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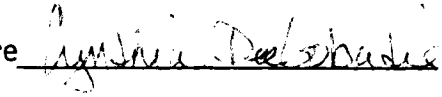
Signature 

Date August, 1985

MERTON'S NORMATIVE STRUCTURE AND THE CONTEMPORARY SCIENTIFIC ENTERPRISE

A Thesis

Presented for the

Master of Arts

Degree

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Cynthia Dee Gobatie

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ABSTRACT

The normative structure of science was articulated by Robert K. Merton, the eminent sociologist of science, in 1942. In his classic article "Science and Technology in a Democratic Order," the author states that the four norms of science are comprised of universalism, communism, disinterestedness, and organized skepticism. A problem results, however, through Merton's ambiguous use of the term "norm" as both descriptive and prescriptive. The purpose of this work is to analyze the descriptive and prescriptive soundness of each of the four norms proposed by Merton in order to determine the validity of the author's claims. Merton advocates his normative structure on two grounds: the methodological and the moral. I argue that, with the exception of organized skepticism, the methodological grounds for the defense of his norms are insupportable. Morally, I argue that none of the norms are strongly defensible. These arguments are based on the fact that there is an inherent clash between the way in which contemporary science is actually practiced and the ideal that Merton advocates.

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CHAPTER I

INTRODUCTION

The normative structure of science was articulated by Robert K. Merton, the eminent sociologist of science, in 1942. In his classic article "Science and Technology in a Democratic Order," the author states that the four norms of science are comprised of universalism, communism, disinterestedness, and organized skepticism (p. 270). Since Merton published this article, the normative structure he proposed has been hailed by scientists, including sociologists (e.g., Zuckerman, 1977; Wunderlich, 1974), as the best expression of the scientific endeavor. In addition, the American Association for the Advancement of Science uses Merton as a guide in their monograph "Scientific Freedom and Responsibility" (1975).

However, despite the acclaim enjoyed by Merton's model, there are problems with using this model as the benchmark of science. Most notable is his ambiguous use of the term "norm" as both descriptive and prescriptive. Descriptively, Merton's norms should describe how scientific research is actually practiced. Thus, he is claiming that scientists <u>are</u> disinterested, communal, skeptical and that they judge contributions to knowledge by a universal criterion of scientific merit. Prescriptively, he makes the further assertion that this is the way that science <u>ought</u> to be practiced in order to achieve the institutional goal of advancing certified knowledge. It is not clear, however, that

either the descriptive or the prescriptive interpretation yields an accurate reflection of contemporary scientific research. The purpose of this work is to detail the normative structure outlined by Merton and argue that the norms are descriptively and prescriptively outmoded by the contemporary scientific endeavor.

Merton begins by stating that:

> Science is a deceptively inclusive word which refers to a variety of distinct though interrelated items. It is commonly used to denote (1) a set of characteristic methods by means of which knowledge is certified; (2) a stock of accumulated knowledge stemming from the application of these methods; (3) a set of cultural values and mores governing the activities termed scientific; and (4) any combination of the foregoing (p. 268).

He also introduces the concept of an "ethos of science" (p. 268) and claims that such an ethos "is that affectively toned complex of values and norms which is held to be binding on the man of science. The norms are expressed in the form of prescriptions, proscriptions, preferences and permissions" (p. 269). Merton also identifies the institutional goal of science as "the extension of certified knowledge" (p. 270). Further, the author asserts that "the technical methods employed toward this end provide the relevant definition of knowledge: empirically confirmed and logically consistent statements of regularities" (p. 270). Thus, "the entire structure of technical and moral norms implements the final objective" (p. 270). Lastly, Merton introduces his now classic institutional imperatives which "are taken to comprise the ethos of modern science"--universalism, communism, disinterestedness, and organized skepticism (p. 270).

Universalism

This imperative posited by Merton's model declares that contributions to knowledge are to be judged solely on their scientific worth, i.e.,

> The acceptance or rejection of claims entering the lists of science is not to depend on the personal or social attributes of their protagonist; his race, nationality, religion, class, and personal qualities are as such irrelevant (p. 270).

It is this category that promotes the "impersonal character of science" (p. 270).

Communism

This term is used to denote "common ownership of goods" (p. 273); "the substantive findings of science are a product of social collaboration and are assigned to the community" (p. 273). In this way the free exchange of ideas, discoveries and technical expertise is interpreted as a mandate for the researcher.

> The institutional conception of science as part of the public domain is linked with the imperative for communication of findings. Secrecy is the antithesis of this norm; full and open communication its enactment (p. 274).

Disinterestedness

Generally, disinterestedness implies "pursuit of science not in search of prestige, power, or financial gain, but only in the cause of science itself" (Blume, 1974, p. 46); and/or the "disavowal of personal or material interest in the product of scientific research" (Blissett, 1972, p. 67). This norm relates to external influences rather than laboratory work. There is also an aspect of

enforcement: "scientific research is under the exacting scrutiny of fellow experts. . . .the activites of scientists are subject to rigorous policing, to a degree perhaps unparalleled in any other field of activity" (Merton, 1942, p. 276).

Organized Skepticism

This final norm constitutes the further mandate that research be approached in an objective manner, by employing a "temporary suspension of judgment and [the] detached scrutiny of beliefs in terms of empirical and logical criteria" (Merton, 1942, p. 277). In this way the scientific endeavor is purged of bias and subjectivity.

It is Merton's claim that these four institutional imperatives form the appropriate methodological framework for accomplishing the institutional goal of extending certified knowledge. This model thus provides a foundation for the technical norms of empirical evidence and logical consistency and leads to results that validate the impersonal quest for truth.

On the surface, Merton's norms seem reasonable and perceptive. But this impression is, in actuality, a hold-over from the days of "gentleman science" (Broad and Wade, 1982, p. 36) where the reward system was based simply on the priority of discovery and the prestige of publication, while the researcher was often supported financially by a private income. Historically, science was more of a hobby than a career. Because of the smaller scope of science prior to World War II, adherence to Merton's norms during that

period seems more likely and feasible. Disinterestedness, for example, could be maintained because there were few material gains to be sought; communication of findings, as dictated by communism, could be fully achieved informally as well as formally due to the smaller number of researchers and publications. Thus, Merton's framework may have been descriptively accurate, for the most part, at that time.

However the onslaught of "big science" (Price, 1963, p. 10) in the 1950's increased the stakes for all concerned. While priority of discovery is still a part of the contemporary reward system, the plethora of scientific journals bestows little prestige through publishing alone. Today's reward system, albeit in part dependent on publications, now includes grant support, academic or institutional positions, and commercial opportunities. This change in the reward system, as well as the increased number of individual researchers working on any one problem, has drastically altered the character of the scientific enterprise, which in turn affects its normative structure. The suitability and accuracy of Merton's norms as descriptors are, in fact, being challenged by internal competition and external entrepreneurship. Nevertheless, his model is still generally held to be representative of the field.

With the establishment of the National Science Foundation and the National Institutes of Health in the 1950's, and the subsequent financial support they represented, there came a turning point for science. Technological advances made this kind of

external support imperative, particularly in the area of equipment acquisition. Although tremendous advances had been made in the design and manufacture of scientific hardware (centrifuges, balances, autoclaves, etc.), the price tag was often too high for independent researchers or those in academia to maintain a state-of-the-art laboratory; this is increasingly true today. It is in this area that external funding became invaluable; grant support enabled laboratories to purchase appropriate equipment and finance research assistants in order to make possible the completion of particular lines of inquiry. The expanded academic programs that resulted from federal and other outside support allowed more students to complete doctoral programs in the sciences, thus increasing the number of researchers. Because of this kind of support, laboratories were upgraded in size, number and quality of staffings and accoutrements.

Eventually, grant support became a yardstick for measuring the success of an academic program or an individual scientist. The more support an academic program or institution received, through individual faculty and staff, the better equipped its facilities became--enabling them to lure the best students, faculty and researchers. Likewise, individual investigators were able to maintain active research programs, thus increasing their publishing and advancement potential in the academic or institutional hierarchy. In many ways, then, grant support has been a positive innovation: laboratories have been equipped with state-of-the-art

equipment, lab staffing has increased and science as a whole has made great strides in the expansion of knowledge.

