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## *Pattern in Chaos: John Banville's Scientific Art*

by BRIAN MCILROY

I think that the illustration of the scientific method as it applies to chaos theory properly stresses the important element of play in creative activity. But any other growing point of science or the arts would exhibit this same vital element. We need to play because logic is such a feeble and restricting tool. Play liberates the imagination, throwing truly surprising things into the air. The trick—and it is a very difficult trick—is to pick the significant from the trivial in the grab bag of novelties brought to light by play. This requires that the creative individual—scientist or artist—be alert to subtle symmetries. We can find only what we are looking for. What we are looking for, if it is to have importance, should be based on insights that extend beyond the corner of the laboratory or studio where we engage in our work. We are guided in our assessment of what is or is not significant by all that has been revealed to us in every branch of contemporary culture. Whether we are physicists or painters, mathematicians or musicians, we are children of our time.<sup>1</sup>

ALTHOUGH JOHN BANVILLE'S recent novels *The Book of Evidence* (1989) and *Ghosts* (1993) have cemented his reputation as a postmodernist writer, a label that emerged strongly with the novel *Mefisto* (1986) but which had often been applied to his earlier fictions, *Nightspawn* (1971) and *Birchwood* (1973), his unique contribution to Irish (and European) fiction is his scientific tetralogy. It seems to me that John Banville is a writer of major cultural significance because he bridges in his work science and art by exploring and nurturing analogies between fiction and scientific theory. His fictional scientific tetralogy makes an aesthetically challenging attempt to fuse renewed notions of science and scientific figures with renewed artistic forms.

In fact, *Doctor Copernicus* (1976), *Kepler* (1981), *The Newton Letter* (1982) and *Mefisto* (1986) are doubly fictional. As a whole, the tetralogy argues that scientific theory comprises much fiction, and Banville's novels are, therefore, fictions which discuss an initial fiction. This "doubling" helps to explain the multiplicity of fictional techniques employed by the author. These include numerous competing narrative voices, which imply that there is no omniscient viewpoint, no unified theory of the universe. These narrative voices also help to imply that every new theory has to go through a societal testing procedure, which perforce can never be truly consistent or reliable.

The magnificent narrative power of his novels is explained not merely by the choice of great intellectual scientific figures as subjects of inquiry, but also by the richness of imagery, the detailed character analyses, the presentation of

1. John Polanyi, "The Magic of Science," *Bulletin: The Canadian Federation for the Humanities* 16. iii (Winter 1994): 10.

exceptionally controlled (though emotive) scenes, and the deliberate formal and technical challenges which the author sets the reader in each text's design. These techniques help the reader to uncover two major themes promoted by the tetralogy: (a) that major scientific advances have depended, and will depend in the future, just as much on passion, subjectivity, and irrationality as on detachment, objectivity, and rationality; and (b) that scientific paradigms are not stable but are constantly shifting. The process of paradigm change is particularly germane to Banville's tetralogy.<sup>2</sup>

Banville is, however, most interested in the creative mind of the scientist, astronomer, or mathematician, his life and times (*Doctor Copernicus* and *Kepler*), and his modern day influence (*The Newton Letter* and *Mefisto*). The novelist's writing is a movement of the subjective (defined here as experiential observation) into what has normally been regarded as the objective (defined here as experimental observation) domain of science. Fundamentally, experiential observations, since based on experience, are chaotic and disordered, rampant with conflicting personal emotions and feelings. By contrast, experimental observations are often linear in conception, since based on controlled conditions and hypotheses, and are therefore typified by method and rational inquiry. Naturally, when an experiment creates an unexpected result, the tendency of normal science is to dismiss it as an error. Banville's work emphasizes that the need for theory emerges from experience, while the formulation of a theory emerges from an act of creation. The social validation of a theory emerges only partly from experimental observation. "Extra-scientific" factors are important to a theory's origin, acceptance, and dissemination, issues which Banville's novels explore.<sup>3</sup>

In spite of the fact that theorists-historians of science Thomas Kuhn (*The Structure of Scientific Revolutions*) and Arthur Koestler (*The Sleepwalkers*) are mentioned by Banville as influences on his work, we may be better served to turn to a more contemporary figure. Gerald Holton's *The Thematic Origins of Scientific Thought: Kepler to Einstein* (1973; rev. ed., 1988) is deeply concerned with finding the theoretical framework within which one can account for scientific genius. Of particular interest to Holton is the "personal struggle" (a phrase appropriated from Einstein) of a scientist in the process of discovery. This "nascent phase" or "scientist-in-the-making," defined usually as the period before the tabulation of results (and before their announcement), is the creative or artistic side of science which Holton is convinced exists but which is often ignored or deliberately omitted from scientific commentary. As Holton explains:

2. For development of this idea, see my articles listed below in Works Cited.

3. The criticism of John Banville's fiction is marked generally by an unwillingness to take the writer's interest in science as an end in itself. The major critical summations may be categorized as follows: metafiction (Deane 1976, Imhof 1989, O'Neill 1991); poetic metaphors (O'Brien 1989, McMinn 1991); historical character studies (Molloy 1981); philosophical tracts (McCormack 1987); covert political broadsides (Outram 1988); and transitional modernist texts (Kearney 1988).

