SCIENCE, ETHICS, AND LAW

by Lawrence Cranberg

The major question to which attention is directed here is one which is an increasingly serious source of misunderstanding and confusion in part as a result of the "two culture" discussion popularized by C. P. Snow.[1] It is the question of the distinction between science and ethics.

The question is at least as old as attempts to formulate clear conceptions of what we mean by "science" in its contemporary usages. Bertrand Russell focused on the question explicitly twenty years ago in the concluding pages of his popular *History of Western Philosophy*,[2] asserting that there is indeed a fundamental dichotomy between science and ethics. And the late Edgar Zilsel, in a noteworthy study[3] which traced use of the word "law" in science to its use in social law, nevertheless acknowledges only a metaphorical connection between physical law and social or "positive" law. Many contemporary scientists, legal theorists, and some philosophers echo such views, as do many theologians who may otherwise feel they have little in common with Bertrand Russell or Edgar Zilsel.

Though not new, the question has special relevance and poignancy today. Citizens of the scientifically advanced countries, because of their singular wealth, and their power to exercise control over their neighbors and their physical environment, confront a bewilderment of decisions about how to use that wealth and exercise that power under rapidly varying social and political conditions. But their know-how and surefootedness in promoting "science" and in using it to create material wealth and military power seem to be in such contrast to the stumbling and perplexity with which they deal with decision-making problems in domestic and international affairs that many are persuaded that science and ethics or politics differ in their essential character. The question has been given a special edge also by the Nazi experience, which

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demonstrated that a state in the front rank of technological and scientific advance could yet relapse into moral barbarism with little effective resistance from its intellectual community. On the personal level also one observes that scientific or other intellectual activity may coexist with moral apathy or insensitivity.

Science and the Should

One of the commonest formulations[4] in which the dichotomy between science and ethics is emphasized states that science is concerned with what *is,* whereas ethics is concerned with what *should* be: that science, including both natural and social science, is the realm of fact but ethics is the realm of values.

To assume that fact and value are categories of non-overlapping, non-interacting elements is to assume a great deal. Even with such an assumption, however, a characterization of science as a concern with facts, with what *is,* radically restricts its common meanings. True, science concerns itself with observations of the current scene. The image of the scientist in a white coat at work in his laboratory is a highly visible stereotype. But most students of science would surely agree that the concern with what *is* represents merely a stage in the formulation of hypotheses which enable us to describe and to predict, so that we may govern our behavior on the basis of sound expectations. The very language of our most basic science, quantum mechanics, is the language of expectation values and of probability amplitudes—a far cry indeed from the simple dogmatisms of the present indicative.

True, our textbooks say that energy *is* conserved. But this dogmatic-sounding statement, albeit in the present, is in fact an abbreviation for statements about the past and the future—namely, that history has not yet recorded an authenticated set of experiences whose interpretation contradicts the hypothesis; and that anyone planning a future course of action would be well advised to assume its continued relevance. The situation seems not different in kind from that in law, private morality, or politics, where to guide us in the ordinary affairs of life we turn to history, to custom, to the precedents of the past for the guidance they offer to a perpetually uncertain future. We can recognize differences of degree of assurance with respect to future expectations without being obliged to assert that we are dealing with fundamental differences in the quality of those expectations.

Some scientists, at least, would go farther. With James Bryant Conant[5] they would assert that even the best established of the hypotheses of science are not themselves the quintessential features of science—

that all the world's libraries of hypotheses and data could be preserved intact and yet science would die if men ceased to question, to test, to probe with integrity and with imagination, to publish and to communicate freely and openly. This is to say, in short, that science, at least in one of its senses, is an ethic of knowledge-seeking, an attitude, a way of life.

Finally, it is pertinent to emphasize some points of fundamental uncertainty in science which only now are receiving deliberate attention. These relate to the scale, tempo, and direction of scientific activity. Alvin M. Weinberg's short paper "Criteria for Scientific Choice"[6] is a pioneer attempt to deal with the problems of what is important in science and of how we should assess importance. Ultimately, the answers must be specific enough for budget-making purposes. No one who attempts to deal with these issues will preserve intact a conception of science as an inexorably surefooted activity. Science policy merges imperceptibly into general social policy. And every introspective scientist who tries to exercise a high level of self-direction and selectivity in his own occupational endeavor is acutely aware of the great complexity and difficulty of the problems of choice at the personal level. Just as science policy merges imperceptibly into general social policy, so does the individual's scientific personality emerge from and merge with his over-all personality.