What seems to have been lost, though, in the transition from "little science" to "big science" (Price, 1963), is the effectiveness of Merton's norms. The notion of careerism in science is fundamentally at odds with Merton's normative structure while at the same time being the most significant feature of contemporary science. The career scientist is faced with increasing competition within the field and increasing temptation external to the field. Internally, there is the pressure to produce and publish results; and, in these days of an intermittently struggling economy, there is also fierce competition for dwindling grant support (from some sources). Such competition severely weakens the impact of disinterestedness and promotes elitism. Externally, the monetary rewards represented by the commercialization of science prove to be a powerful force levied against the norms of communism and universalism.

Of the four, disinterestedness seems to be the most threatened by the pressures mentioned above. Since the point of disinterestedness is to do science for science's sake rather than for any external reward, the strength of this norm is eroded by factors such as the influx of competition for grant support. The scientific endeavor is to be undertaken, according to Merton, purely for the expected knowledge to be gained rather than dictated by the prospective rewards. But contemporary science is built on the foundation of rewards rather than on the notion of pure science

practiced in isolation from social pressures--a researcher cannot be expected to be successful without attention to external rewards. To maintain a disinterested attitude, the researcher must disregard the career imperatives dictated by the field. Conversely, to choose science as a career is to reject the norm of disinterestedness. In general, to be career-minded is to be directed towards personal success and progress in the field. Concern with personal success and progress, measured in contemporary times by publications, experimental advances and originality, amount of grant support, etc., would seem to militate against disinterestedness.

Furthermore, it is just these contemporary career imperatives, heightened by pressure and competition, that, unfortunately, create a climate for negligence and fraud. Where in the past there were few, if any, material gains to be achieved, contemporary science now incorporates financial rewards into its very structure. These rewards are represented by grant support which may provide extra salary and funds for travel, commercial opportunities through biological corporations or patenting, the occasional high paying academic position, and institutional employment opportunities. These rewards are the basis for success or failure in this particular field; a successful scientist will have attained at least some of the financial rewards mentioned. Grant support is particularly important. Regardless of the number of papers a scientist has published, proven ability to generate funds is often a necessary prerequisite for advancement and/or credibility. Thus, the material rewards available to contemporary researchers may

create an environment where fraud, of one type or another, is a tempting resolution to problems standing in the way of a grant renewal deadline, tenure appointment or a successful race for priority.

In light of the challenges to the descriptive power of Merton's norms, their prescriptive authority can likewise be challenged. Merton prescribes his norms on a technical basis, in that they are considered to represent the most effective way of practicing science to maximize its institutional goal. If, in practice, these norms are weakly represented, how defensible are they as prescriptions? To claim that science ought to be practiced according to these norms is to imply that they afford the most efficient way of expanding certified knowledge. The further implication is that if these norms are not applied, scientific advancement will be impeded. Nevertheless, actual practices which deviate from Merton have produced steady advancement in the field. We can, therefore, begin to question the legitimacy of Merton's norms as prescriptions.

This project will demonstrate the inconsistencies between the real and Merton's ideal in science. It will become apparent that science can advance without regard to Merton's normative framework. Thus the counter-examples to Merton's norms offered herein serve to illuminate the flaws in the author's structure rather than to indict science.

Merton also prescribes his norms on a moral basis. Attention will, therefore, be focused on Merton's claim that the norms are "moral compulsives" (p. 268). This claim is not obviously true and

the author does not defend this notion. My analysis will include a consideration of the circumstances under which the individual norms might be labeled morally right. Of the four, universalism and communism are the best candidates for this consideration.

In conclusion, it is my intention to analyze the descriptive and prescriptive soundness of each of the four norms proposed by Merton. In doing so, I will focus upon the various internal and external pressures that characterize contemporary scientific research. These features will demonstrate the inadequacy of Merton's normative structure for the scientific enterprise as it functions today.

CHAPTER II

MERTON'S NORMS AS DESCRIPTIVE

Merton claims that his normative structure is representative of the way in which science is actually practiced. I argue, however, that there are inconsistencies that exist between the values that Merton asserts and the activities of the practitioners.

Universalism

The notion of elitism, the opposite of universalism, has been discussed by several authors. Price (1963), for example, conceptualizes what he calls "invisible colleges." These colleges are select groups of scientists who form a network in order to facilitate communication, among themselves, of ideas, work in progress and specific accomplishments outside the journal process. Communication is in the form of pre-prints and reprints of current papers as well as interaction on the professional/social level that is intrinsic to scientific meetings and workshops. Such invisible colleges appear to exist in all the fields of science and generally consist of a limited number of high-ranking scientists (Price, 1963). Price states further that invisible colleges,

> . . .give each man status in the form of approbation from his peers, they confer prestige, and, above all, they effectively solve a communication crisis by reducing a large group to a small select one of the maximum size that can be handled by interpersonal relationships (p. 85).

Despite the conflict with universalism, Price claims that "Such groups are to be encouraged, for they give status pay-off without increasing the papers that would otherwise be written to this end" (p. 85). This final comment focuses on a flaw in the system of reporting scientific accomplishments. At one time the publishing arena was the greatest source of professional prestige as well as the most effective method of communication. Today, however, the number of papers accepted for publication and the vastly increased number of journals limit the amount of prestige to be garnered. Furthermore, a large quantity of trivia obscures more substantial work.

The existence of invisible colleges constitutes an example of elitism through the establishment of a hierarchy of selective communication. Such a hierarchy can influence "the acceptance or rejection" (Merton, 1942, p. 270) of knowledge because members of an invisible college have privileged access to the most current ideas and accomplishments. Nevertheless, these networks serve their members by maintaining an efficient level of information dispersal. This practice, though at odds with universalism, does support the institutional goal of expanding certified knowledge.

Rothman (1972), claims that there is "a strong elitist trend which runs contrary to the tenets of universalism" (p. 103) and that this trend can be most clearly seen through the distribution of grant money:

> A grant proposal specifies the nature of a proposed project and ideally the expected contribution can be judged in terms of its contribution to knowledge by

> the same universalistic criteria which applies [sic] to other work. However, it appears that particularistic criteria such as institutional affiliation are not irrelevant. In 1965, 25 percent of federal money went to researchers at only ten universities. While at least some of this concentration can be accounted for by the concentration of better scientists at such schools it appears that personal factors do enter in, and that institutional affiliation is decisive (p. 103).

He states further that, "such activity suggests the existence of a small scientific elite who receive, and possibly control, some of the most important resources in the scientific community" (p. 104).

It can be argued, though, that institutional affiliation is a necessary and appropriate consideration and therefore not elitist. The resources available to an investigator (laboratory facilities, library access, support staff, and professional contacts) can influence the success or failure of a project. These resources are often determined by the quality of the institution. Because of these factors, the affiliation of the investigator is not deemed particularistic; rather, it is a sensible and, in some cases, imperative consideration in decisions on grant proposals.

Merton, however, claims that "To restrict scientific careers on grounds other than lack of competency is to prejudice the furtherance of knowledge. Free access to scientific pursuits is a functional imperative" (p. 272). In light of Rothman's claims, the only way of adhering to universalism is to claim that institutional affiliation <u>is</u> directly correlative with a scientist's competency. If this can be demonstrated, then Rothman's claims can be disregarded. However, common sense tells us that not every

scientist at a prestigious university has the potential of receiving a Nobel prize; likewise, not every scientist affiliated with an anonymous institution is incompetent or incapable of significant accomplishment. Common sense also tells us that twenty-five percent of the most worthy ideas did not come from only ten universities. Though institutional affiliation, as such, does not oppose universalism, decisions made purely on the basis of one's connections does constitute an example of elitism. These observations would seem to support the claim that institutional affiliation can be an elitist criterion. To pass judgment on the basis of institutional affiliation, from Merton's perspective, is to restrict scientific careers, deny free access, and hinder the pursuit of knowledge. Since Merton conceptualizes universalism exclusively in terms of competency and scientific worth, the use of institutional affiliation would indeed be particularistic.

