bigger the possible world, the weaker its control over realization, the greater the risk of intrusion by reality/context, and of failure. These worlds appear to grant freedoms and liberties, but they cover up the broader picture: they hide the industrial base in a plurality of commodity.

AI has developed a sophisticated understanding of this process. It now needs to cease looking at the limitations of knowledge representation as failure and instead provide an assessment of its

[68]D. Hofstadter is moving toward this in his commentary on the Zen Koan in "Human and Gödel," in *Gödel, Escher, Bach: An Eternal Golden Braid* (Penguin, 1979); however, he fuses dualistic logic with words in order to explain the activity of the Koan writing, which leaves him stating that "a major part of Zen is the fight against reliance on words" because they are limited and fail, rather than an alternative construction in which the necessary inadequacy of words is engaged with in order to indicate the limitations of dualistic logic.

[69]This is an aspect that Michie and Johnston admire (195).

techniques and strategies[70] so that we can begin to evaluate the status of this plurality that the economics of modern technology is moving us into. It needs to become aware of its stance, to take a stand on it; and as a metacritical discourse it is better placed than many to do so.

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[70]J. McCarthy, "Mathematical Logic in Artificial Intelligence," in *The Artificial Intelligence Debate,* approaches this attitude when he says that AI may lead to a "study of the relation between a knower's rules for accepting evidence and a world in which he is embedded" (310).