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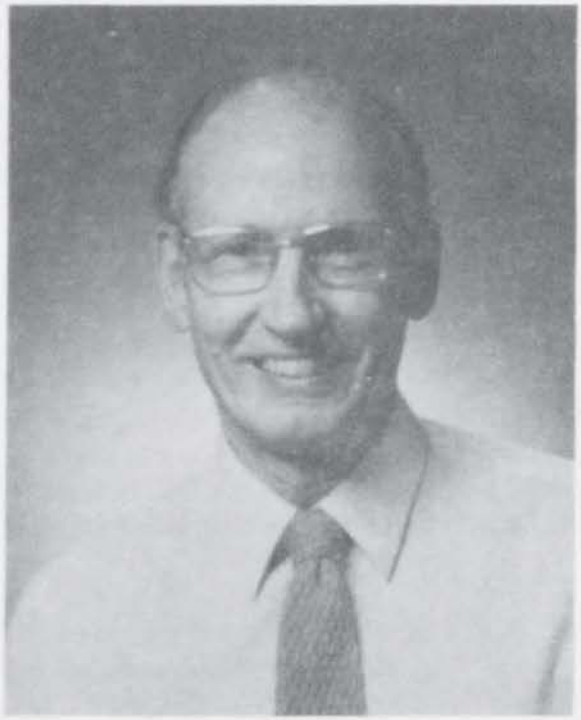

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Making Connections: An Essay on Creativity in Science and Poetry

B. R. Tilghman

I mean to speak
Of that interminable building reared
By observation of affinities
In objects where no brotherhood exists
To common minds.
(Wordsworth, *The Prelude*, II, 401-405)

I

In the tenth book of his *Republic*, toward the end of the discussion of the imitative arts, Plato alludes to a long-standing quarrel between poetry and philosophy.[1] If we are correct in locating the origins of philosophy in the first quarter of the sixth century before Christ, then the quarrel had been going on for about two hundred years when Plato called attention to it. In one form or another the quarrel has been going on ever since.

The reason for the quarrel in the first place is worth thinking about. To be sure, it grew out of a conception of poetry that is rather different from the one that the last four hundred years of English poetry, or French poetry for that matter, has made us familiar with, but by reflecting on that difference our own modern conception of poetry can be brought into sharper focus and the contemporary versions of the long-standing quarrel can be better understood.

Poetry played a different role in the lives of the Greeks than it does in our lives. Homer and Hesiod were the teachers of Hellas and it was from their verses that children learned their earliest lessons and grown men drew the words that swayed the assembly in debate and heartened troops in battle. In the absence of religious scriptures it was from Homer and Hesiod that the Greeks learned about the gods and what the world is like and how it got that way, how the camel got it's hump and how come armadillos; it was from the Homeric heroes that Greek lads took their models of moral behavior and it was Aeschylus and Sophocles who showed the disastrous consequences of *hubris* and the religious indigestion that follows upon having one's children for dinner.

This poetic stew of mythology, cosmology, and moral didacticism was challenged by the new developments of the sixth century out of which grew philosophy and science. In their origins philosophy and science were indistinguishable as part of a single intellectual enterprise

of providing rational, naturalistic descriptions and explanations of the world and its phenomena and it wasn't long before representatives of the new breed were making unflattering remarks about poets; Heraclitus, for example, claimed that Hesiod didn't know Day and Night and Xenophanes charged both Homer and Hesiod with attributing improper behavior to the gods. Thus poetry as the repository of mythology, religion, and traditional mores found itself in competition with the new science over who could best describe the world and tell how it got to be like it is. Early in its career this new science could offer little improvement over the theogonies and cosmogonies of traditional mythology and F. M. Cornford may well have been right when he contended that the early Ionian cosmological speculation was simply taken over from that traditional mythology with only the names of the characters changed.[2] Science, however, was to develop far beyond its beginnings out of Greek mythology and when it comes to a matter of describing the world and finding out what it is really like there would appear to be no contest at all between science and poetry, in that race imagery, metaphor, and their like simply cannot compete with microscopes, telescopes and theirs.

