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SCIENCE AND THE POET

When Thomas Sprat wrote his *History of the Royal Society*, not long after its foundation, he was as much concerned with apology as with history, and devoted a good proportion of his space to an attempt to show that the new experimental science could do no harm and was bound to be of universal benefit. He addressed a special grieved reproof to those literary wits who had already made sport of the *virtuosi* of the Society, assuring them that Socrates was not only author of irony but also founder of philosophy, and is thus the common parent of science and of wit. Consequently, in attacking science, wit "defiles its own Nest." Sprat was genuinely concerned over what the power of ridicule might do to the young science, and he took pains to reassure the wits and writers that they not only had nothing to fear from the scientists, but that, on the contrary, literature would be enriched by new discoveries—which, he says, "will be very serviceable to the Wits and Writers of this, and all future Ages" by providing an inexhaustible new fund of images.

I wish mainly to consider how far, and in what sense, Sprat was right in his view of the service that science could perform for literature; but first his other contention, that literature has nothing to fear from science, is worth a glance. It is obvious that science has by no means killed literature, but it is equally obvious that the relations of the two have not always been amicable. The real causes of conflict Sprat does not discuss, and perhaps did not recognize, although they are present by implication in his work. Throughout his book he tends constantly to identify science and the Baconian philosophy, and insofar as science becomes identified with that philosophy, it is brought into conflict with literature, and indeed with all the arts. This is clear theoretically, and demonstrable historically. (Whether science—or the man of science—needs to become committed to the Baconian, or any other particular philosophy, is too large a question to discuss here. I am sure there is no such compulsion, but a good many scientists, especially those with a contempt for metaphysics, cling eagerly to a single metaphysical system and are prepared to argue that scientist and positivist are inseparable, that methodology must be elevated to a metaphysic.) Sprat may be right in arguing

that science has no adverse effects on literature, but the kind of empirical philosophy that so often accompanies science undoubtedly has. It will be sufficient to note three separate directions from which empiricism makes its attack.

Let us start with the simplest and least important, the attitude towards language. In the attack upon the past, and particularly upon the Aristotelian philosophy of the schools, Bacon and his followers laid great emphasis on the abstract words used by the Schoolmen. These, said Bacon, were the names of things which have no existence, or "names of actual objects, but confused, badly defined, and hastily and irregularly abstracted from things." "There are different degrees of distortion and mistake in words. One of the least faulty classes is that of the names of substances. . ." (he specifies *chalk* and *mud* as good, *earth* as bad, since more abstract). Bacon implies that the ideal language would be restricted to names of material things and physical actions—an ideal properly ridiculed by Swift in the voyage to Laputa. The notion that language can be cleared of ambiguity and given a mathematical precision by an abandonment of most of its resources, that is can cease to be figurative, is a myth created by minds ignorant of the true nature of language and its operations, unaware of the real modes by which language conveys meanings. Nevertheless, the very simplicity of this naive approach to the complex problem of language makes it attractive to certain minds, and establishes the conviction that poetry is a round-about, flowery, and vague way of presenting what could be said 'scientifically,' with no nonsense, in a tenth of the space. Bacon's comments on rhetoric (elaborated by Sprat) further suggest that for this sort of mind literature is the art of *appliqué* work; that it takes a plain idea and tacks on trimmings of imagery, metaphor, and rhetorical flourish. We recognize the tradition in Huxley's rhetorical outburst about the "pestilential cosmetic of rhetoric" on the "plain face of truth." I need not elaborate on the attitude towards literature which all this implies.

More direct in its effect is the assigning by Bacon of philosophy (including science) to the reason, history to the memory, and poetry to the imagination. Science deals with reality, history with past reality; to poetry is left the realm of unreality, the feigned, the fantastic. "Poetry gives that to mankind which history denies, and in some measure satisfies the mind with shadows when it cannot enjoy the substance." It is easy to forgive in Bacon the simple faculty psychology upon which this classification is based; it is more difficult to forgive his followers who for over three centuries have retained a simple opposition of reason and imagination, fact and fiction, and who now tell us that science is concerned with

truth, poetry with emotions, "attitudes," and "values," whatever these last two are. The restriction of knowledge to "scientific" knowledge, and the relegation of art to "the mind at play" or "wishful thinking," is one of the major crimes which scientists, if not science, have committed or abetted. The fact that generations of readers have recognized in great literature some kind of truth to their own experience calls not for a denial of truth, but a recognition of it; that readers constantly distinguish in what they read between truth and fantasy, between wise intuitions on the human situation and mere entertainment, provides a challenge to define the kinds of truth literature conveys, and its modes of communication. (I remark parenthetically that nothing is to be gained by substituting for Bacon's simple psychology a newer simple psychology which merely replaces fancy by the unconscious.)

