SCIENTIFIC ART: THE TETRALOGY OF JOHN BANVILLE

by

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Abstract

The main thesis of this study is that John Banville's fictional scientific tetralogy makes an aesthetically challenging attempt to fuse renewed popular notions of science and scientific figures with renewed artistic forms. Banville is most interested in the creative mind of the scientist, astronomer, or mathematician, his life and times in Doctor Copernicus (1976) and Kepler (1981), and his modern day influence in The Newton Letter (1982) and Mefisto (1986). The novelist's writing is a movement of the subjective into what has normally been regarded as the objective domain of science.

Chapter one gives a critical overview of the present state of Banville scholarship. It reveals that despite his focus on scientists, the novelist rarely invites more than narrow literary approaches. Chapter two discusses the cultural context of relations between science and literature. The theories of Gerald Holton on scientific history, of Arthur Koestler on creativity, and of Thomas Kuhn on paradigm change are shown to be germane to Banville's tetralogy. These theories support the general methodology throughout the dissertation.

Chapter three examines the creation of the scientific genius Doctor Copernicus. In particular, the following areas are examined: the scientist's boyhood; the influences of his family, friends and colleagues; the link between science and public policy; the scientist's living and working conditions; and the scientist's thematic presuppositions. Chapter four continues the exploration of the social and artistic process of science with regard to the astronomer Kepler. This chapter's discussion of the brotherhood of science, astrology, physicalization, religion and dreams inevitably raises questions about the role of the scientist in society and how his ideas are developed.

Chapter five reveals the importance of the extra-scientific factors that go into the composition of any purportedly objective science. In The Newton Letter, both the great English scientist and his Irish biographer seem to suffer from similar paradigm shifts. Chapter six on Mefisto argues that recent scientific theory, including the science of chaos, informs the work, particularly with regard to the notions of symmetry and asymmetry. Chapter seven concludes by advancing the argument that Banville's work is a much needed contribution to Irish culture, which has tended to ignore the social potential of science.

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Chapter One: Introduction

The main thesis of this study is that the novelist John Banville 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. 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 (à la Darwin), which perforce can never be truly objective.

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 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 advanced 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, "universally recognized scientific achievements that for a time provide model problems and solutions to a community of practitioners," are not stable but are constantly shifting (Kuhn 1970, viii). The examination of the process of paradigm change is particularly germane to Banville's tetralogy.

Banville is 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. 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.

This introductory chapter reviews the previous criticism on Banville's work and establishes that the scientific element in the Irish writer's fiction has been, more often than not, glossed over by narrow literary approaches. This introduction concludes by briefly outlining the character and content of my six subsequent chapters, which attempt to travel some way to redress the critical imbalance mentioned above.

The criticism so far of John Banville's fiction is marked generally by an unwillingness on the part of critics to take the writer's interest in science as an end in itself. The major critical summations of Banville's novels may be categorized as follows: metafictions (Deane 1977 and Imhof 1989), poetic metaphors (McMinn 1988 and O'Brien 1989), historical character studies (Molloy 1981), philosophical tracts (McCormack 1987), covert political broadsides (Outram 1988) and transitional modernist texts (Kearney 1988). As I proceed in this discussion, I hope it will be apparent to the reader that when I stress certain

critics' "blind spots," it is in an effort to push the "science debate," however loosely defined, to the forefront of attention.

1. Critical Overview

It is testimony to John Banville's precociousness and talent that the first significant article on his work was written by Seamus Deane, a critic who has consistently cleared a pathway for much advanced criticism in Irish studies. Deane (1976) has set the agenda of inquiry on Banville's first three books. Although I do not dwell on Long Lankin (1970), Nightspawn (1971), and Birchwood (1973) in this dissertation, it is instructive to examine the early development of Banville criticism, since it has clouded consideration of the later tetralogy.

Deane highlights the self-consciousness of Banville's style, its anti-realism, its obvious influences--Nabokov, Green, Hesse, Barth, Borges--and its preoccupation with memory. Deane's observation that Banville chooses to write in the first person but in the past tense to communicate the sense of loss which any recounting excites is appropriate to the later tetralogy. Deane believes that the essential chasm in the first three books is that between the writer and his audience, rather than between the writer and his material.

In Deane's literary map, Banville's work belongs to a

Romantic tradition which ipso facto "possesses" (331) its own products (i.e. self-consuming, self-obsessive). To Deane, the observable worlds as described by the 'I' discourses in the novels are dream-like, either engulfed in or apart from the observed world. Pursuing briefly the Nabokovian narcissism, the critic stresses that Banville's writing "strikes me as being a prolegomena [sic] to a fiction, rather than a fiction itself" (332). The constant foreshadowing and the defamiliarization of narrative techniques make, therefore, for an uneasy read. Most notable to Deane is the self-reflexive narrator in Birchwood, who tells us after a long description, "This is how I remember such scenes. If I provide something otherwise than this, be asssured that I am inventing" (qtd. Deane 333). With reference to specific images, Deane seizes those of the "mirror" and the "prism". These images are unsettling but truthful vehicles of meaning, emerging more forcefully in the tetralogy.

Not surprisingly Deane, himself an acute political critic, categorizes Banville in the ostensibly apolitical, experimental group of Irish writers which includes Joyce, O'Brien, and Beckett. But Deane would like to argue that such deviation from obvious Irish political subject matter is merely a sign of political disillusion and dissatisfaction with the mores of Irish society. Nightspawn's Greek political intrigue is thus possibly an allegory of Ireland's simmering political scene. But the

analogy does not grasp fully the central topic of Nightspawn: a writer's narcissism.

Deane seems, however, to be right on target when he distinguishes the literary technique of Joyce's A Portrait of the Artist as a Young Man (1916) from Banville's Nightspawn and "The Possessed" [the long short story in Long Lankin]. Whereas Joyce's narrator never ceases to pass ironic judgment on Stephen, Banville's narrator appears to make allowances for Ben's youthfulness. If indeed, as Deane claims, Nightspawn and "The Possessed" "fail," it is because of this lack of distance. Significantly, Banville removed "The Possessed" from the Gallery Press (1984) reissue of Long Lankin, and Nightspawn has never been reprinted.

What Deane feels is lacking in the first two books is almost redeemed by Birchwood, in which "phantasmagoria has all the presence of a reality" (337). To Deane and subsequent critics, Birchwood is so diverse and diverting that political and metaphysical readings are equally possible. Deane considers the achronological narrative to be indicative of the nonlinear systems with which Banville's imagination seems to be infused. Timelessness and dislocation strike Deane as Banville's main themes, but a satisfying theoretical model to place the novelist's work eludes the critic.

Five years elapsed without any further significant criticism on Banville, but in 1981 there came an Irish University Review special issue devoted to the author,

including an interview, an extract from The Newton Letter, a transcript of a talk given by Banville at a writer's conference, and two academic articles written by Rudiger Imhof and Francis C. Molloy. Since Imhof has reworked his article into his recent book, I will leave consideration of his views until the end of this chapter.

Molloy's article, "The Search for Truth: The Fiction of John Banville" (1981), begins by arguing that Banville's fiction is a "fabulation" as defined by Robert Scholes in The Fabulators (1967). This concept of fabulation is another way of looking at the artistic and self-conscious nature of Banville's work. Molloy sees a movement from the fabulation of the first three books to something more substantive, in terms of ideas, in Doctor Copernicus. This belief leads Molloy to consider the work of the first four books as essentially a search for truth in a world full of derivations. Molloy stresses that Banville is an international writer, loath to take up Irish subject matter. He also believes the author's own pronouncements in an untranscribed RTE broadcast interview on 15 April 1976 that a writer should not be directly involved in social and political issues: "He has always been more interested in form than content and has never believed that fiction should deal with social, domestic or political affairs" (30). Although Kepler, The Newton Letter, and Mefisto had still to come, Molloy undervalues the very political and social debates evident in Doctor Copernicus.

To Molloy, Ben White's role in "The Possessed" is to achieve liberty and freedom. This pursuit is followed up in Nightspawn, but Molloy is highly critical of the elaborate verbal and intertextual references which strike him as forced. He considers valuable, however, Ben White's seeking of beauty and perfect love, like Aschenbach in Death in Venice. The critic could have said that the search for beauty or elegance may be read as an artistic and scientific pattern necessary for creativity. To my mind, Birchwood is a more successful work, which seeks to establish some absolute values. At the very least, it is a novel that successfully poses the most perceptive questions about the chaos of experience. In particular, Birchwood, as Molloy remarks, constantly admits to the inadequacy of memory. This inadequacy therefore debilitates any historical reading of the text, since "facts" are often regarded as relative in the hands of a first person narrator.

Molloy brings to bear a comment made by the author in the RTE interview mentioned above: that science today must employ the imagination of an artist to be convincing. Hence Banville's interest in major scientific figures who, he believes, worked with specific images in mind. Molloy is happy to move away from the first three books and applaud the historical homework which Banville has obviously done in preparation for Doctor Copernicus because:

> Ultimately, however, a novelist writing fictions about writing fiction is taking his talents up what has been called a 'literary cul-de-sac'. There is too much concern for technique, for the creation of special atmospheres and the construction of literary pastiches. There is not enough substance. Banville has apparently recognized that his talents might be better employed. In Doctor Copernicus he has embarked on a new literary venture, one that promises to be most rewarding. (44-45)

Molloy is concerned to stress the centrality of Nicolas Copernicus to the text, to see the fiction as a novel of character with an historical framework, and the plot as merely the way Banville sets up oppositions or obstacles in front of the hero. Molloy seems most perceptive in commenting that Copernicus regards intuition as one way to glimpse the Truth, although to express this concept in words and in writing is quite another matter. Put another way, intuition (understood here in Banville's tetralogy as a nonlinear, pre-verbal, dream-like vision), can only be held in the mind for a short period, after which only scraps of the entirety of that vision can be relayed to the outside world via speech and text. Molloy sees Andreas, Copernicus' brother, and Rheticus, Copernicus' disciple, as important foils to the astronomer's overexcited mind in this process. Unfortunately, the critic does not develop these notions, nor does he suggest how they relate to scientific creativity.

Molloy regards Doctor Copernicus as a "limited achievement" (50) because he agrees with a review by Seamus Deane (1977) that Copernicus is not portrayed as a genius. [1] Molloy accepts that the introduction of detailed technical information would hold up the narrative, but he believes such an omission leads to a lack of explanation why Copernicus is regarded as brilliant. I agree, but one could say the same about the various portrayals of Jesus in the New Testament. Another "weakness," to Molloy's mind, is the overuse of intratextual and extratextual references, particularly that of Wallace Stevens's "Notes on a Supreme Fiction." One can not help feeling that Molloy is at home with a traditional historical novel. Consistent with this view, Molloy says little about the Rheticus section or narrative techniques as a whole in Doctor Copernicus. Molloy's likes and dislikes of Banville's imagery—he finds the use of "blue" a cliché—are unargued.

However, Molloy has rightly, in my view, established that Banville's work lies neither in the avant-garde camp of postmodernism nor in the camp of traditional realist aesthetics. This view is supported by Banville's own writings on the subject and by his reviews of contemporary novels for the Irish journal Hibernia. In a talk delivered to the International Writing Programme at the University of Iowa City in December 1980, Banville remarked:

> Modernism has run its course. So, also, for that

> matter, has post-modernism. I believe, at least I hope, that we are on the threshold of a new ism, a new synthesis. What will it be? I do not know. But I hope it will be an art which is honest enough to despair and yet go on; rigorous and controlled, cool and yet passionate, without delusions, aware of its own possibilities and its own limits; an art which knows that truth is arbitrary, that reality is multifarious,that language is not a clear lens. ("A Talk" 17)

In a review of John Sturrock's Paper Tigers: The Ideal Fictions of Jorge Luis Borges, Banville wrote:

> The great works of modernism and neo-modernism are precisely those in which classicism masquerades as romanticism. . . . I would not dream of arguing for confessional, "realist" writing against the purely literary, but the great failure of the nouveau roman is that it is unable to to deal adequately, in a way that measures up to daily experience, with ordinary things, while yet, also, it excludes ideas.
>
> ("Enigma Variations" 22)

The scientific endeavour mediated in Banville's fiction lies somewhere between postmodernism and modernism (degrees of experiment) and realism (degrees of experience). Since Banville's protagonists struggle with finding threads between theory and experience, it is fitting that the fictional techniques reflect this unease, and do not settle into any one aesthetic. What is missing in Molloy's work is such a theoretical framework to account for the periodic narrative experiments in Doctor Copernicus which approximate periodic scientific creativity.

The appearance of the IUR special issue, which I believe was premature, seemed to prevent further critical

comment until Banville's tetralogy was complete. The first truly provocative overview of the tetralogy is that by David McCormack (1987) in a review article on Mefisto. McCormack stresses the despair of Banville's writing. Literary despair is revealed by the self-conscious writing; philosophical despair is revealed by the crevasse between word and thing. McCormack mentions the conflicting poles of Cartesian dualism and Wittgensteinian despair. The latter wins out because Banville's work argues that science is a fiction making process to "save the phenomena." McCormack does admit, however, that with The Newton Letter the Wittgensteinian despair is not present as it is in Doctor Copernicus and Kepler. In fact, the narrator in that novella is able to progress with hope, though a cautious and questioning one. This philosophical approach by McCormack is limiting to the extent that it sidelines a debate about scientific creativity and its resemblance to artistic creativity.

Mefisto is viewed by McCormack as an amalgam of themes present in the previous works: the inadequacy of memory, archetypal figures, and the fascination with symmetries and asymmetries. McCormack sees the mathematical emphasis as Gabriel's way of denying human experience. The novel, for this critic, relates its tortured tale by recourse to a number of oppositions: presence/absence, order/chaos, word/thing. A closet deconstructionist, McCormack explains the asymmetry of Mefisto as intended

to ensure that the reader is not allowed to forget that fiction is a form of criticism as well as an imagined world. McCormack's point that Mefisto is a nonlinear system is an excellent one, but remains undeveloped or proven by example.

Molloy and McCormack eschew dealing with the "scientific content" of the tetralogy. This attitude is rejected by Dorinda Outram's essay, "Banville, Science and Religion: Heavenly Bodies and Logical Minds" (1988) Outram is the first to pose the obvious question: why is Banville's work, apart from Ronan Sheehan's short story, "The Boy with An Injured Eye" (1983), unique in contemporary Irish writing in addressing a scientific vocation as subject matter? Outram believes Banville is attracted to this scientific subject because it promotes "personal autonomy," as Outram believes that personal autonomy is necessary for science to prosper. For Outram, the most interesting text so far is The Newton Letter because the narrator does not improve his ability to have a clear "gaze" of the observable world by the end of the fiction. No maturation has occurred (it might be argued each text reveals this tendency). Rather, Banville's fictions explore the limits of subjectivity in a purportedly rational world.

Perhaps of more general substance is Outram's belief that Ireland's failure to modernize in the twentieth century is due in part to the attitude taken by society and institutions towards the role of science. With science understood as rational and objective and yet with the power

to confound religion, it is curious that little work has been written on the interface (if it exists) between the two in Ireland. Outram establishes that individual autonomy has often been associated with science, but in Ireland the nineteenth century advances of (mainly Protestant) scientists, such as mathematician William Rowan Hamilton, were halted this century simply because the Irish Free State was unwilling to invest in the costly equipment modern science demands. Outram raises the issue that the nationalist cause could not stomach criticism of the Roman Catholic Church, and science threatened to do just that. Essentially, science was a Protestant, Ascendancy—influenced pursuit. It did not conform to what Outram calls the "national heritage." As she continues:

> that national heritage was already one conceived in terms of fundamental binary pairs of opposites: as republican, not monarchist; as conservative and therefore not modernising; as culturally monolithic, opposed to the pluralist cultures of the rest of the West; and through a combination of all these factors, based on history, folklore and literature, rather than on science . . . . (10—11)

Ultimately, the state validated romanticism over realism. In the absence of (1) a fully endorsed state policy and (2) a Roman Catholic Church document giving approval, science remains in Ireland, even today, a peripheral activity. Outram believes that Banville's works are a concerted attempt to cast in doubt the monolithic nationalist culture.

He has set up, in Outram's words, "a counter-novel, a counter-mythology" (11) which valorizes individual subjectivity and autonomy. Other writers, like Joyce and Beckett, have equally concentrated on individual subjectivity, but without the scientific emphasis (despite Joyce's aborted medical training). Outram's essay ends with the thought that because Ireland has not fully accepted the ideas of the Enlightenment, stretching back to the 18th century, it can hardly expect its populace to embrace a modernization programme. That is to say, no cultural preparation has been made for societal change. Part of this cultural activity would certainly include Banville's analysis of the scientific pursuit as well as a reassessment of science and public and religious policy.

Outram's essay is brief but provocative. Its thesis has more to say about sociology than literary criticism. However, it is arguable that between literature and science, we must have a sociology. As Wolf Lepenies (1988) has written:

> The problem of sociology is that, although it may imitate the natural sciences, it can never become a true natural science of society, but if it abandons its scientific orientation it draws perilously close to literature.
>
> Sociology's precarious situation as a kind of 'third culture' between the natural sciences on the one hand and literature and the humanities on the other was exacerbated by the fact that the intellectual traditions of the Enlightenment and the Counter-Enlightenment struggled with one another over its destiny. (7)

Banville's tetralogy can then be seen on one level as a fictional sociology. This view seems to me to be a natural extension of Outram's thesis.

Outram's notion of a "counter mythology" is expanded by Richard Kearney in his book Transitions: Narratives in Modern Irish Culture (1988). One of his chapters, "A Crisis of Fiction," attempts to give a theoretical underpinning to the "modernism" of Flann O'Brien, Francis Stuart, and John Banville. According to Kearney, these writers believe that Joyce and Beckett have transformed the novel from quest narratives to self-questioning narratives. It follows, then, that it is no longer possible to be satisfied with "conventional realist" fiction. One must experiment. Kearney finds it significant that at the beginning and end of Birchwood, the narrator refers to Descartes and Wittgenstein, masters of reasoned doubt. These philosophical influences help Banville, among other things, to deconstruct the orthodoxies of the Big House novel. Kearney believes that Banville's switch to European medievalism is an effort to deal with what the critic regards as the modernist "crisis of imagination" (93) in deciding between "history" and "fact." But this medievalism, in fact, may push us into a very localized culture of competing statelets, somewhat similar to Ireland. I discuss this parallel in my final chapter.

To Kearney, Doctor Copernicus exemplifies that scientific knowledge relies on creative leaps of faith not unlike those of the creative artist: "In short, science cannot reach towards the truth of reality except through the prism of art" (94). Kepler is viewed, with all its fragmented narrative experiments, as a text which conveys the extreme uncertainties and excitement of scientific discovery. This emphasis on "dream-intuition" as part and parcel of the scientific process is Kearney's main "scientific" comment about this second work. The Newton Letter attracts Kearney in particular because it "interrogates the very nature of story-telling in the double sense of the narrative form of the writing and the imaginative powers of the writer" (96). More simply, the idea of having a first person narrator who is also a writer confuses the (traditional) distances between and among the implied author, the narrator, the character, and the subject. Kearney repeats Deane's comment on the early novels that the text is intentionally written in the past tense to emphasize narrative incoherence. As Kearney expounds:

> The beginning of the novel thus bespeaks the ending; and the entire intervening nar[r]ative is written retrospectively in the past tense; that is, in the form of a reminiscence which would explain the narrator's own failed quest for narrative coherence. (97)

This incoherence is related to the "Interlude" referred to in the book's subtitle and resonates outward to Newton's own period of breakdown in 1693. Mefisto strikes Kearney as another text which seeks to explode the long held "accredited distinction between scientific fact and poetic invention" (100). Kearney combines Banville with Neil Jordan and Aidan Higgins, writers who accept that there is a very real "crisis of narrative" (99). As a corollary to this, these critical counter-tradition novelists have purposely avoided direct confrontation with any sense of a national Irish literature. As the critic remarks:

> It has been left therefore to those in the mainstream tradition of realist Irish fiction--in particular O'Faolain, Kiely, McGahern, McLaverty and Plunkett--to provide narratives of contemporary Ireland's social history. (100)

What Kearney means is that a post-Joycean synthesis in contemporary Irish fiction has still to arrive, something which will go beyond the "critical" work of Banville and the "realist" work of O'Faolain. I am surprised at Kearney's categorization of Banville completely in this anti-realist camp, since the tetralogy, to my mind, does attempt to bridge the gap between realist and avant-garde pyrotechnics. Although Kearney sees the general conjoining of literature and science, he is reluctant to view this kind of fiction as unique. What appears to Kearney as a crisis of narrative

may merely be the result of his inability to see unusual narrative forms complementing an unusual subject: science.

If such syncretic creative writing has taken root, then certainly syncretic criticism has not. Joseph McMinn is currently writing a book on Banville. He has published two articles already that reveal his desire to situate the tetralogy and earlier works in a decidedly literary and Irish context. The first article, "An Exalted Naming: The Poetical Fictions of John Banville" (1988), argues that Banville's fiction derives its force from its poetic design. Although the fictions appear to privilege modernist techniques, McMinn believes that an inherent Romantic sensibility rules the skepticism which is so overt.

McMinn focusses on certain themes: the narrators' attempts to impose order on a highly disruptive past; the confrontations with the real, everyday world which contradict or question intellectual contemplation; and the inadequacy of language systems to explain phenomena. McMinn further emphasizes the importance of Rilke's "silence" as a pathway towards those very real and unspeakable entities which so fascinate and frustrate Banville's protagonists. According to McMinn, Banville's heroes are "tricked out of perception by knowledge" (22). This criticism is a repetition of Kearney's point about the importance of dream-intuition. By arguing that the astronomers are akin to Faustus and Frankenstein, McMinn desires to establish the Romantic strain in Banville's overall conception, so that he

can say the fictions are "a form of creative compensation" (23). McMinn stresses the importance of Rilke and Stevens as influences, and in so doing almost totally ignores the scientific content of the tetralogy.

McMinn's second article, "Stereotypical Images of Ireland in John Banville's fiction" (1988) develops the argument that the Big House, the Irish "gift of the gab," parody, and literary cliché are integral to Banville's revisionist project. Oddly, McMinn sees, where Deane and Kearney could not, specific Irishness in Banville's images of the hungry peasantry, the wealthy and idle ascendancy, and the "irrational savagery of Irish political history" (95). Not surprisingly, McMinn finds grist to his mill in Birchwood and The Newton Letter. The other three texts of the tetralogy are impenetrable to such a "realistic" interpretation. McMinn indirectly admits this limitation when he criticizes Mefisto as "disappointing" and "studied" (100). To McMinn, the novel fails because it "leaves no room for those redemptive moments of perception and joy which occur in Banville's best work" (101). When the critic begins to doubt the scheme that Banville has constructed in Mefisto—"It is also difficult to see why he [Gabriel] needs to be cast in the role of mathematical prodigy" (101)—the reader of the article wonders if McMinn's starting position is well chosen. This is all the more surprising since McMinn sees the essential aesthetic of the tetralogy very clearly: "Science cannot reproduce reality, only dream

versions of it. The same is true of literature and art." (98) Why McMinn chooses not to explore this obvious area is a mystery. He ends his article emphasizing the influence of Beckett and the belief that Banville's Irish scaffolding enables him to "ascend" to be a European writer.

George O'Brien's recent article, "John Banville: Portraits of the Artist" (1989) is a wide-ranging discussion of all Banville's novels. Like Imhof discussed below, O'Brien would like to see the novels connected through their intratextual and extratextual references. Nonetheless, the critic sides with McMinn and Deane when he states categorically:

> Banville's genre is the romance, the text of journeying to other worlds, to the world of the other; the text of desire, where the ideal called harmony is implored to realize itself; the text of the spirit's ardor and of the heart's vagaries. (162)

This assertion is fine in general terms, but relies upon the premise that Banville's protagonists are artists purely. O'Brien avoids consideration of the choice of scientific figures. He points out, as others have done, the strong Joycean parallels in the opening of Doctor Copernicus, yet he is unable to declare that the early sections of the fiction comprise "A Portrait of a Scientist as a Young Man." O'Brien clearly brings out some of the ironies of the tetralogy, although he underplays the scientific ramifications of his words:

> The magnitude of both [Copernicus and Kepler] these path-breakers' accomplishment is premised upon a good deal that has subsequently been proved wrong. Yet their incorrectness is for Banville perhaps more illuminating than their incontrovertibility, because in it lies the necessary fiction of all theory. Were it not for the flaws there would be no theory: were it not for the fiction that there were no flaws there would be no theory. (169)

This paradox is an excellent point, but it needs more attention. What O'Brien should say is that no new theory can exist without awareness of flaws or anomalies. Without applying this observation to the scientific content of the tetralogy, O'Brien underdetermines his thesis.

Whereas O'Brien finds Banville's work "too modishly indebted to antirealists" (172), and whereas McMinn finds an uneasy oscillation between Irishness and Europeanness, these very features have stimulated the writer of the first book devoted to the author. Rudiger Imhof's recent critical introduction to Banville (1989) combines new ideas with material published elsewhere in the last decade. [2] The following discussion may appear overlong on this one critic; however, since Imhof's views are from the literary mainstream, he deserves a full assessment.

Imhof has little time for the bulk of contemporary Irish fiction, which, to him conforms to the debilitating "mould of cosy realism" (7). He believes that such preponderance of realist aesthetics was due to the need to construct and then to consolidate a national identity.

Remarkably, Imhof believes that this construction is now complete. He thus finds it strange that only a few Irish writers, like John Banville, have sought to explore the various possibilities of the novel form with regard to non-Irish subject matter and literary indebtedness. Linear, sequential narrative is Imhof's bête noire. He has chastised the fiction of Jennifer Johnston, for example, and talks of the "compositional disaster" of John McGahern's The Leavetaking. [3] Imhof is fond of the scathing tone in dealing with writers of "limited" adventure; he is impatient with critics as well. Augustine Martin's The Genius of Irish Prose (1984) is dismissed as "unreliable and unrewarding" (9), not to mention its sins of omission; and if Richard Kearney thinks Banville and Stuart come from an Irish tradition, "he is of course wrong" (9). Imhof is referring here to Kearney's chapter in Transitions (1988) already discussed above.

Imhof fully believes that the intertextuality so evident in Banville's work is not a "weakening feature" as Deane asserts (1977 121), but an integral part of the literary project. Imhof steers clear of the murky pool of postmodernist theorizing, as swum by Ihab Hassan and others, in favour of seeing Banville simply as a post-Joycean/ Beckettian modernist. These "negative" comments leave us, therefore, with a shifting sense of Banville's work. To Imhof, Banville is intentionally resistant to

categorization, except insofar as he chooses a path away from realist aesthetics.

Imhof's first chapter, "A Principia of Sorts: Reflections on Art and the Novel," argues that Banville has been influenced by Henry James with regard to a novel's design or shape. Imhof believes Banville's theoretical statements, some of which I have already considered, concentrate on the appropriateness of style in the late twentieth century. This choice appears to be in Banville's case (and words) a mode of discourse which takes the position that all "art is action" (16). Banville is quoted as saying that novels are about life and, therefore, they teach us certain things. This is what is meant by action. To Imhof, Banville's art is, rather, "first and foremost about form" (17). In effect, this is a way of proposing that biographical criticism of Banville's work is unrewarding. Echoing McCormack, Imhof stresses the "never-ending process of failure" and the "redemptive despair" (18), both of which are readily apparent in the Irish writer's fiction.

For the most part, Imhof's seventeen pages on Long Lankin contain a merciless critique of the weaknesses of Banville's first book. It is not clear for what purpose such rigorous examination is written. Long Lankin is variously described as "disappointing" (30), "glib" and "seriously flawed" (31), "feckless" (32), and overall a "disaster" (35). I do not find these terms theoretically

acceptable. What is interesting in Imhof's analysis of the book is the apparent reliance by Banville on certain myths that one can extract from Frazer's The Golden Bough. Imhof clearly establishes that the Long Lankin or leper/interloper myth does not run successfully throughout, but it puts into sharp relief other myths, such as the ceremony of "carrying out Death" to ensure prosperity, which is evident in the middle section of the novella "The Possessed." Such myth-making and demythologizing occur frequently in Banville's oeuvre.

Imhof is only slightly more satisfied with Nightspawn. Undeniably, the novel lays bare its devices and, as the critic puts it, "Nightspawn was conceived of as a metafictional attack on the nineteenth century conventions of fiction" (40). The influences of Godwin, Eliot, Dostoyesvky, and the thriller genre strike Imhof as major. Surprisingly, the critic does not mention Thomas Pynchon and The Crying of Lot 49 (1966) in particular, when he observes that the main character, Ben White, "is forced into the role of a stupid ignorant pawn in a farcical game 'where nobody trusts anybody' (N 83). The reader's position is little better" (43). Imhof sees the intended "practical joke" nature of the novel, its parodies, its stylistic resemblance to Sterne's Tristram Shandy, its emphasis on process over product. Finally, Imhof believes the "godfathers" (52), Beckett and Nabokov, choke the novel's vitality. Ironically, though, Nightspawn's literariness seems to be

the strongest support of Imhof's general thesis on intertextuality.

Birchwood is a far more complex achievement with which to grapple. To Imhof, those readers who see it as a Big House novel or simply that of Ireland in chaos are "misguided" (53). Equally, Gabriel Godkin's quest is not for knowledge per se but for the possibility of memory in written form. In this sense, it is not surprising that Imhof promotes the influence of Proust, albeit Gabriel's conscious and voluntary memory discourse as distinct from Marcel's involuntary one. The whole issue of intertextuality, source and influence study, obviously fascinates Imhof. He finds it important to mention Dante, Descartes, Edgeworth, Eliot, Goethe, and Sheridan Le Fanu. He sees these writers' works helping Banville or Gabriel Godkin to foreground the art of fictionizing and to perplex the reader.

Less obfuscating and diffuse is Imhof's stressing that Birchwood conveys the importance of being satisfied with rare moments of clarity in a world of chaos. The latter is adumbrated by the parodic use of certain genres and devices: the Big House genre, the picaresque novel, the Gothic novel, the Doppelganger motif, the detective novel, and the Bildungsroman (or Entwicklungsroman, as Imhof prefers). Such parodies convey chaos by the simple fact of their disorientating effects on the reader. Imhof seems to divorce parody from specific genres. In other words, he

recognizes the parody of the Big House genre, but does not seem inclined to grant parody status as a form of transformation of any genre. Again, as he is on discussing Nightspawn, Imhof is aware of achrony or achronological narrative, but he does not fit this into any general metafictional framework, although he may have felt this is too obvious a point. Yet when Imhof states boldly that Birchwood "is, in the final analysis, about the literary, or artistic, imagination and about how the artistic imagination tries to come to grips with the world, life and truth" (72), we surely wonder, is this not what every novel is about?

Imhof asserts that in Doctor Copernicus two major themes are the inadequacy of language to express reality and the pursuit of the Kantian "thing-in-itself." Only thirdly is the novel about the astronomer and his life and times. From this vantage point, historical information is inserted merely "in order to draw a picture of the great astronomer as a sourpuss and a recluse" (74). Imhof does not concede that the historical tracing situates the paradigm changes at work. Imhof is sure that Doctor Copernicus is a "novel of ideas" but only after the first two themes mentioned above have been elaborated upon. Yet surely the novel is deeply concerned with the quest of substantiating or verifying intuitive ideas, particularly in relation to science.

On the linguistic issue, Imhof brings out the astronomer's awareness that language limits our world, determining our reality. To Imhof's mind, this perception

can be found in the work of philosophers Ludwig Wittgenstein and Fritz Mauthner (via Gershon Weiler 1970), language theorist Benjamin Whorf, and social theorist John Locke, all of whom consider our world circumscribed by language acquisition. For example, Fritz Mauthner argues, according to Imhof, that only by breaking the circle of our language can we get at the real world. But since this action is impossible, we are in a permanent state of loss or entropy. Certainly, the astronomer's attachment to the linden tree as sense impression first and then as a label or word bears this out.

A Catch—22 situation looms: if we are to approximate reality, then we must embrace silence, since it is the most "honest" way of dealing with inadequacy. Silence also reverberates with purity of intuition, an idea which Imhof does not develop. Rather, Imhof highlights "Mauthner's notion of the gaiety of resignation and renunciation [which] possesses a striking pertinency for Banville's 'life' of Koppernigk" (76).

Copernicus realizes the world is chaotic; nevertheless, he seeks order and harmony, in Imhof's view, by creating a supreme fiction. Imhof does not clearly establish that this is a late recognition on the part of Copernicus. Whereas Kepler lauds geometry and Gabriel Swan mathematics, Copernicus seeks merely an overall conception of a new science. This lack of focus on a methodology in Copernicus' way of working makes Imhof's job of unifying the tetralogy

very difficult. This unevenness is partly caused by Imhof's tendency to see trees in Kepler and Mefisto and only a wood in Doctor Copernicus (geometrical and mathematical details are clearer in Kepler and Mefisto than in Doctor Copernicus). What might have helped the critic out of this impasse was some consideration of the overall effect of shifting paradigms in the protagonist's era.

Imhof is fascinated by the intertextuality of Doctor Copernicus, particularly the "anachronistic quotations from Kierkegaard, Einstein, Eddington, Planck and Wallace Stevens" (81). These lines extracted from various works give Banville's novel a universal resonance as well as a way of looking at the "act of creation" (DC 85) which seems crucial to scientific advance. Imhof believes, with much basis, that Banville seeks to relate the scientific imagination to an artist's creative output. Artist and scientist grapple with similar problems. Specifically, the issues that arise out of dream, intuition, chance, and inspiration are rendered problematic.

What is less clear, then, is Imhof's belief that Banville senses that his protagonists must lead deeply unhappy lives for a modicum of scientific success. This neat sine qua non parallel is not sustained in Doctor Copernicus and particularly not in Kepler. By sin of omission, Imhof tries to solidify his point by quoting from The Newton Letter about those "high cold heroes who renounced the world and human happiness to pursue the big

game of the intellect" (NL 58), but he leaves out, significantly, the next line in the quotation—"A pretty picture—but hardly a true one." Imhof appears not to be convinced that Copernicus' "resignation" or "renunciation" (Mauthner's terms appropriated by Imhof) become less and less valid as we progress in our reading of the text. The critic is most concerned to establish the cold intellectual link between the act of creation and "supreme fictions." By doing so, Imhof tries to isolate science and ignore its necessary social negotiation.