Most of the [scientific] publications are fairly straightforward reconstructions, implying a story of step-by-step progress along fairly logical chains, with simple interplay between experiment, theory and inherited concepts. Significantly, however, this is not true precisely of some of the most profound and seminal work. There we are more likely to see plainly the illogical, nonlinear, and therefore "irrational" elements that are juxtaposed to the logical nature of the concepts themselves. Cases abound that give evidence of the role of "unscientific" preconceptions, passionate motivations, varieties of temperament, intuitive leaps, serendipity or sheer bad luck, not to speak of the incredible tenacity with which certain ideas have been held despite the fact they conflicted with the plain experimental evidence, or the neglect of theories that would have quickly solved an experimental puzzle. None of these elements fit in with the conventional model of the scientist; they seem unlikely to yield to rational study; and yet they play a part in scientific work. (8)

This confused situation, unscientific in the normal sense, has led Holton to construct nine guidelines for the scholar historian of science to account for the uniqueness of scientific genius. For a literary/cultural critic of a fictional scientific biographical tetralogy, I believe these guidelines also help to construct solid connections between artistic and scientific modes of thinking and creation. Furthermore, what is valuable about these guidelines is that they presume we are interested in *individual* genius, not the teamwork which may be said to be the hallmark of modern (but perhaps mediocre) science. Holton provides nine guidelines to ensure that any reductionist argument may be offset. In effect, the narrators of Banville's works are scientific biographers and autobiographers who consider, perhaps unconsciously, the following parameters important.

The first guideline for the biographer is to establish what "facts," "techniques," and "theories" were current at the time of the scientist's discoveries, both in his own work and in his contemporaries'.<sup>4</sup> For example, Copernicus had to grapple with contemporaries who held Ptolemy's theory of the heavens sacrosanct. Second, the biographer must establish the temporal continuities and discontinuities of ideas which are pertinent to the scientist's discoveries. This guideline includes antecedents and parallel developments. For example, Einstein's "revolutionary" Relativity paper of 1905 had its close antecedents (some would say parallel development) in papers by Lorentz and Poincaré in 1904.<sup>5</sup> Third, the biographer must utilize the scientist's letters, draft reports, and reminiscences, to look for the development of a unique idea. For instance, Bernstein's biography of Einstein (1973) highlights the merging of experiment by quoting from Einstein's writings. In 1940, Einstein wrote: "Science without religion is lame, religion without science is blind" (quoted by Holton, 21).

Fourth, the biographer, if he believes in individual genius, should be able to trace connections between the scientist's boyhood and his later achievements. Bernstein, for example, finds it significant that in Einstein's youth, the two most vivid impressions on him were (a) that the compass needle always pointed north (a fact); and (b) the utility of Euclidean geometry (a believable fiction). The merging of these two impressions and their development strike Bernstein as relevant to the progress of Einstein's thinking of relativity. Fifth, the biographer

4. I use the masculine pronoun exclusively in this essay, since Banville concentrates on male scientific figures.

5. See Holton (1988), 197-201.

must stress the scientist's psychobiographical progress, or how his public work grows out of his personality. The classic case is Kepler, whose manic scientific writings dwell often more on his own mistakes than on his successes.<sup>6</sup> Sixth, the biographer must make allowances for the influence of political and ideological conflicts in his immediate environment. Einstein appeared to dismiss political influences when he remarked that science did not progress "somewhat like the *coups d'état* in some of the smaller, unstable republics" (quoted by Holton, 198). But a biographer may beg to differ.

Seventh, the biographer must be clear about the influences upon the scientist which emanate from his social setting (including his working conditions and his colleagues) and from the various links between science and social policy. Kepler was undeniably influenced by Tycho Brahe's rigorous belief in observational accuracy; and Galileo suffered from political and religious bodies not yet ready to accept as policy his scientific observations and theories. Eighth, the biographer should seek out the philosophical assumptions behind the published writings of the scientific genius. If Renée Weber (1986) is correct, most scientific geniuses believe that there is hidden beauty and order in the world. Ninth, the biographer should establish and analyse the scientist's presuppositions. It is useful to know, for instance, that Newton believed that all absolutes of space and time were to be found in God. Therefore, certain questions need not be asked or worried about.

Holton is wise enough to accept that any list such as the above has elements of artificiality and overlapping scenarios. Nevertheless, such guidelines make us understand more fully the difficult task of Banville's narrators in depicting genius, both in mainly biographical fiction (*Doctor Copernicus* and *Kepler*) and in autobiographical fiction (*The Newton Letter* and *Mefisto*). For Holton, establishing genius can be reduced to discerning the major guiding principles of an individual scientist.