A final and related vulgar error is that of the empiricist aesthetic, which defines the work of art in terms of its emotional effect on the reader or audience. The shift of attention from the work of art to the reader carries still further the denial of objective meaning in art by putting all emphasis on the response of the individual. This can be a comforting doctrine to those who know nothing about art but know what they like: the work of art now means merely what it does to them; it is good or bad only as it affects them; it is hardly necessary or profitable to inquire how it effects them or why. The defensive slogan becomes, "there is no disputing about tastes." The whole history of all the arts provides the refutation: the vitality of the arts derives from lively disputes about tastes. The steady preaching of the doctrine of the "subjectivity" of the arts, again based upon a naive classification into "objective" and "subjective," is the third of the crimes against literature.

The indictments are serious, because the general contempt for the arts, and the fundamental misconception of their nature and function, have spread with the philosophy they spring from, associated with the respectful name of science, until they are generally accepted at the popular level. They have even insinuated themselves into the feebler hearts and minds of some practitioners of the arts. When Housman describes his own poetry as a morbid secretion, and his response to poetry as muscular movement, he is giving aid and comfort to the enemy. So is Day Lewis, when he complains that "poetry was born from magic, and science is the great enemy of magic: for magic is the personal interpretation of the universe; science, the impersonal rationalisation." (I venture to suggest that he is as wrong about magic as about poetry.) It is perhaps significant that Lewis and Housman both uttered their heresies about twenty years ago, at a period when the attack from science, reinforced by various pseudo-

sciences, was at its most triumphant, and the confidence of the artist in his own function most shaken. Much has happened since.

The effects of the attack on the arts have obviously not been entirely disastrous. For one thing, poets have been led constantly, in their own defence, to re-consider the three main questions: of the purpose of poetry, of its proper modes of operation, and of its media; and poetry has benefited as a result. Wordsworth's prefaces, Coleridge's writings on poetry, Shelley's *Defence*, are all concerned with these matters; Browning's penetrating discussions of the poetic function, of the nature of poetic truth, and of the use of language in poetry arise directly from the challenge offered by those who, in Browning's own phrase, look on poetry as a substitute for a good cigar. These are positive gains, and valuable ones.

In the long run, then, Sprat's assurance that poets have nothing to fear from science seems accurate, even if in ways he did not envisage. His second assurance, that literature would be enriched by science, also has proved well-founded, even if exploiting the resource has not been as simple a matter as he seems to have thought. What he had in mind was presumably a new set of metaphors, a range of imagery to replace worn-out mythological allusion,—the sort of "conceit" familiar in seventeenth-century poetry, and illustrated by Dryden's compliment to Howard's poems:

No atoms, casually together hurled,
 Could e'er produce so beautiful a world;
 Nor dare I such a doctrine here admit,
 As would destroy the providence of wit.

Such witty intellectual comparisons form the simplest application of science to poetry, and have a wide range of usefulness, from the jocular to the serious. Swift's comment on critics and poetasters as parasites is well-known:

If on Parnassus' top you sit,
 You rarely bite, are always bit.
 Each poet of inferior size
 On you shall rail and criticize. . .
 The vermin only tease and pinch
 Their foes superior by an inch.
 So, naturalists observe, a flea
 Hath smaller fleas that on him prey;
 And these have smaller still to bite 'em,
 And so proceed *ad infinitum*.

The eighteenth-century poet, Matthew Green, pokes gentle fun at the fashion for scientific imagery in a passage of compliment to Delia, in which

he finds science taking its origin in observation of her qualities:

By tracing the sole female mind,
 We best what is true nature find:
 Your vapours bred from fumes declare
 How steams create tempestuous air,
 Till gushing tears and hasty rain
 Make Heav'n and you serene again.
 Our travels through the starry skies
 Were first suggested by your eyes;
 We, by the interposing fan,
 Learn how eclipses first began. . . .
 The glowing colours of the cheek
 Their origin from Phoebus speak; . . .
 And all things we in science know
 From your known love for riddles flow.