Another area that is questionable in Imhof's account is his belief that Rheticus' section is totally unreliable. But once we look past the excitability of the first person discourse, we are hard put to it to find specific instances of deliberate fabrication (or fabrication that is not later admitted to). Even Imhof has to say that Rheticus "correctly asserts" (82) that the dynamism of Copernicus' theory was that it implied that the centre of the world was in a space some distance from the sun, in a void. Also, Imhof is not on strong ground, it seems to me, when he suggests that the novel implies that Rheticus was not a fully-fledged Copernican, that he was primarily a Ptolemaican. Surely Rheticus is speaking metaphorically, in agreement with Copernicus (and later Kepler), when he remarks "that this planet shall forever be the centre of all we know" (DC 180 & 220).

The most thorough analysis of a Banville novel by Imhof is his chapter on Kepler. The critic elevates the thematic issue of Kepler the man in relation to Kepler the astronomer to prime position, whereas a similar theme in his analysis of Doctor Copernicus only ranks third in priority. Imhof is perceptive in pointing out that dream–intuition, unconventional science, and inspiration are integral to Kepler's success. But for the most part, Imhof concentrates on the intricate formal patterning of the novel and Banville's Kepler vis-à-vis the historical Kepler. On the latter point, one senses that Imhof threatens at many points to confuse the two, to the point of quoting Koestler on Kepler, as if it directly applied to Banville's Kepler. In one instance, Imhof tells us that when Kepler and Tycho argued, they separated for three weeks and not one night as in the novel. "The deviation is important and, presumably, deliberate" (113) says Imhof, and yet in an endnote the critic inexplicably refers to the interval as three days and, more curiously, he admits "the recording of these deviations seems to be of limited value only" (184).

To be fair, Imhof makes an excellent point that Kepler is a misfit who pursues difficult areas of inquiry partly because of external chaos, as related by his financial problems, his marital ups and downs, his family's obtuseness, and his political ineptness. Also of much value is Imhof's overall sense that Kepler was a dreamer or mystic who utilized experimental data to form a beautiful, though

not necessarily accurate, theoretical system. The finely wrought compositional design of the novel, mirroring almost exactly the historical Kepler's five major works, particularly attracts Imhof's sense of order and harmony.

In turning to The Newton Letter, Imhof desires us to see the text as "A brilliant exercise in literary derivation" (140). Of particular importance in Imhof's reading is the influence of Henry James' The Sacred Fount (1901). The latter text shares with Banville's novella an unnamed narrator desperately trying to make sense of a group of people he has just met. Given Imhof's German background, it is not entirely surprising that he latches on to the influence of Hugo von Hofmannsthal's "Ein Brief" (which talks of the limitations of language to express reality) and of Goethe's Elective Affinities. The parallel is seductive because Goethe wrote tracts objecting to Newton's theory of colours. Imhof believes that Goethe's theory of light and colour is a "hopelessly untenable theory" (149), whereas in fact in recent years his theories have had more currency in Chaotic system building (Gleick 1987, 163–5). Strangely, Imhof ignores any scientific ramifications raised by Banville's novella.

On Mefisto, Imhof also presents for examination a store of literary antecedents, including Nabokov and (mostly) Goethe's Faust, as well as Banville's earlier Birchwood. The critic emphasizes that chance is not randomness, but an unknowable order. This explains the Pythagoreanism, the

obsession with number elegance, and also the accommodation of irrational numbers (the exceptions that prove rules). Time and space are integrated. Concepts such as the "eternal recurrence," stemming from Nietzsche, tie in with the series of "symmetrical and mirror-symmetrical relationships, sets of two, binary patterns" (157) that Imhof correctly observes in the text. Two areas raised by Imhof are unfortunately not developed: (1) the reference to the recent "science" of chaos and Mitchell Feigenbaum, one of its proponents, which certainly supports the notion of chaos as infinite order; (2) the way that the scientific imagination in Banville's fiction works similarly to an artist's imagination. Imhof is far more interested in the symmetrical literary patterns between Mefisto and other fictional works.

In his short conclusion to his study of Banville's work, Imhof argues that the writer's oeuvre is accumulative, a progression of certain themes, particularly the search for truth and beauty. Only in Mefisto does Imhof see a "synthesis . . . of the artistic and scientific imagination" (171). All Banville's heroes experience a noble failure, construct a supreme fiction, and live out a redemptive despair. Also, Imhof would rather see Banville's works as a series of five or six books than see a break between the first three books and the later tetralogy. His reasoning here is twofold: (1) he wishes to assert that Banville's novels comprise "an admirable whole" (171); (2) he cannot

see how the tetralogy can stand on its own because it has no obvious classical division (a trilogy followed by a satire). Why Mefisto cannot be this satire, and why a tetralogy must be viewed in a classical framework is unquestioned in Imhof's system. Equally, Imhof's analysis of that "wholeness" is debatable. He thinks "the scientists are defeated by their a priori belief in harmony and order" (171). Yet it is more true to say that without these intuitive theoretical constructs, Banville's protagonists would not have advanced in their scientific endeavours.

Banville's tetralogy deserves extended scrutiny because it investigates, as Geert Lernout has remarked in a short essay (mostly on Birchwood), "the very foundations of the scientific world view that has shaped the world we live in today" (1986, 12). But what appears to be so obvious is not what Banville has regularly received in terms of criticism. There seems to be a resistance to reading the tetralogy as an exploration of how real science is, perforce, personally and "socially negotiated" and of how scientific creativity is very much predicated on biography. All these points raise issues involving cultural contexts, including how we commonly read and understand relations between science and literature. These contexts are taken up in the following chapter. They help us to provide a usable scientific and artistic framework into which we can place Banville's tetralogy.

In summary, then, what is absent so far in Banvillean criticism is an extended examination of the scientific tetralogy in terms of what the author has to say about (1) the relationship between fictional forms and the scientific process; (2) scientific biography; and (3) the whole question of how paradigms change. I seek to fill this obvious gap.

II. Chapter Overview

In chapter two, I examine the cultural context of these scientific fictions and outline my general methodology. Since Banville's tetralogy implies that orderly procedures of explaining a phenomenon are impossible, it may be the case that a critic must employ multiple methodologies to encompass satisfactorily the diversity of material under inspection. In each text the major unifying interest for the critic is in considering the ways Banville allows (1) his brilliant protagonists to build flawed paradigms, and (2) his heroes to be aware of their intellectual shortcomings. The heroes' dilemma encourages them to resort to usable paradigms rather than to seek accurate or true

paradigms. To examine this process, it is helpful to employ the theories of Gerald Holton (1988) whose nine guidelines for the scholar–critic interested in the scientific imagination provide the scaffolding on which another methodology may hang.

The nine guidelines that Holton describes are the following: (1) the awareness of facts, data, techniques, theories of the era to evaluate the scientist's published work, and of others' work around his time; (2) the antecedents—what came before the "Event" of discovery, including continuities and discontinuities; (3) the personal activities of the scientist, as revealed in letters, drafts, unpublished manuscripts, abandoned equipment, interviews, reminiscences; (4) the time trajectory: can we see in the scientist as a boy his later achievements?; (5) the psychological–biographical development: is his published work imitated in his personal life?; (6) the consideration of the ideological/political events of the time; (7) the social setting, conditions, influences, colleagueship, teamwork: is there any link between science and public policy?; (8) the logical structure of the scientist's published work; and (9) the scientist's thematic suppositions. Naturally, not all of these topics will be valuable at any one time for Banville's four protagonists; nevertheless, they present the critic with an effective general framework of analysis.

Perhaps of more specific relevance are the theories of Thomas Kuhn (1970) on scientific paradigms. To Kuhn, new paradigms are foregrounded by [(a)]"the previous awareness of anomaly, [(b)] the gradual and simultaneous emergence of both observational and conceptual recognition, and [(c)] the consequent change of paradigm categories and procedures often accompanied by resistance" (62). This three-step process can be traced in the work of Banville's Copernicus, Kepler, Newton's biographer, and Gabriel Swan. Kuhn also stresses the intuitive and the personal nature of scientific revolutions. The latter characteristics are unscientific in the normal sense, but as revealed in recent books, such as James Gleick's Chaos: Making A New Science (1987), this "artistic" and "subjective" nature of science is becoming very important. In this sense, Banville's tetralogy of the 1970s and 1980s has its counterpart in the actual sciences. In addition, Banville's work appears to draw on notions of creativity developed in Arthur Koestler's The Sleepwalkers (1959) and The Act of Creation (1964).

Integral to Banville's four fictional scientific works is the word "system." It is the striving for a harmonious system that drives Copernicus, Kepler, Newton's biographer, and Gabriel Swan to unprecedented intellectual advances. It is possible to misread Banville's novels as a privileging of the "objective" intellect over "subjective" feelings. That is to say, the experimental observation of reality may appear to some readers to take over from the part intuitive

and part experiential observation of reality. Certainly Banville's protagonists, for varying lengths of time, believe in this divide or estrangement. However, Banville is at pains to show the personal and historical conditions in which these systems were and are created and developed. Invariably, these conditions are chaotic and unpleasant, and encourage the mistaken notion that one can only achieve scientific results by using the intellect exclusively. The fictional characters of Copernicus, Kepler, Newton's biographer, and Gabriel Swan, in reconciling the subjective and the objective, the art of structuring experience and the science of discovery, undermine any surety of a closed harmonious system. The key reasons why Copernicus on his deathbed does not wish to publish his work, why Kepler on his deathbed feels his whole life's work was "thrown away" (191), why Newton's biographer gives up his project, why mathematician Gabriel Swan finally leaves everything to chance, are (1) their awareness that there are only open systems, and in open systems exactitude is illusory; and (2) their awareness that they have merely ended up rationalizing their own experience, without pursuing the ramifications of such a methodology.

In chapter two, the notion of scientific fictions is also examined. Such basic terms as "art" and "science" need reassessment. It is argued here that in pure science the gap between art and science is not a wide one. In this regard, I introduce principally the work of Gerald Holton,

who argues forcefully for the recognition of the artistic side of science, using the Einsteinian phrase, "the personal struggle," to explain the exciting "nascent phase" of "science—in—the—making." This "personal struggle" clearly fascinates Banville. The scientific tetralogy also appears influenced by Thomas Kuhn (acknowledged at the beginning of Doctor Copernicus) who stressed that scientific paradigms become widespread only if they accord with the present beliefs and vested interests of scientists and the general public at any given time.

Banville's work revitalizes the combination of science and literature. In scanning the historical relationship between the two, I emphasize that what sets Banville apart from other writers in this subgenre is that he is not concerned with applied science which has generated science—fiction such as Mary Shelley's Frankenstein (1818) and H. G. Wells' The Time Machine (1895), but with pure science, the science of the mind. Pure science here is understood as theory, speculation, and hypothesis, science considered apart from practical applications.

Banville's tetralogy is best approached as an extended endeavour to collapse the hard distinction between the scientific and artistic modes of thinking. It seems to me that Banville has deliberately chosen the forms of biography and autobiography because they can be said to encapsulate neatly the fusion of "scientific" fact and "artistic" fiction. In the work of Banville, the dividing line between

the theoretical sciences of astronomy and mathematics and creative art necessarily becomes blurred, since the art and science of biography is the writer's central focus. Numerous guides to and critical works on the art of literary biography exist, but the same can hardly be said for the art (and science) of scientific biography. Scientific biographies are readily available, but works on scientific biography are not. Holton calls for more work in this field, and to some extent (in the realm of fiction) Banville, with his varied artistic forms, answers the call.

A main theme of John Banville's scientific tetralogy is that experimental and technological observation cannot account fully for the complexities of the world as experienced by human beings. One of the reasons for the complexity of the novel Doctor Copernicus, the topic of chapter three, is that Banville takes great pains to integrate history, politics, religion, sexuality, and scientific thought, all within the construction of the character Nicolas Copernicus. In short, in his effort to historicize and to explain a genius, Banville appears to cover the key areas about scientific creativity which Gerald Holton finds fascinating.

These areas include the scientist's boyhood interests which are later taken up in his professional life; the influences of his family, friends and colleagues; the link between science and public policy; the scientist's living and working conditions; and the scientist's philosophical

assumptions. These topics are mediated at times by different narrators, a technique which is consistent with the shifting paradigms evident in Copernicus' world. Chapter three explores each of the aforementioned areas to reveal the paradoxical activity of the text which, while it is ostensibly building systems, is constantly unbuilding them.

In chapter four, I examine the peculiar "personal struggle" of Banville's Kepler. Most striking is the apparent Banvillean principle (which resembles Holton's view of the historical figure) that "when his [Kepler's] physics fails, his metaphysics comes to the rescue" (Holton 54). Put another way, when Kepler's science as method and observation retreats, his art of intellectual play (which includes intuition and creativity) advances. Metaphysics here is defined by Holton (and myself in reference to Banville's work) as statements of general understanding which have no basis in the observable world. To Holton. this means primarily a mathematical over a mechanical model, emanating from a theological base or impulse. In a number of areas in the text, intuition and creativity are confronted, directly and indirectly. After considering the general issue of order out of disorder, the chapter explores Kepler's relationship with the following: (a) the brotherhood of science and astronomy; (b) religion; (c) astrology; (d) physical action; and (e) dreams. Discussion of these topics reveals the integrated sense of the scientist's ideas and his society.

The radical shift in the tetralogy from the sixteenthth and seventeenthth centuries of Doctor Copernicus and Kepler to the twentieth century in The Newton Letter and Mefisto is matched by a shift from the more "objective" biographical form to the more "subjective" autobiographical form. In addition, the Newtonian principle of order and regularity, a position which Copernicus and Kepler were working towards, is undermined by the academic narrator of The Newton Letter. Chapter five follows the crisis of faith of this narrator, who is struggling with a biography of Newton. The biographer's sense of failure appears to be of central importance; it is the awareness that the Newtonian and other paradigms are no longer tenable which creates the tension in Banville's novella. I specifically consider the influences of the social setting, including the narrator's relationships with Ottilie, Charlotte, and Edward, as well as his relationship with the fictional figure of Newton briefly brought to life in the text.

The Newton Letter connects with the two previous texts by its insistence on the importance of influences upon the scientific individual, many of which are not scientific in nature. The narrator of the novella clearly learns from his relationships with the inhabitants of Fern House. Their influence, however, is one of displacement from his task at hand—the writing of his book—but they do seem to revive for him, ironically enough, that crucial period of Newton's

breakdown in 1693. It suggests that he, too, can now continue with a greater sense of his own mortality and of his own intellectual limitations in grasping the world of his subject.

Chapter six on Mefisto shows emphatically that experimental observation is a false theoretical trail for the narrator who, finally, fully endorses chance and randomness as the norms of the world. Like Copernicus, Kepler, and Newton's biographer, Gabriel Swan is influenced by those around him in developing his theories of systems. However, in Swan's case, from the nineteenthth century–like section, "Marionettes," set in the Ashburn estate under the tutelage of Mr. Kasperl, to the twentieth century–like section, "Angels," set mostly in the computer room under the supervision of Professor Kosok, a truly postmodern conundrum emerges—too much data and not enough information.

The narrator conveys a distinct unease by the asymmetry of his discourse, both in form and in content. Asymmetry here is understood as the relationship between double forms or double patterns which appear to be equivalent but which on closer inspection prove to be only alike. It is the gradual loss of symmetry in the narrator's world picture that breeds asymmetry. Of course, since Mefisto is an autobiographical reminiscence, the narrator often declines to pursue the ramifications of this asymmetry in case his narrative totally breaks down (which it often threatens to do). The haphazard events which occur in Swan's life—the

sudden deaths of his mother and father and his own horrific burning—convince him that these "subjective" incidents have a wider applicability. In brief, they suggest the influence of randomness and chance as overarching determinants in system building.

In my concluding chapter seven, "Banville, Science, and Ireland," I emphasize that the tetralogy needs to be seen as a unit, for despite a foretaste in Birchwood (1973) and an aftertaste in The Book Of Evidence (1989), the four texts confront boldly the issue of science as subject matter and as a source of constant creativity. In covering the general topic of science and Ireland, I first outline the general criticism of Davies (1985) and Outram (1986). They believe that the relationship between science and Ireland has been purposely ignored by Irish commentators for two reasons: (1) most Irish scientists were Protestants, and (2) science threatened to dislodge the Gaelic Revival as well as the position of the Roman Catholic Church. Banville's extensive interest in science and scientific figures is a response to a gap in Irish culture, itself too long preoccupied with debates about religion and nationality. Along with an important short story of Ronan Sheehan, "The Boy With An Injured Eye" (1983), John Banville's work can be seen as an attempt firstly to demythologize science and secondly to insert its artistic side back into cultural commentary.

Notes to Chapter One: Introduction

[1] Other reviewers of the novel were also disappointed in Banville's underplaying of Copernicus' ability. See, for example, [Anon.] "Brief Lives" (1976, 131): "how the theory itself became so quickly and widely known, in spite of Copernicus' refusal to publish—is not the most satisfactory aspect of Mr. Banville's otherwise outstanding novel."

[2] See in particular his "John Banville's Supreme Fiction" (1981); "The Newton Letter: An Exercise in Literary Derivation" (1983); "Swan's Way, or Goethe, Einstein, Banville—The Eternal Recurrence" (1987); and "German Influences on John Banville and Aidan Higgins" (1987).

[3] See, for example, "A Little Bit of Ivory, Two Inches Wide: The Small World of Jennifer Johnston's Fiction" (1985).

Chapter Two

The Cultural Context: Reading Literature and Science

> We, the inventors, scientists, engineers and craftsmen, had created a terrible weapon, the most terrible in human history; but its use would lie entirely outside our control. The people at the top of the party and military hierarchy would make the decisions. Of course, I knew this already—I wasn't that naive. But understanding something in an abstract way is different from feeling it with your whole being. The ideas and emotions kindled at that moment have not diminished to this day, and they completely altered my thinking. (Andrei Sakharov 66)

The cultural context into which one must place Banville's tetralogy is complex. In the first place, one should take cognizance of Banville's own views on art and science as revealed in his nonfictional writings and in interview. These "personalized texts" enlighten us as to the peculiar nature of the writer's fictional quartet. They also lead us into the specific problems of the two cultures debate, popularized by C. P. Snow in 1959. Following this, I then go on to discuss how theorists and historians of science have tried to reconcile these two apparent poles. In this examination, I introduce mainly the work of Gerald Holton (on psychobiographical development), Thomas Kuhn (on

paradigm change), and Arthur Koestler (on creativity) as ways to understand Banville's tetralogy. These writers' formulations comprise my general methodology throughout this study. The psychobiographical emphasis in these works demands that the critic establish the general kind of fictional biographies and autobiographies which Banville writes. It is within this frame of reference that I discuss the problems of defining the tetralogy's genre.

I. Writing on Art and Science

What is clear from the previous chapter is that critics of Banville's tetralogy acknowledge the existence of science in his work but find difficulty in creating a theoretical framework in which to place it. This difficulty is produced by a confusion of definition with regard to literature that treats science. I believe the literary critic must become a cultural critic to do justice to Banville's endeavour. Certainly this is the impression one receives when one analyzes the nonfictional writings of John Banville himself. Before I consider these, however, I wish to clarify first what my criticism and approach cannot be, given the nature of the texts under inspection.

One common procedure for a literary critic in the field of literature and science is to show how specific scientific texts possibly influenced the writings of particular

authors. To be more precise, the literary critic tries to establish that, along with structural analogies, certain themes, such as evolutionism versus creationism, permeate the artistic work. A more up-to-date example would be Dennis Bohnenkamp's article (1989) on the contemporary novel and modern science. On Thomas Pynchon's Gravity's Rainbow (1973), Bohnenkamp states:

> The title itself refers to the trajectory of a V-2 rocket. The novel contains equations from differential calculus and probability theory. Its whole structure embodies the conflict involved in the paradigm shift from determinism, cause and effect and control, to random chance, statistical probability and freedom. It would be virtually impossible to arrive at a full or, for that matter, adequate understanding of the novel without some grasp of the concepts of Post-Einsteinian physics. (27)

Another procedure is for the literary critic to argue that a scientific text and a literary text written at the same time share common discourses. George Levine's recent book on Darwin (1989) sees Darwinian parallels in the works of Charles Dickens and Anthony Trollope. To all appearances, this is innocuous enough, until it is realized that neither author had read Darwin. Levine's argument is not invalidated, since there is no reason that writers who have no contact with each other should not pounce on similar new ideas. This approach is premised on Koestlerian "ripeness," explained further below. On a more theoretical level, the work of Michel Serres (1982) has attempted to bridge scientific and humanistic knowledge by looking for the "passageways" (another word for structural and thematic

analogies) in fictional texts by Zola and Verne, who seem to emerge under such analysis as philosophical scientists.

These two approaches encourage the employment of critical words such as "echo," "reflect" and "parallel." The critics have two texts, at the very least, between which they draw connecting lines. By interrogating Banville's tetralogy with either or both of these procedures, however, we will underplay its wealth of riches.

To my mind, what attracts Banville is the history of ideas in science and the way scientific thought, however brilliant, depends for mediation on a social negotiation (which is unpredictable). He does not "borrow" science <u>for</u> literature, but takes science as <u>part and parcel</u> of literature and history within the frame of his fictions. One question then occurs: Is Banville's work a new history of science rather than a literary artifact? The answer, I believe, lies somewhere between the two. [1] The tetralogy is not a literary critique of scientific texts; that is, it does not examine the rhetoric of the scientist's published writings directly. [2] This awareness is where the reader's interest lies, for Banville's novels are more notable for what they are <u>not</u> than for what they are. They are not simply (1) historical novels; (2) scientific character studies; or (3) revised histories of science. As a four part system, the tetralogy combines a criticism of received notions of history with a criticism of creativity and of change, the accumulative effect of which is to force the

reader to demythologize the lofty notion of science as separate from artistic ideas or artistic modes of thinking. Artistic and scientific methods are perhaps different, but although implicit in his thinking, this is not Banville's main argument. His central argument is based on the way the mind builds and accommodates systems of thought and perception (or paradigms) from which separate artistic or scientific methods may evolve. In addition, Banville wishes to cement the relationship between the act of (pure) scientific creativity and artistic creativity.

Kuhn, discussed below, talks of the rigid models followed by scientists in their construction of a methodology. The artistic equivalent in fiction could well be the overwhelming popularity of the third person narrative mode as a means to convince the reader of the text's authority. Of course, Wayne Booth's The Rhetoric of Fiction (1961;1983) is only one book in the field of narratology which clearly shows that complex degrees of distance can be discovered in a third person text, just as in a first person text. But the main point here is the ready acceptance of a major model within which or from which certain small details can be worked through.

Some working definition of "science" is required if Banville's work is to be profitably discussed. One is conscious that it is a particular kind of science which is being scrutinized in his fiction and in some of his nonfictional writings. The most significant article he has

written on this topic was published under the title "Physics and Fiction: Order From Chaos" (1985). Banville ends this article, almost triumphantly, declaring that "as science moves away from the search for blank certainties it takes on more and more the character of poetic metaphor, and since fiction is moving, however sluggishly, in the same direction, perhaps a certain seepage between the two streams is inevitable" (42). Pure science is defined by Banville here as an intellectual and theoretical pursuit and thus can be compared to literary activity.

Banville laments that a great writer such as Nabokov has not taken up the challenge of linking literature and science. He is encouraged, however, by the past—Goethe's uniqueness as a scientific and artistic genius is cited. It is surprising that Banville chose not to write a novel about Goethe, since there was a man who "distrusted the paraphernalia of science [its applied element]—microscopes, telescopes, all such 'engines'—which violate the frontiers of human, and humane perception" (41). The core of Banville's argument is that in both science and art there are no simple "yes" or "no" answers but a "drift of probabilities . . . . In science, as in all human affairs, everything ramifies" (1).

As Banville put it in an early interview, "science has changed our notion of the world. Psychoanalysis has changed our view of human beings. It seems to me that artists haven't caught up with that at all" ("Novelists on the

Novel" 1979: 79). His fiction on individual figures will bring, therefore, scientific history to life, for "if I read letters from Kepler or Copernicus, there's a curious bloodlessness about them—even the most passionate letters—they don't have that sense of truth which novels do get" (84). This "sense of truth" is to be found in one of Banville's favourite novels, Marguerite Yourcenar's The Abyss, whose main character, Zeno, is "as most of the great Renaissance figures were, a mixture of scholastic and humanist scientist and mystic, sceptic and fanatic" ("Heavenly Alchemy" 1977: 28). The science of Zeno is both aesthetic and philosophical, and the same can be said of the science of Banville's heroes.

With some understatement in "Physics and Fiction," Banville remarks that "the relationship between literature and science has always been an uneasy one" (41). Banville is truly an inheritor of the two cultures debate, but he sidesteps the question of technology. Following C. P. Snow, I think the divide between art and science strongly manifested itself during the industrial revolution of the nineteenth century when machinery of all kinds came onto the market at an unprecedented rate, and the artistic possibilities of which were not considered. Scientific technology is difficult to define, and cannot be totally distinguished from artistic practice. For example, the technology of printing multiple copies of one text enabled writers to be more widely known and undoubtedly affected

their view of art and writing. Since technology can spread knowledge, it can never be convincingly divorced from artistic activity. For this reason, Matthew Arnold's essay "Literature and Science" (1882) remains significant, despite having been written over one hundred years ago.

Arnold avers, paraphrasing F. A. Wolf, that "all learning is scientific which is systematically laid out and followed up to its original sources, and that a genuine humanism is scientific" (213). He continues: "All knowledge that reaches us through books is literature" (214). Arnold sees little disparity between scientific and humanistic knowledge. If there is a choice to be made between the two disciplines, Arnold is convinced that people will choose humane letters for reasons of beauty and of conduct. The latter seems to mean that literature can improve people's lives, ideas, and morality. Science alone cannot. Arnold implies that science, defined as systematic arrangement of knowledge, is somehow cold, clinical, and deficient. Nonetheless, Arnold also suggests that strict definitions between areas of knowledge are futile to uphold, since knowledge, which may be scientific, once written down becomes literature. One wonders if Arnold conceived a corollary to his notion that "genuine humanism is scientific," that is, can a genuine science convey humanism?

Arnold's essay is fairly brief and strikes one as a reaction to excessive Victorian industrialism, just as perhaps C. P. Snow's notorious Rede lecture, "The Two

Cultures and The Scientific Revolution" (1959) is a reaction to the excesses of the Atomic and Hydrogen bomb development.[3] Snow's essay is a passionate, humanist argument for world social and educational change. Eminently qualified—"By training I was a scientist; by vocation I was a writer" (1)—Snow defines a culture, whether scientific or artistic/literary, when he sees a group of people who "respond alike" (10) to certain issues. Because of the divide between literary intellectuals and scientists, Snow believes they are both "impoverished." Certainly, most intellectuals would have to agree with his argument that British education forces early specialization. Implicit in his writing is his belief that human advances have not been achieved by such specialization but by people with a general ability. To support this assertion, Snow argues that nineteenth century industrial changes owed little to intellectuals. Furthermore, Snow incorporates written personal history, that of his grandfather's underutilization in society, as a "maintenance foreman in a tramway depot" (25). To Snow, his grandfather's work was of a general and useful kind that made practical discoveries, even though he was a man who could have excelled in a more specialized occupation. Possibly for this reason, Snow highlights the virtues of applied science, not pure science. I think this is significant. Snow in his own early research chose pure science, he admits, for its snob value. Pure scientists are "late learners" about life and industry, much

to their individual and society's detriment. Only the catalyst of the war pushed Snow into applied science and some appreciation of the need for balance in education.

In "Physics and Fiction," Banville criticizes C. P. Snow's "The Two Cultures" for depicting technologists rather than scientists. It is true that Banville is interested in pure science, whereas C. P. Snow has applied science much to the forefront of his mind. Rather uncivilly, Banville doubts that C. P. Snow's "wooden style" (42) in his fiction could ever achieve a matching with scientific intellect.

I raise "The Two Cultures" essay to avoid the simple statement that Banville is out to prove Snow's thesis on scientists and artists right or wrong. Rather, he is fascinated by the theoretical analogy between pure science and artistic creativity, which is a somewhat different agenda from Snow's. To the latter's defence, Snow was only drawing attention to what he saw around him at a particular historical juncture. Banville's project, linking science and art, is <u>different</u> from other endeavours in terms of actively blurring the conjoining of literature and science. Novelist Michael Stewart has lamented the imprecision of defining this very field. The novels he speaks of could well include Banville's tetralogy:

> If science is the stuff of life and life is the stuff of fiction, why is there such a glaring lack of scientific content in mainstream fiction today? . . . . The reason why this rich seam remains largely unmined has to do with the legacy

> of the Two Cultures—the arts versus the sciences. Novelists tend to avoid new scenarios because they don't speak the language of science. Reviewers confronted with such a novel give scant column inches to the genre because they lack a grasp of an area of literature without a tradition. I find even publishers and booksellers have a problem in categorising them. Are they thrillers? No, but they're thrilling. Horror? No, but at times morally horrific. Science Fiction? They are fiction and rooted in science fact, but they're certainly not SF. Publishers try coining new labels like "psycho-suspense." But this is to deny the books their wider readership. In the end, they belong on the general fiction shelves, for that is exactly what they are."
> ("In My View" G4)

To establish Banville's space, it is necessary then to turn to dictionary definitions because what we are dealing with here is a form of "science fiction" which is not the popular one.

In the OED (1989), for example, the common definition is preferred, namely, "imaginative fiction based on postulated scientific discoveries or spectacular environmental changes, freq. set in the future or on other planets and involving space or time travel." In this category of science fiction, we have futurity, fantasy, and travel in the universe and beyond. The novels of Isaac Asimov are clearly part of this subgenre. Less ambitious, but more widely read and revered, are Zamyatin's We, Orwell's 1984, and Huxley's Brave New World as novels focussed on futurity on earth. These examples are, of course, dystopias, pointing out the desiccating effects of scientific and mathematical order on human beings. We may

wish to put H. G. Wells's The Time Machine in this category, too, as an application of science which projects us into the future, though presumably also into the past. Banville's tetralogy clearly does not have a home in these definitions.

For novels dealing with science and the past, we have to turn for a reassuring definition of science fiction to Webster's Third New International Dictionary of the English Language, namely, "fiction dealing principally with the impact of actual or imagined science upon society or individuals." This kind of definition is supported by many literary handbooks. Joseph Shipley (1970) declares "Science Fiction (SF) is that branch of literature which deals with the response of human beings to advances in science and technology." Henry Shaw (1972) sees science fiction as "Narrative which draws imaginatively on scientific knowledge, theory, and speculation in its plot, theme, and setting." More subtly, C. Hugh Holman and William Harmon (1986) remark that "conceivably, if the element of time (either past or future) is conspicuously important, then some Science Fiction may qualify as historical fiction." These definitions are broad and accurate enough for us to include Mary Shelley's Frankenstein and John Banville's tetralogy. Both centre on individuals intent on the intellectual pursuit of scientific theory. Of course, where they part company is that whereas Banville is concerned with pure science, theory and only theory, Shelley's novel imagines applied science, the putting into practice of,

interestingly enough, a supposedly discredited theory—that inanimate matter can be animated. Although unconventional science seems to be severely criticized in Shelley's novel, she introduces many ideas that still provoke the scientific world with regard to what are acceptable and unacceptable (Kuhnian) scientific paradigms.

Clearly, our definition of science fiction has to be loose to incorporate works which examine (1) science in the sixteenth and seventeenth centuries from a mostly Renaissance perspective (Doctor Copernicus and Kepler); (2) eighteenth century science from a twentieth century perspective (The Newton Letter); and (3) twentieth century science from a twentieth century perspective (Mefisto). Of course, the tetralogy has appeared in the context of the late twentieth century, and so the distance from that perspective in each of the above three categories is one of degree rather than of kind.

The matter of definition is further complicated by the fact that Copernicus, Kepler, and Newton are household names, and conjure up modern science's forefathers. Not only does Banville have to confront the tremendous quantity of historical material on these men, but the reader, too, depending on his scientific education, will always feel a third presence between him and the fiction, the received notions of scientific history. Perhaps this very problem led Banville to reduce the time and space spent on the historical figure in The Newton Letter. In Mefisto, he goes

further by leaving it open to speculation whether or not Gabriel Swan, mathematical prodigy, is a surrogate Einstein or Godel. Whatever conclusion is drawn, the movement from fictional biography to fictional autobiography poses many questions about the coherence of the tetralogy.

If Banville's tetralogy is an extended endeavour to collapse the hard distinctions between the scientific and artistic mind, then it is important that the writer debunk the notion that science is method, that astronomical and mathematical discoveries emerge from "objective" and orderly procedures. As outlined above, the concentration on pure science in the tetralogy moves us away from methodological considerations. [4] One commentator who has helped to shift the focus on science to more artistic considerations is Renée Weber (1986), who, after exhaustive interviews with the world's leading scientists, concludes that the only way to account for the presence of words such as "elegance" and "beauty" in the scientists' writings is by way of an intrinsic aesthetic demand. As Weber observes:

> A single comprehensive law remains the current ideal. The drive of scientists to achieve this ideal cannot be "scientific" in the conventional sense. It seems closer to an aesthetic demand, the sense that unity is somehow truer, more beautiful and <u>better</u> than multiplicity. The scientific drive seems to me to border on Plato's vision that the good, the true, and the beautiful are the fabric of reality. Such terms as "elegance" and "beauty" recur regularly in philosophical scientists like Einstein,Heisenberg, Eddington . . . Prigogine, Hawking, Sheldrake and others. Behind the aesthetic demand, I believe,

> lies a spiritual one. . . . I believe that at some intuitive level of his awareness, the scientist senses that nature is simple, subtle, interconnected, and one. Without this idea or something like it, it is difficult to account for the way scientific genius operates. (13)

Similarly, Banville's works illuminate the fact that the great astronomers strove for an harmonious system, one which is hermetically sealed, while aware that their experience and intuition suggested the reverse. In turn, Banville stresses the importance of common, random, everyday experience in opposition to any rational methodology.

These experiences include feelings and emotions. The author seems to suggest that pure intellectualism cannot succeed because it relies on the imperfect tool of language to be communicated. Also, Banville wishes to illustrate the experiential nature of a scientific life, and how such influences permeate the individual's work. To the latter point, the author has chosen the forms of biography and autobiography because they, too, are a blend of genres or a blend of two humanities: that of the subject's world and that of the narrator's world. The theme of the observer and the observed is, of course, doubly relevant for an astronomer's life, as much of his time is spent observing and interpreting the past (it takes years for the light of stars to reach us), just as the biographer and autobiographer attempt to shed "light" on the past.

