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ABSTRACT

The belief that science attempts to objectively depict reality is based on a positivist philosophy which is currently considered a discredited theory. This essay advances the argument that science can be considered a rhetorical enterprise; that is, that scientists attempt to influence one another's beliefs concerning the acceptability of theories and research findings. The role of rhetoric in science, scientific discourse and its adaptation to rhetorical situations, and the scientific community's reliance on critical discourse are analyzed. The conceptualization of scientific communication in terms of rhetorical theory can delineate the differences between "hard" sciences (physics, astronomy, etc.) and "soft sciences" (psychology, sociology, etc.), provide a basis from which scientific discourse may be evaluated, and, finally, remove some of the mystique which surrounds scientific activity. (KS)

SCIENCE AS A RHETORICAL ENTERPRISE

by

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SCIENCE AS A RHETORICAL ENTERPRISE

A recurring concern in contemporary rhetorical thought is the scope of rhetoric--what activities do we include within its purview? The current trend has been characterized as encompassing all of the ways in which symbols may be used to influence another's mind.[1] In spite of this broad range, scientific disciplines have generally been excluded. This exclusion is particularly inexplicable when compared to a recent characterization of science by Stephen Toulmin:

> . . . the life of science is embodied in the lives of these men: exchanging information, arguing, and presenting their results through a variety of publications and meetings, competing for professorships and presidencies of academies seeking to excel while still vying for each other's esteem.[2]

In this essay I want to advance the argument that science can be considered a rhetorical enterprise. That is, scientists attempt to influence one another's beliefs concerning the acceptability of theories and research findings.

Traditional Views of the Relationship Between Science and Rhetoric

The distinction between science and rhetoric has been treated by several writers.[3] Donald Bryant wrote that "Rhetoric . . . is distinguished from the other instrumental studies in its preoccupation with informed opinion rather than scientific demonstration."[4] For Richard Weaver science could be differentiated from rhetoric by its rational and neutral character.[5] Bitzer considers science a discipline which doesn't "require

an audience in order to produce its end; the scientist can produce a discourse expressing or generative of knowledge without engaging another mind . . . ."[6] Science's goal is to know reality whereas rhetoric seeks to alter it.

Scientific disciplines and discourse are excluded largely for two reasons. First, they deal with facts and attempt to objectively depict reality, while rhetoric is concerned with opinions or values and seeks to alter reality. Typically, science is characterized as employing neutral language which in some way does not reflect the biases of the scientist. Second, these disciplines do not adapt their communication to an audience or situation. It is assumed that adaptation would encourage distortion of research findings. Both of these rationale are grounded in a characterization of science put forth by logical positivism, an orientation which holds that scientific observations are uncontroversial. "They are," as O'Keefe wrote, "factual, theory-free descriptions which form the foundations of scientific knowledge."[7]

The positivist philosophy came under increasing criticism and is currently considered a discredited theory of scientific knowledge. This criticism was directed at the assumptions underlying science's exclusion from rhetorical consideration. Specifically, critics argued that scientific observations are neither neutral nor objective descriptions of reality. Observations always abstract from our total experience, and the theory operated under influences what scientists look for and the way observations are interpreted. Aune summarizes this

position saying, "experience . . . always requires interpretation; and it is always some conceptual scheme, however rudimentary, and not virgin reality, that supplies the criteria by which an interpretation of experience is to be appraised."[8] Hence, "the meaning and acceptability of an observation claim are . . . ultimately determined by a system of background assumptions."[9]

The issue of objective depiction of reality also extends to theory confirmation or acceptability. The positivist philosophy holds that observations are sufficient to confirm a theory since they are accurate reflections of reality. However, when facts are theory-laden, the process of theory confirmation is changed. Observations are confirmatory because a theory directed the scientist to them and "blinded" him, in a sense, to disconfirming ones. To avoid the problem of circularity that could arise (theory leads to facts which in turn confirm the theory), theories must be judged through a process of intersubjective reliability. Research information can only be considered as bearing on the conclusion that certain theories are <u>preferred</u> at a given time over other theories in light of critical discussion among scientists.[10]