The scientific image can, however, go beyond the merely witty comparison, as the poems of the metaphysical poets show. In his *Hymn to God My God in My Sickness*, Donne makes a brilliant application of cartography:

Whilst my Physitians by their love are growne
 Cosmographers, and I their Mapp, who lie
 Flat on this bed, that by them may be showne
 That this is my South-west discoverie
Per fretum febris, by these streights to die,
 I joy, that in these straits, I see my West;
 For though their currants yeeld returne to none,
 What shall my West hurt me? As West and East
 In all flatt Maps (and I am one) are one,
 So death doth touch the Resurrection.

Here the imagery moves between metaphor and symbol. A later and less familiar example is Edward Young's use of the comet's orbit as symbol of Christ's return; this brings the ideas of vastness, terror, and majesty called forth by the comet and suddenly applies them to the triumphant second coming:

Read Nature; Nature is a friend to truth;
 Nature is Christian; preaches to mankind;
 And bids dead matter aid us in our creed,
 Hast thou ne'er seen the comet's flaming flight?
 Th'illustrious stranger, passing, terrour sheds
 On gazing nations; from his fiery train
 Of length enormous, takes his ample round
 Through depths of ether; coasts unnumber'd worlds
 Of more than solar glory; doubles wide
 Heaven's mighty cape, and then revisits Earth

From the long travel of a thousand years.
 Thus, at the destin'd period, shall return
 He, once on Earth, who bids the comet blaze:
 And, with him, *all* our triumph o'er the tomb.

But for serious poetic use, the scientific idea is of greatest service when it moves entirely beyond simple comparison or analogy towards the richer realm of symbolism. Here it often fits into, refreshes, and reinforces older patterns of symbolism, creating effects of complex significance. Shelley uses a superb astronomical image in *Prometheus Unbound* (IV, 444 ff.) which exploits the cosmic view of the earth, spinning like a "sleeping" top beneath its long cone of shadow, the cone defined by the flood of light around it; the Earth speaks:

I spin beneath my pyramid of night
 Which points into the heavens, dreaming delight,
 Murmuring victorious joy in my enchanted sleep;
 As a youth lulled in love-dreams faintly sighing,
 Under the shadow of his beauty lying,
 Which round his rest a watch of light and warmth doth keep.

The new, scientific image here fuses with a pattern of old and traditional symbols, so that the phrase "under the shadow of his beauty," becomes the focus of a richly complex passage.

It is interesting to see the use Tennyson makes of essentially the same image in *The Ancient Sage*; with even greater compression he creates a comment on a whole set of antitheses: life and death, joy and sorrow, knowledge and ignorance:

Earth's dark forehead flings athwart the heavens
 Her shadow crown'd with stars. . . .

The dozen words call up first of all the vast sight of the terrestrial globe hurtling through space around the sun, with the long cone of its shadow streaming out through space. We are made aware of ourselves looking up through the cone of darkness towards the stars, seeing them because of the cone. The "dark forehead" of the earth suggests our own dark forehead, our thoughts of death and sorrow, our ignorance; we ourselves project the shadow on the heavens; but at the end of the shadow is the crown of stars. The familiar symbolism of darkness and light, of earth and heavens, of the starry crown, is here given fresh vitality and a compressed coherence by the astronomical image.

The poetry of Shelley offers a good many examples of this sort of transformation and amalgamation of the scientific idea; one of the most

familiar is of course the "dome of many-coloured glass" in *Adonais*, where again the old and new are fused:

The One remains, the many change and pass;
 Heaven's light forever shines, Earth's shadows fly;
 Life, like a dome of many-coloured glass,
 Stains the white radiance of Eternity,
 Until Death tramples it to fragments. . . .