A normal biography of an historical figure must cover over many cracks with interpretation to give coherence. How

far this act of interpretation should go is an open question, and at the centre of metabiographical criticism. [5] If we accept that a biography is typically an account of an historical figure of some achievement, usually from birth to death, we can then discern four general kinds of biographical writing. My divisions are externally motivated rather than internally motivated. They are elaborated here (perhaps laboriously) only to make the point that the kind of biographical form chosen by Banville is decidedly slippery when it comes to categorization.

The first kind we might distinguish is the biography written by a friend of the subject in a personal, though serious, vein——"an intimate biography.". In this category, we can place Boswell's Johnson and Moore's Sheridan. We read these biographies today with reserve because there is quite obviously a personal commitment to his subject by the prose biographer which may interfere with the supposed objectivity of the biographical form, in its attention to accurate detail. The two examples above are literary ones, but the same can be said of many Times obituaries of famous scientists because they are usually written by a friend or associate of the deceased.

The second kind of biography is the most common, where a prose–writer produces a biography of a figure whom he did not know personally. This kind is the one most evident in academic circles, such as Ellmann's James Joyce (1959) and Oscar Wilde (1987). In the area of science, we have Frank

Manuel's A Portrait of Isaac Newton (1973) and Richard Westfall's Never at rest: a biography of Isaac Newton (1980). In a few cases, the academic-biographer is able to interview people who did know his subject. This is the case with Ellmann's James Joyce. Overall, however, the emphasis is on chronological narrative informed by the subject's writings, and by reminiscences of friends and associates available in print, letters, and official documentation, such as school, medical, and marriage certificates. The biographer's task, apart from amassing accurate detail, is to decide what were the major formative influences at any given period.

Indeed, modern biographers seem to develop a knack for achieving authority in this area by sheer immersion in their chosen period. Paul Mariani's pursuit of William Carlos Williams for his 1981 biography, for example, often became an intellectual game:

> I had already collected thousands of such letters and was beginning to find a certain repetitiveness in the process. I decided at that point to play a game with the new packets of material which crossed my desk and, after looking at the date of a letter, try to guess what the general contents of that letter would be. I soon found that I could guess fairly accurately a good portion of the contents. (Meyers 134)

In recent years, the critical biography among academics has become foremost, whereby chapters alternate between life and

work. Michael Holquist's book on Bakhtin (1986) is a good example of this trend.

The third kind of biography is that constructed by a creative writer, with the distinct intention of imagining a fictional figure in history. The most pertinent novels must be Woolf's Orlando and Mann's Doctor Faustus. Mann's novel seems to be a parody of the first kind of biography and Woolf's of the second. Where Woolf's novel-biography has all the trappings of a scholarly work—acknowledgements and index, Mann's novel-biography (or autobiographical novel masquerading as a biographical novel) strikes one as of greater complexity because the narrator does not pretend as much as Boswell and Moore to keep a distance from his subject. In effect, Mann's narrator is so powerful that Doctor Faustus becomes his story rather than his subject's. In this way, fiction and form become fused and possibly confused.

With the fourth kind of biography, we can say that fiction, form, and fact are blended together consciously. This category. which includes Doctor Copernicus and Kepler, is distinguished by a creative writer's use of a historical figure that he did not know. The fiction that welds the fact and form in the first two kinds of biography identified above comes out of the closet, as it were, and becomes an equal, or indeed superior, partner in the retelling of a life. In so doing, the fiction tinkers with chronological form, psychological analysis, and faithfulness to the facts

to help in the matter of interpretation. They are what I would call "Superbiographies."

I accept that these divisions can be undermined by peculiar examples, such as Peter Ackroyd's biography, Dickens (1990), where a creative writer temporarily assumes the mantle of a serious academic prose writer (though even here Ackroyd includes imaginary conversations between himself as the novelist and Dickens). And whether or not a distinction has to be drawn between a "pure" biography (including a "chronicle") and a "critical" biography is open to acrimonious debate. [6]

However, I believe the four categories are practical and usable subgenres to situate John Banville's work. Doctor Copernicus and Kepler have within their general, though at times playful , third person narration (so typical of a standard biography) certain first person indeterminacies—Rheticus's section, and the stylized presentation of letters, both of which are uneasily integrated in the various narratives. It is as if Banville wishes to remind the reader that what he is reading is an interpretation of a life, closer in "essence" than a "true" or "scrupulous" account. By the same token, however, the general faithfulness to the facts makes us wonder about those texts, such as Ellmann's James Joyce, and their perceived definitiveness. On what grounds is definitiveness established? Length (wealth of biographical detail)? Writing style? Access to more records (authorized versus

unauthorized)? A more prominent publisher? A seductive author profile? It is a curious fact that Banville mentions the other "competing" biographies in apparatus around his fictions. In Doctor Copernicus the author remarks, "I name them also as suggested further reading for anyone seeking a fuller and perhaps more scrupulously factual account of the astronomer's life and work" (7). The use of the word "perhaps" is teasing, immediately asking us to take on trust the majority, if not all, of the "facts" in this "novel." It also casts a little doubt on the "authority" of these "other" biographies, in a rather Borgesian fashion.

Whereas Doctor Copernicus and Kepler raise problems concerning the presentation of "objective fact" in a biographical fiction, The Newton Letter and Mefisto raise problems concerning the presentation of "subjective experience" in an autobiographical fiction. The shift is one from narrator—subject—world to narrator (as subject) —world. This is more obviously true of Mefisto than The Newton Letter because even in that short novella, we have to come to terms with the narrator's subject, Newton, in both factual and fictional letters.

What kind of autobiographies are these two novels? They are different first person discourses. The Newton Letter is refracted through the memory of a scientific historian trying to grapple with his writer's block which coincides with a chapter on his subject's (Newton) nervous breakdown in 1693. Mefisto's narrator is a mathematical genius, who

could be seen as a contemporary Einstein or Godel. His tale is a true Bildungsroman, almost twice over (the two parts of the novel can be looked upon as two separate lives). Whereas The Newton Letter mainly restricts itself temporally to a few months in the southwest of Ireland and spatially to events surrounding one Big House, Mefisto's two sections appear to switch from the country to the city and from Gabriel Swan's development from inside the womb to age eighteen or so in Part 1 to a very static temporality in Part 2.

Certainly, the pretence of fact has mostly disappeared in the final two texts of the tetralogy. However, they still concern scientific and mathematical figures wrestling with their subjective experiences. It is this overall theme that ties the tetralogy together, suggesting that in the world of so-called established fact--Copernicus and Kepler--and so-called fiction--Newton's biographer and Gabriel Swan--there is a unifying force or preoccupation.

II. Methodological Approaches

I hope that the discussion above relays the complexity which the literary-cum-cultural critic has to deal with in Banville's work. The task is not impossible, however, as long as one accepts that overlapping methodologies may have to be applied for the tetralogy's richness to be appreciated. For this reason, I see much value in the

writings of Gerald Holton, Thomas Kuhn, and Arthur Koestler. The latter two are admitted by Banville in notes around his fictions to be major influences.

Gerald Holton's The Thematic Origins of Scientific Thought: Kepler to Einstein (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 "science-in-the-making" (defined by Holton as the period before the tabulation of results and before their announcement) is the artistic side of science which Holton is convinced exists but which is often ignored or deliberately omitted from scientific commentary. As Holton explains:

> Most of the [scientific] publications are fairly straightforward reconstructions, implying a story of step-by-step progress along fairly logical chains, with simple interplays between experiment, theory, and inherited concepts. Significantly, however, this is not true precisely of some of the most profound and most 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. As a literary/cultural critic of a fictional scientific biographical tetralogy, I believe these guidelines help to construct solid connections between artistic and scientific modes of thinking and creation. What is also valuable in 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 guidelines 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. For example, Copernicus had to grapple with his 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 Poincare in 1904. [7] Third, the biographer must utilize the scientist's letters, draft reports, and reminiscences, to look for the development of an unique idea. For example, Bernstein's biography of Einstein (1973) highlights the merging of experiment and intuition by quoting from Einstein's writings. In 1940, Einstein wrote: "Science without religion is lame, religion without science is blind" (qtd. 21). Fourth, the biographer, if he believes in individual genius, should be able to to trace connections between the scientist's boyhood and his later achievements. For example, Bernstein finds it significant that in Einstein's youth, the two most vivid impressions on him were (a) the fact that the compass needle always pointed north (a fact); and (b) 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 on relativity. Fifth, the biographer must stress the scientist's psychobiographical progress—how, for example, 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. [8] 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" (qtd. Holton 198). But a biographer might 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 public policy. Kepler, for example, 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 Weber is correct, most scientific geniuses believe that there is hidden beauty and order to the world. Ninth, the biographer should establish and analyse the scientist's presuppositions. For example, it is useful to know 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 one 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. Once we have found these principles, we can better grasp his genius.

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. [9] Planck relates many personal battles to have his theories on entropy and thermodynamics accepted, and concludes with the wisdom of a sage (and in words compatible with the later theories of Kuhn): "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" (33–4). The struggle for recognition also bedevils Banville's Copernicus and Kepler. To establish the specific psychobiographical development, I spend much time in my chapters dealing with the influences of colleagues, friends, and family upon the protagonist (as scientist as well as fictional hero).

Banville's narrators seem to probe further than Holton's initial excavations. Not only is "science–in–the–making" explored but also the process of justification and

verification of theory in the social, political, and religious realm. Recent reviews of Holton's new edition (1988) of his 1973 book point to this glaring absence:

> Holton treats the themata as operating mainly at the stage of "science in the making," when the scientist is engaged in a personal struggle to produce his or her ideas. Once science is publicly available and institutionalized in books and journals, his analysis has less relevance. This distinction between the private and public worlds of science can be traced back to another well-known logical empiricist doctrine--the distinction between the context of discovery and the context of justification. Many philosophers of science have held that it matters not one iota where scientists get their discoveries from, the important thing being the rational process whereby scientific ideas can be evaluated and justified. By limiting themata to the discovery phase of science, Holton has implicitly endorsed this distinction. Although science is like the arts and humanities, it is so only in its process of creation.
>
> The irony is that the changes in our understanding of science which Holton's work has helped provide, lie precisely in the breakdown of these old distinctions. The sociology of scientific knowledge in particular has been extended to the context of justification, so that the mathematical, logical and empirical aspects of science can now be all understood as being socially mediated or constructed. . . . How matters of experimental fact are socially negotiated is today one of the central concerns of science studies. 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 versions of the world constructed by Bohr and Einstein were themselves shaped, endorsed and negotiated in the social realm.
>
> (Pinch 1988: 18)

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 real 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" (149). Indubitably, what Banville tries to give us in Doctor Copernicus and Kepler are "superbiographies" which attempt to falsify as few facts as possible and to create fiction between the generally accepted norms. In this way, fiction and fact, art and scientific history are indeed fused.

Perhaps this inevitable merging can be illustrated by a brief look at one of Banville's sources, Fred Hoyle's Nicolas Copernicus (1973). Hoyle, a Professor of Science, admits to entering unwillingly into the artistic/ interpretative/subjective aspect of his task when faced by Copernicus's biography:

> It appeared worth while to add the biographical sketch of Chapter 11. In the outcome this sketch has caused me some difficulty. My first idea was to abstract from standard biographies the aspects of the life of Copernicus which seemed relevant to his astronomical achievements. After consulting such accounts, of which the three volumes by Leopold Prowe (Weidmannsche Buchhandlung, Berlin (1883–4) are the most complete, I found myself

> unable to answer certain simple and pertinent questions, particularly questions concerning the periods when the actual astronomical discoveries were made. I also found aspects of these accounts which I felt to be implausible, at any rate from the point of view of the working scientist. This inevitably led me into issues of interpretation, which I would much have preferred to avoid. (vi) [10] [my italics]

Hoyle raises two problematic areas: the date of the composition of Commentariolus (pre–1512 or post–1530?) and the nineteenth century discovery that De Revolutionibus was not printed from Copernicus's own manuscript but from a copy, which Hoyle assumes to be by Rheticus. Banville's own interpretation follows Hoyle's suppositions that the Commentariolus was mostly written and published post–1530 and that Rheticus is the author of the printer's copy. Banville's fiction here thus solidifies an "official" interpretation, but nevertheless strays from Hoyle where, presumably, Banville felt that certain "facts" do not fit in with his vision of the man. Assumptions and suppositions are believable fictions, of course. They help to deliver a robust image of our scientific geniuses.

For example, the real mother of Copernicus, according to Hoyle, did not die until the son was near thirty, but in the novel she dies during the boy's early years; and where Hoyle speculates that Rheticus did not have time to write a preface for Copernicus's main work (to explain the absence of Rheticus's name from the acknowledgements), Banville introduces a dose of homosexual scandal as his version of

interpretative scientific history, relayed powerfully by the shift to the first person narration of Rheticus.

It is tempting to say that Banville diverges from the "origin" of Hoyle, but it would be more accurate to say that Banville and Hoyle see themselves as involved in the matter of interpretation, where differences of kind and degree between their writings become blurred. I am sure it would be possible to explain the absence of Rheticus's name from the De Revolutionibis in terms of religion: would it be helpful for a Protestant (Rheticus) to uphold the controversial work of a Catholic (Copernicus)? Neither Banville nor Hoyle even entertains this interpretation as valid or useful to his scientific biography of Copernicus.

Banville's "divergences" from Hoyle hinge on personal relationships that are crucial to the fictional Copernicus. Hoyle explains that Copernicus became a doctor of medicine probably because his mother was ill. However, Banville's Copernicus seems to turn to medicine, firstly, under the influence of his Uncle Bishop, and, secondly, under the spiritual influence (though he wishes to deny it) of his homosexual lover Girolamo. Copernicus deliberately distances himself from his friend to further his career, but is later to take up his profession as if in atonement. This homosexual bond, and I realize this is a contentious point, would not have been as strong if the mother were allowed to live longer in the fiction. The importance of Copernicus's homosexuality and his aversion to women will be taken up

further in chapter two. Suffice it here to say that his sexual inclination is a necessary "artistic," "subjective" and "extra-scientific" force which pushes Copernicus to a greater understanding of his own life and of its connections to the work he creates. By the same token, the possible disgrace of Rheticus by his homosexual activities with a boy, Raphael, partly explains some of the discrepancies outlined by Hoyle, and gives Banville an opportunity yet again to underscore the fact that scientist's works are often structured by such "invisible" subjective and personal activities. Of course, Rheticus's narrative finally denies the existence of a homosexual scandal, but given the unreliability of his "confession" when it dwells on his own life (as distinct from Copernicus's), we suspect the homosexuality is real within the novel's system.

An appreciation of general psychobiographical elements is therefore important to our understanding of the tetralogy's vision of science. But as has been indicated earlier, of more specific relevance to Banville's heroes are the theories of Thomas Kuhn on scientific paradigms. We will recall that the latter are defined as "universally recognized scientific achievements that for a time provide model problems and solutions to a community of practitioners" (Kuhn viii). This statement, in general terms, sounds suspiciously like C. P. Snow's definition of culture, discussed above. The scientific genius is the one who breaks that circle, who dares to create a new paradigm.

Banville's Copernicus worries about the publication of his work because it implies the necessity of shifting paradigms, from a sun—centred to an earth—centred universe. Copernicus is concerned about the political and theological ramifications of such a shift.

Kuhn argues that if one accepts that science is not advanced by accumulation, by logical progression, then historians face a methodological crisis, one way out of which is to champion a scientist's "prior experience in other fields, . . . the accidents of his investigation, and . . . his own individual makeup" (4). Kuhn makes the excellent point that when anomalies in scientific experiments become undismissible, a new scientific theory is constructed to accommodate them. Normal science to Kuhn is involved in "mopping—up operations" (24), on the periphery of an accepted paradigm, whereas revolutionary science refuses to be puzzle—solving or devised by method. Examples abound, of course, to prove this contention: "The first X—Rays, is a classic case of discovery through accident, a type that occurs more frequently than the impersonal standards of scientific reporting allow us easily to recognize" (Kuhn 57). Kuhn theorizes a paradigm's development——that anomaly awareness is followed by a reorganization of observational and conceptual data which, in turn, is used to create a new theory while resistance is experienced from colleagues and the scientist's own rationality. Kuhn stresses the importance of the

scientists' "flashes of intuition" (123) in paradigm formation. These notions of creativity and intuition are taken up forcefully by Arthur Koestler not just in The Sleepwalkers (1959) but in The Act of Creation (1964). [11] Although Banville acknowledges The Sleepwalkers in notes around his fictions as a major influence on his approach to Copernicus and Kepler, I believe the core of Koestler's thought is best found in The Act of Creation which, in turn, informs Banville's treatment of his scientific heroes. In this book, Koestler argues similarly to Kuhn that scientific "progress is neither continuous nor cumulative in the strict sense. If it were continuous, there would be no "revolutionary" discoveries, no discarding of discredited theories and sudden changes of direction" (249). Copernicanism, for example, was an idea that had to wait for its proponents to develop it. This observation leads Koestler to examine, as far as possible, the exact nature of the creative and intuitionist impulse behind such revolutions. Many of these intuitions emerge not by God-given powers but by periods of long, prior research, interrupted by a hiatus, after which the inspiration comes. While the conscious mind and body are otherwise occupied the unconscious mind is constantly puzzling scientific problems. As Koestler's research reveals:

> Einstein has reported that his profound generalization connecting space and time occurred to him while he was sick in bed.

> Descartes is said to have made his discoveries while lying in bed in the morning and both Cannon and Poincare report having got bright ideas when lying in bed unable to sleep. (211)

What sets the scientist on his puzzling is the awareness of anomaly or discrepancy (as Kuhn also suggests). To Koestler, Kepler is an excellent case in point. That scientist seized the unusual eight minutes of arc, left unresolved in Copernicus's cyclical and epicyclical universal system, and based a whole new science on that "lopsidedness." By bringing physics and astronomy together at a specific time, Koestler's reading of Kepler exemplifies the creative impulse, one which emanates from chance and ripeness.

Koestler explains that intuitive discoveries are actually a balance of linear evolution (ripeness) and nonlinear activity (chance). In this sense, he would include Gutenberg's invention of printing, Kepler's synthesis of astronomy and physics, and Darwin's theory of evolution by natural selection. In addition, Copernicus's paradigm shift was not a revolution in his lifetime, since ripeness—to use Koestler's term—had not yet occurred. This process of scientific discovery has its own beauty and elegance and has, therefore, certain artistic resemblances. As Koestler laments:

> The creative achievements of the scientist lack the 'audience appeal' of the artist's for several reasons briefly mentioned—technical jargon,

> antiquated teaching methods, cultural prejudice. The boredom created by these factors has accentuated the artificial frontiers between continuous domains of creativity. (267)

Koestler also emphasizes the importance of dream as part of the creative process. Dreams are visual and pre-verbal, whereas "language can become a screen which stands between the thinker and reality. This is the reason why true creativity often starts where language ends" (177). These words are echoed by Banville's Copernicus's views on the value of his writings in relation to reality, and of Banville's Kepler's views on the importance of his dreams. Both of these examples are taken up more thoroughly in chapters two and three. Dream-intuitions are, of course, strong arguments for prior knowledge--that we have the answers to all our questions, but they are latent and rarely manifest themselves.

What Kuhn calls a paradigm, Koestler calls a "collective matrix of a science" (239). But both are in agreement that the revolutionary scientist is the one who breaks an existing model by seeking out its flaws and who then goes on to formulate a new model around that flaw's base. Both Kuhn and Koestler consider objective verification a problematic area. As Koestler puts it:

> Verifiability is a matter of degrees, and neither the artist, nor the scientist who tries to break new ground, can hope ever to achieve absolute certainty. (214)

Indeed, Koestler cites Karl Popper, who had come to similar conclusions:

> The old scientific ideal of episteme—of absolutely certain, demonstrable knowledge—has proved to be an idol. The demand for scientific objectivity makes it inevitable that every scientific statement must remain tentative for ever. It may indeed be corroborated, but every corroboration is relative to other statements which, again, are tentative. Only in our subjective experiences of conviction, in our subjective faith, can we be 'absolutely certain.'
>
> [Popper's italics] (Popper 280; qtd. Koestler 246)

While it may appear a contradiction in terms to talk of "subjective faith" as "absolutely certain," it appears that Banville's scientists (and Koestler and Kuhn) would champion such a notion, at least in the act of discovery or Holtonian "science-in-the-making." Popper holds that "scientific theories are never fully justifiable or verifiable, but that they are nevertheless testable" (Popper 44).

What is striking in reviewing Holton, Kuhn, and Koestler is that the modern revolutionary science of Chaos seems to fit very easily with notions of intuition, dream, biography, ripeness, and chance. James Gleick's Chaos: Making A New Science (1987) concentrates just as much on biography as on ideas. Gleick elevates one of the new theory's proponents, mathematician Benoit Mandelbrot. The psychobiographical factors of Mandelbrot's development are

relayed in detail, thereby confirming that revolutionary science emerges from unusual individuals, not teams of scientists:

> Benoit Mandelbrot is best understood as a refugee. He was born in Warsaw in 1924 to a Lithuanian Jewish family, his father a clothing wholesaler, his mother a dentist. Alert to geopolitical reality, the family moved to Paris in 1936, drawn in part by the presence of Mandelbrot's uncle, Szolem Mandelbrojt [sic], a mathematician. When the war came, the family stayed just ahead of the Nazis once again, abandoning everything but a few suitcases and joining the stream of refugees who clogged the roads south from Paris. They finally reached the town of Tulle.
>
> For a while Benoit went around as an apprentice toolmaker, dangerously conspicuous by his height and his educated background. It was a time of unforgettable sights and fears, yet later he recalled little personal hardship, remembering instead the times he was befriended in Tulle and elsewhere by schoolteachers, some of them distinguished scholars, themselves stranded by the war. In all, his schooling was irregular and discontinuous. He claimed never to have learned the alphabet or, more significantly, multiplication tables past the fives. Still, he had a gift. (87)

What distinguishes chaos as a theory is its fusing of mathematics or numbers with geometry via computer modelling. Benoit Mandelbrot's most famous work is The Fractal Geometry of Nature (1983). He clearly follows the model of creativity and paradigm change outlined by Koestler and Kuhn as well as the individualism so prized by Holton. In the introduction to his book, Mandelbrot writes:

> Many of these illustrations are of shapes that had never been considered previously, but others represent known constructs, often for the first

> time. Indeed, while fractal geometry as such dates from 1975, many of its tools and concepts had been previously developed, for diverse purposes altogether different from mine. Through old stones inserted in the newly built structure, fractal geometry was able to "borrow" exceptionally extensive rigorous foundations, and soon led to many compelling new questions in mathematics.
>
> Nevertheless, this work pursues neither abstraction nor generality for its own sake, and is neither a textbook nor a treatise in mathematics. Despite its length, I describe it as a scientific Essay [sic] because it is written from a personal point of view and without attempting completeness. Also, like many Essays, it tends to digressions and interruptions. . . .
>
> This Essay brings together a number of analyses in diverse sciences, and it promotes a new mathematical and philosophical synthesis. Thus it serves as both a casebook and a manifesto. Furthermore, it reveals a totally new world of plastic beauty. (2)

The infusion of the subject into science, the importance of the individual genius, and the belief in beauty, plastic or not, comes across clearly in Mandelbrot's description. Unsurprisingly, Mandelbrot's book includes detailed biographical and historical "sketches" to help explain complicated theories. All of this makes Banville's Mefisto so interesting as a text which appears, if not influenced by such ideas, at least a concurrent discourse with them. But again, it would be mistaken to restrict analysis of Mefisto or any other tetralogy text to influence study and to a common discourse between science and art, because there is also the central thesis that scientific knowledge is partly a social (and fictional) construct. Experimental facts and theories have to be socially negotiated. This negotiation,

and how paradigm shifts complicate that process, are explored in the following chapters.

Notes to Chapter Two

[1] This may be what Banville meant when he stated in a book review, "Perhaps we need less [sic] novelists and more writers." See "It is Only a Novel" (1977: 23).

[2] The rhetoric of scientific texts is rigorously dissected by Judith Segal in her unpublished Ph.D. dissertation (1988).

[3] Snow is anticipated by David Lindsay Watson in his book Scientists Are Human (1938) who argues for science to be defined as "simply all humanly significant knowledge" (236).

[4] This has not, of course, stopped many books appearing dealing with science as synonymous with method. A stellar example is Carlo Lastrucci's The Scientific Approach: Basic Principles of the Scientific Method (1967). Thirty years earlier David Lindsay Watson, cited above, warned of the social repercussions of such an approach to science, which were to be realized by the Second World War.

[5] See, for example, Ira Nadel's Biography: Fiction, Fact and Form (1984).

[6] See Hayden White's discussion on this point in Mitchell (1980).

[7] See Holton (1988), pp. 197–201.

[8] See Holton (1988), pp. 53–54.

[9] Doctor Copernicus, 208. The notes, presumably the author's, at the end of the first edition (244) refer erroneously to specific page numbers in the text.

[10] In his preface to Doctor Copernicus, Banville repeats Arthur Koestler's error in referring to "Ludwig" Prowe. It should also be clarified that Prowe's work is divided into two parts but published in three volumes.

[11] The work on creativity is vast, but certain positions are agreed upon. One position is that creativity resides in one person at a specific time. An alternative view, but not exclusive of the first, is that individual creativity is only one part of a system of social networks. For a useful discussion of these various positions, see Sternberg (1988).

Chapter Three

A Social Scientist: Doctor Copernicus

John Banville's Doctor Copernicus is a novel replete with ideas. It is also a fictional scientific biography of one of the most important figures in the history of science. Despite some narrative diversions, it is chronological. The first two sections of the novel cover the astronomer's life up to age sixty—six or thereabouts. A third person narration dominates (though not completely) these two sections. There then follows the first person discourse of Rheticus, who continues the narrative and confirms a number of our impressions about the life of the great man hinted at in the previous sections. The novel ends with a fourth section, devoted solely to the day of the astronomer's death. This section is mediated in the third person. Each section provides us with insufficient knowledge to characterize fully the figure of Copernicus. Each section does, however, pose one of the major questions of John Banville's scientific tetralogy: To what varying degrees do experiment, experience, and intuition account, respectively, for the complexities of the world as perceived by human beings in general and scientists in particular?

Banville interrogates the history, the politics, and the religious wars surrounding Nicolas Copernicus. To some extent, all historical and biographical novels do this. What distinguishes Banville is his transference of these considerations to scientific creativity and subject matter. To explain a genius like Copernicus, Banville dwells upon the thorny issue of "subjectivity" in science. For Banville, "subjectivity" is defined not so much as the dominance of Copernicus' point of view in his theorizing, but by the great scientist's active, though often unwitting, use of "extra-scientific" factors, which are absorbed into the "I," in his theoretical science proper.

These "extra-scientific" factors comprise (a) the important events and thoughts in the scientist's boyhood which remain potent throughout his life; (b) the impact of his family's breakdown, including moral and physical corruption; (3) the scientist's philosophical assumptions, which by definition include and exclude various controversial material; (4) the input of friends and colleagues, who bring conflict both to his work and to his life; and (5) the lust for power of his superiors, which complicates the link between science and public policy and affects his living and working conditions.

The overall effect of these factors is not so much a diminishment of the achievements of Copernicus but an awareness that theories depend for their creation and currency on propitious circumstances, more often than not

outside the control of individuals. Be that as it may, Banville engages us forcefully with the internal battles of his protagonist, and it is with these that a comprehensive discussion of Doctor Copernicus should develop.

First, however, I think it is necessary to make a few general comments about (a) the concept of Copernicanism, (b) the implications of the narrative modes chosen in the novel, and (c) the general kind of influence which pervades the fiction. It seems to me that these topics are closer to each other than they appear at first glance.

Copernicanism as we understand it today is the general orthodoxy that the sun is at the centre of the universe around which the earth and other planets revolve. The novel does not go into this theory in detail. What Copernicus actually discovered was that "the centre of the universe is in the region of the Sun" (Duncan 49), meaning that the centre of the universe is some distance from the sun, in space. For scientific intents and purposes, heliocentrism is a fiction. It is a workable fiction, nonetheless, because we find notions of absent centres disturbing (it reveals possibly our lack of understanding or inadequate calculations) and are eager to accept a comforting or elegant theory which is more or less correct. Throughout the novel, the character Nicolas Copernicus is torn between the fear of not being taken seriously and the equal fear of being taken very seriously, since he knows what he has to

offer is ultimately a fiction, albeit a better fiction than the theories of Ptolemy (geocentrism).

Given that the competing theories are likened to competing fictions, it is unsurprising that one discovers a variety of fictional modes in the novel as a whole. The mainly third person narration of sections one, two, and four is called into question by the first person narration of Rheticus in section three. The third person narrative aspires to objectivity, just as Copernicus himself aspires to an objective theory of the heavens. The first person narrative suggests that subjective concerns are invariably incorporated into any theoretical construct. By the same token, employment of a primarily impersonal narration typically promotes a confusion of distance, as Wayne Booth has pointed out in The Rhetoric of Fiction (1961;1983).

This confusion of distance is in that between the narrator and the character of Copernicus, and the distance between the narrator and the reader, not to mention the brittle division between the narrator and the implied author. The "objective" presentation of "subjective" thoughts is achieved, for example, by the insertion of letters, dialogue exchanges, Rheticus's discourse, and by the many italicized sections. On top of these variations, we seem to slip narrators at the end of the second section, when Anna Schillings is introduced into the narrative. These shifts emphasize the novel's fictionality, its distance (but also competition with) a "real" biography.

Nevertheless, in terms of the tetralogy's general argument that an accepted scientific theory is only one of many possible theories (and possible fictions), such competing styles of presentation are highly appropriate.

The topic of degrees of distance is allied to the question of influence. I have argued that Banville's novel does not show us the influence of Copernicanism, but the intellectual and emotional influences upon the individual who was to become notorious in the history of science. The kind of intellectual influence Banville relies upon in his novel for his main character bears a resemblance to that explored in Harold Bloom's The Anxiety of Influence: A Theory of Poetry (1973). Bloom takes as his main subject the role of the past in constructing the present, specifically in the creative activity of poetry. His thesis is stated in a forthright manner:

> Poetic influence—when it involves two strong, authentic poets,—always proceeds by a misreading of the prior poet, an act of creative correction that is actually and necessarily a misinterpretation. The history of fruitful poetic influence, which is to say the main tradition of Western poetry since the Renaissance, is a history of anxiety and self-saving caricature, of distortion, of perverse, wilful revisionism without which modern poetry as such could not exist. (30)

The act of misreading, of conscious misunderstanding even, seems crucial to Banville's Copernicus's intellectual and emotional development, whether in relation to Ptolemy or to

his own father. Bloom restructures and complicates T. S. Eliot's essay, "Tradition and the Individual Talent," to account for his modern "strong, authentic poets." His main point is that conscious misinterpretation of the past is necessary for the artist to advance. The word scientist can easily be inserted here as well.

For the modern scientist, influence can be of two kinds: an acceptance of previous work in an attempt to further its lines of thought; and an acceptance of previous work as only one continuum of certain starting conditions. Banville's novel is focussed partly on the latter conception and partly on what Kuhn summarizes as "the details of biography and personality that lead each individual to a particular choice" (200). Kuhn finds this topic fascinating, as does Holton, but neither chooses to explore it any depth, except in terms of theory. This gap gives Banville space in which to work. It also explains why, below, I spend so much time on the various influences on the character of Copernicus. These influences lead him to (a) conditions in which a new theory can be constructed; (b) his gradual acceptance of observable (in)adequacy over unobservable "truth"; and (c) his acceptance of social blockages to the dissemination of his theories. These three stages can be traced chronologically under six subheadings: (1) the scientist's boyhood; (2) the scientist's family breakdown; (3) the scientist's philosophical assumptions; (4) the scientist's friends,

colleagues and relationships with women; (5) the scientist's dealings with Rheticus; and (6) the scientist's awareness of geopolitical realities.

I. The Scientist's Boyhood

There are two strong early influences on Copernicus's life as depicted in Banville's novel. One is deeply symbolic—the green linden tree—and one concerns a social process—his education or training at the hands of Wodka and Sturm in school. As for the first, the opening pages of the novel stress the relationship between the object (tree) and the subjective experience of it (young Copernicus's observation of it). Banville begins and continues with an ambiguous use of third person interior or limited narration: "At first it had no name. It was the thing itself, the vivid thing" (3). The tree that young Copernicus sees is at first unnamable, and in so far as it does so appear, it is beautiful. Yet the astronomer's whole educated life consists of an attempt to name the unnamable, for all his theories and calculations in later years are geared to that one end: the encapsulation or explanation of the "vivid thing." That which he experiences as a boy, he loses somehow in adulthood.

If we catapult ourselves to the end of the novel, we become aware of how the tree is embroiled in all of Copernicus's aspirations.

In "Magnum Miraculum" we return to the sympathetic narrator at Copernicus's side. The first paragraph sets the gentle tone of introspection in this final section. It is the sun that brings together the fragments of his life for a brief period (naturally so for a heliocentrist). Yet his world has retreated into his skull, a "shrivelled sphere" (223). He awakes slowly to form in his mind the pieces of furniture in his "cell"; they resemble "integers" which assemble his "constellation" (223). In Anna's silent ministrations to his dying body, he feels ever more the necessity of the tangible, the world of action, and the distrust of words.

The only solidity appears to be remembering the past which was "wonderfully intact" (228). For a short while, he believes meaning resides in Torun, his birthplace and where he spent his childhood days, as well as where his linden tree is; but these images fade away, bringing only disembodied voices telling him how to die. The final irony is that Osiander reads Copernicus the preface to de Revolutionibus, in which the Lutheran has assumed that Copernicus has yet again saved the phenomenon with new observations and theories. What he certainly has not done, according to Osiander, is explain the phenomenon, which is why we end the novel with such elegiac lyricism for the unnamed tree.

Banville helps the reader to focus on the major early influences on Copernicus by inserting a letter from the young boy to his sister Barbara:

Dearest Sister:

I am sorry that I did not write to you before. Are you happy at the convent? I am not happy here. I am not very unhappy. I miss you & Katharina & our house. The masters here are very Cross. I have learned Latin very well & can speak it very well. We learn Geometry also which I like very much. There is one who is named Wodka but he calls himself Abstemius. We think that is very funny. There is another by name Caspar Sturm. He teaches Latin & other things. Does Andreas write to you? I do not see him very often: he goes with older fellows. I am very Lonely. It is snowing here now & very Cold. Uncle Lucas came to visit us. He did not remember my name. He tested me on Latin & gave me a florin. He did not give Andreas a florin. The Masters were afraid of him. They say he is to be the Bishop soon in Ermland. He did not say anything to me of that matter. I must go to Vespers now. I like Music: do you? I say Prayers for you & for everyone. We are going home for Christmastide: I mean to Torun. I hope that you are well. I hope that you will write to me soon & then I will write to you again.