The Role of Rhetoric in Science

Because facts do not "announce" themselves to the world and theories are preferred rather than confirmed, science moves into the realm of rhetoric. Scientists must be convinced to accept the world as observed by others or to accept the

plausibility of a theory. Through interaction with other members of the scientific community, the truth of scientists' claims is ascertained. "Modern notions of objectivity," Gouldner writes, "are sensitive to the manner in which truth is speech about reality, that truth is speech-mediated reality, and is aware that the judgement of truth must be a judgement of the warrantability of specific speeches."[11]

What is particularly important about this conceptualization is that you cannot have a formal separation of the justification of assertions and the mode of production of these assertions that classical philosophers of science such as Weber argued for. Our reasons for believing what we do is grounded in the way we come to generate our knowledge. Gouldner expresses it this way:

> In order for us to have rational grounds for believing in the truth of specific assertions about the social world, we must suppose them to have been produced by certain kinds of people, "normal" people, people having certain talents and training, working with a geneuine [sic] commitment to certain <u>justified</u> Criteria with certain Methods, who accept these C[riteria] and M[ethods], and who, also, apply them with technical competence and moral sincerity.[12]

Additionally, since the members of a scientific community are inseperable from their theory or conceptual scheme and what they count as a fact, acceptance of a new fact or theory necessitates a change in the community's beliefs. Since these <u>alterations</u> occur in attitudes toward entities or phenomena with which scientists have long been familiar, and therefore the theoretical framework through which the world is understood, the change must engage the mind of an audience. For example,

in discussing Chomsky's revolution in linguistics Searle points out that his "conception of the goal of linguistics then altered the conception of the methods and the subject matter" resulting in "a dramatic and visible clash of conflicting views."[13] Rather than Chomsky's observations entailing the mere addition of new facts into the linguist's stock of knowledge, his observations involved a change in their beliefs and attitudes, and more generally, the way they looked at language itself. In short, whenever a scientist presents a research report or theoretical discussion, he is asking other scientists to view the world as he does; he makes demands upon their beliefs about the world and asks them to alter their views.

Scientific Discourse and Rhetorical Situations

Science is also rhetorical because it involves adaptation to a situation--it must cope with rhetorical situations. By examining three characteristics of a rhetorical situation--the exigence which leads to discourse, the situation's demand of a fitting response, and a dictated purpose, theme, and style of response--I can illuminate the nature of this adaptation.

The exigence or situation which leads to scientific discourse falls into two categories: a crisis or scientific revolution and periods of normal science. Thomas Kuhn defines a crisis as a period when a scientific community's paradigm or controlling theory fails and is unable to explain all of the observations that have been made. During this time an

attempt is made to find a new paradigm which can account for these observations. For Kuhn, the crisis must be resolved because science does not make significant advances during this time. Such resolution occurs through rhetoric. As he explains, "A crisis may end with the emergence of a new candidate for a paradigm and with the ensuing battle over its acceptance"[14] and "if the paradigm is one destined to win its fight, the number and strength of the persuasive arguments in its favor will increase."[15]

This is illustrated by the shift from structural to generative linguistics. The structural approach faced a crisis because of its inability to account for large amounts of linguistic evidence. In response to this particular exigence the generative approach of Chomsky arose and a battle ensued over its acceptance. Chomsky's review of B. F. Skinner's Verbal Behavior is an example of the persuasive discourse that arose.[16]

During periods of normal science, discourse is also called into existence by the situation. Scientists articulate a paradigm or theory, resolving its ambiguities and solving puzzles that had not been capable of solution under older or previous theories. Much in the same way that Bitzer claims an exigence must be modifiable, the criterion for a puzzle in science is the assured existence of a solution.[17] The discourse that results is designed to present solutions to those puzzles. Scientists must be able to demonstrate and convince others that

the paradigm is providing answers to questions, for unless it can, a crisis will arise.