The theme of the One and the Many, the paradox of unity and manifoldness, permanence and change, is stated first in the abstract terms of the Platonic philosophy, then in terms of concrete symbols, Platonic and Christian—Heaven's light and Earth's shadows. To the Platonic meaning of reality and unreality the broader symbolism of light and shade, joy and sorrow, purity and impurity, is added. The abrupt and emphatic word "Life" brings the theme from the abstract cosmological level to the human and particular, where the antitheses are applied to Life and Death. The human theme is worked out through a highly formal pattern of Life, Eternity, and Death by three linked symbols: the dome, the white radiance, and the many-coloured glass. The shattering of the dome suggests, in conjunction with its shape, the breaking of the egg which at once destroys a world and releases to new life. The shattering to fragments of the many-coloured glass exploits paradox; the glass itself reduces the One (the white radiance) to fragments; its destruction reveals the One. The ancient symbolism of light as the source of Life, or as spirit, and the colour-symbolism of white purity (reinforced by "stains") have here been enriched by the Newtonian theories of colour; the white light is the complete light; the coloured glass lets through fragments, each a part of the real radiance, but never giving back its unity.

It is in passages like these that the scientific image renders the greatest service to the poet, and it will be noted that a process of assimilation and of fusion in the poet's mind has to take place to produce them. It may be significant that the scientific ideas used here by Shelley and Tennyson are by no means new; a degree of familiarity may be necessary to the process of fusion.

Further, the scientific idea is not in these passages the primary subject. We may now turn to the question of direct poetic treatment of scientific subjects. Poets are at least as sensitive as others to the excitement of discovery, and one would perhaps expect a major part of poetry to celebrate new intellectual regions. But a survey of English poetry yields disappointing, if interesting results. The type of long poem rehearsing new systems of science is exemplified by Phineas Fletcher's

The Purple Island and Erasmus Darwin's *Loves of the Plants*. The first of these, Spenserian in inspiration, seizes upon contemporary physiology (including Harvey's theory of circulation) to present an elaboration of the old analogy of man and world; man as the microcosm is here treated with geographical particularity: as a sample I quote some stanzas on the structure of the ear:

The Portall hard and drie, all hung around
 With silken, thinne, carnation tapestrie:
 Whose open gate drags in each voice and sound,
 That through the shaken ayer passes by:
 The entrance winding; lest some violence
 Might fright the Judge with sudden influence,
 Or some unwelcome guest might vex the busie sense.

This caves first part fram'd with a steep ascent
 (For in four parts 'tis fitly severèd)
 Makes th' entrance hard, but easie the descent:
 Where stands a braced drumme, whose sounding head
 (Obliquely plac'd) strook by the circling aire,
 Gives instant warning of each sounds repair,
 Which soon is thence convey'd unto the Judgment chair.

The drumme is made of substance hard and thinne;
 Which if some falling moisture chance to wet,
 The loudest sound is hardly heard within:
 But if it once grows thick, with stubborn let
 It barres all passage to the inner room;
 No sounding voice unto his seat may come:
 The lazie sense still sleeps, unsummon'd with his drum.

The descriptions of the digestive organs are even more brilliant.

Two things should be noted about Fletcher's poem: the first is that he is by no means poetically incompetent; after the fifth canto, when he has finished with physiology and turns to man's psychological and moral qualities, the allegorical treatment becomes less awkward, and the poem is not unsuccessful. The second is that his physiological allegory calls for constant marginal annotation to present the plain anatomical details allegorized. This is very significant—particularly since the same thing happens in Erasmus Darwin's poem. Allegory really depends upon familiarity with what is allegorized, so that the aptness of the allegory can emerge easily. But both Fletcher and Darwin know that they can count on no familiarity; they are presenting factual instruction in the notes to explain the allegory in the poem. Such a procedure suggests at the outset a conviction of the essentially unpoetic nature of the facts, and Darwin's poem especially has the air of trying to make botany palatable

by prettying it up with fancy. In Fletcher's case, the use of allegory is more fundamental to his purpose, which is not primarily to instruct in anatomy. But this type of treatment could only succeed, I think, with scientific ideas that are fully familiar to the reader. And even then, the temptation to translate the allegory immediately back into plain prose fact encourages the view that poetry is a round-about way of obscuring the simple.

How then does the poet fare when he eschews fanciful allegory and versifies science directly? Let us hear Dr. John Armstrong on diet, in his *Art of Preserving Health*:

The languid stomach curses even the pure
 Delicious fat, and all the race of oil:
 For more the oily aliments relax
 Its feeble tone; and with the eager lymph
 (Fond to incorporate with all it meets)
 Coyly they mix, and shun with slippery wiles
 The woo'd embrace. Th' irresoluble oil,
 So gentle late and blandishing, in floods
 Of rancid bile o'er flows: what tumults hence,
 What horrors rise, were nauseous to relate.

