Communications

Contemporary Science and the Poets Reconsidered

While I have observed with pleasure the increasing frequency with which scientific journals have been concerned with problems in language and literature, my pleasure is often tempered with annoyance at the scientist's patronizing tone and his misunderstanding of the poet's function. Mrs. Fullmer's recent article (*1*) is a case in point. Now I do not wish to enter into a discussion of the vexed problem of the values of modern science. But I believe that Mrs. Fullmer's article is a clear case of the inadequacy of the scientific method and perspective as applied to the arts. For example, she sees the poet as a "human kind of barometer . . . to register the impact of each fresh discovery, each major theoretical advance." This notion of the poet as a sensitive instrument recording in fancy language his responses to the stimuli about him is curiously naive and romantic, and it violates the time-honored and much more correct concept of the poet as "maker," as a creator of language Gestalts that embody the feeling-qualities of human experience in a way that ordinary referential language cannot do. As Susanne Langer expresses it (*2*, p. 40; 385–386):

> Art [including poetry] is the creation of forms symbolic of human feeling . . . an art symbol and a scientific symbol . . . are as different as art is from science: it is, indeed, the radical difference between their respective symbolic forms that makes art and discourse (logic, science, matter of fact) fundamentally different realms, and removes the hope (or fear, as the case may be) of some philosophers that in an "age of science" art will aspire and finally graduate to the dignity of scientific thought.

R. P. Blackmur, one of our most distinguished contemporary critics, says (*3*) that

> . . . psychology turns aesthetics into the mechanics of perception, that scientific logic turns it into semasiology, just as technical philosophers had already turned it into a branch of epistemology. All these studies are troublemakers and lead . . . to the proliferation of a sequence of insoluble and irrelevant problems so far as the critic of literature is concerned.

Charles W. Morriss puts it another way (*4*):

> Since the work of art is an icon and not a statement, aesthetic discourse is not restricted to signs whose truth is confirmable. . . . Art does not, except incidentally, make staements about values, but presents values for direct experience; it is not a language about values, but a language of value.

From the perspective of the poet, critic, and esthetician, then, Mrs. Fullmer is a "troublemaker" when she focuses her attention on an irrelevant aspect of modern poetry, its "scientific content."

Furthermore, the restrictions that Mrs. Fullmer puts on the term *scientific content* are puzzling, to say the least. She explicitly excludes (i) "the concept of the very nature of scientific truth," (ii) "value judgment" of the elements of scientific inquiry, and (iii) "products of applied science." What does she include? "The newer theoretical concepts and broad points of view . . . the scientific spirit, the scientific attitude." Her analysis of excerpts from modern poets reveals that she is not self-consistent in applying her own formulas, and she is often unaware of the real meaning of the passages under consideration. For example, in the first selection quoted from Eliot (the lines that the "scientist finds more striking"), the poet is clearly attacking the religious or metaphysical limitations of science when he urges that the experiments of science bring "knowledge of motion, but not of stillness." *Stillness* here is symbolic of the eternal and spiritual unity of the universe (compare *Murder in the Cathedral*); and if this is not a rejection of "the concept of the very nature of scientific truth," what is? It is to be expected, I suppose, that a practicing scientist should see the second selection from Eliot as a fine, worthy expression of the scientific spirit, but Mrs. Fullmer fails to catch the ironic overtones and the significance of the qualifying "only" in "what is actual is actual only for one time/And only for one place." Waggoner, whom Mrs. Fullmer challenges, is indeed right in observing that Eliot indicts science. I personally do not believe that it is of primary importance to the quality of Eliot's poetry whether he indicts science or not, but if we are going to be concerned with the secondary issues of poetry, let us at least be accurate in getting the full lexical sense of the lines. Mrs. Fullmer's scientific faith is, indeed, intellectually provincial; she is "jarred" by Douglas Bush's observation that the airplane in Eliot's poetry is a "symbol of scientific slaughter . . . for this would mean killing in the spirit of free inquiry. It is doubtful that any poet ever meant *this*." But that is precisely what Eliot means, and Eliot is not unique among modern poets and critics. Kenneth Burke, for example, expresses (*5*) an attitude widely felt among humanists that:

> The very scientific ideals of an "impersonal" terminology can contribute ironically to such a disaster [as the genocide practiced by Hitler's scientists]: for it is but a step from treating inanimate nature as mere "things" to treating animals, and then enemy peoples, as mere things. But they are not mere things, they are persons—and in the systematic denial of what he knows in his heart to be the truth, there is a perverse principle that can generate much anguish.