Nevertheless, the elitist practices I have cited do not seem to be detrimental to the field of science in general. Merton implies that the violation of his norms would reduce the field in some significant manner; this is not obviously the case.

Although I have offered only two instances of elitist tendencies, these examples are significant. Communication is a foundation of science and grant funding is certainly an important feature of contemporary research. Elitist practices in these areas affect the scientific enterprise as a whole; although not necessarily in a negative fashion. It follows that, descriptively, universalism

is not a standard that has been uniformly institutionalized in the manner Merton asserts.

Communism

The norm of communism also seems to be descriptively inaccurate. As an example, this norm has been violated in the biomedical arena most recently by the commercial opportunities represented by patenting. Patenting rights constitute ownership, which explicitly contradicts the notion that findings are assigned to the community. Biotechnology, in particular, has become a private rather than a community enterprise; the explosion of entrepreneurship in genetic research, for example, constitutes a further separation of the private from the public. This is evidenced by the number of genetic engineering corporations that are emerging on Wall Street, the patents that are being awarded to scientists, and the current trend of scientists acquiring business degrees in order to handle their new financial interests (Culliton, 1981; Bean, 1982). These trends demonstrate that scientists are broadening their normative structure to include the notion of intellectual property, i.e., that ideas and discoveries are the property of their originator. However, such a broadening is evidence of the incongruency of Merton's norms with contemporary science.

Another violation of communism is through the practice of secrecy. Merton specifically condemns such behavior by claiming that "secrecy is the antithesis of this norm; full and open communication its enactment" (p. 274). However, despite this claim,

secrecy is commonly invoked in defense, weapons and cryptological research (in the interests of security) and also as a protective mechanism to ensure priority of discovery, to allow research the "chance to mature, to be tested and varied, without publicity" (Bok, 1982, p. 25), and for commercial gain.

As Bok (1982) explains, the notion of secrecy presents a number of problems that are not easily resolved. There is a dilemma generated by the conflict between the desire to protect one's own research project from being borrowed, stolen or preempted and Merton's notion of the free exchange of ideas and discoveries. Since military research generally requires a restricted rather than a free flow of information, there is a further possible conflict between questions of security and the separate desires of the scientists who actually perform the research. Bok states that military secrecy,

> . . .is justified at times, but carries immense risks of spreading, of creating bondage, of shielding incompetence and corruption, and of delaying advances in knowledge. . . .it removes what is concealed from criticism and feedback, and thus opens the door to abuse. . . (p. 38).

Without controls dictated by public and scientific outcry, for example, which would not be possible without public disclosure, research with hazardous substances (e.g., germ warfare) could lead to severe abuses of authority and technology. But, paradoxically, disclosures could also lead to abuse. Public scrutiny of new developments in cryptological research, for example, is a source of concern on the part of government, military and business

organizations. In these days of potential computer theft, the successful development of unbreakable codes is a necessary requirement. Such developments affect not only military establishments but businesses, such as the finance industry, as well. Secrecy may well prevent such innovations from being used nefariously. As Bok states,

> The conflicts have to do with the degree of secrecy or openness considered legitimate in the transmission of trade secrets or of military secrets, and with the secrecy needed to hide the possibility of such transmission from outsiders and adversaries (p. 39).

Thus, the problem of secrecy in science is what Cade (1971) claims to be a "simultaneous requirement to promote the flow of thought between some sets of minds yet impede it between others" (p. 182). This comment summarizes the problem of secrecy in science quite accurately.

Contrary to communism, secrecy is, therefore, a significant and at times necessary aspect of the contemporary scientific enterprise. Because of the influence of both entrepreneurship and secrecy, the institutionalization of this norm is not supported in practice to the degree that Merton claims.

Disinterestedness

The norm of disinterestedness is under the most pressure from contemporary scientific research. To do science exclusively for the sake of science is to reject science as a career. It is obvious, though, that such a rejection has not occurred; all respected practitioners in the field of science are careerists. Furthermore,

instances of fraud (clearly acts of self-interest rather than disinterest) generally occur under the pressures generated by competition for scarce financial and employment resources. These resources are a fundamental aspect of the field of science; to compete for them is a natural expression of the career scientist. It would seem, though, that this kind of competition does not reflect the disinterested attitude advocated by Merton. Again, disinterest is to be exercised in regard to external influences.

In the text of Merton's article we see that the author places a considerable amount of faith in the notion that "the activities of scientists are subject to rigorous policing, to a degree perhaps unparalleled in any other field of activity" (p. 276). It is this kind of internal scrutiny that leads Merton to claim that there is a "virtual absence of fraud in the annals of science" (p. 276). Apparently such policing is effected under the aegis of this norm: papers are accepted for publication, grant money is awarded, positions are filled--all with a disinterested eye on extending the scope of scientific knowledge.

Merton's claim as to the effectiveness of the policing system is exaggerated. Contemporary instances of fraud and negligence provide vivid examples of the inadequacies, flaws and limitations of the three forms of scientific scrutiny: peer review, the referee system, and replication, as well as providing contrary evidence to Merton's claim about the "virtual absence of fraud" (p. 276).

A notable example that demonstrates a weakness of the peer review system is the case of John Long of Massachusetts General

Hospital (Wade, 1981). Long was a highly respected researcher who had not only impeccable credentials, but an outstanding history of scientific accomplishments. In 1976 and 1979, Long was awarded grants that totaled $759,000 for work on Hodgkin's Disease. Based on his past successes, these awards appear to have been granted without the kind of scrutiny to which an unknown researcher would have been subject. When an investigation was begun relating to fraud in Long's laboratory, it was discovered that the cell line upon which Long's research depended was a contaminated line. This discovery led to the retraction of numerous publications and the rejection of Long's data as invalid.

The point made by a reporter of this incident (Wade, 1981) is that the purity of the cell line was such a unique occurrence that the scrutiny of the grant proposals should have been even more severe than usual. The assumption is that the contamination problem would have emerged prior to the commitment of funds. But based on Long's record of achievement, the proposals appear to have been given minimal scrutiny. It follows that if these proposals had been submitted by an unrecognized researcher, the grants may never have been awarded.

Although evidence for these conclusions is scant, a scenario such as the following does not seem unlikely. Long was clearly a member of the scientific elite. The members of the granting committee were certainly aware of the researcher's past successes. This knowledge in concert with the significance of the research would probably be sufficient to eliminate any obvious doubts, on the part

of the reviewers, regarding Long's abilities. The influences of elitism and human bias weaken the objective and disinterested character of the peer review system defended by Merton. The effectiveness of this control is subject to question.

A form of fraud, plagiarism, is policed only loosely due to the limitations inherent in the referee system of the journal review process. A noteworthy example, albeit an extreme one, is the recent case of Elias A.K. Alsabti. Over a period of three years, Alsabti stole research proposals, forged letters of recommendation and submitted upwards of sixty already published papers under his own name (Broad, 1980; Lawrence, 1980). That these previously published papers were accepted and published under Alsabti's name, in addition to the fact that it was three years before the theft was discovered, demonstrates the lack of "rigorous scrutiny" which Merton so firmly defends. According to Broad and Wade (1982), "the exploits of Alsabti could never have occurred in a community of scientists where rigorous self-policing was the rule" (p. 38).

Unfortunately, the kind of referee scrutiny that Merton advocates is nearly impossible in these days of journal proliferation. Despite advances in computer technology, there appears to be no accurate method of cross-checking articles in order to verify their originality:

> There are at least 8,000 medical journals in the world, and many of these receive thousands of papers a year. Checking credentials of authors would be a vast and embarassing business. And checking to see if a paper has been published before (under a different name and probably with a different title) would be nigh on impossible. Editors would seem to have little choice

> but to trust the integrity of their contributors and the astuteness of their referees (Broad and Wade, 1982, p. 50).