One may grant readily that Armstrong is at times a better doctor than poet, but digestion as a theme for poetry gave even Milton some difficulty.

Here is an explanation of the refraction and internal reflection that produce the rainbow, from Akenside's *Pleasures of the Imagination*:

Nor ever yet

The melting rainbow's vernal-tinctur'd hues
 To me have shone so pleasing, as when first
 The hand of Science pointed out the path
 In which the sun-beams gleaming from the west
 Fall on the watery cloud, whose darksome veil
 Involves the orient; and that trickling shower
 Piercing through every crystalline convex
 Of clustering dew-drops to their flight oppos'd,
 Recoil at length where concave all behind
 The internal surface on each glassy orb
 Repels their forward passage into air:
 That thence direct they seek the radiant goal
 From which their course began; and, as they strike
 In different lines the gazer's obvious eye,
 Assume a different lustre, through the brede
 Of colours changing from the splendid rose
 To the pale violet's dejected hue.

All of which is very accurate as far as it goes, and written with enthusiasm for the subject. Accuracy and enthusiasm are clearly not enough. At its best, verse of this sort, which merely expounds science, can rise no higher than, say, that which merely records technical processes (Grainger's *Sugar-Cane*, for example), or that which is merely topographical. What is lacking is the sense of connection with man, with the human situation. As scientific ideas carry implications relating to man, and as they then become part of a larger texture of thought and feeling, so their importance to the poet increases, and their suitability to genuinely poetic treatment.

One interesting instance of this is furnished by the mutability theme in poetry. By older poets, devouring Time is thought of in relation to the individual life, and the more confident poet can feel sure of cheating Time by his enduring verse. The less confident weep to see the daffodils haste away so soon; the fate of the flower is man's fate. The flower dies, but the fields endure; man dies, but the poems live. The nineteenth century, with its enthusiasm for archaeology, began to substitute for the human time-scale the historical time-scale of civilizations:

Cities and Thrones and Powers
Stand in Time's eye,
Almost as long as flowers,
Which daily die. . . .
This season's Daffodil,
She never hears,
What change, what chance, what chill,
Cut down last year's. . . .

So Time that is o'er-kind
To all that be,
Ordains us e'en as blind,
As bold as she:
That in our very death,
And burial sure,
Shadow to shadow, well-persuaded, saith,
'See how our works endure!'

That is Kipling; but the theme is also that of *Ozymandias*, and of Volney's *Ruins of Empire*. Armstrong gives us an eighteenth-century version which further extends the notion of Time's decay:

What does not fade? the tower that long had stood
The crush of thunder and the warring winds,
Shook by the slow, but sure destroyer, Time,
Now hangs in doubtful ruins o'er its base.

And flinty pyramids, and walls of brass
 Descend: the Babylonian spires are sunk;
 Achaia, Rome, and Egypt moulder down. . . .
 This huge rotundity we tread grows old;
 And all those worlds that roll around the Sun,
 The Sun himself, shall die; and ancient Night
 Again involve the desolate abyss:
 'Till the great Father through the lifeless gloom
 Extend his arm to light another world,
 And bid new planets roll by other laws.

Here the cosmos itself is seen as subject to Time's decay; a religious idea is given new force by eighteenth-century astronomy. Later in the century the new geology brought fresh evidence of the mutability of nature, and introduced the scale of geological time. The results are vividly shown in Tennyson:

There rolls the deep where grew the tree.
 O earth, what changes hast thou seen!
 There where the long street roars hath been
 The stillness of the central sea.

The hills are shadows, and they flow
 From form to form, and nothing stands;
 They melt like mist, the solid lands,
 Like clouds they shape themselves and go.