If poetry was going to counter this advantage that science held, it was going to have to do it by shifting the ground of the quarrel for it could never meet science on its home grounds. We find the germ of such counter moves in much of the poetry and poetic theory of the romantic period. Typical of this romantic response was Wordsworth's and typical of Wordsworth[3] were the lines: "One impulse from a vernal wood/ Can teach you more of man,/ Of moral evil and of good,/ Than all the sages can." Romanticism was born, at least in part, out of a disillusionment with the "Age of Reason" and the French revolution that many supposed to be the consequence of reason made politically incarnate. While the storming of the Bastille may have heralded a dawn in which it was bliss to be alive, by forenoon the weather had turned pretty drear and drizzly and reason and its offspring, science, were in disrepute, at least in some quarters. The romantic move, then, was to claim that there is a kind of knowledge other than that provided by reason and science, a kind no doubt superior, that is to be got through poetry. Observations and experiments that murder to dissect and meter sticks with their mournful numbers must give way to impulses from vernal woods and the hailing of blythe spirits. The romantics had invented the idea of intuitive knowledge.

The supposition that there is a special kind of intuitive knowledge was widely exploited by philosophers in the latter nineteenth century and early twentieth century. Bergson made intuition the mode of awareness that puts us in touch with the creative impulse that makes the world go round and Croce turned a version of intuition into the

corner stone of his theory of art. Philosophers such as Bergson and Croce tended to hold a purely conventionalist view of science. They thought of scientific theories as somewhat arbitrary symbolic representations of phenomena that may have some justification in practical affairs, but have little, if any, connection with the ultimate nature of things. Less sophisticated modern minds often have a tendency to hold a more Baconian view of science, seeing it essentially as an exercise in fact gathering or, more likely, fact grubbing. In such a view the laws and theories of science are no more than inductive generalizations arrived at more or less mechanically or, these days, computerly from the data grubbed up by the under-laborers. At any rate, despite which of these views predominates, science suffers by comparison with art and poetry for there presumably is no room in science for the kind of creative activity which is the mark of the true artist.

To be sure, the greatest part of the day to day work of science is carried out by its under-laborers[4] who busy themselves with arranging laboratory apparatus, checking the experimental results of others, refining measurements, and generally finding out what happens when. . . . A closer look, however, at what scientists really do when they construct theories based on careful studies in the history of science makes abundantly clear that the Baconian picture of scientific activity is not only hopelessly inadequate, but is down-right misleading as an account of a science such as physics.[5] Although much day to day work may suggest the Baconian picture, it is just not true of what have come to be called scientific revolutions by means of which science has advanced. Here there is indeed room for creativity.

Nor is there any reason to deny a place for creativity in a purely conventionalist account of science. If a scientific theory is a human invention and not merely a recording of what is already there, then science is just as creative as a work of fiction. Plato denied a creative component to art and poetry by denigrating the artist as a mere imitator who does no more than hold a mirror up to nature. A certain conception of science could be described in the same way; the scientist merely holds the mirror up to nature in describing the patterns of phenomena to be found there while adding nothing of his own. If subsequent theory redeemed poetry from the unworthy state that Plato assigned it to, parity of reasoning demands we do no less for science. The denigration of science at the hands of the vitalists and the idealists was not a function of their conventionalist picture of it; it was, rather, a function of their views about ultimate reality. It was one of their theoretical tenets that ultimate reality was such that it resisted scientific description and, hence, science could count for naught in any ultimate reckoning of things.

I intend to dismiss all this talk of ultimate reality as the result of a species of intellectual confusion. Whether science does or does not

describe ultimate reality I do not believe to be a question at all, but a piece of philosopher's nonsense. And the same holds for the analogous question whether art and poetry put us into contact with the innermost recesses of reality. These charges, made dogmatically here, want arguing for in detail, but that must be reserved for another place. The burden of this paper is considerably more modest. I want to investigate one aspect of creativity in science and one aspect of creativity in poetry and to point out in what ways they are alike and in what ways they are different and then to see whether in this we have learned anything useful about our topic.

First, however, a few general remarks about the notion of creativity are in order. From time to time philosophers have attempted to define creativity and to fix the conditions that must be satisfied for someone or his accomplishments to be called creative. There is a consideration that suggests this attempt may be fruitless. We may be tempted to suppose that one mark of creativity is originality, newness, or novelty. We are inclined to believe that a creative accomplishment is something new and different from anything that has come before. While there is surely something right about that requirement, it borders dangerously upon the trivial. A child makes mud pies and there is nothing new in that, but have they been made in exactly *that* shape before? The lady next door paints by number, but would we call her creative because she fills in each space with, say, the compliment of the color called for by the instructions? Mere difference from what has gone before doesn't seem enough to set off creativity. Doubtless some trivial aspect can always be found in which everything differs from every other.