The excerpts that Mrs. Fullmer quotes from Marianne Moore seem to refer to the third element that Mrs. Fullmer had excluded from consideration, namely, the "products of science": the four vibrators of an exact clock and the quartz prism which measures

temperature change. Moreover, the excerpts as they stand are *not* poetry, despite the fact that the right-hand and left-hand margins are irregular. They are referential statements utterly lacking in the imagery that more than anything else distinguishes the language of poetry from ordinary discursive language. Written in prose form in a pamphlet, they would not be identifiable as poetry by any literary critic worth his salt.

However, to the poet and literary critic, Mrs. Fullmer's underlying assumptions and explicit statements concerning the very nature of poetry are much more disturbing than her treatment of particular selections from modern poets. The fact that poets use references to science (which are transformed in successful poems by the language context in which they are employed, so that they are no longer significant as scientific utterances but as part of a symbolic presentation of human conative-affective experiences) is hardly news; as Cleanth Brooks observes (*6*), "all poetry since the middle of the seventeenth century has been characterized by the impingement of science on the poet's world." But this is not to say that there is such a thing as a scientific poetry or even a poetry *about* science, for poems are not documents; and the extracting of documentary excerpts is an ignoring—even a destroying—of what Mrs. Langer describes (*2*, p. 40) as a "virtual experience, wholly formed, and wholly expressive of something more fundamental than any 'modern' problem: human feeling, the nature of human life itself." The creation of such forms of feeling requires mental processes far different from those employed by scientists and teleological aims equally far removed. Mrs. Fuller is simply wrong in asserting that "the thought processes that are successful in transforming scientific techniques are, in some measure, similar to those operating to transform poetic techniques."

It is a puzzle, too, how she can postulate a similarity between poetic and scientific techniques and in the next breath claim that "poetry is a reliable index [of the extent of popularization of major scientific advances] *because it is unself-conscious.*" (Italics mine.) Here she is again a victim of romantic notions of the poet's technique; no successful artist, whatever his medium is, simply expresses spontaneously and unself-consciously the intellectual currents in his environment. Rather, as T. E. Hulme brilliantly described it (*7*),

> The process of artistic creation would better be described as a process of discovery and disentanglement. To use the metaphor which one is by now familiar with—the stream of the inner life, and the definite crystallized shapes on the surface—the big artist, the creative artist, the innovator, leaves the level where things are crystallized out into these definite shapes, and, diving down into the inner flux, comes back with a new shape which he endeavors to fix. . . . It is as if the surface of our mind is a sea in a continual state of motion, that there are so many waves on it, their existence is so transient, and they interfere so much with each other, that one is unable to perceive them. The artist by making a fixed model of one of these transient waves enable you to isolate it out and perceive it in yourself.

For the poet, then, the ideas of science are nothing more than waves on the surface of the sea of his mind; his significant act is the plunge beneath that surface and the return to it with a new symbolic linguistic form in which we may perceive the conative-affective nature of human experience.

JOHN V. HAGOPIAN
English Department, Indiana University, Bloomington

References

1. J. Z. Fullmer, *Science* **119**, 855 (1954).
2. Susanne Langer, *Feeling and Form* (Scribners, New York, 1953).
3. R. P. Blackmur, *Hudson Review* **1**, 182 (1948).
4. C. W. Morriss, *Kenyon Review* **1**, 417 (1939).
5. K. Burke, *A Rhetoric of Motives* (Prentice-Hall, New York, 1950), p. 32.
6. C. Brooks, *Modern Poetry and the Tradition* (Univ. of North Carolina Press, Chapel Hill, 1939), p. 174.
7. T. E. Hulme, *Speculations* (Routledge and Kegan Paul, London, 1936), p. 148.