Holton provides a good general framework within which we can, as critics of Banville's work, clearly see that psychobiographical factors, loosely defined, are quintessential to understanding scientific genius. Lest it be thought that, in real life, subjective concerns do not seriously affect scientific "progress," we have only to look at Max Planck's *Scientific Autobiography* (1949). Not surprisingly, Banville refers to this scientist, though in a fictional context.<sup>7</sup> Planck relates many personal battles to have his theories on entropy and thermodynamics accepted, and concludes with the wisdom of a sage: "A new scientific truth does not triumph by convincing its opponents and making them see the light, but rather because its opponents eventually die, and a new generation grows up that is familiar with it" (33-34). The struggle for recognition also bedevils Banville's Copernicus and Kepler.

Banville's narrators seem to probe further than Holton's initial excavations. Not only is "science-in-the-making" explored, so is the process of justification

6. See Holton (1988), 53-54.

7. See *Doctor Copernicus*, 208.

and verification of theory in the social, political and religious realms. Recent reviews of Holton's 1988 edition point to this glaring absence:

Holton uses his detailed case-studies to show the influence of ideas on scientists and to search for precursors to the emergence of the ideas of figures such as Albert Einstein and Bohr. A more modern concern would be to try to show how the experimental and theoretical version of the world constructed by Bohr and Einstein were themselves shaped, endorsed and negotiated in the social realm.<sup>8</sup>

One suspects that Banville has chanced upon this debate which is now at the forefront of critical work on the history of science, by the very fact that fiction bears an uncanny resemblance to the way that certain guiding principles are supported in the real world—what Pinch sees as “versions of the world.” This point seems confirmed in *Doctor Copernicus* when Emperor Albrecht (who deals with the practical world) tells Nicolas (who would prefer to deal with the abstract world of theory) that what they share as geniuses is the making of “supreme fictions.”<sup>9</sup>

The texts of the tetralogy interrogate our understanding of science and mathematics. Banville chooses to write “superbiographies” and autobiographies of scientific and mathematical geniuses. This is not merely another great-man theory of history, but an attempt to use fiction to tell a more “realistic” story of how seminal discoveries are made and, perhaps more importantly, how these discoveries are supported and defended in the marketplace: what Trevor Pinch calls the “social negotiation” of science.

Banville is convinced that the artistic and scientific modes are very similar, and sets out to show how extra-scientific factors, artistic and cultural contexts, have a major bearing on a scientist's thinking.<sup>10</sup> The tetralogy implies that scientific theories comprise many fictions, necessary fictions, for major work to be achieved. Each of these scientific figures is approached culturally by Banville, as if a wide social net has been cast. The subject-object divide is tackled with particular reference to the role of experience, experiment, reason, and intuition in a scientist's thinking and working life.

Banville takes great pains to integrate history, politics, religion, sexuality and theory in describing these scientists' Einsteinian “personal struggle,” their “science-in-the-making,” and their “science-in-its-justification.” This is why in the first novel of the tetralogy the concentration is on the formative factors of Copernicus' early life which go some way to explain the kind of “discoveries” and “breakthroughs” associated with the great heliocentrist. Much in the same way, *Kepler* alights upon the way such factors as astrology and dreams have an important structuring influence on Kepler's more serious astronomy and laws of planetary motion. Both Copernicus and Kepler strive to create harmonious systems while aware that they have incorporated a great deal of “subjectivity”

8. Trevor Pinch, “Shaping Science,” *Times Higher Educational Supplement*, 26 August, 1988: 18.

9. See *Doctor Copernicus*, 149. The term “supreme fictions” comes, of course, from the poetry of Wallace Stevens.

10. See Banville, “Physics and Fiction,” *The New York Times Book Review*, 21 April, 1985: 1, 41-42.

into their science, whether in the form of selective data or inadequately tested theory. Banville seeks to show how these "creations" are typical in the way that science is negotiated in the world—how false paradigms may have excellent currency.

*The Newton Letter* and *Mefisto* are autobiographical reminiscences, apparently far more fictional in intent than *Doctor Copernicus* and *Kepler*. Yet both show scientific figures wrestling with their subjectivity, not that much different from the tetralogy's first two works. The added problem of shifting paradigms is investigated in *The Newton Letter* through the fictional letter written by Newton to John Locke. It taps into every scientist's fear that new data may emerge, or an anomaly may refuse to be explained, thereby requiring a total renunciation of one's previous work.

*Mefisto*'s refrain, "Cancel, cancel, and begin again," could be said to strike at the heart of every scientific and mathematical theorist. The work's division into two implies a rebirth of theory to accommodate a new political and social setting. In this novel Banville utilizes recent scientific theory, including the science of chaos. Chance and randomness abound to the point that TOE (Theory of Everything) is consistently under some kind of erasure. The asymmetrical formal patterns which are discernible in the novel reinforce Gerald Holton's conviction that the writings of scientists unrealistically convey systems of beauty and elegance from very inelegant data. Nonetheless, these same scientists employ creative play to seek the "magic" that customarily is rewarded with universal recognition and even a Nobel prize.

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