It seems to me that the word "creative" functions primarily as a value term and that a creative artist is a good artist and that a creative scientist is a good scientist. That way of putting it is a little too easy because it doesn't discriminate between the kind of artist we think of as creative and the merely competent illustrator or the truly creative scientist and the merely competent under-laborer. "Creative" is certainly a stronger notion than "competent". It may well be true that we reserve the description "creative" for those cases in which someone has come up with something new, but that something must be worthwhile, worth coming up with: a new scientific theory or concept that leads to a better *understanding* of phenomena, a new way of painting that leads us *to see* things afresh, or a new way of using words that produces a new kind of poetic *delight*. Here we really need specific examples that illustrate the way we use the word rather than generalizations that will more than likely be false to some important cases. We can mention Einstein's relativity physics that began to make sense of the recalcitrant behaviour of the speed of light, the impressionists delighting us with forms dissolved into shimmering color, and Hop-

kins catching this morning's minion of elusive alliteration. And this helps us understand why so many of the attempts of professional pedagogy to encourage "creativity" in children result only in embarrassing irony.

It is because of this connection with value that a theoretical defintion of creativity, or even a general theory of it, will probably never be forthcoming. At any rate, it will have to wait upon a general theory of artistic value, a general theory of what makes good science, and a general theory of value in every other activity that can be described as creative. And even if such theories could be satisfactorily formulated, there is no guarantee that the elements in each one that we call creative would have the kind of common denominator out of which a general theory of creativity could be built. Needless to say, we have none of that sort of theory, but I don't see that as any shortcoming. We can raise all the questions that want raising and set out to answer them on a case by case basis and that is all we really need to do.

II

The example of creativity in science that I want to call attention to belongs to the seventeenth century.[6] It was not the product of any single person: Kepler contributed to it and so did Galileo although the key figure was certainly the incomparable Mr. Newton. How many of the crucial insights can actually be attributed to Newton rather than others, I don't know and for my purposes it doesn't really matter. The important thing is that over a period of time something got done and I want to try to provide a way of understanding what that something was.

One task of the scientific revolution of the seventeenth century was to provide a new theory of motion, a theory of mechanics and especially dynamics, to replace the Aristotelian physics that had come to dominate the scientific thought of the later middle ages. It had been known for a long time that Aristotle's principles were woefully inadequate, but there was as yet no general theory of motion to replace them. Aristotle has postulated that the furniture of the world is composed of five elements, earth, water, air, fire, and aether. Each of these elements was assigned its own natural motion, that of earth and water being staight line motion toward the center of everything, that of air and fire straight line motion away from the center, while aether was assigned an eternal circular motion around the center. Since aether was the stuff which the heavens were made of, the sun, moon, stars, and planets all moved eternally in circular paths while everything else moved in straight lines toward a natural terminus. This theory of the elements and their natural motions thus entailed a sharp distinction between the physics of the heavens and that of the sublunary regions,

that is, the earth and its atmosphere.

If we can put aside at least some measure of the scientific awareness we all share and look at the movements of things with a naive eye, we see an infinite variety. Heavy objects drop straight down when they fall, but feathers and leaves flutter in the breeze. A weight can swing back and forth at the end of a string or describe a circle when whirled about your head. A thrown ball describes a parabolic path and, to borrow a bit from the science we set aside, we are told that planetary orbits are elliptical. And perhaps we shouldn't even try to describe the alarums and excursions of the ball in the pin ball machine.

To the naive eye that we have assumed these motions are all quite different and apparently have nothing in common. Even at the stage of sophistication that subjects their paths to geometrical analysis little, if any, is revealed that they could have in common. Straight lines, circles, parabolas, and ellipses are different curves and are plotted from different formulae. One of the most important aims of scientific theorizing is to bring what is an apparently diverse and disparate range of phenomena under a common explanation so that it can be seen to exemplify a set of common principles and thereby to show that there really is something in common despite the apparent diversity. Thus science can be understood, in part, as a kind of seeking out and showing of connection and one important aspect of creativity in the scientific enterprise is the ability of the scientist to see unsuspected connections. In the case of motion the connections could not be revealed by any mere catalogue of the phenomena or by any process of Baconian induction performed upon the entries in the catalogue. There is nothing in the idea of such a catalogue even to suggest that there are connections to be looked for.