1 July 1954.

J. Z. Fullmer has examined poetry with the aim of finding out how far science has gone in influencing poetic expression and thought. No definite conclusions are apparent from this article.

It is difficult to make any general statements about modern poetry; its sweep, ranging from the conservative and static to the symbolic and experimental, is far too wide. However, there are at least three things one can say with some assurance: (i) the poet is uneasy about modern science, (ii) poetry, on the whole, is definitely antiscientific, and (iii) no real fusion between modern science and poetry has taken place. The questions I should like to pose are these: What is the reason for the antiscientific attitude of the modern poet? Can a *rapprochement* between science and poetry be profitable?

The poet, in our day, must strive desperately to escape the general tendency toward mechanization and to him, machine and science being inseparable, science appears as a menace obscuring the deeper and real values in life. Although I am a scientist myself, I think that this is a valid point of view. On the other hand, the poet also, instinctively, as do many of us, equates the dire prospect of a thermonuclear future with progress in science and thus casts doubt on its value.

Of course, the modern poet has not been able to escape the impact of science. But it is a misconception, shared with Mrs. Fullmer by many scientists, to think that it is the task of poetry to interpret man's place in nature. This is the province of philosophy. The poet is preoccupied with images, form, and expression, and he takes his lesson from André Gide:

> . . . puis il m'a dit que mon erreur était de partir d'une idée, et que je ne me laissais pas assez guider par les mots.

Good poetry follows this dictum. Even where parts of the scientific verbal armamentarium have been ab-

sorbed by some of the poets, real understanding frequently lags behind, as is well expressed by some of the quotations cited by Mrs. Fullmer. To give another example of this, consider a few lines from the poem "The Ratio of Rime to Language" from Karl Shapiro's *Essay on Rime* (Reynal and Hitchcock, New York, 1945),

> . . . words are as lives,
> Deaths and mutations, and the poet learns
> Through search for life, the biology of rime.

One could quote many more, such as "chemic blood," "the very protoplasm of the tongue," "electrons deify a razorblade," and so forth. These and many more constitute rather unfortunate and unsuccessful attempts to make poetic language more scientific. These attempts are made for the following reasons: (i) the poet deliberately chooses scientific words that may give the language an infusion of freshness, and (ii) the poet, though reluctant, cannot escape the fact of the ever-increasing importance of science in our daily lives. This has not always been so. At one time the poet could quite well ignore science altogether, and it was such a feeling that prompted D. H. Lawrence to exclaim: "Whatever the sun may be, it is certainly not a ball of flaming gas." However, such an outspokenly antiscientific attitude is not possible any more today, and the poet is thus caught between his dislike of science and his realization of its importance. Thus it is not surprising that a few of the poets are trying, even if on the whole unsuccessfully, to achieve a fusion between science and poetry. Why do these attempts seem rather trivial? The answer lies partly in the afore-mentioned dilemmas, and partly in the inherent difficulty of the subject matter of modern science. It is this latter fact that explains why no latter-day Lucretius has attempted to write a more up-to-date *De rerum natura* (1st century, B.C.) in the light of recent developments in physics. It is no exaggeration to say that most poets, even the best of them, have been unable to crowd into their lives both a development as creative artists and serious attempts to become acquainted with science—even if we dispense here with the common, and perhaps not untrue, notion that one may possibly exclude the other. Is this state of affairs to be regretted? I do not think so. Scientific poetry is a bore.

I think that any poet, when taken into some corner, will admit that poetry and science are incompatible, that good poetry, in contrast to science, must remain vague, mystical, symbolic, antilogical, a place where white is black and love is hate.

The answer to the questions I have posed is thus probably this: No real fusion between modern poetry and modern science has taken place and none can be expected. And the likelihood is that science and poetry will diverge even further from now on.