Your Loving Brother

Nic: Koppernigk

(16)

His belief in the intellectual life is conveyed by this letter to Barbara, written when only ten years old. We learn that he is lonely but not unhappy (intense individualism and stoicism); he enjoys Latin and geometry (a good mix of arts and sciences); he looks up to his main teachers, Wodka and Sturm (resembling Hesse's Narziss and Goldmund); he discovers the beauty of music through compulsory religion (the latter remains an uneasy but

seemingly necessary relationship); and he becomes used to poor and cold living and working conditions. His concern or interest in Andreas is also apparent.

The narrator makes the point that Copernicus has been thrust at school into a rough new world. This estrangement or separation is obviously of major importance. It is a place where astronomical analogies readily spring to his mind, if not to the mind of the sympathetic narrator: "The school was a whirling wheel of noise and violence at the still centre of which he cowered, dizzy and frightened" (16). As this whirligig slows down, he feels a distinct divide in his make-up, "that other self" (17) which passes him nearby in sunlight. (Sunlight often appears in Banville's work to be a hint of the importance of seeking answers to problems with the help of the natural world; this tendency is particularly evident in Kepler.) Indeed, it seems he has three pulls: the physical world, the astronomical world, and the religious world. All three lay claim to his soul, whether "in green April weather, in the enormous wreckage of clouds, or in the aetherial splendours of High Mass" (17). Banville's narrator solidifies the connection between the everyday existence at the school and some theoretical system by suggesting that his time there resembled a peculiar orbit and "eccentric arc" (17). On an emotional level, the only excitement for Copernicus is that which is associated with an intellectual breakthrough in

mathematics, Latin or logic, any subject where "some glistening ravishing thing" (19) could be imagined.

This education he undergoes brings into sharp relief the subjective or extra-scientific influences upon the young astronomer, for it would be a mistake to argue that pure intellectual excitement comes to Copernicus from nowhere. Canon Wodka and Sturm become his mentors, even more so than he knows at the time. It would appear that Copernicus's fascination for these two men has no logical consistency, as they are indeed opposites. Wodka is a cloistered figure who seems to like weak intellectual types like Copernicus, whereas Sturm is a worldly figure whose favourites are dull, brawny boys. Nevertheless, Copernicus learns from both men, although it is Wodka who takes him under his wing. Wodka introduces Copernicus not just to homosexuality, but to the joy of playful thought, and to an active disdain of the everyday world.

It is to Wodka that Copernicus owes his first venture into astronomical theory, for his master tells him of Ptolemy's theories of the heavens, among the many others propagated by the Egyptians, the Greeks, the Church Fathers, as well as by Aristotle, Cusanus, and Plato. He also sees that the era was ripe for new theories since the physical world was expanding, due to the discoveries of the late sixteenth and early seventeenth centuries:

> In their quest for a sea route to the Indies the Portuguese had revealed the frightening immensity of Africa. Rumours from Spain spoke of a vast new world beyond the ocean to the west. Men were voyaging out to all points of the compass, thrusting back the frontiers everywhere. All Europe was in the grip of an inspired sickness whose symptoms were avarice and monumental curiousity. The thirst for conquest and religious conversion, and something more, less easily defined, a kind of irresistible gaiety. Nicolas too was marked with the rosy tumours ofthat plague. His ocean was within him. When he ventured out in the frail bark of his thoughts he was at one with those crazed mariners on their green sea of darkness, and the visions that haunted him on his return from terra incognita were no less luminous and fantastic than theirs.
>
> (27)

This expansionism naturally excites Copernicus, the would-be Renaissance Man. Wodka's way of explaining seems to implant the notion that a theory is like a musical harmony, "a grave majestic dance," (22) as the narrator would have it. Continuing the musical metaphor, Copernicus seems intrigued with Pythagoras, who "likened the world to a vast lyre whose strings as it were are the orbits of the planets, which in their intervals sing beyond human hearing a perfect harmonic scale" (22). Wodka wishes to tease young Copernicus out of the notion that the universe is a silent machine, and from the protegé's later work he seems to have succeeded.

Perhaps the most important function of Wodka is captured in his stricture, "Consider this, child, listen: all theories are but names, but the world itself is a thing [his italics] (23). Wodka warns the young man that theory cannot teach one how to live; it can only occupy one's mind.

The Master is confirming a distinction between theory and practice as two separate disciplines. This division is not a popular one for a would-be theoretical astronomer who wishes to provide the meat between the halves of bread: "I am seeking a means of understanding and belief" (23). Wodka appears not to believe wholeheartedly in what he publicly disseminates, but he accepts such duplicity as a livable sacrifice for reasons of self-preservation. Young and strongheaded, Copernicus is not so easily calmed; it takes him until well into middle age to reconcile himself with such inadequacies of knowledge. Up until then, he accepts Wodka's pessimistic attitude only when he has time and inclination to reflect.

What he can be happy about is the potential of his life and future research which would magically transcend such differences. Indeed, such thoughts as having an observatory resembling that of Wodka's sends Copernicus into raptures, into a scientific version of an Joycean epiphany:

> The sky was a dome of palest glass, and the sun sparkled on the snow, and everywhere was a purity and brilliance almost beyond bearing. Through the far clear silence above the snowy fields and the roofs of the town he heard the bark of a fox, a somehow perfect sound that pierced the stillness like a gleaming needle. A flood of foolish happiness filled his heart. All would be well, O, all would be well! The infinite possibilities of the future awaited him. That was what the snow meant, what the fox said. His young soul swooned, and slowly, O, slowly, he seemed to fall upward, into the blue. (25)

Of course, since Stephen moves downward rather than upward in his epiphanic moment, Banville's sense of parody is near the surface of our reading of this paragraph.

In contrast to Wodka, Sturm is physically powerful and reputed to be a womanizer, a heavy drinker, and even a murderer. He teaches the supposedly exact subjects of logic, grammar, and Latin rhetoric [the trivium] in the classrooms, while outside he is responsible for teaching the boys falconry. Wodka, by contrast, teaches the more inexact subjects of geometry, astronomy, arithmetic, and music theory [the quadrivium]. At times, in class, Sturm "held riotous assembly, stamping about and waving his arms, roaring, laughing, leaping among the benches to slash with the whip he always carried at the fleeing shoulders of a miscreant. His fellow teachers eyed him with distaste as he pranced and yelled, but they said nothing, even when his antics threatened to turn their classes too into bedlam. Their forbearance was an acknowledgement of his wayward brilliance—or it might have been only that they too, like the boys, were afraid of him" (18).

To Copernicus, Wodka has an excitable mind, whereas Sturm has one of "bleak ferocity" (23), one suited to the teaching of falconry. The savagery of the hawks attracts and repels Copernicus in a very sexual way. More than this, the birds fascinate him because they have "vivid Presence" and appear to be "absolutes" (23). The young astronomer's desire is to transfer that vividness (echo of the Kantian

"thing-in-itself" and Copernicus's linden tree) and absolutism to his academic study and theorizing. In reality, thought of the hawks merely prompts his masturbatory habits.

II. The Family Breakdown

The impact on Copernicus of his family's disintegration can not be overstressed. The deaths of his mother and father, the dispersion of the children, and the moral and physical corruption of Andreas haunts the astronomer throughout his life. Even the title of the first section, "orbitas Lumenque," is relevant here, as it may be translated as "orphaned life," thereby linking the earth's lonely orbit with Copernicus's orphaned childhood. In fact, it might be said that the novel is one long quest by Copernicus for lost union.

The early death of Copernicus's mother highlights the separation between body/soul, body/mind, object/subject, and even corpse/essence when he contemplates the absent/present dichotomy of his mother's demise. Abstract concepts resonate in his mind, as when alive his mother "spoke that name that named nothing [love], some implacable but real thing within him responded as if to a summons, as if it had heard its name spoken" (3-4). This is a rare instance in Copernicus's life that the abstract and the concrete coalesce, but it is of immense importance to him because it

allows for the passage from theory to practice within the subject.

Words do, therefore, excite Copernicus on an emotional level. He is entranced by words, particularly abstract ones. This is a fortunate tendency for an astronomer-to-be, since his later work must deal with abstract concepts in an appropriate language. His pursuit of harmony is begun by considering the possibilities of the combination of words into pleasing patterns and sounds, which account for his interest in rhymes and songs (4). Of course, language is an imperfect medium, but, like most human beings, Banville's Copernicus "soon forgot about these enigmatic matters, and learned to talk as others talked, full of conviction, unquestioningly" (4). This automatism or lack of self-consciousness enables the outlines of new theories to be drawn. However, the scientific theorist such as Copernicus must hold his theory or theories up to internal testing. During this activity, it is natural that the whole question of language use becomes problematic.

The young Copernicus is constantly reminded of such divisions and separations, most notably with the concept of money. His merchant father explains that coins are "only a kind of picture of the real thing, [for] the real thing itself you cannot see" (6). What we understand here, apart from the anti-Kantian resonance, is the seed of Copernicus's acknowledgement that the visible world is at best a distorted mirror of reality.

The trajectory of the scientist as a boy in relation to the scientist as a man is established in the novel around this point, since the mature astronomer is to voice exactly the same sentiments as expressed by his father (though in different form) to Rheticus, his surrogate son: "There is no contact, none worth mentioning, between the universe and the place in which we live" (206). Despite his father's tutelage and the warnings of Professor Brudzewski (discussed further below), it has taken a lifetime for Copernicus to discover this "truth" for himself. Put clearly, he learns that coins are usable currency for abstract leaps of faith, that simple models are commonly substituted for complex systems which are not fully understood.

Thus the influences his mother (love) and father (money) have in the short term only confuse an expanding and ambitious intellect. The narrator's description of Copernicus's relationship with his family reveals his socializing problems, which surface most noticeably in later life. He prefers reclusive Barbara to wild Katharina and Andreas because she is to be a nun; he finds his father's company pleasurable only in silence; and when the object of bullying by Andreas and his friends, Copernicus retreats to cry "discreetly" (11). Rambles with his father introduce the notion of harmony in the workplace, "for nothing could shake the stout twin pillars of debit and credit on which the house was balanced. Here was harmony" (7). Of course, this perceived harmony is totally erroneous and comes

crashing down when his father dies and the business is reported to be running up wild debts. Copernicus takes time to learn that appearance is not reality.

The death of his father can be seen as the most important impetus for Copernicus's academic flowering, for whereas he saw his mother's death as merely a "flaw" in the "machine," his father's death suggested far more:

> This death was different. The machine seemed damaged now beyond repair. Life, he saw, had gone horribly awry, and nothing they had told him could explain it, none of the names they had taught him could name the cause. Even Barbara's God withdrew, in shocked silence. (12)

This early insight can, in the light of Copernicus's later achievements, be taken in one of two ways. Either their arbitrary deaths force him to rescue an "undamaged" or "true machine" of the workings of the universe, with the attendant pressures of saving/explaining the ancients' work, the phenomena themselves, and ultimately his parents' lives; or, more simply, their arbitrary deaths force him, at a young age, to renounce emotion in favour of intellect. One senses that Banville suggests the former underneath the guise of the latter.

Arguably, the most influential figure on Copernicus's personality is Andreas, the proverbial black sheep of the family. He has bad dreams; he lives in his "own silent troubled world" (5); he is violent; he is the butt of his father's scorn; he is mediocre at school where he enjoys

farting contests and bullying others. Yet Copernicus is drawn to him, particularly to his body, which he describes as a "perfect vase" (9). Andreas always seems to appear at the most embarrassing moments, such as that after Copernicus has masturbated (24). His intellectual routing at Brudzewski's house is all the more painful because Andreas is there to witness it. Time and again, he can not find a suitable retort to Andreas's accusations that he is plotting to seek his Uncle's favour by his interest in astronomy. As the narrator explains, the two brothers are "lashed together by thongs of hatred and frightful love" (40). Andreas has some reason for resentment, discovering only after the marauders attack that his brother had been hiding money from him. Though calling Copernicus a "cunt," he does not seem totally surprised by his sibling's deceitful action.

In so many ways, they seem opposites. It is Andreas who complicates Copernicus's life by telling Novara of his brilliant brother. Whereas Andreas loves Rome and its scheming Churchmen, Copernicus hates the capital and its subterfuges. Despite these less than propitious circumstances, Copernicus seems to care deeply about Andreas, for when the wayward brother falls drunkenly into his lap, he is "suddenly stricken by sad helpless love" (47). (Andreas resembles Felix in Kepler.) Slowly, the young astronomer watches his brother disintegrate into penury and illness, "like witnessing the terrible slow fall into the depths of a once glorious marvellously shining

angel" (62). Copernicus can describe his brother but can not explain his actions.

Andreas appears in the second section of Doctor Copernicus to move like the falcons of the first section, hovering above always ready to strike. The first and last paragraph of "Magister Ludi" are the same and they refer, though significantly not by name (since Andreas is very much a "thing" to Copernicus), to the brother as a kind of Miltonic serpent. He is truly the "ineffable" because words/language cannot encompass him, just as Copernicus as a child feels "tree" does not sum up the physical entity, and just as in later life he feels his De Revolutionibus does not sum up the orbits of the planets. Andreas's presence is an irritating reminder to Copernicus of his earthboundedness and coldness, for "between the object and the emotion a third something, for him, must always mediate" (101–2). Andreas is the physical embodiment of the world that Copernicus's theory seeks not to explain, or seeks to ignore. Despite Andreas's venom, Copernicus's response is invariably that of pity and love. He refuses to talk about his brother's predicament with his other Canons, who want shot of the diseased man; but, more importantly, he ensures that Andreas is provided for. In a major departure from Hoyle's biography, Copernicus leaves his official position at Heilsberg to prove his regard for his brother: "He would embrace exile, would give it all up, for Andreas" (108).

Andreas's most important appearance in the narrative occurs in the final section of the novel when Copernicus, close to death, seemingly hallucinates and gives words to his suddenly arrived brother. This extraworldly and wise apparition says that at last Copernicus can be honest and admit that:

> We know the meaning of the singular thing only so long as we content ourselves with knowing it in the midst of other meanings; isolate it, and all meaning draws away. It is not the thing that counts . . . only the interaction of things; and, of course, the names. (239)

In other words, looking only to the sky unnecessarily delimits our horizons and understanding. Andreas further ridicules the astronomer's hubris in using inadequate observational equipment. Andreas argues that it was Copernicus's personal belief system which made any particular light in the sky important. What he means here is that Copernicus's observations are merely theory-laden. Andreas's "truth" is a combination of the world and human beings, the object and the subject; that the deficiencies in our language are there but that we must be satisfied with what we can express; and that the ineffable, the "thing-in-itself" can only be glimpsed, whether in human beings like the "physical" Anna or Girolamo or in the chaos of the "real" world. Connected to this is the concept of redemption which pervades the end of the novel and which is of two kinds: firstly, Copernicus has, even in

hallucination, come to terms with his subjective feelings toward his family and particularly his brother; and secondly, he is reconciled to the "fact" that he has come close to the "thing-in-itself", so that his quest, while ultimately futile, has its own special aura of achievement.

III. Philosophical Assumptions

Near the end of the first section, "Orbitas Lumenque," at the age of thirty or so, Banville's Copernicus convinces himself momentarily that he has broken through what he believes to be the presently closed system of science. His new science would be objective and honest, dispensing with mathematical neatness in favour of a solid theory explaining planetary motion:

> A new beginning, then, a new science, one that would be objective, open-minded, above all honest, a beam of stark cold light trained unflinchingly upon the world as it is and not as men, out of a desire for reassurance or mathematical elegance or whatever, wished it to be: that was his aim. (83)

Whereas the conventional approach required a slow amassing of observations and calculations, the new science of Copernicus "must be preceded by a radical act of creation" (83). This act would explain rather than be content to save (or describe) the phenomenon. The latter activity seeks not to "rock the boat" of conventional science, despite the

appearance of new contradictory data. Copernicus fully accepts that his new science is based on nothing more than an incredible trust in his intuition.

Clearly, Copernicus is at the confused stage of Holtonian "science-in-the-making." Although the narrator of the first two sections is cold and clinical, he is sympathetic to the would-be cold and clinical character of Copernicus. As readers, we sense that the dominant narrator is an older Copernicus looking back or a close friend of Copernicus. The "objective" third person narration makes it difficult to establish the validity of what appear to be first person assertions. For example, the narrator, along with Copernicus, labels previously held beliefs (mainly the geocentric theory propagated by Ptolemy and his followers) as subjective, dishonest, overly elegant, and convenient to account for their calculations and observations. So far, so good. But how, we ask, can this fictional Copernicus delude himself that what he will uncover in his new science will be less than a subjective activity, particularly when he honestly admits to relying upon a "creative act," a "theory" and, most of all, "intuition"? Of course, Copernicus accepts that errors and illusions precede the truth, but equally, it is never really addressed whether or not such false trails lead to the promised land of truth.

More disingenuous from a scholarly point of view is his dismissal of the need to devise original procedures with which to construct a new theory. He feels that spending

time working with new measuring instruments and new observations is an unnecessary occupation. In fact, Copernicus's heliocentic theory and vision of an expanded universe do not come from scholarship but from a "creative leap" (85). He chastises himself for his conservative academic caution, as the narrator explains:

> He had been attacking the problem all along from the wrong direction. Perhaps his training at the hands of cautious schoolmen was to blame. No sooner had he realized the absolute necessity for a creative leap than his instincts without his knowing had thrown up their defences against such a scandalous notion, thrusting him back into the closed system of worn-out orthodoxies. There, like a blind fool, he had sought to arrive at a new destination by travelling the old routes, had thought to create an original theory by means of conventional calculations. (84-85)

This act of creation becomes initially the much sought after "thing itself, the vivid thing" (85), which draws the reader back to the very beginning of the first section to the as yet unnamed tree (3). Memory of this tree conjures up lost youth and purity. In turn, we are pushed back further to the epigraph for the novel from Wallace Stevens's "Notes Toward A Supreme Fiction": "You must become an ignorant man again / And see the sun again with an ignorant eye / And see it clearly in the idea of it". In other words, in the "world" of Copernicus, Stevens and Banville we must always clean our glasses and go back for a second look at "reality". Yet however hard Copernicus works, he cannot verify his theory

of the heavens, at least not in the same visual way that he can verify the existence of a linden tree before names are connected to it.

This search or quest for truth is obviously the core of the novel and bears some examination. It is tied to some extent to his vocation as a religious man, who is supposed to have absolute faith in God. His position as a Canon in the Cathedral Chapter is largely a sinecure, a place where academics can thrive, but this does not mean he takes his religion for granted. It is questioned, however, by his work and his everday experiences.

In sickness, Copernicus feels sharply the divide between the knowable and the unknowable, between observational (in)adequacy (or capability) and unobservable truth. Significantly, as Copernicus recovers from his illness, it is the commonplace which gives him support, such as the flea-bitten dog or his servant Max's surly demeanour. Yet this information is mediated at a distance by the narrator, since it appears that Copernicus does not seem to privilege this observable adequacy in the face of unobservable "truths" which he so desperately seeks in astronomy. This distancing is mirrored in Copernicus's working through of his theory. His ability to verify (or to account for his theories) is sadly lacking; in fact, he echoes Brudzewski's oppositional structures by feeling that his writing could not mediate satisfactorily between the planets and his own physical position (93). Copernicus's

problem is that he regards the subject and the object as mutually exclusive, when in truth the "object" is part of the subject's experience. It is a kind of paradox which produces in him "rapturous grief" (93), or the only happiness possible in his lonely world.

In the second section of the novel, at his first arrival in Frauenberg, it appears his feelings are moving away from mutually exclusive concepts, when the narrator informs us he hated extremes (109). He prefers the sea to the sky, but the murky depths of that sea worry him. He would rather have the rock by the seashore because it would then be something substantial, something "stony," a word which he normally associates with God's silence (110). We begin to wonder if his book is one long preamble to the verification of God (that his book of the Heaven's system is essentially a search for God). Copernicus, however, does not help himself in this academic or theological search by his decision to live apart from his companions, in the tower at the northwest corner of the cathedral wall (110).

In this period of "renunciation" or "passivity", in relation to his colleagues, he takes on the numerous everyday tasks of the Chapter—collecting rents, writing reports, tending the sick. This is the point where Alicia, the poxed girl, enters the narrative. Significantly, like his green linden tree and the green gowned girl at Professor Brudzewski's, Alicia wears a green cloak. Although he seems unaware of what is going on, Copernicus is slowly learning

about the "objective" world and beginning to reconcile it with his subjective view of it. It is just that he is failing to view the sky in the same forms that he views those around him. Yet it is only a start, because he still considers her appearance in either/or terms or as suggestive of a polar opposition: "Once again he was struck by the failure of things and times to connect. The world was there, Alicia was here, and between the two the chasm yawned" (114). Alicia's predicament stirs in him a desire to close that chasm by grasping her body to his, if it would do her any good.

At this point he feels God has abandoned him. Ironically, though consistently, he loses faith in the theory [existence of God] and not the practice [the rituals] which he wholeheartedly believes in because they are tangible and workable. His divorcement of faith and ritual can be correlated to his subjective theory of the heavens (faith) and his worldly life (ritual). He seems to ask too much, hoping intuition can be rationalized fully. The creative leap of faith he so loudly (to himself) proclaims cannot withstand the kind of verification he is accustomed to demanding. Also at this point he loses faith in his book's ability to move outward. Just as he is aware of the nonconnection or arbitrariness of ritual and faith in God, so, too, does he see the arbitrary connection between writing and the external world. His text only refers to itself and when it spun outward, it spun into "emptiness"

(116). The more he revises and reworks, the more he realizes he is slipping away from the original thought. What is missing in Copernicus's view of his book is the power of subjective feelings to make such writings work in the real world. For a man used to scripture, this hesitation is surprising. It suggests that he cannot for much of his life accept the same rule of thumb (a creative leap of faith) in his astronomy as he wishes to do in his religion.

Copernicus's compromise is an academic one. Either he has to write a completely new book or, and this is where he ultimately resides, a new view of the book he has written needs to be explored. He considers that despite its flaws, the world generally would welcome his book as a great event. This prompts him to "publish" or have copied his Commentariolus. He realizes his theory banishes the world/earth from the centre of the universe, but he believes he is only pointing out reality:

> O true, he had no wish to be reviled, but far more important than that was his wish not to mislead people. They must be made to understand that by banishing Earth and man along with it from the centre of the universe, he was passing no judgements, expounding no philosophy, but merely stating what is the case. The game of which he was master could exercise thwe mind, but it would not teach them how to live. (120)

His intellectual rationalizations are curiously contradictory, though necessary perhaps to keep him sane.

His gradual acceptance of observable (in)adequacy over unobservable "truth" is part of the healing process of his intellect and life.

Feelings of mortality take centre stage as Andreas's illness progresses and as Copernicus's adminstrative labours bring him into direct confrontation with the "grimy commonplace world" (130). He resists at first the atrocities his eyes are presented with, fearing his "higher" astronomical work will be tarnished. However, coming across the raped peasant girl not only encourages him to share this experience with Giese in a letter but also encourages him to seek his own sense of compassion. Of course, compassion is a word that conjures up a meeting point between a person or situation and a feeling. As we suspect that the narrator is about to ease us into a warmer conception of the man, the tone becomes extremely academic, detached, and pedantic, utilizing the consciously false description "as if" to point out that at the centre of Copernicus was a void. The narrator who speaks is unknown:

> Nevertheless there was something about Canon Koppernigk—all saw it, even the kindly and all-forgiving Canon Giese—a certain lack, a transparence, as it were, that was more than the natural aloofness and other-worldliness of a brilliant scientist. It was as if, within the vigorous and able public man, there was a void, as if, behind the ritual, all was a hollow save for one thin taut cord of steely inexpressible anguish stretching across the nothingness. (132)

The concept of outer accessibility but inner inaccessibility is clearly brought out into the open here, and it relates directly to the apparent absence of God in Copernicus's theory of the heavens.

IV. Friends, Colleagues, Women

In addition to his mother, Andreas, and Canon Sturm, on the close physical and emotional side of Copernicus's make-up, there are the influences of Fracastoro Girolamo, Anna Schillings, and disciple Rheticus, all of whom bring conflict to the life and work of Copernicus.

Fracastoro Girolamo is plucked out of history by Banville for a specific purpose. To understand his role fully in Copernicus's development, we must turn to one of Banville's sources, W. P. D. Wightman's Science in a Renaissance Society (1972). Wightman explains that the historical Girolamo, who has a statue bestowed upon his memory in Verona, was a contemporary of Copernicus. Furthermore, he was a dilettante who, nevertheless, published a major work, Contagion and Contagious Diseases. He is remembered by medical historians as having coined the name "syphilis." Wightman stresses that Girolamo's uniqueness lay in his isolation from other academics and their influences, and in his firm belief that his work should be based on experience rather than on theory or experiment (Wightman 95).

Copernicus is happy in Girolamo's company, spouting his theory of the planets. For a while, he believes that his homosexual relationship can liberate him from his intellect or, more likely, enable him to fuse his physical and intellectual desires. This is a very selfish attitude on his part, consistent with his intellectual vanity. He seems to enjoy poking fun at Girolamo's higher social standing, but it appears that his perception of his friend is misdirected. Girolamo points to Copernicus's weaknesses and, in so doing, announces his own raison d'être:

> Have you ever, once, shown the mildest interest in my concerns? I am a physician, that I take seriously. My work on contagion, the spread of diseases, this is not without value. Medicine is a science of the tangible . . . . You wanted me to be a rake, a rich wastrel, something utterly different from yourself: a happy fool. And I obliged you. I have been lying ever since. (82)

Once the rug is pulled out from underneath his feet, the young astronomer moves further into his profession, determined that he will prove his ability to perceive beyond the surface. Yet we ask, along with Girolamo, what kind of astronomer–philosopher can exist who is so patently bad at grasping the true worth of those around him? Girolamo's assertion of the value of the tangible sciences haunts Copernicus to the extent that he finds surprising peace of mind as a physician or doctor to his Uncle Bishop Lucas. It is as if he finds the practice of medicine an experiential

lifeline to his metaphysical speculations. It is essentially to Girolamo that he owes this perception, but it is noticeably unrecognised by the narrator and Copernicus.

The astronomer's inability to communicate with women seems deep rooted, possibly due to the loss of his mother at an early age. He respects Barbara but does not participate in any meaningful conversation with her, and he appears to have a deep distrust of Katharina, his other sister. Women are "hopelessly corporeal creatures" (24), meaning that they do not offer excitement at the level of metaphysical inquiry. Indeed, we have already noted when Copernicus masturbated his fantasies revolved around Sturm's hawks not human beings, whether male or female. Curiously, he tries to incorporate into his work the perceived beauty of one woman. She symbolizes his valiant efforts with Professor Brudzewski to discredit the Ptolemaic system. But even here he is seriously misguided. On entering Brudzewski's house, he spies a smiling green clad girl. He sees her as a "talisman whose image he might hold up against the malignant chaos of this ramshackle afternoon" (33). She is very much "the thing itself," elusive but tangible. It is perhaps no accident that he finds, albeit displaced, security in green, for it is the colour of his immortal linden tree (3).

However, just as the linden tree is to be cut down (119) so, too, is Copernicus's view of the girl who is reported by Brudzewski as "mad" (48). The young astronomer's understanding of women is low on originality

and often high on derivation, even to the point of copying a phrase from Regiomontanus, an intellectual antecedent, in his line of argumentation—"like credulous women" (34). More disturbing misogyny is his dispassion on a walking trip to Italy when the women travellers are raped by marauders (43). The narrator seems to suggest that it is because the travellers beat up a diseased female prostitute, who later dies, that their journey is doomed (42). Copernicus's loss of virginity on one drunken evening with a prostitute is viewed by the narrator with equal dispassion as "a messy business, quickly done" (47). Indeed, the end of his relationship with Girolamo is symbolized by the sexual acts of a "slattern" of a maid, who seemingly replaces Copernicus (82–83).

This pessimistic and negative attitude to women undergoes a gradual change in the second section of Doctor Copernicus. The astronomer's cloistered life begins, at Andreas's urging, to strike him as "dry as a barren woman" (102), but most significant is his failed attempts to minister to the venerally diseased fifteen–year–old girl Alicia. In his failure, he brings out a connection between a diseased human being and his limited, indeed faulty, theory of the heavens: "Once again he was struck by the failure of things and times to connect. The world was there, Alicia was here, and between the two the chasm yawned" (114). In other words, he has begun to feel compassion and to see how his earlier division of mind and

body is not so simple. The following quotation is typical of the narrator's summation of Copernicus's early feelings: "There were for him two selves, separate and irreconcilable, the one a mind among the stars, the other a worthless fork of flesh planted firmly in earthly excrement" (27). The movement away from this feeling is further advanced when the narrator, now assuming the pomposity resembling the style of Giese, Copernicus's most friendly Canon colleague, recalls what appears to be a letter from the astronomer in which he describes his outright horror at finding a young girl who had been raped repeatedly and finally murdered: "I realized then, perhaps, (to my shame, I say it!) perhaps for the first time, the inexpendable capacity for evil which there is in man" (130). It is here that he raises the issue of redemption which for Copernicus seems tied up with his previous selfish attitudes to his fellow man, as exemplified earlier by the way "he kept his riches secret, and sewed the gold into the lining of his cloak, because he did not wish to embarrass his penniless brother, so he told himself" (41). The last four words of this quotation seem to mark a distinction between the "naive" character and the "wise" or "moral" narrator. It is a distinction that betrays periodically in the text the existence of an observer (a biographer as narrator) and an observed (Copernicus). We have already seen this in the letter of Copernicus written at school and will see it later in the discussion of Rheticus.

Although he cannot save Alicia from the pox or another girl from the soldiery, Copernicus can save Anna Schillings and her children, even though the retention of his "focaria" [a female servant] proves to be the most disturbing aspect of his life for those plotting against him from within the Church. The narrator devotes a whole section to Anna, although we never really push into her mind as we do into the mind of Copernicus. Her small section (139–48) is recounted by a parodic and jocular narrator, as if by some populist biographer. This Fieldingesque style is replaced in the final section of the book with Copernicus's assessment of Anna, which is one of great compassion and gratitude. Clearly, this woman's role deserves extended consideration.

Frau Anna Schillings bursts abruptly on to the narrative near the end of section two, "Master Ludi," after the threatened invasion of Teutonic Knights into Ermland's towns subsides, and before the presentation of various letters to and fro among Copernicus, Dantiscus and Giese. The narrator's use of the royal "we" in a quotation below is strikingly patronizing, consistent with the remarkable reference to the "weaker sex" (140). The false morality advanced by this narrator adds to the reader's confusion in recognizing the "appropriate" level of distance from the characters. Dashes, parentheses, question marks, and italics also contribute to our sense of this narration's difference. The use of understatement is most noticeable:

"It is a measure of the woman's—we do not hesitate to say it—of the woman's saintliness that at first she did not understand what the beastly man was suggesting; and when he had told her precisely what he meant, she gave vent to a low scream and burst immediately into tears. Never!" (141)

Yet where there is scene over the narrator's summary, Anna Schillings appears to be a tough-minded, sensible, woman. She presents her predicament of poverty first to Canon Sculeti's focaria, Hermina, and then to Copernicus himself, who takes her in. Luckily, too, she seems to be a distant cousin of the good Doctor. Her insertion into the wasteland of Copernicus's life is fortuitous, as she arrives in the vacuum left by the recent deaths of his sister Barbara and brother Andreas. Despite the many veiled threats by letter from Dantiscus, and despite the expulsion of Canon Sculeti from the Chapter for the same "crime," Canon Copernicus holds fast to Anna as some kind of lifeline. He even reveals a sense of humour about his situation by remarking to Giese in a letter, "It occurs to me that our Frauenburg is aptly named" (155). He does issue an edict to expel Anna, but he seems equally convinced that it is pointless as she has nowhere else to go. The continuing development of Copernicus's work would seem to be sustained by the physical presence of Anna. She must be incorporated into his system and his life despite the consequences.

Anna Schillings receives a very unflattering portrait from Rheticus—"that bitch" (162). She is a tyrant in Rheticus's mind because he senses that some "cuntish ritual, performed years before" (190) between Copernicus and Anna gives the latter a certain autonomy. In this assumption, Rheticus accords with the narrator of the fourth section of the novel, "Magnum Miraculum." Away from the fire of Rheticus's embittered account, this narration is serene, reflective, and sympathetic to Copernicus. The Canon tells Anna he is dying; she weeps. In the ironic clarity of illness, "he admired her competence, her resilience; an admirable woman, really. Something of the old, almost forgotten fondness stirred in him" (227). He contemplates whether his sleeping with her (only on three occasions) actually meant more than he would admit at the time. For her part, Anna says little and ministers to him in his time of need; she is a woman of action, a feature which Copernicus recognizes and respects. When the Lutheran Osiander arrives to dictate his preface, Copernicus is embarrassed, not for himself but for Anna, since it is not becoming for a Protestant to be confronted by the "mistress" of a Catholic clergyman. And just before Copernicus hears the horrifying news of Osiander's preface, the sound of Anna's distant footsteps strikes him as the final loss of comfort in his life.

Anna Schillings becomes the focal point of Dantiscus' attack on Copernicus. She is the flaw in his system, at

least according to the world of political chicanery. Dantiscus argues that "For Ermland, the future is one of two choices: this province must become either Prussian & Lutheran, or Polish and Catholic. There is no third course" (153). Dantiscus sees the "corruption" of the focaria business as damaging for Ermland's autonomy, in the sense that for Ermland to be secure, it must always appear to be taking the high moral ground. Of course, Dantisicus is only using this as a ruse to exercise power over the astronomer. Nevertheless, the fact that Copernicus effectively refuses to banish Anna reveals his desire to break orthodox systems, whether theoretical or political.

V. Rheticus

The exploration of Copernicus's theories is carried out in the third section of the novel, the narrative of Rheticus, a memoir of the four years the young disciple spends with the master. It should be pointed out that Banville's Rheticus is far more distant from the historical Rheticus than Banville's Copernicus from the historical Copernicus. [2] Rheticus provocatively asserts that he knows the "truth" behind Copernicus's theory. He claims to have known the man himself, and so his account must be gauged with the same reserve that we read those biographies by Moore and Boswell of Sheridan and Johnson respectively. The first two sections of Doctor Copernicus, we will recall,

cover the astronomer's life up to age sixty-six or thereabouts. Rheticus's discourse continues the chronology and confirms a number of our impressions about the life of the great man. Having said that, we are very conscious that the source of this information is unreliable in certain respects, though not in the essentials.