Aristotelian physics did not go very far toward establishing a unity in all that variety. The theory of natural motions of the elements had little clear application to the actual motions of observed objects--it was, for example, notoriously unable to account for projectile motion--and astronomy remained with no logical connection to terrestrial physics. It was taken for granted by Aristotelian science that there was no connection to be sought between terrestrial and celestial motion. It remained, of course, for the seventeenth century to make the connections and to demonstrate that the motion of a falling body, a pendulum, a projectile, and a planet all do have something in common. Early in the century Kepler had shown that planetary orbits were elliptical and that the angular velocity of a planet about the sun varied in regular ways in the course of that orbit. Galileo had worked out the concept of gravitational acceleration to explain the behavior of falling bodies and of pendulums and had also worked out a primitive version of the concept of inertia. With these two concepts he was able to explain the fact that a projectile follows a parabolic path by deriv-

ing the curve as the resultant of two vectors, a constant inertial vector and a continually increasing vector representing gravitational acceleration. Yet terrestrial mechanics and celestial mechanics were still two logically independent sciences. It was, as we all know, the incomparable Mr. Newton who took the final step and put it all together. Newton's great achievement was the demonstration that all the forms of motion investigated by Galileo and Kepler could be explained in terms of his three laws of motion together with the law of gravitation that supplied the forces to account for the accelerations.

We know that this seventeenth century achievement in mechanics and dynamics was the work of a number of indivduals although Newton certainly has to be the major figure. How much of the ultimate synthesis was his own work and how much must be set down to the insight of others, I am not concerned to sort out. As I suggested before, it is not essential to my thesis that the important connections were seen by any single individual; what is important is the fact that during the seventeenth century there was a development in science that can properly be described as creative and that took the form of identifying a series of connections between what had before been thought to be an altogether disparate collection of phenomena and, furthermore, proved to be extraordinarily fruitful both for our understanding of nature and for subsequent research and scientific development.

III

Emily Dickinson wrote a poem that goes like this.

I like to see it lap the miles,
And lick the valleys up,
And stop to feed itself at tanks;
And then, prodigious, step

Around a pile of mountains,
And, supercilious, peer
In shanties by the side of roads;
And then a quarry pare

To fit its sides, and crawl between,
Complaining all the while

In horrid, hooting stanza;
Then chase itself downhill

And neigh like Boanerges;
Then, punctual as a star,
Stop--docile and omnipotent--
At its own stable door.

The poem is based on an extended comparison between a railroad locomotive and a great beast that laps up distance, feeds, peers, complains, neighs like a son of thunder, then stands docilely as if to accept the bridle. This, I suggest, is another example of ferreting out unsuspected connections and in this respect there is an interesting parallel between poetry and science.

Metaphors, similes, imagery, and symbols all serve as vehicles of poetic connection. The connection can emerge in the moment of a single line like the bloom on some fair maid's cheek or inform an entire poem as in the example from Emily Dickinson, or it can be as oddly idiosyncratic as Rimbaud finding the vowel "A" black and buzzing with flies. The connection can be embodied in a single symbol such as the unicorn with the broken horn in Laura's pitiful little glass menagerie which symbolizes purity, fantasy, withdrawal from reality, and both shattered limbs and shattered dreams and which brings together in a single image the concerns and perceptions of Amanda and Tom as well as Laura herself. One sometimes effective poetic device is to locate the connection in elements that seem to be almost polar opposites and logically incapable of being brought together. Cleanth Brooks surely went too far in his contention that the kind of paradox characteristic of metaphysical conceit is the essence of poetic language.[7] His is a fascinating way of bringing the variety of candles, flies, lovers, and the two being one who die to rise the same into a literary unity, but not all poetic connection trades on paradox; Emily Dickinson does not generally do that sort of thing although the yoking of docility and omnipotence comes close to being such a conceit.

One important way in which science and art are alike is, then, in the making of connections. Are there any others? I think so. In both areas the connections can have consequences. Scientific connections allow us to explain phenomena and in addition to their explanatory power they often permit the prediction of phenomena. This is eminently true of Newtonian mechanics. With it we can calculate the trajectory of a projectile, predict the position of a planet, and loft a communications satellite into orbit. The practical applications of all that are enormous.

The consequences and implications of artistic and literary connections are of a rather different sort. Many are purely artistic. With respect to Donne's "The Canonization", for example, Brooks showed how once the fundamental comparison established by the phoenix image is grasped, the rest of the images fall into place and the entire poem makes a kind of sense it could not have made while it remained a series of unconnected figures. Sense can sometimes be made of a piece of music by showing its connections with other things. Musical understanding can follow from pointing out that a certain passage must be taken as like an answer to what has gone before, or perhaps as like a joke, or that it is a parody of another work. Awareness of such connections can guide a musician in playing the work properly and with understanding and it can also guide the audience in listening to it with understanding.