HERBERT M. HIRSCH
Department of Physiology,
Division of Cancer Biology,
University of Minnesota, Minneapolis

27 September 1954.

I wish it were possible for Mrs. Fullmer's article to reach more of the literary fraternity at large because of the implications of "source" in reference to our own age. I am a bit disappointed that she did not include Robinson Jeffers in her list. Jeffers has expressed, in some of the noblest passages of the English tongue, basic concepts of modern science. I refer to the vision of Onorio Vasquez in "The Loving Shepherdess," and the death of the eagle in "Cawdor." Such references to fundamentals of physical science are many in the works of this poet—whom Mary Austin once described to me as "the greatest poet since the Greeks." He always avoids the trite descriptive qualities of verse as well as the "heroic" adulations of science and scientists so common in the popular press.

An analysis of Jeffers' poetry from the scientists' viewpoint would be a worthy undertaking.

ANSEL ADAMS
131 24th Avenue, San Francisco, California

29 June 1954.

It is with pleasure that I join the arguments advanced by J. V. Hagopian in his communication, and I do it with the full awareness that what is here under discussion may concern problems more basic than the surface preoccupation with the science content of modern poetry would indicate. Hagopian has provided the occasion for a discussion that might help throw into sharper relief some of these more fundamental problems.

No great complexity of argument was presented in my paper of 18 June. Some literary critics say there is a considerable modern science content in modern poetry. A smaller number maintain that the modern science content in modern poetry is negligible. Since this difference of opinion involves science content, it would seem entirely proper for a practicing scientist to focus his attention on some poetry, to determine whether, in his opinion, there is or is not a modern science content.

Disagreements can arise in several ways. They can arise because the bases of the problem are not clearly defined, or because they are defined in different ways by those party to the quarrel. For this reason it was necessary to state immediately what is not meant by the modern science content of a poem, as well as what is meant by science content, to a practicing scientist. A disagreement can arise, too, because of the method or methods used to explore the problem. Methods are notorious because of the subtle and various ways they impose limitations on the answers obtained by their use; it is not at all unusual for the way a question is framed to dictate the form the answer takes. For this reason it was necessary to state what method would be employed—the method, confronting modern poems with modern science as one practicing scientist conceives it to be—and to point out, too, the limitations that such a method places on the conclusions drawn.

My conclusions were these: Some modern poetry does contain what to a practicing scientist is modern science. This, as Hagopian observes, is hardly news.

It was noted that the scientist does not always agree with the critic about what the science content of a poem is. Apparently this, to Hagopian, is news. It was also noted that Ezra Pound, a man evidently not without influence in shaping the idiom of modern poetry, urged the poets more than once to "look to the scientist" for certain kinds of information and techniques.

The ancient and alluring question about the function of the poet (or, for that matter, about the function of the scientist) was not raised. Because the statement of the problem of "Contemporary science and the poets" is independent of the question of the poetic function, it is possible to treat the poems simply as having existence. Logical extension of notions about the scientific content of poetry that carry with them, either directly or by implication, phrases like "all science" and "all poetry" leads easily to the statement that "the poets, a human kind of barometer, should be quick and sensitive to register the impact of each fresh discovery. . . ." Recently a critic [J. Isaacs, *The Background of Modern Poetry* (Dutton, New York, 1950)] established the usefulness of poetry to the historian of science by pointing out John Donne's usage of the phrase "magnetique force" some 20-odd years before the date of the earliest entry of this term in the *Oxford English Dictionary*. Such a statement seems to justify the notion that poets may be "quick and sensitive to register" impacts of discoveries. In this instance Donne acted as a "human kind of barometer." If this view in any way detracts from or nullifies the view of the function of the poet as *vates* (and Hagopian seems to think that it does), if this view in any way creates a muddle, one can only regretfully point out that it is a muddle of the critics' own making. Questions about the function of the poet are different, not only in degree from the problem in "Contemporary science and the poets," but also in kind. They are in fact *sui generis*.