The seat of this unreliability resides in the fact that Rheticus is writing his memoir-autobiography to prove that he has been grossly punished (he has been sent to languish in the provinces). Rheticus's overbearing nature and conceit warn us that we should be careful as readers in taking all that he says at face value. Within the "I" of his discourse, he refers to Copernicus as an "old fool" and "friend." We are amused that Rheticus is now physician to a Count who is regarded as "mad"; indeed, the astronomer seems aware that he, too, is regarded so. Despite our doubts concerning Rheticus's delusions of grandeur, we are prepared to accept his descriptions because they accord with the impressions left by the previous narrator(s), and we cannot argue one way or another why Rheticus would find it in his interests to lie about certain issues and experiences.

Rheticus provides insight not only into Copernicus as a human being, but also into his flawed theories. In addition, he complicates our views of Giese, Anna, and Dantiscus. Rheticus also provides the reader with the novel's only real humour: we are constantly amused at the

fundamental Protestant view of Catholic Copernicus and his horror at the "bloodstained idols" (161) which surround him.

As an impatient narrator, Rheticus puts forward his thesis sentence very early on in his narrative: "Copernicus did not believe in truth. He had no faith in truth" (163). To give authority to his account, Rheticus claims he saw the core of Copernicus, "the true thing, a cold brilliant object like a diamond" (169). This is consistent with Rheticus's astronomical claims that he improved upon Copernicus by actually finding the "thing itself". His "seeing" Copernicus imitates Copernicus seeing reality, "the thing itself." Also, it could be said that "the person himself" is the biographical equivalent of Copernicus's astronomical task. However, Rheticus's insight, if we can call it that, is speedily undermined humorously by the narrative form, with its frequent self-conscious asides in parentheses—"(not like a diamond, but I am in a hurry)" (169). Rheticus loathes the upright nature of both Giese and Copernicus; he regards them as people who used words to avoid the harsh realities of the world. This supreme egotism on Rheticus's part is not without foundation: in his own work on the problem of the orbit Mars he dashes from wall to wall in exaggeration, until reflecting, "Good, Rheticus, very good! You have found what you sought, for just as you have whirled about this room, just so does Mars whirl in the heavens!" (195) Here Rheticus attempts to transcend the subject-object

divide by physically imitating the movement, as observed, of the planet Mars.

Giese wishes Rheticus to stay and persuade the Canon to release his manuscript. This gives Rheticus courage to confront Copernicus over the book and, having done so, he is privy to its contents. We are never sure if Rheticus is correct in wondering that perhaps there is collusion between Copernicus and Giese to have the Lutheran publish a Catholic work. Like Rheticus, we are unclear about the possible political ramifications. It may be that Rheticus is simply overstating his case in an attempt to find reasons for banishment. Certainly, Giese's provision of paper and writing implements for Rheticus to copy the master's work is no direct indication of any conspiracy. For Rheticus, however, truth appears to be hidden in conspiracies.

Rheticus's appeals to Copernicus to let his manuscript be published fall at first on deaf ears, with the aging astronomer appearing most conservative—"we must follow the methods of the ancients!" (184). But if Rheticus is to be believed, Copernicus's hesitations are guises, and every now and then he lets some revealing statement emerge from his usually closed lips. Such a remark is his belief that Ptolemy's theories (and by implication his own work) are far more efficient at "computing" the inexistent or the unobservable world than existence or the observable world. In this way, Copernicus seems to be saying that his work's

value lies in fixing the boundaries of knowledge rather than offering definitive statements about knowledge.

The discussions with Copernicus bring out a number of issues germane to man's relation to the universe. Rheticus argues that Copernicus's book is of great relevance to men because it is tangible and not a flight of fancy. Copernicus replies negatively in the language of Professor Brudzewski that subject and object are irreconcilable and that seeing is not perception or knowledge. That observation is merely observation. With typical uncertainty, Copernicus further argues, "My book is not science—it is a dream" (207). Rheticus finishes copying the manuscript and then there is an extremely stylized, italicized discussion in which the unities of time are denied by quotations from twentieth century texts by Einstein, Planck, Eddington, Kierkegaard, and Stevens. These statements are not acknowledged in the narrative (they are acknowledged in an ending note on page 244) but actively put into the mouths of Rheticus and Copernicus. This narrative experiment marks the point at which the aging astronomer hands over his manuscript. But before he does so, he explains his life work to Rheticus in pessimistic, almost frightening terms:

> When you have once seen the chaos, you must make something to set between yourself and that terrible sight: and so you make a mirror, thinking that in it shall be reflected the reality of the world; but then you understand that the mirror reflects only appearance, and that reality is somewhere else, off behind the

> mirror; and then you remember that behind the mirror there is only the chaos. (209)

Rheticus takes up Copernicus's point about chaos, for after he is disgraced and not even referred to in the preface of De Revolutionibus, he thinks that the "engine" devised by Copernicus destroys itself in its faulty detail. He also thinks that the sun-centred universe, much touted, is only a half-truth, for what the treatise actually implies is that the centre of the universe is some distance from the sun, in space, in nothing, so much so that "the world turns upon chaos" (218). This is too apocalyptic a vision for Rheticus who appears to reason that though fictions are everywhere, the knowledge that "this planet shall be the centre of all we know" (220), should suffice.

VI. Science and Geopolitical Realities

The lust for power of his superiors complicates the link between science and public policy, and affects Copernicus's living and working conditions, as exemplified earlier with Dantiscus and Anna Schillings. The political ambitions of his uncle, who wants disciples, determines much of the education of Andreas and Copernicus. Copernicus faces the political and scientific meshing head on in his confrontations with Professors Brudzweski and Novara and with Emperor Albrecht. Each meeting delivers a body blow to

any hope that scientific theory can succeed by merit alone: it has to be socially negotiated.

It is no accident that in the first edition of the novel a map of Europe in 1500 is provided. The many states and statelets are comparable to competing theories, a muscular struggle for supremacy. This struggle for harmony is allied to Copernicus's desire for harmony in both his personal life and astronomy. As a diplomat for his exceedingly political Uncle Bishop Lucas, Copernicus has to deal with the everyday presence of warring factions. Of particular importance are the issues of allegiance and nationality. Petitioners pull him this way and that, to the extent that he becomes aware that nations are just a series of spies of conflicting names, "one more mask" (94). Still the nominalist, he asserts his own name. [3] Nonetheless, he requires a better and more detailed definition of himself to satisfy various parties. Although Uncle Lucas insists he is an Ermlander, Poland, Royal Prussia, East Prussia, and even Italy have legitimate claims upon him throughout his life. Copernicus is born in Torun in Royal Prussia, moves to school in Poland, then on to university in Italy before returning to work for his Uncle in Ermland, tussling in the process with an ambitious East Prussia. The point here is that in terms of political geography, one can view the many powers as satellites of an absent centre, in the same way that Copernicus's theory, though heliocentric, is in fact (as Rheticus points out with apparent glee) a system

revolving around a "centre" some distance from the sun. More mundanely, Emperor Albrecht gives abstract concepts or theory a decidedly political and territorial significance. When Copernicus travels to Albrecht in the hope of staving off war, he pleads:

> 'you are contemplating waging war for the sake of sport. What is Ermland to you, or Royal Prussia? What is Poland even?'
>
> Albrecht had been expecting something of the sort, for he answered at once:
>
> 'They are glory, Herr Doctor, they are posterity!'
>
> 'I do not understand that.'
>
> 'But you do, I think.'
>
> 'No. Glory, posterity, these are abstract concepts. I do not understand such things.'
>
> 'You, Doctor?—you do not understand abstract concepts, you who have expressed the eternal truths of the world in just such terms? Come, sir!' (136)

The map within the map provided in the first edition suggests a connection between drawing and redrawing of boundaries of the known world. In the novel generally, Banville also connects, quite unusual for a "scientific biographer," Copernicus's seeking for his own identity with his seeking of the workings of the universe.

Two wily figures influence his intellectual understanding of the social process involving scientific theory, though in extremely different ways: Professors

Brudzewski and Novara. Brudzewski serves as a cerebral foil to the young Copernicus. The Professor represents the worn-out orthodoxies of Ptolemaic respectability which are anathema to Copernicus. It is more complicated than this, since Brudzewski is a "prime conspirator" (34), in the sense that the Professor supports Ptolemy's theories as consciously false propositions, as if they were true.

Copernicus is young and unsure of himself in this influential meeting, because he cannot see beyond the knowledge that Ptolemy's edifice is deeply cracked; he has yet to offer a persuasive alternative. Copernicus mumbles vaguely about the "principal thing" (34), by which he means the "thing-in-itself." However, Brudzewski undermines this by pointing out that it is impossible to delineate the universe's shape, since there is no direct relation between the individual who looks up and the sky which looks down. Ironically, this sentiment is uttered to Rheticus by Copernicus when it comes his time to adopt the role of sage (206). Even in the conversation with Brudzewski, Copernicus loses heart, thinking, "what can we know that is not of ourselves?" (35). Strangely, he does not explore this possibility. It would lead him to worrying subjective concerns. This quotation is also the validating principle underlying the whole novel: that which appears objective comprises much subjectivity.

Finally, it is Brudzewski's cutting, albeit perceptive, comment that rocks Copernicus: "Listen to me: You are

confusing astronomy with philosophy . . . . You are asking our science to perform tasks which it is incapable of performing. Astronomy does not describe the universe as it is [explaining the phenomenon], but only as we observe it [saving the phenomenon]" (35). Copernicus's changing of the agenda of scientific inquiry is a quantum leap into areas that leave the astronomer very open to traditional criticism. Even Copernicus's invocation of Columbus does not sway Brudzewski, because he doubts the "proof." He does not accept that Columbus actually discovered a New World. This scene reiterates the point Max Planck makes in his memoirs that it takes many years for any "proof" to be generally accepted and incorporated into scientific research. It is, as yet, in Professor's Brudzewski's world, a foolhardy attempt to combine astronomy and philosophy into a new paradigm. After this drubbing, it is with some desperation that Copernicus tries to hold fast to his beliefs in "things" not "names" (influence of Wodka) and in "explaining" the phenomena (possible influence of his parents' early deaths), but he has yet to make the creative leap that will combine philosophy and science into a workable paradigm. So, in this sense, when Brudzewski accuses him of being an unwitting nominalist, he is correct. [3]

While still trying to assess his intellectual position vis a vis astronomy, the pale spectre of Professor Novara presents itself. Novara is looking for an extremely bright

"puppet" for his political plans, but Copernicus feels detached, "a little Prussia in the midst of Italy" (53), and adamantly states that he believes in nothing more than mathematics. The excesses of homosexuality cast a warning shadow over his mind, particularly when he sees Novara's motley cabal. The group comes across as almost an occult force, which he feels is not for him but which parades a philosophy that Copernicus believes as another competing theory of explaining phenomena:

> Nicolas had already heard of the strange aetherial philosophy of this Thrice—Great Hermes, Trismegistus the Egyptian, wherein the universe is conceived as a vast grid of dependencies and sympathetic action controlled by the seven planets, or Seven Governors as Trismegistus called them. It was all altogether too raddled with cabalistic obscurities for Nicolas's sceptical northern soul, yet he found deeply and mysteriously moving the gnostic's dreadful need to discern in the chaos of the world a redemptive universal unity. (55)

Instinctively, Copernicus believes that this group's politicization of astronomy is dangerously false. They wish to utilize his "proofs" of his new theory to wrench power from what they see as a bad Pope:

> What if our young astronomer, at the end of this two or three years of seclusion, should travel to Prussia and present to his uncle the proofs of his new theory? It is well known that the Bishop of Ermland is no friend of Rome's . . . . In that battle, then, between a theory mathematically verified and vouched for beyond all doubt, and a bad Pope, who, we wondered, would be likely to win? (59)

Sensibly, Copernicus refuses to be seduced both physically and intellectually at this meeting. The dangers so evident in Novara's scenario makes the astronomer's fear of publication quite understandable. Later, Copernicus is to have an acrimonious meeting with Novara, at a time when the old professor is dying and all his schemes are thwarted. Like Wodka and Brudzewski before him, Novara explains to the arrogant young astronomer that people need lies or myths to sustain themselves, and part of the intellectual's job is to confirm consciously false propositions: "You must try to understand that men have need of answers, articles of faith, myths—lies, if you will" (63). Although Copernicus rejects Novara, this "lore" is co-opted and, indeed, relayed to Rheticus much later: "When you have once seen the chaos, you must make something to set between yourself and that terrible sight: and so you make a mirror" (209). As Copernicus strives at the working out or verification of his theory, he returns ironically enough to the texts suggested by Novara in the classes that he had attended as a student. In acceding to the publication of his work, there may be an acceptance of Novara's point that the world needs such "fictions," if only to sustain further research.

Very tentatively, then, Copernicus enters the political realm through his creative acts. The publication of his Latin translations of Simocatta could have been construed by his own Church as a political act, in the sense

that it represented (by choice of subject) a belief in humanism and a criticism of the fundamentalism of both the Catholic and Lutheran Churches. However ludicrous or neglible this might appear (it seems so to Copernicus), it plays a part in his reluctance to seek publication of generally unacceptable scientific paradigms.

The major scene that introduces the relationship between politics and paradigms of a scientific nature is that involving Albrecht and Copernicus. Duke Albrecht is leader of the Teutonic Knights (East Prussia). He wishes to break Poland's hold on Royal Prussia by joining the latter with East Prussia and presumably Ermland. Copernicus by this turn of events has become Land Provost for the state of Ermland, with his centre of operations at Allenstein. In this period of high office, Copernicus relinquishes much of his astronomical activities for the cares of the here and now, even to the point of distributing a treatise of his on the debased monetary system of Prussia. Albrecht draws a comparison between Copernicus's tools [mathematics] and his tools [the people] to achieve the "supreme fictions" that are the lot of the "lofty suffering of the hero" (136):

> You and I, mein Freund, we are lords of the earth, the great ones, the major men, the makers of supreme fictions . . . . The people—peasants, soldiers, generals—they are my tool, as mathematics is yours, by which I come directly at the true, the eternal, the real. (136)

This strikes a chord in the sense that Copernicus is reluctant to draw a theory from experience; rather, he would like to confirm a theory by experience. Observation is thus theory—laden. One suspects here the general influence on Banville's novel of Einstein, who argued that experience can support or refute a theory, but a theory cannot be built from experience. [4]

VII. Some Conclusions

The construction of the subject in fiction is most commonly achieved by having one central consciousness or character through whose eyes the reader can picture a distinct world. Banville's Doctor Copernicus frustrates any easy path to that world by firstly utilizing an impersonal and unspecified narrator for sections one, two, and four; and, secondly, by utilizing the impassioned "I" discourse of Copernicus's "pupil," Rheticus, in section three. Just as Copernicus cannot seize the "true" explanation of the phenomenon, so we, too, cannot seize the essence of Copernicus, the apparent scientific genius. The series of blockages in the text are both intellectual and social.

At first Copernicus does not understand these social formative factors, what I have discussed above as "extra—scientific." It is as if two parallel lines are recognized by the astronomer, but then he resists accepting that it is only he who is sustaining the gap between them. Copernicus

values intuition in science without analyzing exactly what that means——essentially a nonrational leap of faith. Since we are presented with little technical material dealing with Copernicus's De Revolutionibus, it is not so much science-in-the-making that is important as science-in-its-justification. That is, the novel stresses how theories have to be socially negotiated. Furthermore, the novel stresses the scientist's social and biographical influences: how family, school, university, loved ones, colleagues, church, and politics structure one's ideas, frequently bringing two unlike concepts together to create a unique synthesis.

Notes to Chapter Three

[1] The six classical terms he chooses—Clinamen, Tessera, Kenosis, Daemonization, Askesis, and Apophrades—can be translated respectively as "swerve away," "recognition," "discontinuity," "expansion of original," "truncation," and "comparison."

[2] See R. Hooykaas (1984). In this work, Hooykaas argues that Rheticus always revered his teacher and that in subsequent publications he tried to support his master's theories of the heavens and, in some cases, build upon them for his own work. Hooykaas makes no reference to any disagreement over the preface by Osiander, although he does refer obliquely to false inferences by historians of science (149). Hooykaas is silent on the assumed homosexuality of Rheticus and says nothing about the possibility that Giese was unhappy with Rheticus's treatment of Copernicus's manuscript.

[3] Nominalism is a philosophical theory that asserts that classes of things, such as "animal," "nation," and "city," have no independent reality outside of the mind. Therefore, terms such as "heliocentrism" and "geocentrism" merely save the phenomena in an intellectual sense; they do not explain it in a physical sense.

[4] Note Einstein's remark, "It may be heuristically useful to keep in mind what one has actually observed. But in principle, it is quite wrong to try founding a theory on observable magnitudes alone. In reality the very opposite happens. It is the theory which decides what we can observe" (qtd. Holton, 277).

Chapter Four

Re-Ordering Disorder: Blurring Science and Art in Kepler

> Copernicus was dead fifty years, but now for Johannes he rose again, a mournful angel that must be wrestled with before he could press on to found his own system. he might sneer at the epicycles and the equant point, but they were not to be discarded easily. The Canon from Ermland had been, he suspected, a greater mathematician than ever Styria's calendar maker would be. Johannes raged against his own inadequacies. He might know there was a defect, and a grave one, in the Copernican system, but it was a different matter to find it. Nights he would start awake thinking he had heard the old man his adversary laughing at him, goading him. (Kepler 24-5)

> [Kepler's] first public defense of Copernicus was based upon his profound belief that Copernicanism was ultimately consistent with mysticism. (Nicolson 1956: 6)

Kepler resembles Doctor Copernicus in one very strong sense. It is a novel which attempts to capture the tribulations as well as the successes of one of history's greatest thinkers. It is also a novel which struggles incessantly with an appropriate narrative frame. The book is divided into five sections: "Mysterium Cosmographicum," "Astronomia Nova," "Dioptrice," "Harmonice Mundi," and "Somnium." These are the names of Kepler's great works

(1596, 1609, 1611, 1619, 1634). In this very simple way, Banville forces the reader to conflate Kepler's life and work. Banville's novel, however, is an astute examination not so much of scientific discovery but of how science is negotiated and justified in the social realm. To establish this emphasis, one must first consider the implications of the novel's formal devices.

Whereas the various narrators of Doctor Copernicus function together mostly in a linear or chronological fashion, the dominant third person narration of Kepler employs an extremely complex temporal and spatial network to convey the biography of its astronomer. John Banville has said in an interview that such patterning is an attempt to integrate the artistic and scientific vision:

> One of Kepler's theories, his favourite, and his most deluded, was that within the intervals of the six planets of the solar system as he knew it, could be inserted the five regular polygons of geometry, the cube, the pyramid, etc. Kepler, my latest book, is constructed in five sections, the number of chapters in each of the sections corresponding to the number of sides of each of the five polygons, and all of the chapters of equal length within the section. Also, the narrative structure itself is closely worked. Time in each of the sections moves backward or forward to or from a point at the centre, to form a kind of temporal orbit. But no section comes back exactly to its starting point, since, as Kepler discovered, the planets do not move in circles, but in ellipses. [1]

In his book on Banville, Rudiger Imhof devotes many pages to the detailed working through of what the author has stated

above. [2] But often one feels that Imhof misses the wood because of the trees. This "wood" is our understanding that an artifact's framework determines what kind of conclusions or discoveries can be made by artists and scientists alike. The narrative's imitation of Kepler's early astronomy is, undeniably, a statement that the conceptual models of art and science can overlap. In addition, it seems to me that Banville in the quotation provides us with the structure so that we can move on to the ideas that support such scaffolding, ideas and themes which blur dividing lines between science and art.

Furthermore, Banville's "confession" reveals to us a number of things. Firstly, he is aware that Kepler's vision of the world is false to today's scientists and astronomers. However, as a true contextualist, Banville seeks only to account for the (Kuhnian) paradigm that Kepler created, which, in turn, necessitated a revamping of Copernicus' system and a rejection of Tycho Brahe's system. [3] These differences will be delineated later. Secondly, we are struck that the whole novel is structured around ideas of geometry elaborated upon in Kepler's first work, Mysterium Cosmographicum. This implies that a whole life's writing can be understood in relation to early work (as Holton's "psychobiographical" guidelines suggest). Thirdly, the temporal re-ordering throughout the novel not only matches the elliptical path of the planets (read sections) but also suggests that step by step empirical testing, and empirical

ways of looking at and understanding the world are inadequate to the task of representing reality and accounting for creative acts which form scientific paradigms. I am thinking here, of course, of Kuhn and Koestler. Before these writers, the prolific Marjorie Nicolson in Science and Imagination (1956) insisted that "Kepler remained, in his own mind, first a mystic, second a scientist" (6). In the same interview cited above, Banville appears to seek this very peculiar ground:

> Always I begin with the shape. But let me make a distinction, a very important one. The form of, say, Kepler, is, in itself wholly synthetic, by which I mean that it is imposed from outside, yet by synthetic I do not mean false, or insincere. It is, this formal imposition, the means by which I attempt to show forth, in the Heideggerian sense, the intuitive shape of the particular work of art which is Kepler, and which was there, inviolate, before and after the book was written. I am aware that this sounds suspiciously like mysticism—or hokum, if you prefer—but once again I can only say that this is the way I work, the way I must work, and that it is insincere, with the peculiar sincerity of art. [his italics] (6–7)

What a critic can draw from this statement, apart from its idealism, is Banville's belief in intuition, a priori knowledge, and a covert belief that meaning and shape have only to be found not created. The pathway to these hidden meanings is not a smooth one. It is consistent, therefore, that the text provides a site for a whole amalgam of re-ordering devices. The novel can give the impression of a complete jigsaw but the pieces forced together in the wrong

configuration. The reader has to be creative to enjoy such a puzzle. The defamiliarizing techniques facing the reader force him, of course, to examine his own epistemology.

The movement of such historiographic metafictional techniques to fictional scientific biography and autobiography complicates pure notions of scientific progression. To privilege constant re-ordering is to attack the assumed accumulative nature of scientific discovery or science-in-the-making as well as the assumed orderly procedures involved in the justification of science. I realize that this is a contentious point, in that one may ask why should metafictional techniques (however defined) or departures from a singular third person chronological narration (with few discontinuities) necessarily attack our modern notions of orderly acquisition of knowledge in the sciences. I believe the answer here is partly historical, since in Kepler's time the field of inquiry did not have today's restrictions or specializations, and was therefore open to diverse influences; and partly modern (à la Kuhn), since I suspect that Banville takes seriously that great advances are, by their very nature, discontinuities.

The re-ordering devices include temporal and spatial slippages. Of most interest are dreams (including prolepsis), astrology as prophecy, and achrony through the elliptical arrangement of letters in "Harmonice Mundi." While each section of the novel is of a different length and of a different form than the next or previous section, the

precise formal structures which sustain Kepler and the text are intrinsically flawed since they are traceable back to a self-consciously deficient origin. As Kepler himself puts it in a letter to daughter Regina, "We are the flaw in the crystal, the speck of grit which must be ejected from the spinning sphere" (134). But that sphere has been constructed by the sight and insight of "impure" human beings.

The opening re-ordering device is that of dream, in particular the image of the perfect egg and the number 0.00429. This dream information is a sign of prolepsis, which may be understood as a narrative device which evokes in advance a future event. It is a form of prophecy which undermines linear causality in fiction as a whole. Additionally, it casts doubt on a scientist's logical, accumulative process of discovery, since it is anti-empirical.

Imhof has rightly commented upon another re-ordering device: the shifting in tense within many paragraphs in Kepler (Imhof 107). A good example is found in one of the novel's final paragraphs:

> Ill? Was he? His blood sizzled, and his heart was a muffled thunder in his breast. He almost laughed: it would be just like him, convinced all his life that death was imminent and then to die in happy ignorance. But no. "I must have been asleep." He struggled upright in his chair, coughing, and spread unquiet hands to the fire. Show them, show them all, I'll never die. For it was not death he had come here to meet, but something

> altogether other. Turn up a flat stone and there it is, myriad and profligate! "Such a dream I had, Billig, such a dream. Es war doch so schon. (191)

I think it is important to bring out strongly what this technique provokes. It blurs the character of Kepler and the narrator, the main story and the narrative frame, the time of the narrative with the time of the narration. The narrator's belief in a priori knowledge leads him to confirm the predestination of Kepler's life and work.

Astrology, of course, is a form of prophecy; it moves us into an area of predestination which, in turn, links us to the world of Kepler and his fundamental Protestantism. In turn, we see connections between religion as a form of divine prophecy, and astrology as a form of pagan or secular prophecy. Astronomy has to find its own way between these two poles. Furthermore, the achrony of the elliptical nature of the letter section of Kepler appears to undermine linear development. But Kepler, even if conceived as a historiographic metafiction, merely releases time and history from inexorable progression; it does not totally undermine them. [4]

What appears to be unresolved in both Doctor Copernicus and Kepler is this relationship between history (actual events in the past) and fiction (imagined extrapolations from these events). For the most part, Imhof presents the views of the historical Kepler (an interesting phrase in itself) as quoted by Arthur Koestler, as reason to praise

Banville's fictional construct (Imhof 105–6). Yet surely the whole point of historiographic metafiction is that the literary critic can not prove that historical discourse is inherently superior to, or more accurate than, a fictional discourse of an historical personage. In other words, the traditional division between history and fiction is rendered problematic. Since historical development is cast into doubt by the form of the novel, the reader senses that scientific and astronomical discoveries, including their verification, can only be understood with regard to predetermined discontinuities, involving chance and random decisions. While Banville's novel's structure imitates the astronomical order behind the superficial disorder of Kepler's experience, the structure also suggests that discontinuities are necessary for the advancement of knowledge—the proverbial "quantum leaps" of radical science.

Perhaps it needs to be underlined that both Kepler and Doctor Copernicus are not conventional third person biographies. Within each text, first person "slippages" occur. The major shift in Doctor Copernicus is the Rheticus section, and in Kepler it is the section of letters arranged in a circular or elliptical shape. In essence, at the centre of these texts, subjective recollections by memoir or by missives explode the distance normally allotted to or desired by biographical projects. The narrator's failure to contextualize overtly in Kepler helps to pose the question:

can human beings embarked upon the scientific pursuit escape their subjective feelings or can they knowingly (or consciously) incorporate them into their system building? It is the latter point which appears to be reified in Banville's novels.

In Kepler, the Holtonian/Einsteinian "personal struggle" of the scientist is furthered by the apparent Banvillean principle that when science as method and observation retreats, intuition and creative sensibility advance. [5] In a number of areas in the text, metaphysics, intuition and creativity are confronted, directly and indirectly. After consideration of the general topic of order from disorder, this chapter explores Kepler's relationship with a number of psychobiographical aspects, including the brotherhood of science, religion, astrology, physicalization, and dreams. Discussion of these topics will inevitably raise questions—and some answers—about the role of the scientist in society and how his ideas are developed within an artistic and social framework.

I. Order From Disorder

Kepler's dominant quest is to establish a semblance of order out of disorder. This is his science, his ultimate achievement when setting down certain laws of geometry. However, what is ironic in Kepler's travels is that he perpetually confronts the horror of disorder. At times, he

thinks that order is separate from disorder, is to be found, not created, from everyday experience. When he arrives at Tycho Brahe's Castle Benatek, the sympathetic narrator remarks, "Surely here disorder would not dare show its leering face" (6). One can only think of Copernicus' labelling of the sick and diseased Andreas in this statement.

Kepler is soon disenchanted with his new abode: "this grey, these deformities, the clamour and confusion of other lives, this familiar—O familiar!—disorder" (6). The hyperbole here conveys Kepler's almost constant indignant nature, but also conveys his energetic mind, one which stubbornly refuses to accept less than adequate conditions. Hence his angry feelings: "O familiar indeed: disorder had been the condition of his life from the beginning" (11). His playing at astronomy, and it is a form of play, becomes "a thing apart, a realm of order to set against the ramshackle real world in which he was imprisoned" (20). But the way he comes to his ideas is a reordering of disorder, precipitated when "A chaos of ideas and images churned within him" (23).

The leap from viewing ideas as chaotic to viewing observable reality as equally chaotic is not a difficult one for Kepler. What he does find problematic is seeing something salvageable from the chaos of observable reality. For example, at the Duke's palace, the revelry disturbs him:

"The table and these people, and the hall behind them with its jumbled hierarchy of other tables, the scurrying servants and the uproar of the crowd at feed, all of it was suddenly a manifestation of irremediable disorder" (34) This instance of disorder clearly unsettles Kepler, yet a similar experience in Winckelmann's company and home allay many of these fears. At first he sees Winckelmann's workshop: "The floor and the workbenches were a disorder of broken moulds and spilt sand and wads of oily rag, all blurred under a bluish film of grinding flour" (46). From this relatively peaceful description, he advances to seeing disorder as merely a complex order: "The world abounded for him now in signature and form. He brooded in consternation on the complexities of snowflakes" (49). [6]

Of course, his examples have a very definite shape and texture, and he finds difficulty in addressing less defined objects or landscapes greater than the eye can see. We sense this problem in the moment when Kepler is travelling in an uncomfortable carriage away from Benatek Castle after yet another argument with Tycho Brahe. The sympathetic narrator recounts: "His world was patched together from the wreckage of an infinitely finer, immemorial dwelling place; the pieces were precious and lovely, enough to break his heart, but they did not fit" (58).

Putting pieces together is the subject of "Dioptrice," [the work itself looks at the refractive qualities of lenses] the return to Weilderstadt, Kepler's home town. The

reader may question why the novel pauses on this visit of a few days for a whole section. The answer lies in the narrator's comment that all the physical locations seemed "unaware that his memory had long ago reduced it all to a waxwork model" (87). In other words, the thing itself, just as Banville's Copernicus understood it, is so much more elusive (as a disordered entity) than the (ordered) theoretical system he has commonly used to label the past. His ordered disorder comes in snatches of memory, as the following suggests:

> Kepler suddenly recalled a sunny Easter Sunday long ago, when his grandfather was still alive, one of those days that had lodged itself in his memory not because of any particular event, but because all the aimless parts of it, the brilliant light, the scratchy feel of a new coat, the sound of bells lofty and mad, had made together an almost palpable shape, a great air sign, like a cloud or a wind or a shower of rain, that was beyond interpreting and yet rich with significance and promise. Was that . . . happiness?" (92–3)

Similarly, Kepler's astronomical work is an effort to take from worldly disorder a specific or reduced order or system. When his brother Heinrich enquires as to the nature of Kepler's Astronomia Nova, the astronomer is forced to declare, "It is a new science of the skies, which I have invented" (94). What he means is that he has "reduced to order" observable reality. This verges on a paradox, as Kepler is clearly aware: "The world shifted and flowed: no sooner had he fixed a fragment of it than it became something else . . . . His ailing eyesight increased the

confusion . . . . Only the stars he knew for certain to be dead, yet it was they, in their luminous order, that gave him his most vivid sense of life" (100). This "luminous order" is likened to the crests and troughs perceptible in Kepler's thinking about his own life and, generally, about the lives of human beings.

In his early forties in 1611, he writes to Regina while in a very depressed state. He appears to discount any ability to eke out an order from the disorder of the world while living; rather, it seems that the human being is the disorder:

> Life, so it used to seem to me, my dear Regina, is a formless & forever shifting stuff, a globe of molten glass, say, which we have been flung, and which, without even the crudest of instruments, with only our bare hands, we must shape into a perfect sphere, in order to be able to contain it within ourselves. That, so I thought, is our task here, I mean the transformation of the chaos without, into a perfect harmony & balance within us. Wrong, wrong: for our lives contain us, we are the flaw in the crystal, the speck of grit which must be ejected from the spinning sphere" (134). [his italics]

The perfect crystal exists, Kepler ruminates, but human beings are imperfect holders of its beauty. This "imperfectness" can be associated directly to the "mysterious firmament contained within the skull" (137). The human head is an excellent sphere, yet it is full of a cacophony of confusions. It leads Kepler to postulate that

all observation, and therefore order, is theory-laden from the mind:

> The mind learns all mathematical ideas & figures out of itself; by empirical signs it only remembers what it knows already . . . . If the mind had never shared an eye, then it would, for the conceiving of the things situated outside itself demand an eye and prescribe its own laws for forming it. For the recognition of quantities which is innate in the mind determines how the eye must be, and therefore the eye is so, because the mind is so, and not vice-versa. Geometry was not received through the eyes: it was already there inside. (149)

This assertion criticizes directly empirical ways of looking at the world, yet even Kepler is confused why external disorder can breed internal order. The best metaphor for this model is the red spot of Jupiter, which rotates mathematically and is stable while all around it is instability. Likewise, in the midst of war, science is a "great consolation" (133). More interestingly, when Kepler writes to Johannes Brengger, he establishes a strong link between life and work in Dioptrice:

> Now I am subject once more to bouts of fever, and consequently I have no energy, and am sore in spirit. Worries abound, and there are rumours of war. Yet, looking afresh at the form of this little book, I am struck by the thought that perhaps, without realising it, I had some intimation of the troubles to come, for certainly it is a strange work, uncommonly severe & muted, wintry in tone, precise in execution. It is not like me at all. (136)

It appears that when external disorder is rampant, the mind

finds consolation in internal order, however achieved or defined.

Much in the same way, Kepler considers his childhood as some kind of internal order, as memory, set against his restless disordered present. He remembers the period at "Old Sebaldus'" house (his grandfather), which was "within him a vision of lost peace and order, a sphere of harmony which had never been, yet to which the idea of childhood seemed an approximation" (159). And when late in life, under Wallenstein's patronage, he must return to teaching mathematics in a district school, it reminds him of the origin of his most celebrated work, Mysterium Cosmographicum. Desperate to account for the loss of Winckelmann, who seems to have been a victim of an anti-semitic attack or pogrom, Kepler freshly considers that even "random phenomena may make a pattern which, out of the tension of its mere existing, will generate effects and influences" (175).