In any case, science, as some, at least, understand its essential character, is itself an ethic whose keystone is the quest for knowledge, for order, and whose supporting substructure consists of rules and customs which have proven essential to concert the efforts of the society of scientists. Many of the rules of that ethic, such as the telling of truth, are rules which all men live by whom we would call reasonable, regardless of their occupational identity. The rules, in their general formulation, are often not new rules but have emerged with the evolution of human culture and are the common property of many cultures. When men misrepresent or conceal the harmful side effects of a drug, they violate simultaneously essential rules of science and ancient rules of society, written and unwritten. True, the Nazi era reminds us that so-called scientists systematically subjected human subjects to inhuman experiments. But this was in flagrant violation of the principle of informed consent which is as essential to science and evolves as naturally from inner necessity as does the writ of habeas corpus in the law. It is difficult to conceive of a principle of proper conduct governing the relations of scientists to society and of scientists to one another which is not intimately related to a principle of proper general social conduct.

ETHICS AND THE IS

If science is inaccurately portrayed as an enterprise focused merely on what *is,* ethics and law, it seems, are equally inaccurately portrayed by the imperative and punitive connotations of words like *should* and *ought.* Just as the man-in-white with a test tube is a misleading stereotype in science, so is the man-in-blue with a nightstick a misleading stereotype for law and ethics. Less visible, but more important, surely, than the law-enforcement officer and his club are the authors and interpreters of law and of rules of social conduct. For these are the men who forge the analyses of social issues which then materialize as rules of law or ethics. Surely it is the soundness of those analyses that determines in large part the spontaneous compliance the law enjoys. Imposition of compliance on the wayward may be a continuing practical necessity, but it is *not,* obviously, the dominant feature of law.

It is significant that Zilsel, although tracing the genesis of the concept of physical law to the concept of positive or social law, insisted that there is only a metaphorical connection between the two; but his attitude toward social law is conveyed in the following words: "In a well-governed state there will be laws which are for the most part observed by the citizens. Law-breaking will occur comparatively seldom, and will be punished when detected. The more powerful the government and the cleverer the police is, the rarer it will be." In short, in this analysis it is the compulsion of force rather than reason which dominates the foreground of thought about social law. On such a view, a categorical distinction between social and scientific law is difficult to avoid, if not inevitable. The distinction is based, however, on an implicit distrust of the state, rather than on grounds of logic or evidence.

An attitude toward social law which focuses on the punitive finds expression also, no doubt, in the woefully widespread idea that law is antagonistic to freedom, that the less law we have the better. Morris Raphael Cohen has called this often unarticulated identification of law with bad law "anarchistic."[7] Such an identification, and the association of law with command and with punishment, suggest an alienation of the citizen from the law-making process and spuriously reinforce prevalent conceptions of the dichotomy between science and social law. An acceptable definition of "good" social laws surely requires that they be "liberating," freeing men from fear, confusion, and arbitrary power, in significant analogy with the effects of the laws or hypotheses of science. It seems evident that for reasonable men the majesty and authority of social law derive not from intimidating threats but from

operation of the self-same spirit of reason which brings forth law in our study of nature.

Often law in the natural sciences is represented as an expression of inviolable natural "necessity"[8] in juxtaposition to human law, which is represented as a product of human choice and therefore as being changeable and violable at will. But the alleged contrast on grounds of necessity arises from special metaphysical assumptions about natural law or from interpretations of scientific formulations which slight the role of creativity in science. Consistent use by scientists of the word "hypothesis" in place of the word "law" would probably help to avoid unwarranted interpretations of the significance of scientific results and would reduce confusions which arise from diverse interpretations of the word "law." The term "hypothesis" is often an appropriate replacement for "principle," "theorem," "postulate," etc., terms which are often used with little discrimination. It is sometimes maintained that the variety of terms conveys a graded sense of acceptance, yet Avogadro's "hypothesis" still stands, while Newton's "laws" have been superseded. The customary terminology is unstandardized and is doubtless a serious source of confusion to the novice.

It is pertinent also to note that the alleged contrast between scientific and social law on the grounds of violability does not withstand formulations which emphasize an operational viewpoint. Thus a man may act as though the speed limit on the highway is not sixty miles an hour. He does not thereby invalidate the considerations which fixed that limit as a "good" one. Similarly, a man may act as though energy were not conserved—for example, by undertaking an experiment to test its validity—without thereby "violating" the law. Indeed, from this example one sees that the notion of natural law as inviolable can be stultifying and antiscientific, since it tends to discourage fresh testing and verification. The notion of inviolability may be as responsible as anything else for the psychological difficulties encountered by the scientific educator in motivating certain kinds of laboratory work by the young, who respond to dogma quite properly—that is, with boredom.

The position which emerges from these considerations is that science, in one substantial and accepted sense, is a prescriptive ethic as well as the result of adopting the prescription. It is distinguished from the general ethic or the laws of society by serving the particular end of seeking certain kinds of knowledge. And this brings us to the classical question of the ultimate goal and purpose of "good" social law.