The final form of self-policing that is used in science, replication of experiments to validate research claims, also displays certain limitations. The major problem with this form of scrutiny is that the reward system of the field only recognizes original work, not replicated work. Thus, it is only in principle rather than in fact that replication is a useful scrutinizing tool. In cases of suspected fraud, replication can certainly be an aid in determining experimental accuracy. Replicating experiments, however, is costly and time consuming. For these reasons, replication is generally the final method of confirming or refuting claims of fraud, rather than a routine form of scrutiny.

Merton further asserts that "The translation of the norm of disinterestedness into practice is effectively supported by the ultimate accountability of scientists to their compeers" (p. 276). While the three forms of self-policing that have been detailed do represent methods of monitoring the field of science, the accountability necessary for Merton's translation of the norm is only weakly evidenced. The most compelling support for this claim is the fact that fraud does occur. According to Merton, the supposed rigorous scrutiny of the internal policing system is what guarantees the absence of fraud. The emergence of fraudulent activities in contemporary science attests to the fact that the policing mechanisms are inadequate to the task. The norm of

disinterestedness, therefore, is not founded upon an accurate description of the field.

Organized Skepticism

According to Merton's final norm, organized skepticism, science is done from a completely objective standpoint. This norm supposes that scientific merit is judged by logical and empirical criteria and is supported by a "temporary suspension of judgment" (p. 277). Practitioners apparently work in deliberate isolation from preconceptions and existing dogma. What is not addressed by this norm, though, is the influence of expectancy and self-deception.

Kuhn (1962) points out that the notion of a paradigm is intrinsic to the practice of science. Those researchers who share the same sub-field of science, who have similar training and therefore share the same attitudes toward their research subject, likewise share a paradigm. The way that researchers approach a subject of investigation reflects their preconceptions rather than setting them apart from them. Kuhn states:

> Normal science, the activity in which most scientists inevitably spend almost all their time, is predicated on the assumption that the scientific community knows what the world is like. Much of the success of the enterprise derives from the community's willingness to defend that assumption, if necessary at considerable cost. Normal science, for example, often suppresses fundamental novelites because they are necessarily subversive of its basic commitments (p. 5).

This assertion seems contrary to Merton's norm, and yet at the same time very basic to the scientific enterprise.

The influence of expectancy and self-deception is evidenced by the case of the Piltdown man, an artifact which was accepted for a number of years as the "missing link" (Weiner, 1955). This artifact, and the circumstances surrounding its discovery, was later found to be a hoax, but the inconsistencies associated with the relic were overlooked by eminent scientists of the day because they wanted to believe in the significance of their findings (Broad and Wade, 1982). A similar example is Morton's late 1800's report of the relation between skull size and intelligence. The presentation of Morton's data, as revealed by Gould (1978; 1981) was biased and non-objective and yet it was accepted because it reflected existing dogma.

A classic example of the influence of expectancy on investigators is Rosenthal's (1966) experiment with "maze-bright" and "maze-dull" rats. His study presents a group of psychology students who were given rats with the two labels mentioned above. Although there was no difference between the two sets of rats, upon being tested on their maze running abilities, those rats labeled "maze-bright" consistently did better than those labeled "maze-dull"--the data collected was unconsciously being manipulated by the students.

Human subject research, however, has tried to deal with the problem of researcher expectancy or deception. In order to circumvent this problem, double-blind studies have been instituted (e.g., in placebo research neither the investigator nor the subject is aware of which group is the control and which group is the experiment) (Bok, 1982). Although this practice is not universal,

it is at the very least an acknowledgement of the problem and an attempt to eliminate the factor of expectancy from the data collected.

Broad and Wade (1982) claim that "all human observers, however well trained, have a strong tendency to see what they expect to see" (p. 114). Barnes and Dolby (1970) claim further that a "scientist generally has a specific viewpoint which makes him sceptical of some results whilst uncritically accepting others" (p. 10). Although the factors of expectancy and self-deception may not be as pervasive as these sets of authors claim, they are certainly worth noting in relation to the way that science is practiced. Organized skepticism is difficult to control or maintain and hence does not, as practiced, guarantee a "suspension of judgment" (Merton, 1942, p. 277). Merton appears to present an unrealistic framework for scientists to operate within. This norm, therefore, is descriptively incomplete.

Overview

Quantitative data to support the anecdotal evidence presented thus far is scant. However, there are two studies which address, in part, the institutionalization of Merton's norms.

Mitroff (1974a, 1974b) performed a study which focused on the subjective dimension of science. The author's results were based on the responses of forty-two eminent scientists affiliated with the NASA Apollo space program. These responses were gathered during four interviews conducted over a period of three and one-half years.

"The interviews ranged from open-ended discussions in the opening round to written questionnaires in the subsequent rounds (Mitroff, 1974b, p. 580).

The most significant tentative finding that emerged from Mitroff's study is the existence of a number of counter-norms that seem to operate in a paradoxical conjunction with Merton's norms. The counter-norms articulated by Mitroff are essentially the opposite of Merton's and yet the two function side by side. Mitroff's list of counter-norms (1974b, p. 592) includes:

> 1) particularism--the acceptance or rejection of claims entering the list of science is to a large extent a function of who makes the claim; the social and psychological characteristics of the scientist are important factors influencing how his work will be judged; the work of certain scientists will be given priority over that of others; the imperative of particularism is rooted deep in the personal character of science (Boguslaw, 1968; Mitroff, 1974a; Merton, 1963; Polyani, 1958).
>
> 2) solitariness--property rights are expanded to include protective control over the disposition of one's discoveries; secrecy thus becomes a necessary moral act (Mitroff, 1974a).
>
> 3) interestedness--scientists are expected by their close colleagues to achieve the self-interest they have in work-satisfaction and in prestige through serving their special communities of interest, e.g., their invisible college (Boguslaw, 1968; Mitroff, 1974a).
>
> 4) organized dogmatism--each scientist should make certain that previous work by others on which he bases his work is sufficiently identified so that others can be held responsible for inadequacies while any possible credit accrues to oneself; the scientist must believe in his own findings with utter conviction while doubting those of others with all his worth (Boguslaw, 1968; Mitroff, 1974a).

Mitroff, in his concluding remarks, asserts the following:

> This paper has argued that science contains norms and counter-norms. Both, however, do not operate equally in every situation. . . .Norms dominant in one situation can be subsidiary in another. Dominancy is not an invariant property of a set of norms (1974b, p. 593).

The significance of Mitroff's findings, for the purposes of this project, is the revelation that Merton's norms are not the only normative structure in operation. Descriptively, as I have argued, Merton's norms are not sufficiently dominant to justify the author's claim of institutionalization. It is apparent that, under certain circumstances, different attitudes and approaches to the scientific endeavor are valued over those articulated by Merton.

Mitroff's conclusions, while extreme, do support the evidence presented in this chapter. The author's conclusions do seem representative of at least a segment of the scientific community. His presentation is persuasive because it offers a view of science as human and fallible. Such a view seems more realistic than Merton's ivory tower depiction of scientists. It would be difficult for Merton to summarily dismiss Mitroff's findings on the descriptive plane. Nevertheless, Mitroff's presentation violates the ideal embodied in Merton's normative structure. Merton would claim that science ought <u>not</u> to be practiced in the manner which Mitroff suggests. Merton might even go so far as to claim that the enterprise undertaken on the basis of the counter-norms is not

science at all, regardless of how well the institutional goal is being met.

Fishman (1981) published a study aimed at discerning scientific autonomy and purity. These two qualities reflect the spirit of Merton's norms: they require that the enterprise of science be set apart from political and social influences and that it remain so due to the disinterested attitude maintained by the practitioners. The author collected responses from a survey directed at 1,200 academic scientists representing the fields of physics, biology, and sociology. Fishman drew the following conclusions:

> 1) the responses. . .represent significant recognition on the part of scientists that the actual objectives of contemporary science are not restricted to the traditional goals of pure science (p. 152).
>
> 2) 79.3% of the respondents disagreed with the statement "Basic (pure) science is a more legitimate and valid type of scientific activity than is applied science." . . .the vast majority of scientists endorse concepts which are clearly at variance with the tenets of "pure" science (p. 153).