This optimism vis à vis random phenomena is taken up more forcefully in Kepler's "final synthesis" (179), Harmonice Mundi. His outstanding book is predicated on the simple fact that harmony is to be found in geometry, not arithmetic. His research casts new light on the "fragmentary and enigmatic charts apparently unconnected with each other. Now he understood that they were not maps of the islands of an Indies, but of different stretches of the shore of one great world" (179). The casting of new

light also suggests that his previous work if not wrong, could be more exact. The neatness of the Mysterium Cosmographicum is undermined by the elliptical paths of the planets worked through in Astronomia Nova: "Somehow the rules of plane harmony must be made to account for the irregularities in this model of the world. The problem delighted him. The new astronomy which he had invented had destroyed the old symmetries; then he must find new and finer ones" (181). It is not surprising that faced with a disordered world, Kepler's experiments meet with haphazard success. As pointed out in chapter two, Gerald Holton and Thomas Kuhn have much to criticize in the modern tendency to suppress the roundabout nature of scientific discovery (nonlinear systems). Kepler, however, sets great store by his failures, as the following sympathetic narrator's account reveals:

> He began by seeking to assign to the periods of revolution of the planets the harmonic ratios dictated by musical measurement. It would not work. Next he tried to discern a harmonic series in the sizes or volumes of the planets. Again he failed. Then he sought to fit the least and greatest solar distances into a scale, examined the ratios of the extreme velocities, and of the variable periods required by each planet to rotate through a unit length of its orbit. And then at last, by the nice trick of siting the position of observation not on earth but in the sun, and from there computing the variations in angular velocities which the watcher from the sun could be expected to see, he found it. (181)

The above quotation is a concentrated discourse of "astronomer-speak," but what is clear--even to the most

unscientific of laymen—is the trial and error procedure of creative thinking. Another less obvious aspect is the emphasis on musical harmony, which like a game of chess and the fundamentals of chaotic theory, has a limited number of starting elements but an unlimited number of combinations. When the science becomes increasingly difficult, the narrator lurches into a more "objective" biographer-like style:

> For in setting the two extremes of velocity thus observed against each other, and in combined pairs among the other planets, he derived the intervals of the complete scale, both the major and the minor keys. The heavenly motions, he could then write, are nothing but a continuous song for several voices, perceived not by the ear but by the intellect, a figured music which sets landmarks in the immeasurable flow of time. (181)

The fugal solution to the complexity of the universe is an ingenious one to explain the sun's orbital influences; if he cannot explain planetary motion, he will have to admit the "universe is a senseless and arbitrary structure" (181-2). Such an admission would completely render useless all his previous work. But amidst this increasing worry of intellectual inadequacy, his creativity and inspiration come to the rescue. Significantly, it arrives in the middle of external disorder:

> When the solution came, it came, as always through a back door of the mind, hesitating shyly, an announcing angel dazed by the immensity of its journey. One morning in the middle of May, while Europe was buckling on its sword, he felt the wing-tip touch him,

> and heard the mild voice say I am here. [his italics] (182)

Loath to discard completely his previous work, Kepler seeks a more complex solution, just as Copernicus complicated his basic geometrical premise by introducing many epicycles. Essentially, the mature work of Kepler and Copernicus sidestep the issue of whether they are saving or explaining phenomena and concentrate on the act of saving or explaining their previous writings as far as possible. In the following quotation, Banville's Kepler appears to dismiss his clockwork mechanism theory, but really he only gives it more flexibility by his musical solution:

> The world, he understood at last, is an infinitely more complex and subtle construct than he or anyone else had imagined. He had listened for a time, but here were symphonies. How mistaken he had been to seek a geometrically perfected, closed cosmos! A mere clockwork could be nothing beside the reality, which is the most harmonic possible. The regular solids are the material, but harmony is form. The solids describe the raw masses, harmony prescribes the fine structure, by which the whole becomes that which it is, a perfected work of art. (182)

Kepler's vision is an artistic one, betraying a definite need to see the world in aesthetic terms, working partly on the assumption that God would not construct an ugly system.

II. The Brotherhood of Science

Within the overall master concept of extracting order from disorder, the brotherhood of science, in all its manifestations, on the surface gives Kepler the confidence to continue his studies. Peer review of one's work can be the most gratifying or the most frustrating experience for any artist or scientist. In Kepler's case, he is severely tested by the theories and opinions of his teachers, friends and professional correspondents as well as by Tycho Brahe to whom he has gone to stay with when the narrative opens.

The older astronomer, Kepler hopes, can be the epitome of order in the chaos of the castle and the world in general:

> Tycho, with his silence and his stare, his gleaming dome of skull and metal nose, seemed more than human, seemed a great weighty engine where imperceptible workings were holding firmly in their courses all the disparate doings of the castle and its myriad lives. (6—7)

Throughout the novel, Kepler returns to Brahe's achievements and to those of Copernicus. Although the latter was more than fifty years dead when Kepler begins his work, "for Johannes he rose again, a mournful angel that must be wrestled with before he could press on to found his own system" (24). As for Brahe, "Posterity might forget his books, ridicule his world system, laugh at his outlandish

life, but not even the most heartless future imaginable would fail to honour him as a genius of exactitude" (62–3). Both Copernicius and Brahe provided elegant solutions to new data that had become available since the time of Ptolemy. Kepler worries that his work, which appears inelegant, is therefore wrongheaded or "irredeemiably vulgar" (71).

Kepler's view of natural philosophy on meeting Brahe is optimistic: "I hold the world to be a manifestation of the possibility of order" (7). Brahe's response is more cautious, reminiscent of communication theory and the role of noise: "One has always to contend with disturbance" [my italics] (7). In communication theory, and in statistical surveys, margins of error and/or "noise" disturbance have to be incorporated into the basic "Sender–Message–Receiver" model. Brahe argues that Kepler's Mysterium Cosmographicum is flawed because it is based on the Copernican system (and presumably not on Brahe's). Nevertheless, Brahe does see Kepler's work as "significant," and the young astronomer/scientist is partly reassured by this because he "believed in the brotherhood of science" (10).

This belief in brotherhood may originate at the point when the young Kepler, age twenty–three, in pursuit of the "eternal laws that govern the harmony of the world" (19), begins a teaching career. The Rector Papius observes the passionate young man in the classsroom. His exuberant pedagogy is not altogether a successful technique, but one

certainly consistent with Kepler's natural but "disconcerting blend of friendliness, excitability and arrogance" (22). Kepler is grateful to Papius for his understanding of the impatience exhibited by the ambitious and earnest young scientist. Despite doubts, Kepler wants to see harmony and order in God's universe, believing "geometry is the earthly paradigm of divine thought" (26). His flash of insight vis à vis the geometrical distances between the planets comes in sunlight, unawares, while teaching.

In that moment in front of his class, in that special kind of brotherhood, he believes the distances are in ratios determined by the fundamental figures in geometry, namely, the cube (6), the pyramid (4), the dodechedron (12), the icosahedron (20), and the octahedron (8). Once he has refined his thoughts on these ratios, he travels to Tubingen to publish his work and to seek the informed opinion of his old teacher Michael Mastlin. The latter's views coincide with those of Andreas Osiander's on Copernicus' work. Mastlin argues that "the mathematician has achieved his goal when he advances hypotheses to which the phenomena correspond as closely as possible" (30). This is not the kind of conservative thinking that Kepler wishes to hear. He says that he respects the past, but not slavishly. Like Copernicus, he does not set out merely to save the phenomenon, but to explain it. Nonetheless, the debate with Mastlin helps Kepler to refine his own thoughts. As with

his reluctant students, Kepler views such (Kuhnian) resistance in the long run as beneficial.

Another form of brotherhood is represented by the Jew Winckelmann. It is ironic that the Protestant and the Jew find each other, both outcasts in a Catholic world. Winckelmann has books on the discredited "scientific" theories or paradigms, including the Magia naturalis as well as other works by Nostradamus and Paracelsus. By lauding Copernicus, Kepler is continuing this "heresy." Winckelmann calls his scientific books "a comprehensible magic" (46). The Jew is a craftsman, although he is also a labourer of sorts in his lens grinding profession. Such an occupation suggests an early Spinoza (1632–77 [Kepler died in 1630]), who posited the belief in Monism (reality is unified but we can only perceive certain attributes of that unity). This system of understanding is surely similar to Kepler's dream about the perfect egg which is dispersed into small bits in the conscious world. Kepler also considers late in life that his work has in effect rediscovered different stretches of one large coastline. Kepler is, then, a de facto Monist.

Once it is revealed that Winckelmann has read Rheticus' Narratio Prima, an interesting discussion ensues. Kepler argues that "science is a method of knowing" (47), but the Jew replies, "Of knowing, yes; but of understanding?" (47). Winckelmann argues that Christianity deals with words out of nothingness, so much so that "Jesus Christ is the word made flesh!" (47). He is coy about Judaism, except in the sense

that he believes man has been told everything, even though he does not understand that telling. It is in Winckelmann's abode that Kepler really senses the harmony of the world: "Everywhere he began to see world-forming relationships, in the rules of architecture and painting, in poetic metre, in the complexities of rhythm, even in colours, in smells and tastes, in the proportion of the human figure" (48). During this confinement, Kepler reads Plato, Aristotle, and books Winckelmann had given him, particularly one by the Cabalist Cornelius Agrippa, whose excitable mind resembles Kepler's. In addition, Kepler turned to music, mathematics, and Pythagoras with intense obsession. These readings and influences give Kepler the intellectual support to be a maverick thinker.

It is not surprising, then, that Kepler rubs many people the wrong way. For example, at the source of what appears to be a worldly disagreement between Brahe and Kepler over the latter's official designation in Castle Benatek, there is a real scientific problem. Brahe believes the earth is at the centre of the universe, but that other planets orbit the sun. Kepler believes the universe is sun-centred, following Copernicus' system. Clearly, a fair degree of jealousy exists between them over this crucial system-building operation, and it clouds their behaviour towards each other, contributing to ad hominem scientific arguments.

As for curious continuities and discontinuities, a personal link is established between Copernicus and Kepler. Baron Hoffmann, who puts Kepler up during arguments with Brahe, had learned his mathematics from Valentine Otho, the pupil of Rheticus who, in turn, was Copernicus' pupil. Such pupilage helps to force Kepler to see the value of making accommodations with a prickly superior in years and rank. After the two make up their differences and a feast is put on, a wager to solve the orbit of Mars is arranged. In the atmosphere of professional camaraderie, Brahe is cajoled into giving access to his observations, which Kepler rightly calls the older man's "immortality" (62). Although Kepler takes some seven years to calculate an approximation for the Mars orbit, he does succeed Brahe as Imperial Mathematician, thus showing the importance of scientists having protégés and/or assistants. True, Kepler held a different view of the system of planetary motion, yet it is also true that without Brahe's observations, Kepler would not have been able to make many of his own advances, both theoretical and practical.

Whereas today scientific experiments that promise to change the agenda of inquiry are often quickly written up and published in Nature or faxed to endless numbers of people and institutions, in Kepler's time the letter was often the only way of keeping abreast of developments outside one's own immediate area. So it is consistent that apart from missives to Regina and to his mother, the

writings of Kepler reveal evidence of an academic sometimes thinking aloud, sometimes answering detailed inquiries from enthusiastic colleagues, and sometimes striving to disentangle principled arguments from ad hominem arguments. The letters cover seven years, 1605–12, a time when Kepler was probably at the peak of his powers. By detailing some of the ideas in these letters, we can see the ideological conflicts within Kepler's own views of his scientific work. The letters are fictional to the extent that their contents do not fit exactly to the real Kepler's letters, as edited by Max Caspar (1954) or in the selection edited by Carola Baumgardt (1951). Nevertheless, Banville seems to have scanned the letters for key moments and has translated the tone very faithfully.

At first glance, the twenty letters covering forty pages in Kepler are exceedingly unpalatable. They are brimming with so many ideas that the reader is overwhelmed. Clearly, in the wider view, the letters convey, at long last, no confusion of distance between the narrator and the character of Kepler. As a form of narrative, the letter is intrinsically incomplete. It is an intimate first person medium, but only to the extent that the relationship between the writer and the receiver is developed. A distance always separates the reader from Kepler's letters, whether physical or intellectual. Some of the missives he writes, for example, are to people he has never met and never will meet (David Fabricius, letters 1 and 20). The implied

author/narrator has patterned the letters in a fictional shape, marking to us readers that these texts comprise no ordinary or nonfictional biography, at the very point such a "mistake" could be made.

This one-sided correspondence (since we are not given any responses to his letters, unlike that found in Doctor Copernicus) is arranged in an elliptical fashion. In brief, the form of the letters coalesces with Astronomia Nova's assertion that the planets move in ellipses. By re-ordering the chronology of the letters but ensuring nonetheless that they accord to a certain pattern, we suspect that Banville wishes us to see that within apparent disorder, there is an obsessive mathematical order. Also, the ongoing work of Kepler mentioned in the letters is elliptical in a general sense, returning constantly, if not exactly, to the "original" findings of Mysterium Cosmographicum, a text which Kepler sees as a central paradigm or model from which certain details can be worked out.

In terms of style, a close reading of the first letter to David Fabricius tells us that there is no substantive difference between the letters and the other sections of the novel. We have Kepler's cocksureness, the use of exclamations--"Honoured Friend!" (111); the use of italics and the declarative air--"the new astronomy truly is born" (111); the use of parentheses--"(and he who believes that a clock has a soul, attributes to the work the maker's glory)" (112); the use of (unintentional) bathos--"I enclose my

wife's recipe for Easter Cake as promised" (111). In addition, we often see in the letters the impassioned anger of Kepler, sometimes revealed in the use of indignant questions. Since all these writing techniques appear in the third person narration which dominates the four other sections of the novel, the supposed distance between character and narrator is further complicated. The most striking change is in the humility of the third person interior narration of "Somnium:" "Always he believed without question that others were better than he, more thoughtful, more honourable, a state of affairs for which the standing apology that was his life could not make up". (160–1). These admissions are in startling contrast to the general energy of the first four sections. The main originality of the letter section is the necessary exclusion of scenes with dialogue.

The clear strength of "Harmonice mundi" is its window opportunity for the reader to see Banville's Kepler in moments of contemplation. One salient fact about the section is Kepler's understanding of the <u>implications</u> of his wide brotherhood of science. As he excitedly recounts to David Fabricius:

> That I have won, I do not doubt, as I say. My concern is, what manner of victory I have achieved, and what price I & our science, and perhaps all men will have to pay for it. Copernicus delayed for thirty years before publishing his majestic work, I believe because he feared the effect upon men's minds of his having removed this Earth from the centre of the world, making it merely a planet among planets;

> yet what I have done is, I think, more radical still, for I have transformed the very shape of things—I mean of course I have demonstrated that the conception of celestial form & motion, which we have held since Pythagoras, is profoundly mistaken. (111)

What Kepler thinks he has achieved is a mechanistic world view, a clockwork, extrapolated from the planets' "physical causes" [his italics] (112). In the process, he hopes to do away with the need for certain assumptions, which basically translate as leaps of faith about the workings of the world. As has been pointed out above, this excitement is replaced by doubt in later years and replaced, in turn, by the musical fugal metaphor. Kepler's trial and error procedures and his theoretical constructs without proofs are explained in a letter to Johannes Fabricius in 1611, on the topic of sunspots:

> For my own part, they are of the utmost interest not in their cause, but in that, by their form & evident motion, they prove satisfactorily the rotation of the sun, which I had postulated without proof in my Astronomia nova. I wonder that I could do so much in that book, without the aid of the telescope, which in your work you have put to such good use. (133)

Not all his correspondence implies a settled community of scholar-scientists. The rivalry with Galileo is clearly a prominent issue. Galileo will not send a telescope to verify the "four new planets" which, in fact, are, as Kepler believes correctly, the four moons of Jupiter. Kepler is very conscious of possible political chicanery in this perceived rivalry. In a letter to Georg Fugger, the

Protestant astronomer seems to explain partly the Catholic Galileo, simply because he is "in the employ of the Venetian Republic" (123). He means here that the political realities of Venice demand that Galileo be cryptic about his allegiances. Ironically, Kepler finds himself defending Galileo's integrity against Fugger's assumption that the Italian is contrary out of jealousy. Kepler appears to write only a half-truth on their joint calling: "Science, sir, is not like diplomacy, does not progress by nods & winks & well wrought compliments . . . . In these matters of science, it is a question, you see, not of the individual, but of the work" (123-4).

These statements are hard to countenance given Kepler's own trysts, not to mention his own thoughts on the various subterfuges he has had to resort to (of which more later). Fundamentally, he reads Galileo's Sidereus Nuncius as a fascinating work, one in need of a reply (hence Kepler's Dissertatio cum nuncio Sidero), but which should not be seen (as Fugger and other partisan politicians would like) as a refutation. Since Kepler admits to knowing "what a long road it is from the theoretical concept to its practical achievement" (139), he is willing to let Galileo have his day in the sun, even though the anagram announcing the discovery of two moons circling saturn infuriates the Imperial Mathematician. [7] Another reason for Kepler's fascination and tolerance of Galileo is the latter's discovery that the red spot of Jupiter appeared to rotate

mathematically, an island of order in a sea of disorder. Disputation with Galileo from afar on abstruse topics may be the high point of Kepler's intellectual play with other scientists after Tycho's death. However, he is conscious that the more mundane tasks and the help he receives from others are significant to his work. The Jesuits come to him to write a treatise for their missionaries in China to explain the recent astronomy; the Tables will be of practical use to seafarers, making his work vital, and his disciple Jakob Bartsch eagerly takes over the menial work so that Kepler can spend time on Somnium.

III. Religion and Science

The correspondence with fellow scholars and astronomers is a keystone to Kepler's confidence in his work. Other essential building bricks are his faith in God and his Protestant religion. As for the first, Kepler believes that God is not just "good" (120) but "great, and I am his servant" (152). His ability to complete Astronomia Nova is thanks to "God's help" (111), since "God will not abandon me" (131). When circumstances turn to his advantage, the sympathetic—and seemingly Protestant— narrator is quick to praise God's will: "At the beginning of 1595 he received a sign, if not from God himself then from a lesser deity surely, one of those whose task is to encourage the elect of this world" (23). This sign is his success at astrology

which, in turn, encourages him to take up his Mysterium Cosmographicum. Not only does astrology bolster his astronomy (discussed further below), but God is regarded as the origin of all knowledge.

When faced with tragedy, Kepler is never bitter against God; his faith never falters; he remains only mystified. At the death of his son, he attributes the loss merely to a "weary" God (126). God is most important to Kepler's belief in merging geometry and mathematics to construct his astronomy: "The search for knowledge everywhere encounters geometrical relations in nature, which God, in creating the world, laid out from his own resources, so to speak. To enquire into nature, then, is to trace geometrical relationships. Since God, in his highest goodness, was not able to rest fom his labours, he played with the characteristics of things, and copied himself in the world . . . . the created imitates the Creator" (145). One is struck by the Platonic notions of Kepler; he seems to accept that as some kind of artist his work is third from the truth; before him lie the world, and ultimately God.

Whereas Kepler's faith is straightforward, no end of complexity, intrigue, and agony is associated with his Protestant religion in a primarily Catholic world. While it is important to characterize the effects his religious battles have on his life, it is also important to explore or speculate upon the influence of Protestantism in his theorizing. Indeed, it could be argued that Protestant

Kepler provided for innovative astronomy in his very religion a necessary balance and intellectual integrity, since it ensured that Catholic Copernicus was not simply dismissed or paraded because of his religious affiliations. Of course, there is also the parallel that both Rheticus and Kepler extrapolate from Copernicus' work, as Protestantism extrapolated from Catholicism.

Technically, Kepler is a Lutheran. Graz, Austria, where he initially resides may have been full of "Protestant loonies, it was Protestant filth, and a Protestant heaven those spires sought, hence the wider air hereabout: but the Archduke was a rabid Catholic, and the place was crawling with Jesuits" (21). In the real world that Kepler must operate, he suffers the indignity of not being allowed to practice his free conscience. At first, it seems the Catholic authorities are after his head: they close down the Protestant school, where he teaches, force him into exile on two occasions, and even at one point confiscate his library. Kepler complains bitterly to Brahe about the Catholic power-mongers who wished him to renounce his Lutheranism and who demanded that he pay a fine to have his children buried under that church's auspices. Kepler's general stoicism (though he tends to complain often) is confirmed in his own eyes by the lack of principle of both his wife's father and Tengnagel who, when the proscriptions are issued, quickly convert to Catholicism. To Kepler, "This shows the man's character for what it is" (115). Kepler's unwillingness to

shift to Catholicism reveals his general method of not following the easiest path.

Ironies abound where religion is concerned. The Archduke Ferdinand who had driven him out of Graz as a young man denies him patronage as an old man for much the same reason—his Lutheranism. Emperor Ferdinand, as he becomes, suggests that Kepler convert to receive preferment. This Kepler cannot do, since his mind is too rigorous in questioning dogma to make such a political move. Kepler's provocative pose, however, is not without awareness of repercussions:

> The [mainly Protestant] Palatinate's army had been crushed in the battle of Weisser Berg and Bohemia regained by the Catholics, but the war of the religions still raged. The Empire was ablaze and he was on the topmost storey . . . . When in the autumn of 1619 the Elector Frederick and his wife Princess Elizabeth entered Prague to accept the crown offered him by the Bohemian Protestants, the World Harmony had been on the presses, and Kepler had had time to suppress only in a few final copies the dedication to James of England, the Princess's father. (183)

Kepler also is concerned that the marriage of Regina to a Lutheran in the Palatinate will tar him in the eyes of the Catholic authorities. It all seems trivial and academic to Kepler, who is uncomfortable with "pure" Catholic, Lutheran, and Calvinist views of the world. This unease may be placed in part at the door of the Jew Winckelmann who argues that the difference between Christian and Jew is between a priori and a posteriori knowledge—"You think nothing is real until

it has been spoken" (47). In simpler terms, the Jews are still waiting for the Messiah; their faith relies not on the son of God's de facto appearance, but on the simple belief of his coming (a form of prophecy).

The debate with Winckelmann is thus important to Kepler's interrogation of Catholicism, Lutheranism, and Calvinism. Kepler is caught not just between Catholicism and Protestantism, but Lutheranism and Calvinism. The successor to the kindly Rector Papius at the school, where he teaches, Johann Regius, is an immediate enemy because of his strict Calvinist views. Yet in later life Kepler is excommunicated from the Lutheran Church for appearing to agree with the Calvinists on the import of the Communion Service. Lutheran Pastor Hitzler refuses Kepler Communion unless he ratify the Formula of Concord. The sticking point here is the debate over transubstantiation. The Calvinists believed that the bread and wine at Communion were merely symbols. As Kepler declares, "The body and soul of Christ are in Heaven. God, sir, is not an alchemist" (169).

The truth of Kepler's position is that he finds discomfort in Catholicism, Lutheranism, and Calvinism. He appears to lean toward fundamental Protestantism to some extent by allowing Regina to marry and live in an area populated by Calvinists and by dedicating his Harmonice Mundi to Protestant James I of England. What is perhaps most problematic is the issue whether or not Kepler regards himself as one of the elect. Barbara disparages this notion

(18), but his success at calendar making suggests to the narrator at least that Kepler is bound for greatness, to be one of "the elect of this world" (23). If the narrator is a Calvinist, believing in predestination, Kepler would appear then to be a Lutheran on this subject——"I reject the barbarous doctrine of predestination" (166).

While Kepler declares his position, the reader is not so convinced, mainly because predestination is found in astrology which, in turn, bolsters Kepler's astronomy. It is meet, then, to look at the role of astrology in Kepler's life and work.

IV. Astrology

Strictly defined, the practice of astrology is a predictive process based on numerological and geometrical data. It is not hard to see the similarity between this activity and astronomical model-making. Yet Kepler would like to resist any formal validation of astrology, since his astronomy might then appear to be of lesser value. As he writes, somewhat belligerently, in a letter to Roslin, "The stars do not compel, they do not do away with free will, they do not decide the particular fate of an individual; but they impress on the soul a particular character" (118). Simply put, Kepler would like to have his cake and eat it too. Astrology, Kepler claims, is "a political more than prophetical tool" (114), a "pseudo-science" (117), a

"starry-scrying" (113). Perhaps, but the reader notices how when Kepler is reluctantly married, "he had not the heart to compute the figures, nor the courage, considering the calamitous disposition of the stars" (40).

On the surface, the initial interest in astrology is financial. Kepler is embarrassed to admit to Tycho that he makes horoscopes for money (9). This bread and butter work began at an early age. While at the Protestant school, Kepler is responsible for making up a calendar for the province of Styria. In the process, at his first attempt, he predicts two events that come true--a bad winter and a Turkish invasion. Kepler confesses to Mastlin, also a maker of horoscopes, that he regards the practice as "star magic" (31) which, nonetheless, mysteriously influences people's lives.

This tergiversating response by Kepler to Mastlin's enquiry to his involvement in astrology is borne out when the former draws up a horoscope for his first child Heinrich. He pronounces it promising <u>after</u> he has made a number of modifications. The child dies within two months, however. It is curious that Kepler disclaims rational belief in such calendar making, and yet by habit introduces it into his own family. More than this, he ignores its original prophecies.

Astrology and people's perception of it, particularly of those in absolute power, place the subject in Kepler's time on every astronomer's agenda. Its predictive power has

a natural attraction for Emperor Rudolph, who believes there is "magic in numbers" (81), despite Kepler's voluble doubts. But some astronomers, like Tycho Brahe, are concerned that astrology's "false" belief system prevail in the eyes of those in power, because then more interesting intellectual work will be financed. Tycho Brahe remarks to Rudolph that what attracted him to astronomy (and astrology) was that certain astronomical events could be predicted, were probably influential in the world, and therefore of use to Kings, Princes, and travellers. Naturally, Banville reminds us here as well that in Kepler's time, alchemy and astrology were on a par with empirical investigation as ways to the truth. Today we may have discarded them, but Copernicus, Kepler, and Newton could not do so. Banville's tetralogy suggests that we have been overhasty in our dismissal of anti-empirical activities.

As time passes, Kepler takes up Brahe's position on astrology, confessing in a letter to Hans Geo. Herwart von Hohenburg that Rudolph is in the hands of "wizards" (114). Kepler would like to find a geometrical explanation to the grains of truth he has found in astrology, and his serious academic searching may be traced to his period at Winckelmann's house where "astrology, which for so long he had despised, assumed a new significance in its theory of aspects" (49).

He raises the spectre of astrology, however, only so high. In considering his Harmonice Mundi, he ruminates: "Do

the planetary aspects influence us? Yes, but the zodiac is no truly existing arc, only an image of the soul projected upon the sky. We do not suffer, but act, are not influenced but are ourselves the influences" (180). Kepler desires desperately for free will to be the order of the day, but he is never totally convincing. For example, in the power struggle for Emperor between Rudolph and Matthias, both sides seek the Imperial Mathematician's advice. Kepler draws up their horoscopes which, yet again correctly predict the outcome, namely the victory of Matthias. We are left with the bizarre situation of Kepler, who does not fully believe in astrology by any stretch of the imagination, falsifying his results to give solace to Rudolph.

Astrology is at the same time a relief and a curse when, late in life, Kepler applies to Emperor Ferdinand for patronage. He does not succeed but meets General von Wallenstein, Ferdinand's Chief Commander, who reveals that twenty years earlier the calendar that Kepler drew up for him was very accurate. Again prophecy proves to be a worldly help to Kepler, now that he comes under the control and benefice of the General. However, this arrangement soon deteriorates into nothing more than Kepler's compliance in drawing up the raw data for "more willing wizards" (188) to construct dubious horoscopes. His ambivalence towards astrology remains, therefore, right to the end.

V. Physicalization

It may seem strange to shift from astronomy and astrology to consideration of Kepler's view of physicalization; however, as the scientist writes in a letter, he wishes to reshape celestial motion, seeking to explain the phenomena from "physical causes" (112). In general terms, this is clearly an attempt to merge intangible theory and tangible practice. Kepler's own subjective observation of the world needs to be integrated into his overall conception of the heavens, otherwise his work will be just another dispensable and falsifiable theory. The most dynamic figure in Kepler who represents the problem of the physical world and its randomness is Felix, the Italian mercenary. There seems to be a binary opposition operating between Kepler and the Italian, the intellectual and the physical. If only he could understand the Italian, he would then grasp a major clue about the physical causes of the universe.

Kepler first comes across the mercenary eating voraciously in Benatek Castle. Consistently, Kepler notices Italian oranges beside Felix which, like the mercenary, "were uncanny in their tense inexorable thereness" (7). Since he did not know any better, the young scientist mistakes him for the eccentric Tycho Brahe. This faulty superimposition ties Felix to Kepler's scientific destiny.

The second experience is when the wounded Italian arrives, Christ—like, on a mule. Suggestively, he sits by a mirror and leans into his reflection, becoming a kind of mirror image for Kepler who, in caring for the worldly Felix, believes he has regained a dimension of himself, "a vivid and uncanny sense of his own presence" (68). Throughout the convalescence of the Italian, Kepler seems to be constantly at the man's bedside, despite the fact he is continually ignored. One wonders if the Italian mercenary is the surrogate for Galileo in Kepler's mind. He persists because "In the Italian he seemed to know at last, however vicariously, the splendid and exhilarating sordidness of real life" (169). Later, the recovered soldier strides dramatically into the Dane's sickroom only in time to clasp Brahe's dead hand. For Kepler, the final irony is to learn from Jeppe, the dwarf, that the Italian's bastard will inherit money and materials owed to him (Kepler) from Tengnagel.

The Italian's enigmatic nature most likely strikes a chord with Kepler's vague memory of his father, a mercenary also. Kepler wonders if one can love a life of ceaseless action, one devoid of retrospection. The earliest scenes of his father he can remember is of the beating of his brother Heinrich to "cure" him of epilepsy. In thinking of his father, Kepler considers the earthiness of that man's life:

> The stamping of feet on the march, the brassy

> stink of fear and expectation on the battlefield at dawn, brute warmth and delirium of the wayside inn? What? Was it possible to love mere action the thrill of ceaseless doing?" (96)

This fascination with action also relates to General von Wallenstein:

> Wallenstein's world was all noise and event, a ceaseless coming and going to the accompaniment of distant cannonades and hoofbeats at midnight: as if he too were in flight from an inexorable demon of his own. Yet Kepler had never known a man who so fitted the shape and size of his allotted space. What emptiness could there be in him, that a stalking devil would seek for a home? (188)

In his own experience, he finds it difficult to argue with his mother's lurid remedies for illnesses, particularly when she powerfully asserts: "I dabble with the world, you keep your snout turned to the sky and think you're safe" (106). Only when the witchcraft charge is lodged does Kepler seem to assume leadership on the issue. This hesitation is partly explained by the natural deference children have for their parents and partly by Kepler's gut feeling that she may be more in tune with the world than he is. The witchcraft trial of his mother is analogous to his own predictive aspirations and his religious trysts. Kepler and his mother do not deny certain "facts" of their activities but they do question interpretations of those facts. One possible confusion is why Kepler sees the Jew's demise and the trial in conjunction. Both Judaism and natural medicine

(and Kepler's theories) are divergences from the orthodoxy of Catholicism.

Of specific physical importance to Kepler himself is the memory of a beating as a child meted out by his mother, in which he experienced the "startling vividness of pain, the world abruptly shifting into a new version of reality" (44). His attitude to his wife Barbara is one of awe at her physicality. At the wedding reception, "he suddenly found himself holding something unexpectedly vivid and exotic" (40). He goes further to say that she was "flesh, a corporeal world wherein he touched and found startingly real, something that was wholly other and yet recognisable" (41). Unsurprisingly, to socially conservative Kepler, Barbara achieves "ideal harmony" (41) when pregnant.

Physical experiences are highly prized by Kepler, particularly so when he comes to the realization that the principle of uniform velocity is false. This creative intellectual leap arrives just after a whore fondles him and just before he vomits!: "He marvelled at the process, how a part of his mind had worked away in secret and in silence while the rest of him swilled and capered and lusted after poxed whores" (73). It is an incident that would fit in well with Koestler's examples in his Act of Creation (1964) cited in chapter two and the same feature occurs in Doctor Copernicus, as cited in chapter three.

The natural world has a pleasing, moderating, influence over the excitable scientist. In an academic argument with

his old teacher Mastlin, Kepler finds strange sustenance in a flock of sheep, partly because they are mute and partly because no easily apprehended pattern to their existence is presented: "Sometimes like this the world bore in upon him suddenly, all that which is without apparent pattern or shape, but is simply there" (31). This magical feeling also includes a view of a prancing horse and hound near the Emperor's palace (58). The decision to apologize to Tycho after another endless academic argument is prompted by a look at the natural world, in this case Baron Hoffmann's garden after a shower (60–1, 86). And, finally, the decision to make up after an argument with Jonas Saur, the printer, is pressed upon him by taking stock of his priorities while in the midst of a field of turnips (187).

Forever seeking the tangible which does not speak or explain itself, Kepler is naturally drawn to his stepdaughter Regina. Like the sheep, she is often mute. She attracts him physically, so much so that when she announces her marriage, he is insanely jealous. Also, when Kepler marries late in life, he chooses a girl who not only resembled Regina in muteness but who also had a poor cabinet–maker as a father. It is no surprise to the reader that Kepler has a dream of "inexplicable significance" (178), starring the Italian holding a statue which comes to life, with the face of Regina. These two individuals Kepler loves, although he is never satisfied with what is given in return. This blockage is symptomatic of the gulf Kepler

feels in his astronomical work between the thereness of the planets and the transitoriness of any theoretical explanation.

VI. Dreams, Visions, Prophecies

Dreams, visions, and prophecies are often intertwined as images blurring past, present, and future events. In the oscillating world of Kepler, and in his attempts to theorize orbital motion they are, unsurprisingly, potent. Dreams and visions play a mysterious (though generally recuperative) role in the mind of Kepler the scientist. The novel opens with the dream which purports to provide "the solution to the cosmic mystery" (3). He dreams of a perfect egg which shatters once he has been awoken. The few coordinates of broken shell are left, along with the number 0.00429, which is to be of extreme importance to his later work. This dream is recorded in a letter to David Fabricius, when he has "remembered" the crucial number and asks: "Was it a premonition glimpsed in some forgotten dream?" (151). When Kepler declares that the world is a "manifestation of the possibility of order," he wonders, "Was this another fragment out of that morning's dream?" (7). Most markedly, the process of discovery of the elliptical orbit of Mars strikes Kepler as resembling a dream. He writes in a letter to a colleague: "Thus we do progress, my dear Doctor,

blunderingly, in a dream, like wise but undeveloped children!" (150).

On a number of occasions, dreams are portrayed as a form of antidote: firstly, it could be said that Kepler's caring of the Italian becomes a kind of dream (69), since when the soldier is better he does not recognize or acknowledge his eager nurse; secondly, on seeing the light of the Billigs' house after travelling for a long time in the dark and rain, Kepler compares it to "an image out of a dream" (155); and thirdly, Kepler dies with pleasant dreams circulating in his mind. Admittedly, there remains the "inexplicable" dream of Felix and Regina, and the recurring dream he had had as a child which depicted "terrible tortures and catastrophes" (157). These are forbidding images, but they are not dominating.