It is tempting to surmise that the prescriptive aspect of science differs, if at all, from ethics generally only in consequence of the ways that

scientific knowledge may differ from "knowledge" in its more general senses. To discuss the various meanings of "knowledge" would take us far beyond the scope of this paper. But it is pertinent to take note of earlier speculations that the search for knowledge in some general sense might be the driving engine for the ethic of society in general, just as the search for scientific knowledge energizes and steers the society of scientists. This is at least a plausible surmise for *Homo* who calls himself *sapiens.*

Knowledge and Virtue

The notion that knowledge and virtue are intimately related is an old idea, coupled as it is to the names of Confucius[9] and Socrates.[10] The ground has been re-examined yet again by the contemporary philosopher Abraham Edel. The concluding sentence of his essay published in 1961, entitled "Science and the Structure of Ethics," is as follows: "It would indeed be a strange retribution if mankind, so prone to seek its salvation in the act, to conjure up romanticisms of the heart and will, were to find the stoutest ally for both heart and will in the quest for knowledge."[11] And the American physicist, R. Bruce Lindsay, seemingly restates that position in the special style of the physicist when he suggests that the proper object of all men's actions is the consumption of entropy or the maximization of "order" (in some not yet fully defined sense) and that the endeavors of science epitomize this process in a particular sphere of human conduct.[12]

If knowledge-seeking, the explicit preoccupation of the scientist, is in some general sense the wellspring of all right action, then it is natural to suggest[13] that the scientific ethic has a special validity and force—that the rest of society might turn to it for inspiration and emulation. The argument has some attractions. The simplicities of science may sometimes make especially visible the mechanisms whereby rules of proper conduct are brought into being. And the acceptance of science as a source of culturally invariant belief imparts to its ethic a similar quality of cultural invariance, of universal acceptability. Thus, science has proven to be a natural bridge for international communication and understanding even across wide cultural gaps. In the thirties there stood in Nanking a monument to the cultural greats of all time which included statues of Galileo, Pasteur, Lord Kelvin, Newton, and Benjamin Franklin, surrounding a central figure of Confucius. It would be encouraging to know that those statues are still there and that they symbolize science as a basic source of common values of the most far-reaching importance, and not merely as a source of technique.

It follows that science, properly taught, has great potential for character education and for the promotion of intercultural understanding. But by the same token, science improperly taught, science represented merely as a source of technique or presented in a foreshortened historical context so that it appears as peculiarly the product of Western effort and values, could have a powerfully adverse effect on personal and social development and on international understanding. The distinction between "developed" and "underdeveloped" countries has heavily invidious connotations which often extend far beyond what may be justified in a proper historical and cultural context, and it implies an exclusive concentration on natural science and science-originated techniques. The term "two cultures" had perhaps better be reserved for the distinction between Western and non-Western cultures in lieu of such imprecise and patronizing terminology as "developed" and "underdeveloped."

It is necessary to emphasize, however, that one can thus far speak confidently only of the potentialities of science for character education. One must guard against the unwarranted inference that scientists as a group today have special awareness of ethical problems or that a scientist of special technical competence is especially likely to display ethical perceptiveness in dealing with unfamiliar problems of power and responsibility. Indeed, there may be grounds for suspecting that not all scientists are well prepared by temperament and training to resist temptations toward a shallow opportunism and a neglect of their own basic values which arise from the extraordinary rates of expansion of the scientific and educational establishments. There may be too much complacency and perhaps a touch of arrogance in assuming that working arrangements which sufficed when science was the leisure-time pursuit of a tiny handful suffice now when it is an enterprise of vast dimensions. Scientists may be tardy in recognizing that not only formally is their code the same as that of society's at large but that its adaptations to the complex conditions of today confront the scientists with the same richness and complexity of human problems that men in many other occupations—for example, law, medicine, and engineering—have long accepted as part of their occupational responsibility. One suspects that the scientist is more likely to learn from the other occupations than to teach them. If humanists feel that the pressures are strongly upon them to become "scientific," the pressures on the scientist to become more concerned with social problems in the large and within his own ranks are at least as strong.

In this connection it is important to note that the concrete ethical

issues arising from the scientist's everyday occupational life are discussed with increasing frequency in periodicals such as *Science*[14] and that the American Association for the Advancement of Science has adopted an official policy of concern and responsibility for such problems.[15] This action by the Association has at least a great symbolic significance. It represents the official emergence of an explicit empirical counterpart to what has been a merely implicit theoretical relationship between science and ethics. The conscious interaction of theory and experiment has always been the most characteristic feature of scientific methodology and the source of its enormous power. It may not be too much to hope that empirical study of practical problems of ethics in the scientific milieu will provide us not only with deeper theoretical insights but with more effective practical means for favorably influencing human conduct and character in general.