It was by pursuing lines as straightforward as those described in the opening paragraphs that I earned the epithet "troublemaker" (and, what is more refreshing, a romantic one, to boot). Why it should be troublesome for a scientist to state what for him is the science content of a poem is difficult to see, especially in the face of the number of poets, critics, and estheticians who have stated what to them is science content. The fact that what some of these poets, some of these critics, and some of these estheticians call "science content" may occasion among scientists at least a raised eyebrow seems to trouble Hagopian not at all.

When Hagopian is puzzled by the restrictions that a scientist places on the term *scientific content* he is reacting in a way that is symptomatic of a strange situation. The criterions established to restrict the term *scientific content* were neither capricious nor irresponsible statements of what science is and of what science is not. Rather they attempted to be a thoughtful assertion of a position taken by many working scientists, stated by them in many ways. *Per se* the assertions are of interest, for at one time or another in the history of science not all of them have been operative. For a nonscientist to reject the 20th century restrictions and the definition of science (itself a partial one) produces a predicament that can only be described as awkward. A scientist goes daily to the laboratory to carry out certain operations, some manipulative, some paper and pencil calculations. From the operations he reaches certain limited conclusions whose validity is subject to check, usually most efficiently by another scientist or group of scientists. On the other hand, the nonscientist does not enter into the operations; for him the conclusions may frequently appear only as Venus of miraculous birth. Because the careers—scientist or nonscientist—are entirely a matter of personal taste and choice, no praise or condemnation is awarded to either man for his choice of occupation; but this fact in no way permits the nonscientist to state dogmatically what the scientist is doing. The embarrassment, as well as the awkwardness, arises when the nonscientist wrongly attributes activities to the scientist. How best can the scientist cope with so perplexing a state of affairs? Short of nailing theses to his laboratory door, the scientist can continue to point quietly and firmly to the published journals as demonstrable proof of what he is doing. For a scientist the three listed points (and Hagopian has the listing only partly right) are statements of what is not included in the term *science*. Science is not philosophy. Science cannot permit the imputation of motives to inanimate objects. Science is not the products of applied science, or again, science is not a machine. But what then is science? There are nearly as many ways of answering this question as there are scientists. One of the ways is to state that science is an "attitude . . . related to the 'particular go of things.'"

It is necessary to be as clear on these points as is possible. Science is not philosophy. This does not say that scientists do not have a working philosophy—indeed, the three restrictions and the definition of science are themselves part of that philosophy. No one would be so foolish as to claim the absolute perfection of that philosophy, or its universality, but there is, to be sure, a certain hard core of belief that prevails among a good number of working scientists. The three statements of what science is not and the statement of what science is represent an attempt to define that hard core of belief.

Science does not permit the imputation of motives to inanimate objects. In no way does this limitation divorce the scientist from his own motives, and they operate in a very decisive way to determine the body of science. The scientist had a motive, first, in becoming a scientist. He may be, for example, of a practical bent of mind, he may be inquisitive, or he may find in science a satisfaction of his own esthetic needs. His particular bent partly dictates, too, the problems on which he will or will not work once he has achieved the status, scientist. Of equal importance are those motives that guide him in the ordering of his laboratory or computational findings, usually an esthetic problem within the framework of the experimental system.

Science is not the products of applied science; that is, science is not a machine. The broad tapestry that is the

history of science shows threads of many origins, not the least of which is applied science, and, on occasion, a machine. But since the chief scientific activity is the ordering of facts and the products of applied science come frequently only as the result of such ordering, it is not too wise, in the 20th century, to equate science with the machine.