Indeed, it appears that visions are paramount, for "in his heart the predictability of astronomical events meant nothing to him; what did he care for navigators or calendar makers, for princes and Kings? The demented dreamer in him rebelled" (86). Following this kind of assertion, we half expect to see that the "inexplicable dream" starring Felix and Regina is inscribed into his work, "its silvery glimmer was mysteriously present in every page of his book of the harmony of the world" (179). In his sleep he moves into black space, to become a Koestler like sleep-walker or "night-walker" (180). What he brings back from this journey into blackness he believes to be a true "vision that has

[nevertheless] all at once opened before me of the profound effects of what I have wrought" (111). Like blind Jeppe's prophetic abilities, Kepler's dreams and visions catapult him into a more informed and "better world" (99).

One senses Kepler regards much of his writing as a kind of dream work. Generally, this could justify imaginative fabrication of his data to fit an elegant theory, a fact recently uncovered about the real Kepler. [8] More specifically, Somnium, his last work, opens with a fictional dream of a journey to the moon: "The story of the boy Duracotus, and his mother Fiolxhilda the witch, and the strange sad stunted creatures of the moon, filled him with quiet inner laughter, at himself, at his science, at the mild foolishness of everything" (190). It is tempting to argue that if this work is the summation of all his previous writings, then it is an admission that all successful theories are dream visions, which happen to work in the real world as usable paradigms. Dreams and visions are disordered images which we draw upon to order our present and future behaviour. For Banville's Kepler, such visions help to order his supposedly objective scientific work within an artistic frame.

By way of conclusion, I think it is important to stress that Banville's Kepler is a telling confrontation of the exact and inexact sciences, of the power of social influences in determining the acceptable science of the day.

The striving for order out of disorder is paramount and, as a general concept, bridges Kepler's artistic and scientific outlooks. His involvement with his colleagues in the field of astronomy, mainly by letter, reveal a man aware that science must be socially negotiated first before it can be publicly justified by empirical testing. His experiences with astrology, physicalization, and dream tell him that a scientist cannot unilaterally limit his model-making to rational enquiry. The scientist's mind must truly be as flexible as the artist's.

Notes to chapter four

[1] See interview with Rudiger Imhof, IUR Spring 1981: 6.

[2] See Imhof (1989): 131–8.

[3] Whereas Kepler is a Copernican in that he believes the sun is at the centre of the universe, Tycho Brahe believes the earth is still at the centre while the other planets circle the sun.

[4] For a further discussion of historiographic metafiction and John Banville's work, see Hutcheon (1988): 93, 113, 142, 150, 184, and 186.

[5] Gerald Holton (1988: 54) takes this position concerning the historical Kepler: "When his physics fails, his metaphysics comes to the rescue."

[6] Similar "brooding" can be found in recent "scientific" works on Chaos Theory, particularly Gleick (1987), Hawking (1988), and Mandelbrot (1977; rev. ed. 1983).

[7] The anagram has slightly different spelling versions in Koestler (1959: 376); Kepler (138–9); and Imhof (1989: 115 & 184n17). Imhof follows Koestler for the first part of the word and Caspar (1959) for the last part. Banville seems to have just misspelt Koestler's version.

[8] William Donahue has recently claimed that Kepler fabricated data to enhance his theory concerning the way the planets revolve around the sun. See Broad (1990).

Chapter Five

Reconstructing Artistic and Scientific Paradigms: The Newton Letter

> In one person he combined the experimenter, the theorist, the mechanic, and, not least, the artist in exposition. (Albert Einstein on Newton) [1]

Banville's short fiction The Newton Letter (1982) is the third volume in the contemporary Irish novelist's scientific tetralogy. It follows Doctor Copernicus (1976) and Kepler (1981), but comes before Mefisto (1986). At first glance, The Newton Letter appears to be a radical departure from the two previous works. It comprises only eighty-one pages, unlike Doctor Copernicus, which has two hundred and forty-two pages, and Kepler, which has one hundred and ninety-two pages. Also, the whole discourse is channelled through a first person narrator (in a letter to history) who is a major participant in the action, whereas an interplay between first and third person narratives had formerly been Banville's method of expression. Furthermore, we are projected to twentieth-century Ireland instead of contemporary eighteenth-century England to grapple with the importance of Isaac Newton. Despite these obvious quantitative and stylistic differences, The Newton Letter

continues to examine, albeit indirectly, a great scientist's organizing principles.

The general feeling and tone of the novella is one of sombre reflection at past mistakes and inferences. This tone is also captured in the latter parts of the first two tetralogy texts. One senses that Banville decided at this juncture to narrow his focus to a specific time, a specific place, as well as a specific subject (in crisis) to question the mechanistic or clockwork laws of the universe which made Newton famous. Banville seems to have chosen Newton's letters as a basis for exploration, perhaps because, as M. H. Nicolson has indicated, "There is little enough metaphysics in Newton's scientific writings, and students have been forced to deduce many of his philosophical opinions from his letters" (1946; 1963, 74–75).

How does the third volume fit in theoretically to Banville's previous work? Clearly, Doctor Copernicus and Kepler concentrate on the many societal influences upon the scientist in forming his ideas, as Gerald Holton has propagated as necessary for the full understanding of scientific laws. Furthermore, both texts approach the thorny problem of paradigm change, as Thomas Kuhn has elaborated upon. Moreover, the two novels follow very closely the genesis of creativity expounded by Arthur Koestler. The third volume of the tetralogy grapples with the first two points at the expense of the third.

Criticism of the novella so far has not settled into easily recognizable patterns, although Richard Kearney (1988) and Rudiger Imhof (1989) have directed attention to the intertextual play of the fiction, while Joseph McMinn (1988) has argued that Irish themes must not be overlooked. It seems to me that a stronger argument can be made that Banville's whole project is of particular interest for critics and writers who see much value in the convergence between literary activity and scientific theory. Certainly kindred problems in both practices appear to be articulated, if not addressed, in the eighty-one page novella. These practices include the setting up of a workable frame which, most likely, is "knowingly false," the reliance upon certain key concepts, the fascination with images, and the need to put ideas in writing.

More specifically, Banville's narrator in The Newton Letter is an historian who has to negotiate obstacles similar to those facing a scientific theorist who tries to construct a new model for understanding the world. The meeting between artist and scientist is enhanced by the fact that the historian is attempting to produce a biography of Newton. The main argument of this chapter is that the narrator-historian unconsciously draws clear theoretical parallels between his own "artistic" life and work and his subject Newton's scientific life and work.

Some general connections between these two "narratives" can be made easily. In the first instance, the narrator

must deal with the eighteenth-century influences on his subject and the twentieth-century influences on his own writing of the past. A scientific historian must examine the social reasons for a previous theory to have been popular in the past and the current reasons for accepting or rejecting it. Second, the narrator must account for sudden "revolutions" or paradigm changes in his life and thought. A historian of scientific theory must also clarify what is original, conventional, or simply wrong in the work of other theorists. Third, the narrator must endeavour to explain his creative and noncreative periods. Likewise, the scientific historian must puzzle out what creative thought actually is, if he is to make claims for his own forays in the field. It might be futher argued that scientific theorists such as Newton are, in fact, historians, since they must build upon previous work. Newton always claimed he could see so far as he had giants like Kepler to help him.

What Banville seems to be suggesting by the structure and content of the text is something that resembles a fleshing out of the theories of Thomas Kuhn on Scientific Revolutions. We know that Banville has read Kuhn closely: he acknowledges his work in the foreword to Doctor Copernicus. In my view, this influence is the cornerstone of the novella's provocativeness. In particular, Banville sets up a parallel between scientific paradigms and artistic paradigms. The Newton Letter then becomes a literary

exploration of the wider applicability of scientific paradigm change.

I think a brief outline of the novella is useful here. A nameless Dublin historian is crippled in completing his chapter on Newton's breakdown in 1693. He moves to a country house estate in the South of Ireland looking for inspiration. He becomes fascinated with the Lawless family from whom he has rented his accommodation. He is first introduced to two women: Charlotte, who, along with her husband Edward, owns the Fern House estate; and Ottilie, a younger woman in her twenties. A young boy, Michael, later appears. The historian finds the exact relationships among these people elusive, at least until near the end of his narrative. Not a great deal of action subsequently occurs. The historian begins a sexual relationship with Ottilie, while secretly harbouring desires for Charlotte, who we gradually learn is preoccupied with Edward's cancer of the stomach, her own sedation, and with the possible loss of her home–based business. The historian socializes with this enigmatic family, in the process of which he finds great difficulty in returning to his manuscript on Newton. He meets abrasive relatives of Charlotte at a birthday party for Michael. The historian leaves for Dublin following a cathartic evening when Edward has to be attended to by a doctor after a bout of heavy drinking. Keeping up a correspondence with Ottilie, the historian learns that he is the father of her soon–to–be–born child. The novel ends

with the seeming optimism of the historian's determination to resume work on his manuscript and to continue his relationship with Ottilie.

As the historian tries to come to terms with his writer's block, it becomes clear to the reader that the feelings of uncertainty and hesitation exhibited by both Newton and his biographer result for the most part from an inability to provide a theoretical framework with which to account for new empirical and conceptual data. The undismissability of anomalies bends, stretches, and finally breaks the narrator's existing paradigms. In turn, such a breakage allows a new paradigm to be formed.

Kuhnian paradigms are understood here as scientific achievements generally agreed upon by a community of practitioners and theoreticians who can then concur on the nature of the problems still to be solved. Artistic paradigms may also be understood as generally agreed coordinates, such as character types, a balance of scene and summary, a consistent narrative frame, and the unities of time and space, which combine to convey an apparently settled system.

The settled "systems" in fiction, it could be argued, have been agreed upon by novelists, the majority of readers, publishers, journalists, and critics. Literary movements—realism, naturalism, magic realism, modernism, and postmodernism—have their proponents and detractors, a struggle for dominance not unlike competing scientific

theories. This explains why so-called outmoded paradigms can make a comeback wearing only slightly new clothes. In this way, motions of linearity and of circularity are reconciled, in the sense of Koestlerian "ripeness."

The compatibility between these general definitions of artistic and scientific paradigms underscores Banville's complete tetralogy. We have already seen that what characterizes Banville's Doctor Copernicus and Kepler is the constant interrogation of agreed suppositions by both third and first person narrators. The novella is no exception. Its narrator grapples with—almost gleefully—parts of the overall sum which do not add up.

I. Dealing with Crises

According to Thomas Kuhn, when crises in science occur they are solved in one of three ways: (1) by an ingenious reworking of the existing paradigm; (2) by a move to label them as "insoluble" or "time-wasting"; or (3) by a new paradigm, over which there is much disagreement (Kuhn 84). The narrator's Newton takes the second course of action vis à vis doubts concerning the absolute nature of space, time, and motion, while Banville's narrator himself seems to progress through all three stages in the understanding of his own life and relationships. It may be more accurate to say that this protagonist experiences the foregrounding of a new paradigm, comprising in Kuhn's words, "the previous

awareness of anomaly, the gradual and simultaneous experience of both observational and conceptual recognition, and the consequent change of paradigm categories and procedures often accompanied by resistance" (62). This three-step process is mirrored both by the narrator and by the narrator's understanding of Newton's activities in 1693. The latter is clearly based on the assumption that following Newton's Principia, the scientist's work began to cast doubt on previous achievements. This "breakdown" period, the historian assumes, emerged because of an undissmissable anomaly which began to move from the periphery to the centre of his thoughts, thus forming a new model.

The narrator expresses this torturous process via the self-reflexive form of autobiographical reminiscence, in the midst of which there are attempts to objectify and distance experience by recourse to traditional historical writing. These attempts are short-lived, however, and often flippantly undermined (see below). What is certainly clear is that the narrator has decided to work through his writer's block by writing a missive to the muse of history, "Clio" or "Cliona." The novella opens with an address to the muse: "Words fail me, Clio. How did you track me down, did I leave bloodstains in the snow? I won't try to apologise. Instead, I want simply to explain, so that we both might understand" (1). Yet he is caught in the typical scientist's and artist's conundrum: how does one truthfully objectify subjective experiences?

The narrator's awareness of a previous anomaly is crystallized in the flawed figure of Newton (circa 1693) whom he has created in his writing, including the scientist's intellectual and personal problems. Gradual change to a new paradigm is effected by the lengthy time and thought he expends on the Lawlesses at Fern House, an interesting surname of Beckettian proportions—a parody of Newton's exact laws and suggestive of entropy or increasing disorder. Although the Newton letter "discourse" appears very briefly in the text, it is part of the new paradigm at work on the historian, and I want first to isolate it to emphasize its ultimate importance.

The narrator is stymied by two letters written by Newton to John Locke in 1693 and which he incorporates into his narrative . In an endnote, Banville tells us that the second letter is a fiction, "the tone and some of the text of which is taken from Hugo von Hofmannsthal's Ein Brief ("The Letter of Lord Chandos")" (82). The fictional letter of Hofmannstahl imagines a correspondence between Lord Chandos and Francis Bacon, in which the former laments his inability to make meaningful sense of reality, including the inadequacy of language to mediate experience: "My case, in short, is this: I have lost completely the ability to think or to speak of anything coherently" (Hofmannstahl 133). This second letter, in which Banville has his Newton play Lord Chandos to Locke's Bacon, is also the most important missive. The first letter, a real one, indicates the

passionate and irrational side of Newton the scientist. Banville's narrator explains these problems, initially under the first person guise of an unpretentious casual inquirer, and then under the third person guise of an academic historian:

> Remember that mad letter Newton wrote to John Locke in September of 1693, accusing the philosopher out of the blue of being immoral, and a Hobbist, and of having tried to embroil him with women? I picture old Locke pacing the the great garden at Oates, eyebrows leaping higher and higher as he goggles at these wild charges. I wonder if he felt the special pang which I feel reading the subscription: I am your most humble and unfortunate servant, Is. Newton. [narrator's italics]It seems to me to express better than anything that has gone before it Newton's pain and anguished bafflement. I compare it to the way a few weeks later he signed, with just the stark surname, another, and altogether different, letter. What happened in the interval, what knowledge dawned on him?
>
> We have speculated a great deal, you [Clio] and I, on his nervous collapse late in that summer of '93. He was fifty, his greatest work was behind him, the Principia and the gravity laws, the discoveries in optics. He was giving himself up more and more to interpretative study of the Bible, and to that darker work in alchemy which so embarrasses his biographers (cf. Popov et al) He was a great man now, his fame was assured, all Europe honoured him. But his life as a scientist was over. The process of lapidescence had begun: the world was turning him into a monument to himself. He was cold, arrogant, lonely. He was still obsessively jealous—his hatred of Hooke was to endure, indeed to intensify, even beyond the death of his old adversary. He was—
>
> Look at me, writing history; old habits die hard. (5–6)

In this reference to a real letter dated 16 September 1693, Newton accuses Locke of immorality, of Hobbism, and of

an attempt to entrap him with women. This missive sets out Newton's criteria for the judgement of a life. An essential connection is evident between the first letter's contents and the narrator's own existence. According to one of Newton's actual biographers, Frank Manuel (1968), the word "immorality" concerns not sexual relations, but the greedy seeking of a "place" or "position" (216). The narrator is also clearly desirous of reputation and acclaim for his work: "It would be a splendid book, fresh and clean as this bright scene before me . . . . and Cambridge would offer me a big job" (6). To be accused of Hobbism is to be labelled as one who believes (fascist-like?) that absolute government is necessary because of the selfishness of human beings which--left unchecked--can lead to chaos and disorder. Hobbism is a totalizing concept, an adherence to a monolithic structure or entity, somewhat resembling the power the narrator gives to the muse of history, Clio or Cliona, to whom he readily confesses. Lastly, it is not surprising that the narrator finds significance in Newton's paranoid feelings concerning "entrapment by Women," since he fornicates with one woman while having adulterous desires for another.

In this early section, we sense a superimposition of the narrator's academic life on to that of Newton's. Fern House becomes a kind of Woolsthorpe, a quiet place to add the final touches to a major tome or report on a discovery.

Woolsthorpe Manor in Lincolnshire was Newton's mother's home. It was here in the period between 1665–67 (during the plague) that Newton is thought to have made major advances in celestial dynamics, mathematics and optics. The narrator believes "time is different in the country" (4), which strikes us as an awareness of anomaly, a time away from normal practice. Crucial differences in location (Ireland instead of England) may exist between the two country retreats, but perhaps not in abstract concepts, such as the recognition of a gulf between the knowable and the unknowable. It seems where Newton and the narrator part company is in the perception of Nature. Newton believed many unanswered questions were inappropriate or unnecessary because the pure absolutes were to be found in God; the narrator, however, appears to have no faith and is subsequently at variance with the natural world, exemplified by his fear of animals, birds, and insects and his bemusement at the various kinds of trees. Thus he becomes and feels detached, "an interloper" (5), so much so that even his manuscript appears to be severed from him.

The second letter, the fiction, is supposed to have been written a few weeks after the first. Our narrator informs us that Newton at this point in 1693 was fifty years old, with his best work behind him. In real life, as Manuel's biography makes clear, Newton relinquished the world of the intellect in science by giving up his Cambridge position as lecturer. There he had a reputation for

speaking to empty halls, so incomprehensible was his discourse; in fact, only two accounts of his lectures have come down to us, a sign perhaps of his reconditeness. Newton took up an administrative position at the Royal Mint, a job of immense routine dealing primarily with everyday matters. Historians of science believe that this choice was intentional, since Newton realized his great creative period was over. Newton turned to biblical study and alchemical pursuits in the twilight of his life. Perhaps Banville's novella suggests that this change was dictated by an unwillingness to address an anomaly in Newton's previous theoretical system.

Before discussing the second letter directly, it is worth remembering that the title of the novella on the surface describes the narrator's whole epistolary discourse. Banville did not choose "A" Newton Letter or The Newton "Letters". Thus we are led to assume that it is the second letter which is the one at issue. As the narrator remarks on this anomalous letter, he ties his work and life experiences at Fern House together: "The letter seemed to me now to lie at the centre of my work, perhaps of Newton's too, reflecting and containing all the rest, as the image of Charlotte contained, as in a convex mirror, the entire world of Ferns" (50). The introduction of a comparison with Charlotte is significant. She is as inscrutable as Newton's letter. She would appear to be at the core of the family drama at Fern House, just as the narrator sees the second

letter of Newton's to be at the core of Newton's fluctuations in thought. It is also significant that Newton is writing to John Locke, who denied the power of innate ideas and emphasized experience.

In this second letter to Locke, Newton complains of an intellectual impasse. He steers away from the mere pronouncements of beliefs in God and in a mechanistic universe to that which is creating doubt in his mind, his everyday meetings with tradesmen:

> They would seem to have something to tell me; not of their trades, nor even of how they conduct their lives; nothing, I believe, in words. They are, if you will understand it, themselves the things they might tell. They are all a form of saying—and there it breaks off, the rest of that page illegible (because of a scorch mark perhaps?). All that remains is the brief close: My dear Doctor, expect no more philosophy from my pen. The language in which I might be able not only to write but to think is neither Latin nor English, but a language none of whose words is known to me; a language in which commonplace things speak to me; and wherein I may one day have to justify myself before an unknown judge.
>
> (narrator's italics, 50–51) [2]

Newton believes these tradesmen have a form of knowledge which is unspeakable and untransmissible. It is as if Newton acknowledges the eternal mystery of human creation, that which lies beyond the boundaries and potential of language. The inadequacy of human language to explain the phenomena of life is a constant theme throughout Banville's tetralogy. Copernicus and Kepler constantly revise their writings, admitting at least to themselves that

errors have been made. Newton goes on to say that these individuals he meets provoke in him the thoughts of another language, a site where future philosophy would be grounded. It is a language of the "commonplace," a yardstick he feels he may have to be judged by. Newton seems to fear the judgement not of God but of his fellow man, the tradesmen who are supposedly inferior to his intellect. He senses they have a power over him.

The believed reductionism of his scientific endeavours structures the philosophy underlying the second letter. It might be argued that in the letter he is doing no more than admitting before his peers (Locke) and superior (God) that his discoveries and theories are in reality miniscule. This assertion would explain the presence of the famous preface: "I seem to have been only as a boy playing on the seashore, and diverting myself in now and then finding a smoother pebble or a prettier shell than ordinary, whilst the great ocean of truth lay all undiscovered before me" (v). Similarly, what interests Banville and the narrator are the limitations of one intellect to understand the world. The "secondary" nature of a history, biography or even autobiography/personal memoir—an uncertain writer dealing with an uncertain subject—promotes the debilitating feeling that exactitude is illusory and that subjectivity is the only reality worth attempting to objectify.

In the narrator's mind, the "story" of Newton's "madness" in the autumn of 1693, sparked by the horror of a fire in his room which destroyed a number of his papers (including a manuscript on optics), is to be understood by means of the man's pleasure in entering into the minutiae of everyday life. [3] Like Banville's Kepler, the reassuring elements are apparently innocuous: "He notices details, early morning light through a window, his rescuer's one unshod foot and yellow toenails, the velvet blackness of burnt paper. He smiles" (23).

The narrator's contention is that to Newton the destruction of his work mattered little because the great ocean of truth lay around him in this real, observable, though inexplicable, world. As the narrator informs Charlotte, Newton's absolutes of space, time, and motion upon which he based his theories had to be revised the more he thought about his science. The grand design or system, seemingly absolute and closed, became unnervingly relative and open in tandem with the chaos and disorder of the human life around him. This "confused mix" is succinctly conveyed when the narrator <u>marries</u> his scientific speech to Charlotte with his feelings for her, during the dinner table chaos when Mr. Prunty attempts to focus conversation on buying out the Lawlesses' business. For the first time, Charlotte seems to recognize the narrator and his work, and the historian is eager to impress, even if he has to be pedantic:

> "Because he had to have certain absolutes," I said, look at me, keep looking at me, "certain absolutes of of of, of space, time, motion," beats, soft beats, soft heartbeats, "can only be relative, for us, he knew that, had to admit it, had to let them go,and when they went," O my darling, "everything else went with them." Ah! (63)

The realization of an undismissible anomaly in his work led Newton to give up science. Equally, the narrator's difficulty with his writing on Newton's breakdown is in not realizing at what juncture the scientist failed to continue supporting a flawed paradigm, and at what point he withdrew from constructing a new one. Stephen Hawking, in A Brief History of Time (1988), has commented directly on the scientists' choices when faced with the mistakes of previous work:

> What should you do when you find you have made a mistake like that? Some people never admit that they are wrong and continue to find new, and often mutually inconsistent, arguments to support their case—as Eddington did in opposing black hole theory. Others claim to have never really supported the incorrect view in the first place or, if they did, it was only to show that it was inconsistent. It seems to me much better and less confusing if you admit in print that you were wrong. A good example of this was Einstein, who called the cosmological constant, which he introduced when he was trying to make a static model of the universe, the biggest mistake of his life. (151)

Hawking omits the possibility of silence and Newton's "solution," of shifting to other pursuits. The beauty of

Banville's novella is that we see the narrator advance (as if having read Hawking) in this area of cognition to the point of beginning to construct a new paradigm (concerning Newton), despite his own resistance. The latter is rooted in the traditional biographer's reluctance to argue that the man to whom he has devoted a great deal of time and energy had a breakdown and changed occupations primarily because his celebrated theories did not square either with experience or with further reflection.

From the narrator's account of Newton, it would appear that the mathematician desired a life of action, an insight gleaned from personal tragedy (madness). If he publishes his biography, the narrator would be asserting that Newton did lead a life of action (in a narrow sense) by casting out old, worn theories. Yet the narrator is unhappy with this surmise because of what Newton's letters and breakdown suggest and because of his own personal experiences, which appear to be more real, urgent, and true than his profession of "objective" historical–scientific writing. The narrator would like to believe that he and his subject have seen the light and the light is the real world of action, feelings, and so on. Tellingly, Newton smiles and cries in the narrator's account of the burning (Newton is believed to have only laughed once in company!). The narrator's own dose of humanity comes slowly but surely during his relationships with the inhabitants of Fern House.

To underscore this humanitarian emphasis, one must first clarify the way the text can send the reader on false trails. In the following quotation, the first sentence could easily fit snugly in any imaginative introduction to a great scientist's biography: "Sitting at my table before the window and the sunlit lilacs, I thought of Canon Koppernigk at Frauenberg, of Nietzsche in the Engadine, of Newton himself, all those high cold heroes who renounced the world and human happiness to pursue the big game of the intellect. A pretty picture—but hardly a true one" (49–50). It is too easy to believe the first sentence, like most critics such as Outram (1988, 9) and Imhof (1989, 153) have done. Surely, however, it is the second sentence that the narrator finds nearer the truth. It suggests a man who desired to interact with the world in the hope of finding knowledge of a sort there. By engaging with "actuality," Newton may hope his speculations will be related to the observable world of everyday life.

One of the major features of The Newton Letter is the humbling of the intellectual in the face of the natural, arbitrary, tragic, disorganized world. Both Copernicus and Kepler face similar embarrassments. The narrator of the novella clearly learns from his relationships with Ottilie and Charlotte. Their influence, which serves as the Kuhnian introduction of new conceptual and empirical data, displaces the writing of the book on Newton as initally designed; however, the two women seem to revive for the narrator,

ironically enough, that period in 1693 of Newton's breakdown. It seems the result of this influence is that the narrator can now continue with a greater sense of not just his mortality but of his intellectual limitations in grasping the world of his subject.

Whenever the narrator attempts to put names to the experiences that he has, he inevitably fails to give a fair account. At base, there exists a definite flaw or weakness in the intellectual endeavour of any writer because he is attempting to objectify his subjective feelings. No surety exists, of course, that these feelings and instincts are valid to other people. The following discussion traces the narrator's learning of his limitations, and the burgeoning awareness of rampant anomalies.

II. Failing Systems

His first failure is simply that of his book. He has been unable to deal adequately with Newton's period of breakdown. It is the problem of a biographer faced with a subject who momentarily renounces his philosophy. A biographer constructs a suitable model for his subject's ideas to be explained. "Odd behaviour" by his subject can only cast doubt on the biographer's model. In this particular case, Banville's Newton appears to renounce his philosophy only once, in the second letter to John Locke. Matching his writing failure is his failure to judge events

surrounding him. We understand from the end of the novella, with its inscription, "Dublin—Iowa—Dublin Summer 1979—Spring 1981," that the narrator is on his way back to Ireland from his American sojourn, from where we assume he has written this letter to Clio. I take this inscription to be the narrator's and not Banville's. His account is a humble one, anxious to show that in terms of chronology, remembered of course, he has not acquitted himself well. After his query whether or not he has "lost [his] faith in the primacy of text?" [an ironic question, for why then write a letter?], which is in response to "real people . . . objects, landscapes even" (1), he remembers his first visit to Ferns past Killiney Bay. Such visual images that he conjures up appear "at once commonplace and unique" (2). These two apparently oppositional notions are at the core of his visit to Fern House.

The narrator of our story is full of hubris, arrogance, and misogyny. Fern House, for example, is the kind of place where a "mad stepdaughter" would be locked up (3). Even from the very first meeting with the two women who are to dominate his summer break, he assumes, incorrectly, a great deal. He believes from a distance that Charlotte is the younger sister of Ottilie; it is not until he is up close and after she takes off her straw hat that a middle-aged woman is revealed. This initial incident is a marker to the reader of the narrator's peculiar vision. He does not see something other; he merely sees them truly: "I had

got them nearly right, but the wrong way round" (3). In other words, the observable world is presented but not explained. Such disjunctions between picture and reality disrupt the narrator's concentration. He has brought guidebooks to trees and birds, but he cannot connect their contents to reality. He begins to feel detached from his manuscript on Newton, even entertaining the notion that it had been written "not by someone else, but by another version of myself" (5). This awareness of anomaly is reinforced when in the forest he at first thinks he sees a rat. "To smell a rat" is a saying that foregrounds a crack in some existing system. The narrator qualifies this anomaly awareness by seeming to reverse the notion: "I never saw sign of a rat. It was only the idea" (8). Put simply, the narrator is struggling to rescue his previous models of Newton so that his book can continue to be a seamless whole.

For a while it seems the narrator imagines his life at Fern House as a counterpart to Newton's mother's country residence, Woolsthorpe. In so many ways, then, is the historian a tracing of the original (Newton). With this superior air, he looks upon Edward, Charlotte, and Ottilie, seeing them as "Protestants, of course, landed . . . to me, product of a post-peasant Catholic upbringing, they appeared perfected creatures" (12-13). Only slowly does the narrator lose this illusion. One is also intrigued why a Catholic (albeit lapsed) historian would devote his major work to a Protestant genius, who had been involved in anti-Catholic

politics in the British parliament, acerbically described by Stephen Hawking (181–2).

The narrator is entranced by Charlotte who, unlike him, can name things very exactly (for it is her business). He is mystified by the presence of young Michael. The young boy falls out of the tree (a proverbial apple) and serves as the human anomaly of the Fern House system: "I couldn't fit him to the Lawlesses" (16). As the historian reads under an apple tree (Newton echo), he spies Michael perched like an apple among the branches (16). Later, Ottilie brings the "fallen" Michael to the writer's lodge. This incident sparks the relationship between Ottilie and the narrator.

Many flaws in conceptual systems are present, but often missed by the narrator who, for example, expects somewhat more than a plastic tablecloth when he is invited up to the House for a meal. He had assumed a grandness consistent with the building. The Big House is like a massive and impressive theoretical system inside of which anomalies and incongruities flourish. He observes but does not take in the significance of a hurley stick in the umbrella stand. (One wonders how many Protestants in Ireland play hurley?) At this unexpectedly meagre meal he hears, though does not understand the meaning of, Edward's outburst: "Well what's wrong with being ordinary?" (18). The narrator's educated guesses prove to be only half–truths. With good reason, he believes that he has been dragged up to the house for dinner to prevent discussion about Edward's drinking. But the

other half of his new paradigm is extremely askew: "I saw the whole thing now, of course: he was a waster, Charlotte kept the place going, everything had been a mistake, even the child. It all fitted. . . " (19). Later, his ruminations are even more far-fetched by seeing Edward as a "fortune hunter" in marrying Charlotte (32). The narrator further puts his foot into it by thinking Michael is Charlotte's child; in the embarrassing silence that follows his utterance he then erroneously assumes Michael is Ottilie's child. Such a febrile imagination is consistent with the role of an historian who seeks to perceive extraordinary events to make his narrative compelling to any reader. Perhaps the "insistent enigma of other people" (19) is partly created and partly found.

Ottilie actually suggests the problem that is besetting Edward and Charlotte, but the narrator is a bad listener. She asks him if he had ever taken drugs, such as the ones they give people dying of cancer (29). The narrator does not pick up on this nuance. Ironically, it is Edward who tries to give him good advice: "It goes to show, you should listen to people, eh?" (34). The narrator, however, seems unable to shake off his prejudices. When Edward's sister Bunny arrives, he expects her to be the "West Brit," but quite the reverse is true: instead of uttering laments at the deaths of Mountbatten and eighteen paratroopers, she wants to name a street after the date to celebrate the slaughter.

The narrator is unceasingly patronizing toward Ottilie, seeing himself as "one of those tragic gentlemen in old novels who solace themselves with a shopgirl, or a little actress, a sort of semi-animate doll with childlike ways and no name, a part for which my big blonde girl was hardly fitted" (43). Only when she approaches him and sexual activity results does he begin to dispense with these doubts and censures. Another attempt at cognition is the belief that he is in love with Charlotte. He is troubled that as a writer he can yet find no words which are adequate to describe her. The following quotation reminds us of the second letter to John Locke. The narrator seems to be re-enacting unconsciously Newton's difficulties:

> When I search for the words to describe her I can't find them. Such words don't exist. They would need to be no more than forms of intent, balanced on the brink of saying, another version of silence. Every mention I make of her is a failure. Even when I say just her name it sounds like an exaggeration. When I write it down it seems impossibly swollen, as if my pen had slipped eight or nine redundant letters into it. Her physical presence itself seemed overdone, a clumsy representation of the essential she. That essence was only to be glimpsed obliquely, on the outer edge of vision, an image always there and always fleeting, like the afterglow of a bright light on the retina. (44)

Like the nature of the Newtonian universe itself, his estimation or picture of her relies on a fair degree of imagination and fabrication, a consciously false fiction; it is, in truth, a very immature unrequited love.

Constantly, he misunderstands Charlotte; her blankness (induced by drugs) creates in her conversation many longeurs and disconnected speeches. The narrator seems unable to discern what is the matter with his would-be love. This failure is clear when they drive to the town together and stop suddenly. He thinks this is the opportunity for a move (sexual perhaps) on his part, but a sixth sense prevents him from doing so, and he is oblivious to the important statement, "Edward is not well" (46). He can not see beyond his infatuation. He even merges the two women in his mind into a portmanteau word: "Charlottilie!" (48). By bringing two unlike concepts together, he hopes to create a Koestlerian synthesis. The closer he examines his feeling of anomaly, the more complex it appears, although he does believe it is a corollary to "this summer as a self contained unit separate from the time of the ordinary world" (49). One anomaly breeds another.

With even more hubris, he assumes a number of things about Ottilie, whom he thinks he sees more clearly than ever before: "Receding from me, she took on the high definition of a figure seen through the wrong end of a telescope, fixed, tiny, complete in every detail" (53). Ironically, he is on to something here. He repeatedly looks through the wrong end of the telescope in judging character or coordinates in a system. For example, he assumes that the child Michael is Ottilie's, born when she was around sixteen: "That she was the mother I never doubted" (54). At

Michael's birthday party, he begins to think that Edward is the father of Ottilie's child (two assumptions here). He does learn that the family are in fact Catholics, not Protestants, and as he says, but does not necessarily heed, "My entire conception of them had to be revised" (54).

The gullible narrator is led astray by Ottilie in the way she brings him into Charlotte's bedroom to make love, maintaining that it is her own. He overlooks the anomalous fact that he sees a black hair on the pillow, "like a tiny crack in the enamel" (55). Once tricked and told of the true state of affairs, he loses his temper, forcing Ottilie to utter a perceptive comment: "You think you're so clever, but you don't know a thing" (57). He refuses to believe Ottilie's story that Michael is not her child but one adopted by Charlotte, who could not have any children herself. This obstinacy reveals a man who treasures his paradigms of understanding. He also fails to see the depth of feeling Ottilie has for him. When it does dawn upon him, he is aghast and surprised (67). It is not until Edward's bout of drinking and the Doctor's suggestive comments that the narrator can find the right questions. Even then, he has to weed it out of Ottilie: "Valium, seconal . . . . Six months she's been on it. She's like a zombie—didn't you notice?" (75) Ottilie sees that the writer has not understood Charlotte, Edward, or her. Meeting Mr. Prunty on the train, he seems to lie when he admits that he knew, as Mr Prunty puts it, that Edward "has it in the gut" (77).