Merton's norms focus exclusively on the notion of pure science. This can be most clearly seen through the institutional goal (expansion of certified knowledge) and the norm of disinterestedness, where science for the sake of science is promoted rather than the promotion of the utility of science. Attention to the applied aspects of the field is beyond the scope of Merton's normative structure. Fishman suggests that,

> . . .the scientists who participated in this study, regardless of discipline, perceive the conduct of scientific activity to be greatly at variance with

> the value assumptions of the. . .Mertonian perspective of science (p. 158).

These two studies support the argument that Merton's norms do not accurately describe the realities of contemporary scientific investigation. Given this assessment, my next question is whether or not there can be prescriptive efficacy in the face of descriptive inadequacy. That is, is it reasonable to adhere to a code of values that is an ideal reflection rather than an actual reflection of the scientific endeavor?

CHAPTER III

MERTON'S NORMS AS PRESCRIPTIVE

Merton prescribes his norms on two separate bases: their technical worth in terms of maximizing the institutional goal, and their moral worth. He claims that the norms are "right and good" (p. 270) on both counts. In order to determine the appropriateness of the prescription, it is necessary to examine each norm from the technical standpoint as well as the moral standpoint.

Universalism

Merton describes universalism by claiming that:

> . . .the acceptance or rejection of claims entering the lists of science is not to depend on the personal or social attributes of their protagonist; his race, nationality, religion, class, and personal qualities are as such irrelevant (p. 270).

He further states that "Free access to scientific pursuits is a functional imperative" (p. 272). I will argue that this norm can be supported by the general moral requirement of treatment as an equal regarding interests such as selective communication. As was discussed earlier, however, the existence of invisible colleges clearly violates the norm of universalism, and as a consequence, apparently violates the more general moral principle concerning treatment as an equal. These invisible colleges are elitist groups that promote communication exclusively among their members (Price, 1963). Invisible colleges can be viewed as part of the scientific

class hierarchy; being a member of such a class brings rewards that are not available to all scientists. These rewards can take the form of relaxation in the scrutiny of manuscripts, preferential consideration for grant support and lucrative job offers (e.g., lecture appointments) (Broad and Wade, 1982; Price, 1963). Membership in the scientific elite, therefore, can indeed influence "the acceptance or rejection of claims entering the lists of science" (Merton, 1942, p. 270). Research rewards equal to those extended to the members of the elite appear to be denied to the bulk of scientists.

Despite these violations, the existence of elitist practices does not, as Merton requires (p. 269), result in censure from, or discord among, the members of the scientific community. One possible explanation for this is that non-elite scientists aspire to the ranks of the elite and the rewards and opportunities that this position offers. Such aspirations may prove to be a strong motivating force for individual researchers whose entry into the upper ranks is dependent on superior accomplishments. Nevertheless, the existence of a hierarchy can lead to abuses of universalism which result in losses of knowledge.

Another explanation of this situation is that the norm of universalism is being violated in order to further some other goal besides the principle of equality. The institutional goal of science is the extension of certified knowledge and it is this goal that is being promoted by elitist practices at the apparent expense of treatment as an equal.

Elitist practices violate the norm of universalism and yet, as was argued, particularistic criteria, such as institutional affiliation, can represent important factors influencing the success of research projects. Successful programs of research lead directly to the institutional goal. Furthermore, elitist groups, such as invisible colleges, facilitate improved communication of ideas and results among the elite. I shall argue that this improved communication serves the institutional goal by encouraging research success. Improved communication within an invisible college, for example, allows those at the forefront of research to better utilize their time and energy as well as enabling them to refine their investigations at a swifter rate than would be possible if results were communicated through the journal process alone. The general practice of universalism would render journal communication even more unwieldy, and therefore slower. Improved communication allows for swifter progress through elitism and thus a more rapid accumulation of certified knowledge. For this reason, elitist practices provide a more efficient enhancement of the institutional goal than can be expected from universalism and the promotion of treatment as an equal. Thus, the norm of universalism and by extension (it may appear) the general principle of equality, are sacrificed to this end.

This assessment undermines the technical basis for Merton's prescription of universalism. The author focuses on the institutional goal of the scientific enterprise. He proposes universalism as a means to maximizing this goal; it is by adhering

to this norm that the institutional goal will best be enhanced. But the enhancement evident in practice is through elitism. Considering that furthering the institutional goal is the primary focus of the field, it is to be expected that the practitioners will choose that norm which they think will lead most directly to this goal; the norm chosen is elitism. Universalism would be adhered to if it more effectively met this goal. Although this claim is controversial, it would have to be granted by Merton who asserts that science chooses efficiency over personal gain. Elitism is instrumentally good because it leads to the furtherance of certified knowledge. The institutional goal is in itself, however, an instrumental good because it leads to the improvement of the quality of life. This intrinsic good is what is promoted by elitism.

Universalism, though, appears to promote a different state of affairs that is intrinsically good: adherence to the principle of equality. This moral principle seems to support Merton's prescription of universalism. Dworkin (1977) describes this moral principle as "the right to equal concern and respect in the. . . decision about how. . .goods and opportunities are to be distributed" (p. 273). The rejection of discrimination, the foundation of universalism, is judged right and good for society at large as well as for the smaller community of scientists. If elitism best serves the institutional goal, however, then the intrinsic rightness and goodness of universalism competes with the instrumental goodness of furthering certified knowledge and thus the intrinsic good of improving the quality of life. While it appears that the

institutional focus is on improving the quality of life, it also appears that the right to treatment as an equal is denied to the majority of scientists in order to serve this goal. Is this choice legitimate? In order to approach the question of legitimacy, I am going to discuss an argument from utility and explore Dworkin's response to this argument. I shall argue that elitism is favored over universalism both by (a) an ideal act utilitarianism which grants some value to the fulfillment of rights and also by (b) a morality which gives the highest priority to the requirement that everyone be treated as an equal.

In simplified terms, Feldman (1978) defines ideal act utilitarianism as the view that: "An act is right if and only if there is no other act the agent could have done instead that has higher utility than it has" (p. 26); utility is the amount of good that results. Thus it is necessary, from an ideal act utilitarian point of view, to compare the overall value that would result from each of the choices involved in this discussion: universalism and elitism--i.e., to compare the overall net value of maximizing treatment of scientists as equals and the overall net value of maximizing the improvement of the quality of life. Certainly there is resultant good from both the options under examination. In act utilitarian terms, though, the right action is the one with the best consequences.

Let us start the assessment of consequences with universalism. Maximizing treatment of each scientist as an equal helps to secure an important individual right. A right can be interpreted as an

entitlement to some state of affairs to which one has a just claim. The central quality of a right is that such claims cannot rightly be denied arbitrarily, nor can denial be justified on the basis of general welfare. It is this central quality that gives the notion of a right its moral value (Bowie and Simon, 1977). Universalism generates utility (although not in the conventional sense of satisfying desires) because, in this instance, it incorporates, through its non-discriminatory foundation, this rights-based morality. Adherence to universalism produces value through the defense of rights.

The main value that results from the practice of elitism lies in its improving the quality of life. Research, which results from serving the institutional goal, leads to medical, agricultural, industrial and technological advances that improve the lives of all (an intrinsic good). Moreover, the rapid expansion of certified knowledge encouraged by elitism will result in the generation of more prestige and satisfaction when compared to that which may be garnered through the general practice of universalism.

While the kinds of utility so far considered are all significant, the balance of importance shifts to the goods produced by elitism when we add that, compared to the norm of universalism, elitism better promotes medical advances which improve life in a way more fundamentally necessary to survival. Treating scientists as equals increases utility in morality. Survival, however, is fundamentally more important than this sort of moral conduct, primarily because behavior presupposes the existence of the agent

that behaves. The promotion of medical advances is significant, but it should be noted that there are limitations on the utility that can be credited to elitism. The difference in survival must be calculated on the basis of advances made by the elite compared to the advances that could be anticipated from the practice of universalism. It would seem, though, that despite this limitation, the expansion of knowledge encouraged by elitism would favor an increase in survival. Improving the quality of life in ways fundamentally necessary to survival, therefore, means that elitism results in more utility than is realized through maximizing the treatment of scientists as equals.