This points to the second and third characteristics of a rhetorical situation--the response must fit the situation and must have a dictated purpose, theme, and style. Both crisis and normal science situations demand these. In the former, for example, discussion must center on which of several alternative paradigms is the best candidate for resolving the crisis and the scientist's discourse will address itself to this. The style of the scientist's argument is constrained too. The manner in which the scientist presents his argument must fit the situation. Again, Chomsky is illuminating in this respect, as Searle points out:

> Chomsky's work is interesting in large part because, while it is a major attack on the conception of man implicit in the behavioral sciences, the attack is made from within the very tradition of the scientific rigor and precision that the behavioral sciences have been aspiring to. His attack on the view that human psychology can be described as correlating stimulus and response is not an a priori conceptual argument, much less is it the cry of an anguished humanist resentful at being treated as a machine or an animal.[18]

Viewing science as rhetorical also enables us to understand how scientists' failures to take into account the rhetorical situation leads to controversies over scientific material. One instance was the Jensen IQ controversy which arose in the late 1960's from the claim that a large fraction of the differences in the white population are due to genetic factors. Although the conclusion is relatively innocuous, the controversy was fueled by the media's handling of the issue.

As Cronbach comments, "The news media were not able to weigh matters as directly as Jensen had."[19]

In this case Jensen, a well-known educational psychologist, failed to recognize that rhetorical situations demand a response. "Every rhetorical situation in principle," Bitzer writes, "evolves to a propituous moment for a fitting rhetorical response. After this moment, most situations decay; we all have the experience of creating a rhetorical response when it is too late to make it public."[20] From 1969 to 1973 Jensen failed to clarify his position that he had set forth in 1968, a position that was being inaccurately portrayed by the media, and the ensuing effect was an ill-timed response, one that caused him to become the object of scorn.[21] In short, a fitting rhetorical response was demanded earlier, at a time when Jensen could have clarified his position.

Furthermore, the Jensen controversy indicates that members of the scientific community were dissatisfied with Jensen's discourse, not solely because it was incompatible with the community's standard for appropriate discourse but also because it was inappropriate to the "tenor of the times." Indicative of this feeling was an article in the Harvard Educational Review where the noted psychologist Martin Deutsch said: "I am publishing this critique because I believe the impact of Jensen's article was destructive; that it has had negative implications for the struggle against racism and for improvement of the educational system."[22] Deutsch's response is not atypical of that segment of the scientific community which was

critical of Jensen because his article was inconsistent with the type of response demanded by the state of racial affairs in 1969. Importantly, then, scientists may have to adapt their discourse to the rhetorical situation as defined by the scientific community, as defined by society, or as defined by both.

The Scientific Community's Reliance on Critical Discourse

Finally, if science involves discourse responsive to a situation and the use of language to induce belief, then an additional characteristic of its rhetoric becomes noteworthy. In discussing oral rhetoric Carroll Arnold pointed to the commitment that participants share, and this idea can be extended to the scientific community and its discourse by noting its commitment to critical discussion or argumentation.[23] That is, scientists are committed to critical discussion of theories and conjectures and assume that others in the community share this commitment. In this way the quality of the relationship in the scientific community--the community's ability to understand the world--is promoted. As Karl Popper points out, "Criticism of our conjectures [theories] is of decisive importance: by bringing out our mistakes it makes us understand the difficulties of the problem which we are trying to solve. This is how we become better acquainted with our problem, and are able to propose more mature solutions; the very refutation of a theory . . . is always a step forward

that takes us nearer to the truth."[24] Science learns from its mistakes and only through this critical dialogue are mistakes found. Ultimately, science's ability to come to an accurate understanding of the world rests on the quality of the dialogue or rhetoric between scientists.