There is, however, another kind of consequence of artistic connection that must be mentioned. In the course of developing a general theory of art as metaphor Arthur Danto has recently introduced a number of interesting and insightful examples of artistic connections. Danto says

> the greatest metaphors of art I believe to be those in which the spectator identifies himself with attributes of the represented character: and sees his or her life in terms of the life depicted: it is oneself as Anna Karenina, or Isabell Archer, or Elizabeth Bennett, or O: oneself sipping lime tea; in the Marabar Caves; in the waters off East Egg; in the Red Chamber . . . where the artwork becomes a metaphor for life and life is transfigured.[8]

The importance of this remark for me does not lie in the support it may or may not offer to any general theory of art. It lies, rather, in being a reminder of what art can sometimes do. It can illuminate a life and it can lead to an understanding of oneself. Art can sometimes say, "Thou art the man," and one's own life is thereby seen differently and sometimes changed.

IV

After having dwelt at some length upon certain similarities between art and science it is time to move on to the differences and to return to those ancient and still nagging doubts that the difference may, after all, be much more significant than the similarities. Let it be granted that science and poetry seek connections. The claim that there is a connection between things is not by itself sufficient to establish that

there is, in fact, such a connection in any particular instance whether it be a scientific or a poetical one. We can get right to the troublesome aspect of this issue by asking how such claims are verified and made good. In the case of the connections hypothesized by Newtonian mechanics the answer to the question is relatively simple and straightforward. Each of the trajectories or curves traced by the different moving objects previously mentioned can be derived by mathematical deduction from the laws of the theory together with appropriate information about the mass and initial velocity of the moving object, the gravitational and other forces acting on it, and the like. This additional information about masses, velocities, and forces can be determined by empirical measurements. The values thus gotten can replace the quantified variables in terms of which the laws are stated and the resulting accelerations easily calculated. That the bodies actually move in the way thus predicted by the theory can be checked empirically. It is by means of the whole process that the claim that the motion of a cannon ball and the motion of a planet are significantly similar is made good. Those philosophers of science who thought of scientific theories as paradigmatically deductive systems were perhaps not far wrong. In this instance, at any rate, the connections between the different phenomena are logical ones to the extent that the relevant empirically verifiable descriptions of the phenomena can all be deduced from the same set of postulates (the laws).

When we look at art and poetry, however, all that is different for there is nothing that passes for theory, nor, *a fortiori*, deduction from the principles of the theory, nor even empirical verification, in any clear sense, of the metaphorical connections. These facts could easily lead someone to believe that poetry is essentially humbug and that poets fail to establish any real connections between phenomena at all. From this perspective what some would call artistic creativity is but willful arbitrariness in the use of words: the whole tribe of poets turns out to be a tribe of Bunthornes. From another perspective, if one is already predisposed toward poetry, the same facts can encourage one in the belief that the poet is privy to a kind of knowledge or awareness of things denied to the philistine scientist and we find ourselves back in romantic prattle about intuitions versus intellect. Neither perspective is, I think, ultimately justified and at this stage in the discussion we should be content merely to note that while there are certain similarities between science and poetry, there are also these salient differences and refrain from offering any hypotheses to explain those differences or to judge them.

There is still another interesting difference between the two that either side in the quarrel could cite to its supposed advantage. Once the creative scientific work has been done and the insight locating connections between otherwise disparate phenomena has been

achieved, the task of applying the theory and tracing out the connections in particular cases can be left to the under-laborers. Once the theory has been constructed, the verification of the postulated similarities can be carried out by anyone capable of performing the necessary mathematical calculations. The under-laborer does not require the same "nose" for the material that the original scientist does. The situation in poetry, by contrast, is significantly different. The poet's reader must react in an appropriate way to the poet's comparison; he must see the point of it and then find it apt, or, perhaps, clumsy, and so on. There are no procedures or devices for verifying a poetic comparison as there are for measuring forces, masses, velocities, and accelerations. While the poet's image or figure would likely not have struck the reader on his own — he is, after all, a reader and not a poet — he must be able to realize the connection for himself when it is presented to him. There is, however, no guarantee that any reader will see the point of likening a locomotive to a fabulous monster; there are those for whom talk of supercilious peers and horrid hootings makes no contact with cross heads, side rods, and feedwater pumps. This can be taken as reinforcing either the charge that poetry lacks any substance or, contrariwise, the sometime romantic view that the reading of poetry is itself a creative act that joins reader to writer in a creative consummation devoutly to be wished.