It might appear that Dworkin would disagree with the above assessment. The principle of equality is based on the right to treatment as an equal. Dworkin claims that "if someone has a right to something, then it is wrong. . .to deny it to him even though it would be in the general interest to do so" (p. 269). This is exactly what the utilitarian formula seems to have allowed: the right of non-elite scientists to treatment as an equal has been overruled in favor of maximizing the general interest by improving the quality of life.

This objection does not hold, however. Dworkin explains that the right to treatment as an equal is "the right to equal concern and respect in the. . .decision about how. . .goods and opportunities are distributed" (p. 273). The losses of those who may be injured by a particular action must be taken into account in the decision-making process. It is this taking into account that

fulfills the right to equal concern and respect and thus the right to treatment as an equal:

> But when their interest is taken into account it may nevertheless be outweighed by the interests of others who will gain from the policy, and in that case their right to equal concern and respect. . .would provide no objection (Dworkin, 1977, p. 273).

This seems to be a more accurate reflection of the relationship between elitism and universalism, than is the utilitarian assessment. The choice of elitism over universalism is legitimate, and thus fulfills the moral requirement of treatment as an equal, if the scientists affected by this decision are treated with concern and respect equal to that with which other interested parties are treated. If the right to equal concern and respect is honored, then the interests of the scientists in access to selective information can be outweighed by the interests of others who will also be affected by the choice. Thus, the fundamental right to equal concern and respect appears to be fulfilled through elitism. The adoption of elitism is justified in light of the fact that the interest of non-elite scientists in access to invisible college communications is outweighed by the interests of beneficiaries of science in survival. The further conclusion is that the principle of equality has <u>not</u> been violated as it first appeared.

There is, however, an additional good promoted by elitism which further weighs the scales against giving equal rewards to non-elite scientists. That is the moral good of treating seriously ill persons with concern and respect equal to that shown healthy persons. Elitism, by best promoting the intrinsic good of improving the

quality of life, advances treatment as an equal in a way more fundamental than universalism; this is so because the interests involved are concerned with the survival of the individual. For example, the use of kidney dialysis machines was at one time considered an exotic treatment. Access to this resource was limited due to the number of machines available. As a result of biomedical technology, what was at one time an exotic treatment is now considered routine in the case of kidney disease. The routine nature of this particular medical procedure (strongly presumed to have been developed through an invisible college) effectively decreases the number of individuals dying from kidney disease--a state of affairs that is required by an equal application of concern and respect. The interests of those in mortal danger due to illness outweigh the interests of healthy individuals in, for example, preventive care. This is so because in applying equal concern and respect, the interests of all concerned parties must be weighed. If adherence to universalism had been maximized, this would expectably have resulted in a slow-down of medical advances. Under these conditions, it is highly probable that dialysis would not have become a routine treatment until a much later date--thus contributing to a lower survival rate. Treatment as an equal (through improved concern and respect) is better fulfilled as a result of improving the quality of life, and hence better served by elitism than by universalism.

We have seen that universalism is supported by Merton as a prescriptive norm on the ground that it best serves the institutional

goal. We have also seen that universalism can apparently be supported as a prescriptive norm on the ground that it promotes the treatment of scientists as equals. Challenging both these grounds, I have argued that universalism does not best serve the institutional goal, and that it does not best serve treatment as an equal in the deepest sense.

Communism

Merton states, "The substantive findings of science are a product of social collaboration and are assigned to the community" (p. 273). This is the key element to his norm of communism. The author states further,

> An eponymous law or theory does not enter into the exclusive possession of the discoverer and his heirs, nor do the mores bestow upon them special rights of use and disposition. Property rights in science are whittled down to a bare minimum by the rationale of the scientific ethic. The scientist's claim to "his" intellectual "property" is limited to that of recognition and esteem. . .(p. 273).

While it is true that recognition and esteem are a significant part of the scientific reward system, it is certainly not true that rewards for scientific productivity are limited to prestige. In contemporary science, the reward system has deviated from Merton's norm by incorporating financial rewards. This can be most clearly evidenced by patenting, a clear case of ownership. The notion of ownership, though, is at odds with the norm of communism. Despite this conflict, private ownership does exist in the realm of science through patenting. Merton argues, however, that scientists ought not to acquire property rights. If Merton's proscription is to be

defended, it must be demonstrated that the scientific enterprise is limited, in some significant manner, by these legal practices or that they are morally undesirable for some other reason.

The purpose that communism serves in the normative structure defended by Merton, is to promote the flow of information resulting from scientific research. Communism asserts that findings belong to the community of scientists rather than to the individual who does the actual research. Since findings belong to all, there is no impediment to the flow of information generated by the scientific endeavor. The sanction against private property implies that information dispersal would be restricted by private property to a degree that would adversely affect the increase of certified knowledge. Is this, in fact, the case?

Private ownership in science is represented by patenting. Patenting is a legal procedure instituted in order to establish ownership and to prevent infringement on the rights that support ownership. Burge (1984), a patent attorney, describes a basic feature of the patent system:

> A view of a patent. . .is that it is a contract between the government and an inventor. In exchange for the inventor's disclosure of an invention previously unknown to the public, the government promises the inventor certain exclusive rights in the invention for a limited period of time. As a part of this contract, the inventor agrees to the government's publication of the invention upon expiration of the patent. During the time the patent contract is in force, the public has access to the published disclosure of the invention and can use its teachings in constructive thinking to forward the development of the art, whereby improvements are often promulgated. Members of the public may also approach the patent

> owner while the patent is in force seeking permission to practice the invention on terms suitable to the patent owner (p. 25).

Given this description, patenting practices appear to support and encourage the institutional goal of science. Rewards, in the form of exclusivity, may, in fact, promote the flow of information rather than hinder it.

The key element, for the purposes of this discussion is disclosure. Each patent that is approved is outlined in the federal publication, Official Gazette. Additionally, copies of the complete patent agreement are available on demand (Burge, 1984). Open disclosure practices inherent in the patent system, therefore, militate against the implication that private property in science restricts the flow of information.

This is not to say, however, that there are no restrictions at all. But the restrictions that exist are on the actual use of the property. The rights of the patentholder are negative rights as opposed to positive rights. A negative right entitles the patentholder to deny access to the property in question: no other individual may utilize or benefit from the property without the express permission of the patentholder in the form of a license. The patentholder may, on occasion, also have positive rights in regard to the property. A positive right enables and allows the patentholder to freely produce the patented product. But positive rights are by no means intrinsic to the patent system. Burge illuminates the distinction between the two rights and offers an example of how the two relate.

Inventor A invents a three-legged stool and is awarded a patent on its design and use. Inventor B improves on the basic design of the three-legged stool by adding a fourth leg, arms and a back. He is awarded a patent on the chair's design. Inventor C modifies B's chair by adding "rockers"--he is subsequently awarded a patent on the design of the rocking chair. All three inventors automatically assume negative rights to their inventions, i.e., no individual may produce their design without permission. However, note that each modification overlaps the previous design: Inventor C may withhold access to the rocking chair (negative right) but this does not allow him to produce his design on his own because of infringement on Inventor B's chair patent and Inventor A's stool patent. Inventor B can exercise his negative rights by denying C access to the chair design but B is in the same position as C in regard to production--B does not have the positive right to produce his chair unless being released to by A. Inventor A, alone of the three inventors, has the positive right to produce his design of the stool because his design does not infringe on any other patented design; his design is basic (Burge, 1984, p. 10).

At this point what needs to be determined is whether or not the negative rights intrinsic to the patent system constitute an obstacle to the scientific enterprise.