In many occupations considerable efforts have been focused on the preparation and enforcement of codes of conduct appropriate to a particular occupational setting. These efforts often arouse public skepticism and even scorn, but they remain virtually unstudied. Proper study of their functioning and potentialities may now find an important place on the scientific agenda, drawing fresh, creative resources into an area long occupied by cant, wishful thinking, and traditionalism.

Snow's observations about the difficulties of communication between scientists and humanists are not dispelled, to be sure, by theoretical arguments which establish connections between science and traditionally humanistic subjects such as law and ethics. Yet I fail to discern for myself distinctions which I would care to call fundamental, and I feel drawn to the conclusion that the problems of communication are not different in kind from those among the various subspecialties in science, where we know they can be formidable. Knowledge and order are the common goals, reason and experience the common tools, but the range of experience is so vast and the details of knowledge are so numerous, while life is so short, that on technical matters pertaining to our occupational specialties we can hope to be on intimate intellectual terms only with a few colleagues.

It is a great pity when the resulting lack of communication produces, for example, constitutions for the government of scientific societies without sufficient benefit of legal or political experience or when a vast program of construction of research laboratories is undertaken with almost no provision for the creation of works of art suitable for their embellishment. It is a minor paradox of our times that men spend the

better parts of their working lives trying to create experiments of elegance and beauty in surroundings which are visually devoid of either and which may indeed present spectacles of confusion and even of squalor. The times demand more effective interdisciplinary communication and a more even-handed distribution of the wealth and effort of our society.

From the point of view presented here, the real obstacle to communication is not the existence of "two cultures" but the poisonous narrowing of occupational and particularly of scholarly specialization, for which an effective antidote must be sought. Here each may seek his own, but what emerges from the preceding discussion as particularly appropriate is a concern for the ethical quality of our daily choices. For however diverse are the languages we speak in our professional domains, the languages include and perplex us with the words "good" and "bad," "right" and "wrong." When we bring these perplexities into focus for common study and constructive action, we are involved in common by our deepest purposes and problems.

NOTES

1. C. P. Snow, *The Two Cultures and a Second Look* (New York: Cambridge University Press, 1964).

2. B. Russell, *A History of Western Philosophy* (New York: Simon & Schuster, 1945), pp. 834–35.

3. E. Zilsel, "The Genesis of the Concept of Physical Law," *Philosophical Review*, LI (1942), 245.

4. See, e.g., H. Margenau, *Ethics and Science* (Princeton, N.J.: D. Van Nostrand Co., 1964), p. 142, and R. P. Feynman, *Frontiers in Science* (New York: Basic Books, 1958), p. 307. For an extensive critical and historical discussion see A. Brecht, "The Myth of Is and Ought," *Harvard Law Review*, LIV (1941), 811.

5. "Let us imagine a period in the future when all interest in scientific investigation had ceased but the relatively simple conceptual schemes about matter and energy, the solar system and the basic facts of chemistry of the late nineteenth century were accepted and widely taught. Would the people of that day 'understand' science as the late Victorians did? Not to my mind. There would be little difference in their intellectual outlook from that of a people who accept their cosmology as part of a revealed religion. If this be so, the characteristic of the scientific age in which we live lies not in the relative adequacies of our conceptual schemes as to the universe but in the dynamic character of these concepts as interpreted by both professional scientists and laymen. Almost by definition, I would say, science moves ahead" (J. B. Conant, *On Understanding Science* [New Haven, Conn.: Yale University Press, 1947], pp. 24, 25).

6. A. M. Weinberg, "Criteria for Scientific Choice," *Physics Today*, XVII (March, 1964), 42.

7. M. R. Cohen, *Reason and Law* (Glencoe, Ill.: Free Press, 1950), p. 5.

8. For a discussion of "necessity" and of natural law generally, see E. Nagel, *The Structure of Science* (New York: Harcourt Brace & Co., 1961), esp. chaps. iv and x.

9. As quoted in J. B. Noss, *Man's Religions* (New York: Macmillan Co., 1964), pp. 386–87.

10. Quoted in "Protagoras" of the *Dialogues of Plato,* trans. B. Jowett (New York: Random House, 1937).

11. A. Edel, "Science and the Structure of Ethics," *International Encyclopedia of Unified Science* (1961), Vol. II.

12. R. Lindsay, "Entropy Consumption and Values in Physical Science," *American Scientist,* XLVII (1959), 376.

13. E.g., A. Rapaport, "Scientific Approach to Ethics," *Science,* CXXV (1957), 796.

14. For a summary, see L. Cranberg, "Ethical Problems of Scientists," *Educational Record* (Summer, 1965), p. 282.

15. Dael Wolfle, "AAAS Council Meeting, 1965," *Science,* CLI (1966), 842.