This attitude toward discourse is also important in that it distinguishes scientific rhetoric from other types of rhetoric. Scientific discourse does not assume a rhetorical character merely because it entails symbol-using behavior, as some seem to argue.[25] It is the scientific community's commitment to a particular type of discourse, i.e., critical discourse, and the conclusions reached thereby that distinguishes its rhetoric from other symbol-using behavior. As Ziman points out: ". . . <u>when it is available</u>, scientific knowledge is more reliable, on the whole, than non-scientific. . . . Our general argument here is that in a discipline where there is a scientific consensus the amount of <u>certain</u> knowledge may be limited, but it will be honestly labeled: 'Trust your neck to this', or 'This ladder was built by a famous scholar, but no one else has been able to climb it'."[26] This reliability is due to the nature of scientific rhetoric.

Conclusions and Implications

I want to consider in this final section of the paper what seem to be a few of the implications of considering science a rhetorical enterprise. First, such a perspective may make a contribution to a question which has captured the attention

of many philosophers of science; namely, in what way do the "hard" sciences such as physics and astronomy differ from the "soft" ones such as psychology and sociology? A reasonable response is that they can be distinguished on the basis of the rhetoric they characteristically employ. These disciplines may differ not only in their methodologies, phenomena of interest, and so forth, but also in the nature of their argumentation and critical discussion. If, for example, Kuhn is correct in his implicit claim that the social sciences are preparadigmatic, then it would be worth examining whether this has an impact on the type of discourse social scientists employ. Furthermore, does this characteristic of the social sciences distinguish its discourse from that of the physical or natural sciences, which are presumably paradigmatic disciplines?

A second implication is that this perspective provides a basis from which scientific discourse can be <u>critically</u> examined. One criterion suggested by the previous discussion is that scientific discourse must contribute to the growth of scientific knowledge. Using it, one might focus on the discourse in the Velikovsky affair, a scientific dispute which arose over a theory which claimed "that global natural catastrophes occurred at the time of some of the more dramatic episodes related in the Old Testament. These natural catastrophes occurred when a large comet, ejected from Jupiter, nearly collided with the earth. . . ."[27] Here, the discourse of those scientists critical of Velikovsky might be examined with respect to its adherence to the principle that critical

discussion of scientific issues is the keystone to the reliability of scientific knowledge.

Another incident which might prove to be interesting is the role of discourse in the conflict between the Mendelian and the biometry schools of genetics England during the early twentieth century. As one observer of this controversy has noted, "There is evidence that the alientation felt between these men [Bateson and Pearson] spread 'in a vicious circle.' . . . Students and colleagues of the disputants, as well as other members of the scientific community, found it difficult to remain unemotional about the issues at question."[28] Given such an atmosphere in this community, questions may be raised as to what impact discourse between scientists had in creating this atmosphere and whether the nature of the discourse changed from the period prior to the controversy to the period during the controversy. Hopefully these examples are suggestive of the types of questions that such analyses will ask and the sources of scientific discourse which may be useful in answering such questions.

Finally, in attempting to understand scientific discourse we may create a more accurate picture of science, one which will remove some of the mistique surrounding it. No longer should scientists be viewed as people engaged in the objective sifting of data, hoping to find "truth." Rather, we must begin to understand that science depends on communication among scientists, communication which ultimately influences the character of scientific knowledge. Scientists use language which

reflects their theory or conceptual scheme and they attempt to convince other scientists of the soundness of their arguments. Similarly, scientists adapt their use of language to a situation with the purpose of having an impact on an audience. Perhaps John Ziman sums these ideas up best when he writes: "The scientific enterpri s corporate. . . . The audience to which scientific bl ions are addressed is not passive; by its cheering and booing, it bouquets and brickbats, it actively controls the substance of the communications that it receives. . . . To understand the nature of Science, we must look at the way in which scientists behave towards one another, how they are organized and how information passes between them."[29]

NOTES

[1]Douglas Ehninger, "Introduction," Contemporary Rhetoric, ed. Douglas Ehninger (Glenview, Ill: Scott, Foresman and Co., 1972), p. 3.

[2]Stephen Toulmin, Human Understanding, I (Princeton: Princeton University Press, 1972), p. 262.