The fact that a patentholder has the right to deny access to a certain invention, be it a design or a process, leaves open the possibility of abuse. It is possible that a patentholder could reject all license applications, thereby reserving for him/herself

the option of developing the property. If the patentholder does this and also chooses not to develop the property, it would seem that the scientific endeavor would be impeded: the information would be available but the development of the information would be halted. An example would be the possible limitation on research in biomedicine to be discussed shortly. That it is a temporary halt, until the patent agreement expires (seventeen years), does not negate the potential damage.

Although the potential for abuse exists, actual damage to the field of science would depend on whether such abuse is significantly widespread. Due to the complexity of the patent system, this is difficult to ascertain (Machlup, 1958). But in discussing the issue of abuse in regard to Merton, it is necessary to distinguish between the exercise of negative rights in the application of knowledge (through refusal to market or develop) and the exercise of these rights in regard to knowlege itself. This distinction is necessary in light of the mandate of Merton's institutional goal: the expansion of certified knowledge.

Negative rights do not clearly affect scientific knowledge. The disclosure practices inherent in the patent system assure that the knowledge is a part of the public domain. Additionally, the receipt of a patent does not limit the publishing potential of the patentholder. Thus there are at least two separate sources for obtaining patented information. An additional factor to be considered is that a certain amount of limited individual experimentation is allowed without the necessity of obtaining a

license from a patentholder (Chisum, 1978). In this way, scientists "can use its teachings in constructive thinking to forward the development of the art" (Burge, 1984, p. 25).

Another question that arises is whether or not sufficient powers of investigation are being bent in a particular direction, after a patent has been awarded. For example, if a patent is awarded to a biotechnology corporation for the development of a specialized laboratory technique, does the research that is actively being pursued by this company represent enough interest to justify the general exclusion of other scientists? By exercising their negative rights, the corporation limits full-scale research to what they themselves can accomplish. Although research is undertaken, it is not open to all interested scientists. Does this situation represent an impediment to the scientific endeavor? The best that could be said regarding this scenario is that the institutional goal is being met minimally. The situation described precludes maximization of the institutional goal which would be achieved only if the research was open to all. Thus, the expansion of knowledge would be limited to the successes of the patentholders. If the researchers are very successful then the impact on the field would be slight. If the researchers are unsuccessful then the impact would be more significant. To improve the chances for success, though, institutional job opportunities are created. In this way, other interested scientists are allowed to participate in a full-scale research project from which they would otherwise be banned.

There are positive aspects to patenting. The right to exclusivity is a reward for the undertaking of research and creativity that would possibly not be forthcoming merely for its prestige value. Research is an expensive undertaking and the money has to come from somewhere; by granting exclusivity in one's invention, that expense is countered by whatever profits may be received in the future. Thus the financial potential represented by a patent agreement can encourage research. Further, once the success of a particular line of inquiry has been established through a patent award, competing researchers will expectedly increase their own efforts in parallel research, in the hopes of building on earlier successes. In addition, institutional employment opportunities may be increased through patented developments: expanded research programs subsequent to receiving a patent are to be expected.

Currently, it is impossible to measure accurately the relative benefit or harm to scientific knowledge that results from patenting practices (Machlup, 1958). The resolution would lie in being able to quantify the number of patents that remain undeveloped in relation to their significance to the expansion of certified knowledge. Any defense or indictment of patenting practices is inconclusive without this information (which is not forthcoming). Merton, nevertheless, asserts that property rights in science are to be limited to prestige and implies that the scientific enterprise would be thwarted by practices such as patenting. While it cannot be established that property rights in science, represented by

patenting, significantly enhance the field, it is not obvious that private ownership is significantly detrimental to the institutional goal. Admittedly, the potential for abuse exists. But likewise there is a potential for accomplishment that could advance the institutional goal.

The basis for Merton's prescription is the defense of the institutional goal of science. I have argued that the threat to this goal represented by patenting is not established to the point where property rights in the field are precluded. Thus the prescription of communism is not justified in terms of the institutional goal. Can the prescription of this norm, however, be justified on other grounds? At this point I will present a discussion concerning the exercise of negative rights in regard to applied research and development of patented inventions, and the moral implications of such actions.

The patent system seemingly incorporates into its structure John Locke's theory of acquisition, i.e., that "property rights in an unowned object originate through someone's mixing his labor with it" (Locke, 1967, p. 138). What may not be incorporated into the patent system, however, is Locke's proviso that there be "enough and as good left in common" (p. 138). This proviso "is meant to ensure that the situation of others is not worsened" (Nozick, 1974, p. 175) by a particular acquisition. Nozick (1974) asserts that,

> Someone may be made worse off by another's appropriation in two ways: first, by losing the opportunity to improve his situation by a particular appropriation or any one;

> and second, by no longer being able to use freely (without appropriation) what he previously could (p. 176).

Based on this analysis, Nozick claims that the situation of independent inventors is worsened:

> An inventor's patent does not deprive others of an object which would not exist if not for the inventor. Yet patents would have this effect on others who independently invent the object. Therefore, those independent inventors. . .should not be excluded from utilizing their own invention as they wish (including selling it to others) (p. 182).

Nozick would appear to be advocating a change in the patent system that would accomodate Locke's proviso that "enough and as good [be] left in common" (Locke, 1967, p. 138). But such a change in the patent system would only benefit other inventors, and not favor communism.

Nozick includes in his discussion of Locke's proviso an example that relates to negative rights:

> A medical researcher who synthesizes a new substance that effectively treats a certain disease and who refuses to sell except on his terms does not worsen the situation of others by depriving them of whatever he has appropriated (p. 181).

The author, however, does not consider the patentability of the new substance:

> The others easily can possess the same materials he appropriated; the researcher's appropriation or purchase of chemicals didn't make those chemicals scarce in a way so as to violate the Lockean proviso. . .(p. 181).

According to Nozick, the proviso is accomodated because "the medical researcher uses easily available chemicals to synthesize the drug" (p. 181). Although the ingredients of a patented substance are

accessible, the point overlooked by Nozick is that these chemicals cannot legally be used in the generation of the protected substance without permission of the patentholder. As we shall see, it is not clear whether we should say that scientific patenting can worsen the situation of non-scientists, but it is quite clear that it can be said to result in serious harm to them.

Biological research can result in patented products the withholding of which could prove detrimental to people's health. Suppose, for example, that biomedical research leads to the discovery of a vaccination serum that would protect an individual from contracting Acquired Immune Deficiency Syndrome (AIDS). This serum and the process for making the serum are patented. The population most susceptible to this disease is thought to be homosexual and, given the connection between AIDS and homosexuality, the patentholders exercise their negative rights, thereby denying access to the serum and its possible benefits. It is the patentholders' belief that homosexuality is deviant and immoral and that by refusing to develop and/or market the serum they are effectively assisting in the demise of this perversion. On the basis of the patent award, the patentholders have a legal right to deny access and allow the serum to remain undeveloped. What are the moral implications of this scenario?

It is perhaps not clear that the condition of the homosexual has been worsened. Since the serum is an original invention there is no lost opportunity to the non-scientist to appropriate it. Likewise, since the serum has never been available, the notion of

"no longer being able to use" (Nozick, 1974, p. 176) is inapplicable. Perhaps the potential AIDS victim is worse off when the patent for the only possible AIDS vaccine is held by a homophobe than he would be if there were still the chance that a humane scientist would develop and make available this vaccine. We need not settle this question, however, to say that the exercise of negative rights under these circumstances constitutes an abuse of the property right in this product, in that it is tantamount to seriously harming individuals. Rachels (1975) claims that not helping can be the moral equivalent of harming; that is there is no significant moral difference between Smith, for example, killing his nephew for an inheritance and Jones, from the same motive, standing by and refraining from rescuing his nephew from drowning in a bathtub (Rachels, 1975). Given the AIDS scenario, not helping potential victims through the exercise of negative rights, is morally tantamount to harming these individuals. If harming others is taken to be immoral (principle of non-maleficence), then Merton's prescription of communism is supportable insofar as it would prevent this kind of harm. But it would be extreme indeed to ban patenting completely on the basis of potential abuse which could result in harm. What is needed is some sort of limitation on the exercise of negative rights in products that affect the survival of the individual. Such a limitation could be instituted on the basis of Dworkin's notion of equal concern and respect.