It is as if the poet sees geological change accelerated so that the surface of the earth floats and shifts, and man makes only a momentary flicker in the unstable flow. The only escape from the meaninglessness of the flux is to challenge the reality of time. To the Christian view of eternity as timeless, Tennyson and Browning could add the Kantian view of time as subjective; Tennyson has his Princess Ida say:

Let there be light and there was light: 'tis so:
 For was, and is, and will be, are but is;
 And all creation is one act at once,
 The birth of light: but we that are not all,
 As parts can see but parts, now this, now that,
 And live, perforce, from thought to thought, and make
 One act a phantom of succession: thus
 Our weakness somehow shapes the shadow, Time;
 But in the shadow will we work. . . .

Browning often voices similar doctrines. But with the twentieth century, science itself began to revise its notions of time, and to provide the poets again with satisfactory modes of resolving the paradoxes of linear time, as T. S. Eliot illustrates.

Apart from those scientific ideas which affect the poet's view of time and change, the two scientific concepts most important for poetry have been the Newtonian physics and the concept of evolution. Again, these are important because they carry with them implications which link them to those ideas about man and nature that are the poet's permanent concern. The great outpouring of Newtonian poems in the eighteenth century had a uniform theme; Thomson's lines will illustrate:

With what an awful world-revolving power
 Were first th' unwieldy planets launch'd along
 Th' illimitable void! Thus to remain,
 Amid the flux of many thousand years. . . ,
 Firm, unremitting, matchless in their course;
 To the kind-temper'd change of night and day,
 And of the seasons ever stealing round,
 Minutely faithful: such th' all-perfect Hand!
 That pois'd, impels, and rules the steady whole. . . .
 How shall I then attempt to sing of Him!
 Who, Light himself, in uncreated light
 Invested deep, dwells awefully retir'd. . . ;
 Whose single smile has, from the first of time,
 Fill'd overflowing, all those lamps of Heaven,
 That beam for ever through the boundless sky:
 But, should he hide his face, th' astonish'd Sun,
 And all the extinguish'd stars, would loosening reel
 Wide from their spheres, and Chaos come again.

This is the religious Newtonianism of Newton himself; the poet is stirred by the contemplation of the divine order and power confirmed by science, though known before.

The idea of evolution forms a main element in nineteenth-century thought, and appears, associated with quite different philosophies, in the works of such poets as Tennyson, Browning, Meredith, and Hardy. If I had space, it would be interesting to show the different sets of implications used by these poets, and the various ways in which they fit evolutionary ideas into their general poetic patterns. It would be pleasant, too, to discuss what is, I believe, one of the few successful long scientific poems in English, Bridges' *Testament of Beauty*. It represents a type of philosophical and scientific poem for which Lucretius set the pattern, but which is rarely produced. It seems likely that the composition of such a poem calls for very special conditions, as well, perhaps, as a special poetic ability. Bridges' poem comes at the end of a century during which new scientific ideas had at first disturbed element after element in general thought, but had at last reached a point not only of acceptance through familiarity, but of relative stability with other areas of thought. The

comprehensive range of the poem, and its tranquillity, mark the fruits of a century of conflict. Even as Bridges wrote, new strains of scientific thought, and shifts of scientific emphasis, were beginning to disturb the whole pattern; the world of atomic physics, of relativity, was replacing the world of geology and descriptive biology, of evolution. No new stability is yet possible, and we see in poetry (Christopher Fry's, for example) a return to the quick glancing wit and allusive symbol of the metaphysicals, who wrote in that earlier age of new science, fascinated by novelty.

What I have tried to suggest is that scientific ideas can be readily and immediately useful as a form of intellectual imagery and for analogy; that in course of time they can fuse with and enrich traditional symbols; that direct presentation of scientific fact is perhaps never suitable for poetry, but that major scientific concepts, insofar as they impinge on areas of general thought, play a major part in poetry; and that finally, at very rare moments of stability, given the proper poet, a long philosophical and scientific poem is possible. The poet's concern with science must be, however, part of his more general concern; he will always approach science, not as scientist, but as poet.

Wordsworth (in his Preface of 1800) summed up the conditions that make science available as a major resource for the poet: "The remotest discoveries of the Chemist, the Botanist, or Mineralogist, will be as proper objects of the Poet's art as any upon which it can be employed, if the time should ever come when these things shall be familiar to us, and the relations under which they are contemplated by the followers of these respective sciences shall be manifestly and palpably material to us as enjoying and suffering beings."

Poetry and science, as major human activities, both proceeding from man's restless effort to know himself and his world, are inevitably related.