A striking feature of the kind of poetic connections we have been talking about is that they seem to demand description by means of the preposition "as": Emily Dickinson presented the locomotive *as* a horrid hooting beast, Donne the lovers *as* like the phoenix, Rimbaud the vowel A *as* black. One sees oneself *as* Anna Karenina, or Laura *as* the shattered unicorn. This interesting use of the word "as" has been explored in a fascinating manner by Ludwig Wittgenstein in his *Philosophical Investigations.*[9] Wittgenstein introduces this use in an examination of various forms of visual perception in which the objects of perception are different from what we usually think of as the things we see. He talks of seeing a likeness between two faces, of ambiguous figures such as Jastrow's duck-rabbit which can been seen one time as a duck and another as a rabbit, and of formless things that can suddenly take on an organization as when we come to see a certain shape in a cloud. He refers to these objects of perception as aspects and is concerned to make sense of the kinds of experience we have when an aspect is seen to change or a new aspect suddenly dawns on us and to exorcise certain philosophical and psychologial theories of mental life and perception whose grip upon us produces intellectual confusion. What he says about visual experience has obvious application to how, say, music can be heard and to poetic imagery as well.

Wittgenstein goes on to connect his investigation of seeing one thing as something else with certain considerations about the meaning

of words. He was especially interested in the idea that one can sometimes experience the meaning of a word and that when we hear or read a word it may seem to us to be filled with its meaning or, sometimes, to be drained of its meaning. He reminds us of the familiar experience of repeating a word a number of times in rapid succession until its sense seems to disintegrate into no more than a series of curious sounds. It is in discussing this phenomenon of experiencing the meaning of a word that he introduces the idea that a word may be used in what he calls a secondary sense. He cites two interesting examples of words used in secondary senses. "Given the two ideas 'fat' and 'lean', would you be inclined to say that Wednesday was fat and Tuesday lean, or the other way around?" Wittgenstein opts for fat Wednesdays and adds "For me the vowel *e* is yellow."[10] This latter example is obviously reminiscent of Rimbaud although there is nothing at all to indicate that Wittgenstein had Rimbaud in mind.

It is not in order here to explain the many questions and philosophical concerns that drive Wittgenstein in this part of the *Philosophical Investigations* nor to try to sort out the many connections that run through this discussion in which he has spun an extraordinarily subtle and complex web.[11] It is enough for my purposes to borrow some of his conclusions and suggestions and apply them to the things we have been saying about creativity in order to bring a kind of understanding that I hope to be altogether in a spirit that is Wittgenstein's.

Much of the language of poetry must be understood, I believe, in terms of Wittgenstein's notions of seeing one thing as another and words having secondary senses. Wittgenstein does not offer us any general account of what makes the use of a word a secondary one; he offers us only a few examples, but a close look at these reveals several characteristic features. (1) The thing to which the word is applied is usually quite different from the things to which it is ordinarily applied and may even appear to be of the wrong category to be the subject of such a description. A day, for example, is not the kind of thing we think of as being either fat or lean. (2) There need be no similarity between the subject of the secondary use and the thing the word usually describes. There is nothing that Wednesday and a fat man can intelligibly be said to have in common nor is a vowel like a colored object. (3) The meaning of the word used in a secondary sense does not change under that use. The meaning of "fat" in "fat Wednesday" could only be explained by reference to fat men. (4) The ability to use a word in a secondary sense depends upon the ability to use the word in its ordinary (primary) sense. I must know what it is to call a man fat in order to be inclined to describe Wednesday that way. (5) The sense of the secondary description cannot be rendered by any paraphrase. In no other way could I make the point that Wednesday is fat. (6) No causal or psychological explanation is relevant to an under-

standing of a word used in a secondary sense. (7) No reason, justification, or criteria can be given for the application of a word used with a secondary sense. We call a man fat on the basis of his girth and the folds of his flesh, but nothing of the sort can support the description of Wednesday as fat. There is, instead, only the *inclination* to use the word in that way and, we may note, such uses often appear remarkably fitting and apt.