To repeat, Dworkin's claim is that the principle of equality is embodied through "equal concern and respect in the decision

about. . .how goods and opportunities are to be distributed. . ." (p. 273), i.e., the losses of those who may be injured by a particular action must be taken into account in the decision-making process. The interests of homosexuals in survival must be weighed against the interests of the patentholders in withholding the serum. An equal application of concern and respect would certainly consider losses in survival to be more extreme than the losses in patent privileges. Thus it would seem that the principle of equality would favor survival. As it stands, the losses of potential AIDS victims are taken into account (and encouraged) by the patentholders, but their action weighs interests that are not relevant to the issue. Dworkin claims that external preferences should not be considered when weighing interests. Rather, personal or self-regarding interests are to be the focus (p. 275). Supposedly, the interests of the patentholders in eliminating homosexuality are weighed against the interests of homosexuals in survival. However, even if the weighing of these two interests <u>were</u> appropriate to the problem, the supposed immorality of homosexuality (which I need not address), does not outweigh the moral urgency of the duty not to do harm (in this case through the refusal to help as Rachels defends) based on the principle of non-maleficence. The principle of non-maleficence dictates that we have a moral duty not to do harm. The claim that homosexuality is immoral is, therefore, an insufficient basis for not treating this community with concern and respect equal to that extended to the heterosexual community. Using the guidelines of

equal concern and respect, therefore, may be effective in protecting society from the abuse of negative rights in products such as the fictitious AIDS serum.

In conclusion, the prescription of the norm of communism is to some degree morally defensible as a preventive measure in regard to the harm that may result from the abuse of negative rights. I have argued, though, that the prescription of this norm, which would eliminate patenting in the sciences altogether, has not been adequately justified.

Disinterestedness and Organized Skepticism

These two final norms will be considered simultaneously due to their relative lack of moral weight. Both of these norms dictate the manner in which science is to be undertaken from a methodological standpoint. Disinterestedness (regarding external influences) is represented by "the pursuit of science not in search of prestige, power, or financial gain, but only in the cause of science itself" (Blume, 1974, p. 46). Organized skepticism is characterized by a "temporary suspension of judgment" (Merton, 1942, p. 277) which encourages an objective, detached observation of phenomena.

The prescription of disinterestedness, as we have come to expect from Merton, is based on the maximization of the institutional goal. It is to be supposed that the scientific enterprise, shorn of external societal influences, will move forward at an unsurpassed rate of accomplishment. This norm is limited, however, by the fact that science does not operate in such a vacuum. The field of

science is made up of individual scientists, who, being human, are subject to the pressures and demands of the society of which they are a part. While Merton admits that prestige, for example, is an acceptable reward for scientific accomplishment, the point of science is the expansion of certified knowledge, not the reward. But how realistic is such a prescription? Success in contemporary science, through careerism, is represented by just those rewards that Merton rejects. Furthermore, the scientific enterprise would be significantly impeded without these rewards. The elimination of grant support, for example, could effectively halt the majority of research projects in progress today; scientific research is too expensive an undertaking for the individual scientist. The only way to maintain grant support within Merton's normative structure would be to radically change the competitive nature of granting practices; this does not seem to be a likely possibility. Given this nature of contemporary science, the ideal represented by disinterestedness is impossible to meet because the field would collapse. Thus, the prescription is undesirable because it (in concert with the present funding structure) impedes Merton's institutional goal rather than supports it. The prescription is hardly warranted on other grounds since disinterestedness would have to be ruled more important than the practice of science itself.

Merton's prescription of organized skepticism is justified on methodological grounds because it generally encourages and and promotes accuracy of results. Scientific knowledge is empirically based and testable. For this reason accuracy is of

supreme importance; accuracy also advances the institutional goal. While it is true that a certain amount of human bias is probably unavoidable, and that self-deception is a real hazard, the field of science has made strides in limiting these influences. The introduction of the vast array of diagnostic equipment and computer analysis techniques has made a difference in how contemporary research is conducted--a difference that improves the objectivity of the enterprise as a whole. Although biased computer output is possible based on programmer bias, the introduction of such tools is a significant step to limiting the problem. The norm of organized skepticism, with the assistance of scientific hardware, is supportable as Merton claims, because it helps to assure the accuracy of the results of research; accuracy that is fundamental to the institutional goal. The prescription of this norm is, therefore, valid as a methodological requirement directed at the expansion of certified knowledge.

It must be remembered that Merton prescribes his norms on both methodological and moral grounds. Neither of these two norms, however, has a clear moral basis. Is it <u>immoral</u> to approach science as a careerist rather than from an ivory tower? Is it <u>immoral</u> for personal bias to interfere (unknowingly and unintentionally) with the analysis of data? Conversely, do disinterestedness and organized skepticism represent moral requirements? I would answer negatively to all three questions. There is a distinction between practicing poor science (as in the case of personal bias) and behaving immorally. Neither the advocacy nor the rejection of

these norms can be defended by a general moral principle (e.g., the principle of equality, the principle of non-maleficence, the principle of beneficence) or by other qualities generally held to be moral--honesty, fidelity, charity, etc. Without grounds such as these, the moral prescription of these norms is indefensible.

Disinterestedness, though, has the potential of being supported morally. An important aspect of this norm is the internal policing system that supposedly promotes rigorous scrutiny of science and its practitioners. The benefit of this system is that it may expose and/or prevent fraudulent activities in the field. Acts of fraud are clearly immoral because such acts are dishonest. Thus the requirement of a norm that effectively limits dishonesty could be supported on moral grounds. Insofar as disinterestedness limits fraudulent activities, the prescription is morally defensible. As was argued, though, there are limitations inherent in this monitoring system. The limitations discussed earlier may be severe enough to discount the effectiveness of the policing system, thus weakening the moral weight of this norm. In any case, it is not necessary to accept the norm of disinterestedness as a package. We can certainly appropriate the requirement of scrutiny and vigilance against fraud without granting thereby any moral weight to the proscription of material rewards.

CHAPTER IV

CONCLUSION

Merton advocates his normative structure on two grounds: the methodological and the moral. The author further asserts that his norms are institutionalized, which leads him to his descriptive claims. Merton's prescription of the norms rests on his assertion that the norms are right and good. I have argued to the contrary. Although cases of adherence to the norms in all likelihood occur, the existence of, for example, invisible colleges, private property, fraud, and self-deception, belie Merton's descriptive claims. Institutionalization of the norms, according to Merton, is supported "by precept and example and [is] reenforced by sanctions. . ." (p. 269). But actual practices in the field are not characterized by this support. It is my claim that science is practiced in a manner that serves the expansion of certified knowledge and the field need not adopt Merton's norms in order to serve this goal most effectively. I have argued that the norms practiced by scientists, those that enhance the institutional goal, are not the norms advocated by Merton.

Methodologically, the prescription of Merton's norms is weakened by the success of a science that deviates from these norms. Organized skepticism is the single exception: because of the accuracy encouraged by this norm, the technical prescription is warranted. Morally, the prescription of universalism and communism carries weight; as do the counter-norms of elitism and private

property. Given competing moral worth, it appears that the technical merit of these counter-norms may be the determining factor in the moral choice. The prescription of most aspects of disinterestedness and organized skepticism is without moral basis and is therefore unsupportable.

The most significant issue that this project has explored is the actual character of the contemporary scientific enterprise in relation to Merton's normative structure. The complex and intricate nature of contemporary science is incompatible (again with the exception of organized skepticism) with the kind of structure that Merton advocates. Features such as careerism are an indelible part of how science operates; to do away with this feature would be to diminish the field as a whole. Although at one time Merton's normative structure may have been a useful and functional aspect of science, the changes that have occurred in how the enterprise is actually practiced severely limits the usefulness of Merton's norms.

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