Hagopian feels that the application to poetry of these three criterions was not self-consistent, and that it was done without an awareness of the meaning of the passages to which they were applied. The complaint would appear to have little basis in fact. The lines of T. S. Eliot, "knowledge of motion, but not of stillness" are striking to a scientist. Surely the metaphysical implications are obvious; that is, they can be apprehended directly from the text of the poem, without the guidepost provided by the literary critic, and without having to be read in conjunction with *Murder in the Cathedral*. The lines provide an excellent example for the statement that in T. S. Eliot the science does not stand away from his personal metaphysic. The point is a minor one, and I would make no attempt to belabor it were it not that the issues of this correspondence here broaden to include more than the surface preoccupations with "Contemporary science and the poets." Hagopian is quite clear on the nature of this issue, for he says: "*Stillness* here is symbolic of the eternal and spiritual unity of the universe . . . and if this is not a rejection of the 'concept of the very nature of scientific truth,' what is?" A statement of an "eternal and spiritual unity of the universe" does not constitute a rejection of scientific truth, for science, by definintion leaves untouched these philosophic matters. To be sure, in the heyday of the scientific materialists there were those who felt that an acceptance of science meant a rejection of statements about "eternal and spiritual unity of the universe." Even in that heyday, however, some scientists recognized that the concomitance of the two views was not impossible, and today there is no uneasiness implied by the coexistence of the two notions. They are, indeed, peaceable bedfellows. Hagopian's refusal to recognize such a coexistence provides a striking example of the need for limiting a definition of science with the statement: science is not philosophy.

When a practicing scientist insists on rigorous use of the term *scientific* he is charged with being an intellectual provincial. The statement of Bush's about "scientific slaughter" would have been more acceptable had it read "airplanes fly all through poetry as a symbol of killing by men by means of a machine," or something to that effect. The statement made by Bush is a sample of the tendency to equate the products of applied science—that is, the machine—with science itself.

To a practicing scientist the quotations from the poem by Marianne Moore are of considerable interest and seem to have to do with science itself more than with applied science. In addition to an awareness of some of the properties of quartz the lines demonstrate something about the nature of scientific procedure: "Repetition, with the scientist, should be synonymous with accuracy."

When Hagopian chooses to discuss the thought processes of the artist in contradistinction to the thought processes of the scientist he raises a point of considerable interest. He feels that "the creation of such forms of feeling [poems] requires mental processes far different from those employed by scientists." He maintains that it is "simply wrong" to assert that the "thought processes that are successful in" science may, "in some measure," be successful in poetry. The context of this assertion was supplied, in my "Contemporary science and the poets," in conjunction with the making of abstractions. Can the mental process that abstracts and frequently symbolizes properties of one situation be too remarkably different from a process that likewise abstracts and frequently symbolizes properties of another situation? The entire question (and it is a difficult one) of scientific and artistic creation, of scientific and artistic invention, of scientific and artistic discovery, is one that needs full exploration. It may be that Hagopian wishes to deny the scientist any part of creative endeavor, but surely he cannot do this in the face of modern science. C. N. Hinshelwood writes [*The Structure of Physical Chemistry* (Oxford, Clarendon Press, 1951)]

> Science is not the mere collection of facts, which are infinitely numerous and mostly uninteresting, but the attempt by the human mind to order these facts into satisfying patterns. Now a pattern or design is not a purely objective function but something imposed by the mind on what is presented to it, as is seen in those pictures of piled cubes which can be made at will to appear in advancing or receding order. The imposition of design on nature is in fact an act of artistic creation on the part of the man of science, though it is subject to a discipline more exacting than that of poetry or painting.

And there the matter may rest, or nearly so. It has already been established that one literary critic has pointed out the value of poetry to the historians of science. The suggestion that this notion be broadened to include contemporary poetry and present-day science, thus providing an index of popularization, merely extends the idea. How does the poet use his science? He is not, of course, writing a scientific treatise. The science comes frequently as "an artifact of the poetic energy . . . used as one of the means for creating and heightening the poetic expression." Hagopian's metaphor (the one based on that of Hulme) hardly contradicts this view.

J. Z. FULLMER

4714 Fifth Avenue
Pittsburgh, Pennsylvania

8 November 1954.

Publication of the communications on "Contemporary science and the poets" has been delayed because of the prolonged illness and convalescence of Mrs. Fullmer.