There is a temptation to dismiss the notion of using a word in a secondary sense as merely a curious idiosyncrasy that can't tell us anything about poetry; successful poetic images are anything but idiosyncratic. Wittgenstein's examples of talking about the days of the week as either fat or lean and ascribing colors to the vowels certainly increase that temptation, but a careful look at poetic language reveals, I believe, that it can share many characteristics of secondary senses. The locomotive neighs like Boanerges. Locomotives, not being animals, much less horses, are not the sort of thing that either neigh or restrain their voices. A locomotive does not resemble a horse in any way that justifies or sheds light on the comparison; driving wheels and eccentrics are not like hooves and pasterns. The word "neigh" does not change its meaning when used of the locomotive. There is no special ferro-engine meaning for the word; after all, the point of usng the word was to make a connection between the two. The creation and appreciation of the metaphor obviously depends upon knowing about horses and being able to use the word of horses. Some piece of psychological theory or bit of causal history may explain why Emily Dickinson chose a horse rather than something else as the metaphorical basis of a poem — we can imagine childhood associations or perhaps prenatal influences at work — but none of that could explain the poetic aptness or force of the metaphor. We, her readers, do not have to share her causal history in order to appreciate her images. There are criteria of a rough sort that distinguish the horse's neigh from the snorts and other noises the creature makes. The dictionary tells us that the neigh is the "loud and prolonged cry" of the horse and, doubtless, the poet would not be inclined to describe, say, the blowing off of the cylinder cocks as a neigh unless the noise was reasonably "loud and prolonged". Things being as they are, however, "neigh" is not a term used to denote one out of the range of possible locomotive noises and thete are, in fact, no criteria for its application to locomotives.

It is at this point that the whole business of using words in a secondary sense and, perforce, much of the language of poetry cries out for explanation. The same demand to explain more prosaic use of words where there are often fairly definite criteria for their application does not press upon us in the same way. This seems even more true of scientific descriptions where we are inclined to think that our scientific vocabulary is applied on the basis of technical and very precisely

specified criteria. The difficulty that we want an explanation to get us out of can be better understood by reflecting on a comment of the French literary scholar and critic René Etiemble. His detailed study of Rimbaud's sonnet "Voyelles" failed to turn up any possible explanation for the poet's intriguing and baffling imagery; no childhood associations, appeal to the pseudo-phenomenon of synaesthesia or other psychological mechanisms, no other facts of personal or cultural history were found relevant. He concludes in this way.

> Why "flies", "tents", "lips", "bugles"? Because the poet has seen them. Why has he seen them? Because he is a poet. The misforture is that the literary critics, vexed by their own sterility, attempt to suppress this *vision* which obeys neither the laws of "literary history" nor those of "source criticism". This original symbolism, which it is impossible to reconstruct, to formulate in an equation, must be accepted, submitted to.[12]

The thing that Etiemble says cannot be explained but must be accepted and submitted to we are now in a position to identify as the fact that words can have secondary senses, that there is that use of language and it is that that makes the poet's vision possible.

Etiemble's remarks open up two possible directions for our thought. The first is that we must be content with merely accepting the poetic use of language because we are unable to explain it. This possibility very naturally suggests that there is something that needs explaining and, since we cannot explain it, we are left with a mystery. The second possible direction is that explanations are somehow logically inappropriate and that all there is to do is to accept the fact of poetic language, but not from want of something better. It is this second option that is Wittgenstein's for it is one of his principal contentions that philosophy can only describe a use of language and can give it no foundations.

The air of mystery surrounding poetic language results from contrasting it with certain other uses of language. I can't call a man fat simply because I am inclined to or claim that planetary motion manifests the same dynamic principles as projectile motion simply because it strikes me that way. I am constrained in these cases by criteria of varying degrees of stringency in a way that I am not when I find Wednesday fat or the locomotive like a great beast. We don't want to conclude that poetic language is therefore deficient, for it certainly isn't, but on the other hand we can neither explain nor justify it by appealing to a faculty of intuitive knowledge that puts us in contact with connections unavailable to the artistically underprivileged. That is neither explanation nor justification of anything and only increases the sense of mystery. The air of mystery must be dispelled by the real-

ization that we have here to do with another use of langauge: not an improper or deficient use, not somehow a superior use, simply a different use.