[3]Several writers have recently dealt with this issue. See Wayne C. Booth, Modern Dogma and the Rhetoric of Assent (Chicago: University of Chicago Press, 1974); Richard Burke, "Rhetoric, Dialectic, and Force," Philosophy and Rhetoric 7 (1974), 154-65; Paul N. Campbell, "Poetic-Rhetorical, Philosophical, and Scientific Discourse," Philosophy and Rhetoric 6 (1973), 1-29; Joseph Gusfield, "The Literary Rhetoric of Science: Comedy and Pathos in Drinking Driver Research," American Sociological Review 41 (1976), 16-34; Philip C. Wander, "The Rhetoric of Science," Western Speech Communication 40 (1976), 226-35; and Walter B. Weimer, "Science as a Rhetorical Transaction: Toward a Nonjustificational Conception of Rhetoric," Philosophy and Rhetoric 10 (1977), 1-29.

[4]Donald C. Bryant, "Rhetoric: Its Function and Its Scope," Contemporary Rhetoric, ed. Douglas Ehninger (Glenview, Ill.: Scott, Foresman and Co., 1972), p. 20.

[5]Richard Weaver, "The Cultural Role of Rhetoric," Contemporary Rhetoric, ed. Douglas Ehninger (Glenview, Ill.: Scott, Foresman and Co., 1972), p. 293.

[6]Lloyd F. Bitzer, "The Rhetorical Situation," Contemporary Rhetoric, ed. Douglas Ehninger (Glenview, Ill.: Scott, Foresman and Co., 1972), p. 44.

[7]Daniel J. O'Keefe, "Logical Empiricism and the Study of Human Communication," Speech Monographs 42 (1975), 170.

[8]Bruce Aune, Rationalism, Empiricism, and Pragmatism (New York: Random House, 1967), p. 83.

[9]Ibid., p. 148.

[10]Karl R. Popper, Objective Knowledge: An Evolutionary Approach (London: Oxford University Press, 1972), p. 20.

[11]Alvin W. Gouldner, "The Dark Side of the Dialectic: Toward a New Objectivity," Sociological Inquiry 46 (1976), 3.

[12]Ibid., p. 1.

[13]John R. Searle, "Chomsky's Revolution in Linguistics," The New York Review of Books, June 29, 1972, p. 17.

[14]Thomas S. Kuhn, The Structure of Scientific Revolutions, 2nd ed., enlarged (Chicago: University of Chicago Press, 1970), p. 84.

[15]Ibid., p. 159.

[16]See Jeanine Czubaroff, "Intellectual Respectability: A Rhetoric Problem," Quarterly Journal of Speech 60 (1974), 155-64, for a discussion of how these scientists responded to each other's arguments.

[17]Kuhn, p. 37.

[18]Searle, p. 16.

[19]Lee J. Cronbach, "Five Decades of Public Controversy Over Mental Testing," American Psychologist 30 (1975), 4.

[20]Bitzer, p. 47.

[21]Cronbach, p. 12.

[22]Martin Deutsch, "Happenings on the Way Back to the Forum," Harvard Educational Review 39 (1969), 525.

[23]Carroll Arnold, "Oral Rhetoric, Rhetoric, and Literature," Contemporary Rhetoric, ed. Douglas Ehninger (Glenview, Ill.: Scott, Foresman and Co., 1972).

[24]Karl R. Popper, Conjectures and Refutations: The Growth of Scientific Knowledge, 2nd ed. (New York: Basic Books, 1965), p. vii.

[25]See Wade for an example of this.

[26]John Ziman, Public Knowledge: An Essay Concerning the Social Dimension of Science (Cambridge: Cambridge University Press, 1968), p. 8.

[27]R. G. Dolby, "What Can We Usefully Learn from the Velikovsky Affair?" Social Studies of Science 5 (1975), 166.

[28]Lyndsay A. Farrell, "Controversy and Conflict in Science: A Case Study--The English Biometric School and Mendel's Laws," Social Studies of Science 5 (1975), 296.

[29]Ziman, pp. 9-10.