We have the impression that the everyday use of a word such as "fat" is fully explained because we know its criteria of application. And the same is, of course, true for our scientific vocabulary. Wittgenstein made the point that language cannot be understood in abstraction from the human activities and practices in which it is embedded and, in addition, he insisted that far from having a single use our words and expressions play many different roles and are consequently embedded in many different activities and practices. The explanation of the meaning and the criteria of application of an everyday word such as "fat" as well as of scientific terms takes place within the context of that ordinary or scientific usage. We can ask for the criteria governing "fat" or "velocity" because there is the activity, on the one hand, of describing people like that and, on the other, of doing science. What we cannot do, of course, is demand a similar justification for the general practice of using language either in that ordinary or scientific way. It is not at all clear what would count, if anything, as explanation or justification for the very existence of a use of language with its attendant form of human activity. What we can do is to describe the various uses of language and display their role in human life.

This way is open to us with respect to the poetic use of language in which words are used with their familiar meanings, but without their familiar criteria of application. We can describe this kind of language and its relations to other uses of language, everyday or scientific, and we can make clear its role in human life, but we cannot explain or justify it in some larger, metaphysical sense.

The announced burden of this paper was modest and my conclusion is equally so. Science and poetry are different activities and they are not competing for the same prize. There is no logical room, consequently, for a quarrel between them. They do, nevertheless, have certain things in common: they can both be creative by way of seeking out connections. We have seen, however, that these connections are of rather different kinds, their consequences are of different kinds, and they play different roles in our lives. We can sort out these similarities and differences and describe them and place them in a wider range of human interests and practices. This kind of description of the language of science and poetry and the activities in which they are embedded, which is all that philosophy can provide, dispels mystery by denying that there is any mystery to be dispelled. For some this conclusion is too modest, indeed disappointing. To those I would reply that while philosophy dispels mystery, it does not thereby dispel wonder; rather it allows it to be directed at the proper targets by

showing that our prosaic uses of language and our scientific uses of language are just as much proper objects of wonder — are just as lacking in explanation — as the poetic. If one insists on searching out a mystery, don't seek it in the fact that there is human activity of this or that particular sort, but seek it in the fact that there is human activity at all or, better, in the fact that there is something rather than nothing.

Notes

[1] Plato, *Republic*, X, 607.

[2] F. M. Cornford, *From Religion to Philosophy* (New York: Harper Torchbooks, 1957).

[3] In making this point, however, we must not forget that Wordsworth also expressed a fascination with geometry. See *The Prelude*, Bk. VI.

[4] I borrow this expression from John Locke who remarked that "every one must not hope to be a Boyle or a Sydenham; and in an age that produces such masters as the great Huygenius and the incomparable Mr. Newton . . . it is ambition enough to be employed as an under-labourer . . ." (*An Essay Concerning Human Understanding*, "The Epistle to the Reader").

[5] See, for example, Thomas S. Kuhn, *The Structure of Scientific Revolutions* (Chicago: The University of Chicago Press, 1962); Stephen Toulmin, *The Philosophy of Science* (London: Hutchison University Library, 1953) and *Foresight and Understanding* (Bloomington: University of Indiana Press, 1961).

[6] The literature of the history of seventeenth century science is vast, but the following are especially helpful. A. C. Crombie, *Medieval and Early Modern Science*, II vols., 2nd ed. revised (Garden City: Doubleday, 1959); Alexander Koyrē, *From the Closed World to Infinite Universe* (Baltimore: Johns Hopkins University Press, 1957); Stephen Toulmin and June Goodfield, *The Fabric of the Heavens* (New York: Harper, 1961).

[7] Cleanth Brooks, *The Well Wrought Urn* (New York: Reynal & Hitchcock, 1947), Chap. 1, "The Language of Paradox".

[8] Arthur C. Danto, *The Transfiguration of the Commonplace* (Cambridge: Harvard University Press, 1981), p. 172.

[9] Ludwig Wittgenstein, *Philosophical Investigations*, 2nd ed. (New York: Macmillan, 1953) especially Part II, sec. 11. Much additional material on this part of Wittgenstein's thought has recently become available with the publication of *Remarks on the Philosophy of Psychology*, II vols. (Chicago: University of Chicago Press, 1980).

[10] *Philosophical Investigations*, p. 216e.

[11] For a detailed account of what I take to be Wittgenstein's views on aspect perception, experiencing the meaning of a word, and secondary sense see my *But is it Art?* (Oxford: Basil Blackwell, 1984), Chaps. 6 and 7.

[12] René Etiemble, *Le Sonnet Des Yoyelles: De L'Audition Colorée A La Vision Erotique* (Paris: Editions Gallimard, 1968), p. 221. My translation.