By way of conclusion, I wish to stress that what The Newton Letter offers the reader is an ingenious exploration of how conceptual frames, both artistic and scientific, are imagined and reimagined to produce new syntheses. The first person narrative, structured in the form of a letter to history, contains within its frame two letters purportedly written by Newton. These inner texts strike the narrator as the kernel of his own surrounding text. Even so, the problem remains that the narrator is at first resistant to the message these inner texts seem to imply—that theories of the world are only valid onto themselves—for when the subjective view of the observable world is introduced, anomalies appear and theories must be recast accordingly. This recasting, this process of rearrangement, is embedded in the act of writing and recording itself, whether in an artistic or scientific context.

In his eight chapters, divided into twenty-eight sections, the narrator reluctantly recognizes Kuhnian periodic scientific (and humanistic) revolutions. By so doing, he is able to construct a new workable paradigm: "I shall take up the book and finish it: such a renunciation is not of this world" (81). Nevertheless, he is wary, worried that in time he will have to construct yet another paradigm to keep in step with scientific progress and areas of human feeling.

Notes to Chapter Five

[1] Quoted in Nicolson (1946; 1963, ix)

[2] The latter part of the quotation is almost taken verbatim from "The Letter of Lord Chandos." See Hofmannstahl (1952), pp. 140–141.

[3] The fire burning story is not backed up in Newton's letters, although Newton's manuscripts do bear numerous scorch marks.

Chapter Six

Casting and Recasting Theories: Mefisto

Banville's Mefisto (1986) is the fourth volume in the author's fictional scientific tetralogy. At first glance, it would appear that the novel is a major departure from the previous three works. Mefisto is not directly reliant on an historical figure; it is autobiographical not biographical; it dwells on psychology, almost to the point of mysticism; it is a good deal more "literary," resembling the "posthumous fantasies" of Flann O'Brien and Samuel Beckett; and it relies heavily on metaphors and similes to create its world. At second glance, however, it is clear that the major similarity between Mefisto and the other three novels is the quest for order and harmony. In the last fiction of the tetralogy, this quest appears to revolve around three binary oppositions: incompleteness versus wholeness; chance and randomness versus order and harmony; and asymmetry versus symmetry.

The first part of Mefisto tends to focus on the awareness of incompleteness which undermines order and harmony; the second part of the novel tends to focus on the gradual awareness that chance and randomness may be the only possible "order." Throughout the novel, symmetries and

asymmetries abound, as if to warn us readers away from simple generalizations about the nature of the world as perceived by the "brilliant" Gabriel.

Generally speaking, Mefisto explores within a fairly contemporary frame the scientific imagination and recent chaotic theory. At the literal level, we follow the chronological reminiscences of a young mathematical genius called Gabriel Swan who, in the first part of the novel, shows promise at school in rural Ireland despite his less than supportive family background. He is introduced to the inhabitants of the small town's mansion, Ashburn, by the enigmatic Felix who arranges for Gabriel to work on mathematical problems for the silent engineer–scientist Mr. Kasperl. The latter owns an unstable anthracite mine in the vicinity of the small town. As time passes, Gabriel forms an attachment to Sophie, a resident at Ashburn, who appears to be a deaf mute. Just as it appears that Gabriel is well entrenched in Ashburn, a mine explosion destroys the mansion and in the ensuing fire Gabriel is severely burned.

The mutilated Gabriel awakes in part two of the novel to a long period of recovery before he begins his quest again for meaning by use of mathematical symbols and figures. This time Felix introduces him to Professor Kosok who works in computing within a city environment and under a government agency. Gabriel works alongside the homosexual Leitch, while desiring an intimate relationship with the drug addict Adele, who is as mysterious as Sophie in the

first part of the novel. Adele dies in hospital from an overdose of drugs supplied by Gabriel in exchange for sexual favours. The novel ends with the irresolution of the computing work, and Gabriel's belief that all must be left to chance.

As we ponder over Gabriel's development, we notice how his scientific work is indissociable from his personal circumstances, particularly with regard to the concepts of symmetry and asymmetry. In addition, we are impressed at the (Holtonian) prominence of the social setting, including influences, working conditions, colleagueship, teamwork, and the link between science and public policy, in determining the formation of theoretical models. Overall, the novel presents an argument that pure science is, to a degree, a subjective activity which yet purports to deny such subjectivity. The novel also investigates the details prefacing a scientific paradigm change by emphasizing Gabriel's tendency to alight upon undismissable anomalies.

Like the earlier The Newton Letter (1982), the setting of Mefisto is 20th Century Ireland. However, it appears that the country environs of "Marionettes," the first part of the novel, resembles life out of the nineteenth Century (a not uncommon response to modern rural Ireland). The following paragraph gives us a taste of this historical appreciation:

> The town was twelve thousand souls, three churches and a Methodist hall, a narrow main street, a disused anthracite mine, a river and a silted harbour. Fragments of the past stuck up through the present, rocks in the stream of time: a Viking burial mound, a Norman tower, a stump of immemorial wall like a broken molar. History was rich there. Giraldus Cambrensis knew that shore. The Templars had kept a hospice on the Spike peninsula. The region had played its part in more than one failed uprising. By now the splendour had faded. There was too, I almost forgot, the great war against the Jehovah's Witnesses. I had watched the final rout: a priest punching in the belly a skinny young man in a mac, the crowd shouting, the bundles of The Watchtower flying in the air. And there was a celebrated murder, never solved, an old woman battered to death one dark night in her sweetshop down a lane. It was the stuff of nightmares, the body behind the counter, the bottled sweets, the blood. (15)

The above description and its images convey provinciality, religious divisions, failed industry, a pastiche of historical landmarks, and, finally, anomalies, in the forms of the "new" religion personified by a Jehovah's Witness and of an unsolved murder (an incident from a previous short story of Banville's). [1]

As a narrator, Gabriel's vision is bleak, unforgiving, extremely detached, and darkly ironic. This irony seems to attract the educated reader to certain literary antecedents, particulary those of Goethe's Faust and Marlowe's Dr Faustus. References to Shakespeare, Yeats, Beckett, and Keats—among others—are also evident. Felix is a modern Mephistopheles (the title of the novel?) who tempts the Faustian Gabriel to rise above the mundane world. Whereas Marlowe's Mephistopheles has the ability to give Dr. Faustus

powers, Felix can only facilitate a cerebral working atmosphere for Gabriel by introducing him first to Mr. Kasperl and then to Professor Kosok. He tempts Gabriel in the way of a trickster, jester, coyote, or fox figure. The constant instability of various choices facing Gabriel— mostly presented by Felix— is part of the general randomness and chance theme. In sum, for the narrator, Felix is a trickster with words (an artist) while Gabriel is a trickster with numbers (a scientist).

I. Scientific Marionettes

Very near the end of part one, the deaf mute Sophie puts on her marionette show:

> The marionettes jerked and clattered, bowed and swayed. The strings seemed not to guide but hinder them, as if they had a flickering life of their own, as if they were trying to escape. It was my story they were telling. Everything was there, the meeting above the meadow, my first meal with them, D'Arcy's visit, Jack Kay, the kiss, everything. (114)

The fact that the strings appear to hinder the movements of the marionettes is significant. Gabriel's narration here tries to get to grips with his feeling that his life has been mapped out "always already" with no security that specific causal (strings) events can be uncovered. The flexible and loose configurations of the marionettes are in

microcosm what Gabriel perceives—in his act of narration of both parts of the novel—as the characters and events pertinent to the understanding of his own life and quest.

While the novel is not concerned directly with education, it still reveals the importance of social institutions on geniuses. Before he reaches Kasperl and also during his encounter with Ashurn, Gabriel is influenced by his school education. Each year he would come top of the class in arithmetic, and then in senior school he came under the beady eye of Pender, the maths teacher. It seems significant that Pender is an English layman and not an Irish priest. His foreignness casts a special glow over the pursuit of mathematics. This man's approach is also special: "His taste was for the byways and blind alleys of his subject, for paradoxes and puzzles and mathematical games" (24). This peculiarity, or the seeking out of anomalies within systems, is at the heart of the scientific process, as explained by Thomas Kuhn (1970) and elaborated earlier in chapter two. To Gabriel, Pender is "liturgical" (24) in the way he explains the mysteries of boolean algebra, the fibonacci sequence, and the binomial theorem. These terms are not thrown out casually; they are relevant to the whole asymmetrical/symmetrical issue that pervades the novel.

Asymmetry here is understood as the relationship between double forms and double patterns that appear to be equivalent but which relationship on closer inspection

proves only to be an appearance of such. It is the gradual loss of symmetry in the narrator's world picture that breeds asymmetry. Of course, since Mefisto is an autobiographical reminiscence, the narrator often declines to pursue the ramifications of this asymmetry, in case his narrative totally breaks down (which it often threatens to do by the increasing number of small sections and the colloquial tone).

A binomial is a scientific naming system, consisting of, or using, two names. More specifically, it is a mathematical expression consisting of two terms connected by a plus sign or minus sign. This duality is, of course, applicable to Gabriel and his dead brother, who is always a present absence. Boolean algebra is used extensively in the theory of computer programming because it refers to the use of logical symbols to represent relations between sets. Gabriel takes up serious computer-related topics in part two, "Angels." Lastly, the Fibonacci sequence is an infinite sequence of whole numbers, in which every number after the first two is the sum of the two numbers immediately preceding it (e.g. 0,1,1,2,3,5,8,13). As will be seen, certain numbers, such as ten, have a special resonance for Gabriel.

A familiarization with the unfamiliar is initiated by Pender in his classroom. He mentions "queer names . . . Minkowski and Euler, Peano and Heaviside, Infeld, . . . Tarski and Olbers" (24). These names suggest the conjoining

(Koestler-like) of previously assumed separate disciplines, research into scientific and mathematical paradoxes, and Einsteinian relativity. Leonhard Euler was a Swiss mathematician who published over eight hundred papers, applying mathematics to astronomy. He helped to replace the geometric approach to metaphysical problems with an algebraic approach. Oliver Heaviside was an English physicist and electrical engineer. He applied mathematics to the study of electrical circuits. Guiseppe Peano, an Italian mathematician, applied symbolic logic to the fundamentals of mathematics. A. Tarski, a Polish-American mathematician, was a proponent of seeing intuitionist logic as a form of interpretation. [2] Heinrich Olbers, a German astronomer, is best known for his "paradox." He argued that if, as was thought, the sky were full of stars evenly distributed, then the sky should be continuously light. He thought the reason it was dark was because of dust. Hermann Minkowski was one of Einstein's teachers. His 1908 lecture "Space and Time" raised interest in relativity, particularly the movement of three dimensional geometry into four dimensional physics. By so doing, space and time become a continuum, revealing "eine Welt an sich" [a world in itself] (Holton 257). Leopold Infeld worked closely with Einstein for many years and became his biographer (1950).

Pender visits Gabriel's home, as if wanting to have a much closer relationship with this boy genius. Earlier Father Barker had called Gabriel and his mother in to

express what seemed like adoration for the boy's brilliance and potential (clear echo of Stephen Dedalus in Joyce's A Portrait). However, not long after both Barker and Pender leave the school, and no more attention is paid to Gabriel, except that he will soon encounter the Ashburn residents. In the meantime he, like Kepler, "saw mathematical properties everywhere around me. Number, line, angle, point, these were the secret coordinates of the world and everything in it. There was nothing, no matter how minute, that could not be resolved into smaller and still smaller parts" (32). Of course, Gabriel has not yet foreseen that if this is the case, then there is conceivably no end to subdivision and, therefore, no beginning or end, but rather a continuum.

The dominating rival to the institution of school is that of Ashburn. Once the seat of power through the Anglo-Irish (Protestant) Ascendancy connections, the Ashurn manor is now in a state of decrepitude, providing a home for an unusual cabal: Kasperl, Sophie, and Felix. Gabriel moves from basic education in mathematics to become Kasperl's protégé, just as Copernicus is Wodka's protégé and Kepler is Tycho Brahe's in Banville's previous works. In each case, the student is far more advanced than the master.

It is when school fades away and when he is happy discovering the flexibility of mathematics that he encounters through Felix the inscrutable Mr. Kasperl, who even wears "incongruous" clothing (33). He is foreign and

educated in philosophy and science. He is supposedly an engineer come to fix up the disused anthracite mine. Gabriel typically spies him sitting on a disordered bed, contemplating "a large chart or map" (44). Later, when Sophie takes him into Mr. Kasperl's room, he finds the "big black notebook, thick as a wizard's codex" (69). In this notebook, Gabriel sees the work of many years, involving quaternions, matrix theory, and transfinite numbering. Of specific relevance to Gabriel is Kasperl's interest in symmetries and palindromic series. When Kasperl enters the room, he begins work on a few enigmatic field equations whose solutions tended towards infinity. Kasperl gives this open notebook to Gabriel to ponder over. In doing so, Gabriel becomes Kasperl's mathematical protégé.

Gabriel often discovers Kasperl's open notebook has been intentionally left out for his perusal. Its contents reveal "always some paradox, some tautology" (76). Kasperl is fascinated by inconclusivity, by systems without parallelisms, by concepts which contradict infinity. The pursuit of harmony, pattern, and wholeness cannot be completed until these anomalies have been resolved. Gabriel also finds a need to penetrate these self-reflexive systems. Like Banville's Copernicus, Kepler, and Newton's biographer, Gabriel receives intellectual insight at the oddest moments. As he looks at his dead mother, he finds a solution to one of Mr. Kasperl's black notebook equations. Furthermore, while he adjusts to his mother's death and his father's

withering illness, he slips into a world of mathematics, hoping to blend together the abstract and the actual:

> Ashburn, Jack Kay, my mother, the black dog, the crash, all this, it was not like numbers, yet it too must have rules, order, some sort of pattern. Always I had thought of number falling on the chaos of things like frost falling on water, the seething particles tamed and sorted, the crystals locking, the frozen lattice spreading outwards in all directions. I could feel it in my mind, the crunch of things coming to a stop, the creaking stillness, the stunned, white air. But marshal the factors how I might, they would not equate now. Everything was sway and flow and sudden lurch. Surfaces that had seemed solid began to give way under me. I could hold nothing in my hands, all slipped through my fingers helplessly. Zero, minus quantities, irrational numbers, the infinite itself, suddenly these things revealed themselves for what they really had been, always. (109)

Gabriel's relationship with the inhabitants of Ashburn is outwardly slight. Mr Kasperl and Sophie do not speak; their muteness is interpreted by Gabriel as a sign of immense intelligence or wisdom. In contrast, Felix talks at great length, far too much for Gabriel's liking. As events at the mine turn to disaster, Felix departs, telling Gabriel in the most basic mathematical way, to "cancel, cancel and begin again" (117). This phrase foreshadows the end of part one and Gabriel's own belief, before his horrific burning, that he must start again (120). He must reconstruct the equation of his life and surroundings.

The social setting of rural Ireland is not conducive, however, to men of superior intellect. Both Barker and

Pender are removed from their positions. They saw in Gabriel a brilliant anomaly, but he is isolated by his family from such aspirations. His new "family" at Ashburn only lasts for a short while. Ashburn is a kind of scientific research station where Gabriel is able to test his theories of experiment and intuition.

Felix's role in the education of Gabriel is problematic. As already noted, Felix is loquacious where Kasperl is silent. Felix is the survivor, the opportunist, the popularizer of theories. His role in the text appears to be as a vehicle for Gabriel's intellectual advancement. He is a Mephistophelean figure who does, in a sense, convince Gabriel to sell, or bind, his soul to such mathematicians and scientists as Kasperl and Kosok. Felix also functions as a source of humour in what is a blackly comic novel. As a trickster or jester figure, he has no equal. He seems to echo what Arthur Koestler has to say about humour as a "lopsided phenomenon which has puzzled philosophers since antiquity" (Act of Creation 31). The lopsidedness emerges out of the fact that an utterance can create a physiological reaction. Felix seems to be in constant good humour, always cracking jokes, and laughing. This is another asymmetry for Gabriel to puzzle over.

Without roots in the community of the small town where the mine explodes and kills people, Kasperl and Felix can be easily seen as foreign interlopers who come to Ireland to exploit its resources, symbolized by their residence in the

old seat of power: Ashburn. The name of "Ashburn" itself brings to the surface the ultimate fate of the mansion in the novel, and it is also a literary and historical reference to many Georgian houses in Ireland which were gutted because of their Protestant ownership. William Trevor's Fools of Fortune is a recent example which explores this theme.

By the end of the first section, Gabriel has been educated to the point that he is aware of previous mathematical and human anomalies (his own life and family). He has also taken in gradually new observational and conceptual data concerning his family, his life, and Ashburn's new residents. He has reached a stage where he can take Felix's advice and "cancel" out to begin again. In other words, he is about to construct a new paradigm to live by when he is physically reshaped by another mine explosion. He is not given the chance to formulate his own new synthesis, but the problems of complacency have been posed. The subsidence of the ground beneath him is a metaphor that the old systems of thought will not do. The second section, "Angels," is a battle with resistance to this new paradigm.

II. Angels From Hell

The title of part two, "Angels," refers on a literal level to the painkilling drugs Gabriel takes during his hospital stay. He likens them to classical figures like

Oread, "white nymph of forgetfulness" (123). On a metaphorical level, the word "angels" suggests that he has entered a new world, perched precariously at the edge of a new paradigm, which is presented to him periodically. For example, when a word or light is discernible it would "ramify for hours" (124). This scatteredness, this loss of centre—controlled unity, is pervasive in the apparent parallel universe of the second part. As the narrator puts it: "This was a place where I had never been before, which I had not known existed" (124). Physically, the narrator has been scarred for life, reborn in a startling way. The fact that now "zeroes gaped like holes" (127) suggests that he is beginning to look at the old constants in a radically new way.

His personality has to be reassembled from scattered "bits and scraps, of memories, sensations, guesses" (130). The pain of recovery is the pain most unbearable. In reassembling his parts, he is creating a new workable paradigm by which to live. His sojourn at the hospital is a process of casting off the outworn, including Kasperl's black notebook, which he shuts behind a door. The hospital is his purgatory. When he visits the maternity ward, viewing the newborn babies, he feels contradictory impulses. He may be "an old ghost stumbling on a new world" (136), but he also resembles the newborns. "They look like me!," he exclaims.

Immediately he steps out into the city he is harassed by scatteredness: "A panic of disconnected numbers buzzed in my head" (139). Gabriel is conscious that "everything was new and yet unaccountably familiar" (139). Essentially, he has reordered experience, reason, and intuition and is now looking for a workable synthetic paradigm. He lists his observations in the city streets, half aware that "some dirty little truth is being wearily disclosed" (141). The dispersion appears to be moderated when Gabriel meets Felix and is brought into the house on Chandos street to work for Professor Kosok. [3] But this reinsertion into another "institution" creates its own problems, just as much as the problems created by the previous institutions of his family, small town, Convent school, St Stephen's school, Ashburn, and the hospital.

The research he undertakes for Kosok takes place in a basement. He works at night in "downtime." The computer is housed in a special white room, inside grey cabinets. It startles Gabriel to assert that humans " were the wrong shape" (167) and did not really belong in the computer world. And yet after the initial shock, it occurs to Gabriel that this computer is the Kantian Ding an sich:

> Yet I recognized it. It hummed in the depths of its coils, dreaming its vast dream of numbers. It had a brain, a memory. I recognized it . . . . The thing itself spoke to me. (168)

When the machine does speak, networked as it is to other computer systems around the world, it ushers forth endless data. This information excites Kosok and Gabriel; however, whereas Gabriel desires to find some orderly procedure in it, Kosok "seemed to want only disconnected bits" (170). What is apparent is the emphasis on nonlinear systems, produced by the computer. The machine and output seem oddly consistent with the disparate nature of the observed world. Even so, in seeking answers to the "old, insoluable problems" (173) of Kasperl's black notebook, the computer cannot help. Kosok may indeed dismiss the problems in the black book as "history" or "Antique stuff" but this attitude is no more nor less than traditional science's way of sidelining anomalies, as Kuhn argues. It is not until he is in full companionship with Felix, Tony and Liz, and other drug addicts that he grasps the "secret" which he had in his possession all along: "Chaos is nothing but an infinite number of ordered things" (183). This statement is directly applicable to recent chaotic system theory as explained in books such as James Gleick's Chaos: Making A New Science (1987). As with Kepler and Copernicus, this insight emerges out of a chaotic experience. The novel seems to come to a kind of rest here, as if Gabriel having found a workable thesis can now proceed with more focused caution.

Stephen Hawking (1988) has stepped back from the complexities of chaos theory experimentation (combining

computers with mathematics) to postulate three general possibilities:

> 1) There really is a complete unified theory, which we will someday discover if we are smart enough.
>
> 2) There is no ultimate theory of the universe, just an infinite sequence of theories that describe the universe more and more accurately.
>
> 3) There is no theory of the universe; events cannot be predicted beyond a certain extent but occur in a random and arbitrary manner. (166)

Banville's mathematical prodigy strives for the first possibility, but is to accept by the end of the text possibilities two and three, which imply that chance is the best definition of the universe. It would also appear that Mr. Kasperl's black notebook paradoxes and Professor Kosok's eschewing of pattern in computer data logically position them with Hawking's second point while they struggle with the third. Gabriel as narrator merely brings this aspect forward, arguing that if order is required, then invent it. Although Kosok blurts this feeling out (193), the subjectivity involved is not addressed, in spite of the fact that it would easily solve his problems of finding "absolute" answers to the workings of the world.

Gabriel begins section eight of part two with unbelievable confidence in his new way of approaching old

problems. In a sense, it resembles the beginnings of the possibility of a theory of everything:

> Everything had brought me to this knowledge, there was no smallest event that had not been part of the plot. Or perhaps I should say: had brought me back to it. For had I not always known, after all? From the start the world had been for me an immense formula. Press hard enough upon anything, a cloud, a fall of light, a cry in the street, and it would unfurl its secret, intricate equations. But what was different now was that it was no longer numbers that lay at the heart of things. Numbers, I saw at last were only a method, a way of doing. The thing itself would be more subtle, more certain, even, than the mere manner of its finding. And I would find it, of that I had no doubt, even if I did not as yet know how. It would be a matter, I thought, of waiting. (185)

What Gabriel believes at this juncture is that his fetishization of numerology is not the methodology to adopt to uncover the world's innermost secrets. Another methodology has yet to be formulated, but he is certain that the tasks, the specific questions he asks, are still valid. In putting to one side the black notebook, he contradicts his expressed purpose to have explained the world's paradoxes. His escape clause is simply that if infinity is where impossibilities happen, then why not accept it at face value, since infinity is unenclosable by definition? The burgeoning weight of his dead brother is likened to this metaphysical search for "the thing" (186), which would magically one day emerge under its own steam.

It may simply be looked at as a division and classification problem. When Gabriel begins to reorder his past experiences, he discovers that dismantling them only encourages a centrifugal explosion/pattern, with endless data becoming scattered. (Uncovering centrifugal patterns also led to Ashburn's and Kasperl's demise.) Kosok confirms that exactitude lies in numbers, but only as a self-consuming system. Miss Hackett, the personification of the real world of accountability, and of an invisible bureaucratic system, accepts the quantitative ability of the computer while lamenting its qualitative poverty. Miss Hackett wants to have precise aims and objectives from this research; she wishes, in other words, to help create certain kinds of results. Here the narrator touches upon the contentious issue of scientific compromise in the face of public policy. The haziness and uncertainty which are so integral to science-in-the-making are severely criticized by representations of the state. As the Professor exclaims, echoing the narrator's feelings on the novel's final page:

> There is no certainty! he cried. That is the result! Why don't you understand that, you you you . . . ! Ach, I am surrounded by fools and children. Where do you think you are living, eh? This is the world, look around you, look at it! You want certainty, order, all that? Then invent it! (193)

Gabriel is caught up in this uncertainty issue himself. He hopes that one can press onto any reality in a particular

way and, in so doing, pattern, order and harmony will emerge. The problem lies in establishing the correct pathway. To Gabriel, there must be a horde of secret signs or hidden meanings. All he requires is a key to this veritable Fort Knox.

This search is remarkably tied to Gabriel's desire to penetrate Adele. She will give him "everything" (206) as long as he will provide drugs for her. What is so striking about the closing sections of Mefisto is the chapel setting for illicit sex and drug use. One senses that the religious paradigm has been rejected outright, despite Father Plomer's "resistance," and that it is no longer meaningful to talk about blasphemous behaviour, such as making love inside the "House of God." The act of illicit sex calls into question the ambitious totalizing system that goes by the name of the Roman Catholic Church. In short, religion is just another outworn paradigm.

Less expected is the loss of confidence in the computer as a possible redeemer. As the bureaucratic support decreases, international networking stops. The Professor is forced to admit that the computer only knows what it has been told (218). This statement reminds one of Banville's Kepler's acceptance of Winckelmann's comment that the world is given to us but not explained (Kepler 47). Felix sums it up as unpopular science: "Listen, that place is finished, you know it. They thought the old boy was doing something brilliant, until they found out he was using

their precious machine to prove that nothing could be proved" (226). Felix makes similar remarks about Mr. Kasperl (119). This whole problem of observable inadequacy versus unobservable adequacy or even truth is conveyed in the scene with Dan's mother. Gabriel lists all the accumulated furniture amid the almost dead woman, but it signifies nothing: "She had no meaning. She was simply there" (230).

The death of Adele (Kosok's daughter, the narrator belatedly informs us) is proof of this disorder and uncertainty. That the narrator chooses to wait until the penultimate page to tell us of this information suggests that he has just invented the relationship, much in the same way it is suggested that ordered scientific patterns are invented. He has also lost his black notebook, remnant from earlier Kasperl days; however, it is small matter, because he believes the narration he has just undergone is a black book of paradoxes in its own right. The novel ends optimistically, in the sense that Gabriel is prepared to seek simplicity while aware of world pluralities and complexities:

> I have begun to work again, tentatively. I have gone back to the very start, to the simplest things. Simple! I like that. It will be different this time, I think it will be different. I won't do as I used to, in the old days. No. In future, I will leave things, I will try to leave things, to chance. (234)

Notwithstanding the "stories" the narrator has given us, by leaving everything to chance and randomness, he will not construct a false paradigm readily.

III. Asymmetry/Symmetry

Up until now, I have discussed Mefisto in general terms, arguing that Holtonian psychobiographical influences, Koestlerian synthesizing, Kuhnian paradigm change processes, and recent theory directly affect the reader's perception of Gabriel's intellectual progress. But I believe one of the contemporary resonances of the novel, in scientific terms, is its investigation into symmetrical and asymmetrical patterns as observed in the world. The omnipresence of asymmetricality suggests that Gabriel's world view, or his constant searching for neat theoretical systems is deeply flawed. The theory of everything is as elusive as ever. The theories on symmetries and asymmetries abound. The following remarks by Ian Aitchison (1988) on T.D.Lee's Symmetries, Asymmetries and the World of Particles (1988) details the importance of the topic to contemporary scientific theory:

> The study of symmetries became a central preoccupation in the microscopic physics of the first half of this century, and proved to be both aesthetically pleasing and a powerful heuristic tool in the construction of new theories. Then, in 1956, came a scientific bombshell. Following an elegant and bold theoretical of certain experimental puzzles by Tsung Dao Lee and Chen Ning Yang, a violation of symmetry was discovered in a natural process. The symmetry which was violated was a familiar one: that between left and right. But it had been universally assumed that the basic laws of physics would show no preference as to handedness—that is, no absolute distinction between left and right should be detectable. Yet nuclear B-decay, and other related processes, proved to have an intrinsic handedness. The fundamental nature of this discovery can be gauged from the fact that Lee and Yang received the Nobel prize for physics on the first available occasion, in 1957.
>
> It turned out that this was only the first of many other examples of "lopsidedness" to be discovered. (Aitchison 25)

The most obvious asymmetry in Mefisto is that between part one, entitled "Marionettes" and part two, entitled "Angels." In terms of length, part one is longer than part two, thirteen chapters to twelve chapters; but looked at in another way, part one has 45 sections and part two has 53 sections. Also, part one has a tale to tell very similar to part two. Gabriel and Felix are the lynch pins in this arrangement. Kasperl, Sophie and D'Arcy are replicated in Kosok, Adele and Miss Hackett. It is still asymmetrical, however, since the "family" of part one is replaced by the "community" of drug addicts and neurotics of part two. Even the homosexual Leitch may have a counterpart in Pender, the mysterious English Maths teacher of part one. This asymmetry should not disappoint the critic, if he accepts

that this lopsided construction is the essential art and science under scrutiny.

Right from the beginning, we are asked to consider asymmetrical possibilities. The narrator rewrites Yeats: instead of "The broken wall, the burning roof and tower / And Agamemnon dead" we have "the burning town, the white room and Castor dead" (3). This latter refers to Castor and Pollux, the dioscuri, twin brothers of Zeus and Leda. Banville's rewriting is a parodic form (perhaps parody here is another asymmetrical possibility), for though both quotations deal with classical antiquity and sexual mythology, the narrator of Mefisto points out that sexual activity in this case leads not to a magical merging of God and (Wo)man but to a situation wherein the success rate is only 50% at best. The narrator hints here that he is pondering on his own becoming whereby he is Pollux and cognizant that his brother, Castor, has died or did not reach the opening into life. The narrator is unimpressed with procreation, "the banal mathematics of gemination" (3). Of course, to geminate means to double, and the constellation Gemini contains two bright stars, Castor and Pollux. A reference is made to "Polydeuces," which suggests "many devils," although the word 'deuce' may be a devil or a card or die with two spots.

This symmetry/asymmetry issue is continued when the narrator "progresses" backward into family history. First, on his mother's side, there was another pair of twins,

referred to as "monovular," but both died. Ushering in the macabre, the narrator wanted these boys bottled, so he could have had them as a "mascot" (3). Second, the narrator cannot help noticing the "symmetrical arrangement of grandparents," yet within each pair, there exists physical asymmetry as both men have "miniature wives" (3). Such arrangements strike the narrator at this point as a way of proving that chaos or randomness does have order and symmetry. This optimism is undermined by the parodic rewriting of Beckett's famous maxim in The Unnamable: "I can't go on. I'll go on." It becomes less polarized, less contradictory; indeed, it becomes asymmetrical: "I could go on. I shall go on" (3). The narrator finishes this early section, suggesting that he has his own equations and symmetries, as distinct from God-given ones. Perhaps what he really means is that he has his own asymmetries; that within symmetry there lurks asymmetry.

The narrator has a distinct obsession with bifurcation. He mentions the "existence" of a "dead brother" (8). He is not satisfied with the medical explanation of twins, a "minor arrest in the early development of a single egg" (8); he prefers a grotesque seaside postcard, "the fat lady, apple cheeks, big bubs and mighty buttocks, cloven clean in two by her driven little consort" (8). Crudely put, the oneness of the penis inserts itself between the two halves of the female's legs, resulting in an egg which also splits. Infatuation with

coupling extends to the narrator's hypothesis that he may be part of a botched Siamese experiment, where tragically, "one of us might have exsanguinated into the other's circulation" (8). In other words, the two become one. The narrator proudly states: "I came first. My brother was a poor second" (8).

The act of splitting is also experienced in Gabriel's early recollections, for even Miss Kitty, the last of the Ashburns, is broken into two. She at first talks to Gabriel and his mother calmly, but then abruptly orders them off the estate. In his class at school, he contemplates "another" pair of twins. What fascinates him is the possibility of becoming "other," as he explains: "Apart, each twin was himself. Only together were they a freak" (17). Gabriel feels a "momentous absence" (17) because of his dead brother, although it ties him umbilically to something undefinable: "No living double could have been so tenacious as this dead one" (17–18). Clearly, the feeling Gabriel has about his lost sibling is equivalent to his feeling about the figure one (1) and zero (0): "From the beginning, I suppose, I was obsessed with the mystery of the unit, and everything else followed. Even yet I cannot see a one and a zero juxtaposed without feeling deep within me the vibration of a dark, answering note" (18). The narrator's point here, of course, is that his mathematical skills and scientific genius are rooted in personal experiences and events out of his control. At this early stage, he believes naively in

order and symmetry, even while his feelings convey asymmetry.

In the character of Sophie, the narrator sees a particular asymmetry within general symmetry when he refers to her "tiny imbalance," "slope of the shoulders" and "lopsided face" (55). Yet, in rivalry to the perceived physical asymmetry, an emotional asymmetry also exists. This sense is communicated when Gabriel meets Sophie again after his brief kissing interlude and after his many imaginings of the incident: "It was as if I had just parted from her more dazzling double" (18). This fascination with bifurcation continues with Kasperl, whose notebook contains numerous calculations and formulas, things apparently symmetrical: "a particular fondness for symmetries . . . for mirror equivalences, and palindromic series" (69). However, the more Gabriel considers the notebook problems, the less confidence he exhibits in symmetry. In this way, the narrator and Kasperl are close companions.

In part two, Gabriel in hospital is very aware of bicameralism as a kind of therapeutic device: "I built up walls of number, brick on brick, to keep the pain out. They all fell down. Equations broke in half, zeros gaped like holes" (127). His whole being is divided, though whether or not asymmetrically is unclear, for he was "neither this nor that, half here, half somewhere else" (130). Perhaps the asymmetry may extend to Felix's sense of landscape:"There is order in everything, he said. Isn't it wonderful? Look at

this place. It seems a wilderness, but underneath it all there's a garden" (160–1). Gabriel via Felix seems to be hinting here that all observation and experience are paradoxical. Arguably, paradoxes are symmetrical and asymmetrical at the same time. For example, as Felix satirically imitates the Professor's faulty assumptions, he reaches a disturbing conclusion: "Blind chance, he says, blind chance, that's all. As if chance was blind. We know better, don't we, Castor?" (162). Another paradox is the Professor's motivations for his computer work: "he seemed to want only disconnected bits, oases of order in a desert of randomness. When I attempted to map out a general pattern he grew surly . . . " (170). The irony is very profound: Kosok demands data but eschews information or pattern.

Like Banville's Copernicus, Kepler, and Newton's biographer, Gabriel—when in a drunken state—can perceive, or so he believes, the ambiguities of the world: "And all at once I saw again clearly the secret I had lost sight of for so long, that chaos is nothing but an infinite number of ordered things. Wind, those stars, that water falling on stones, all the shifting, ramshackle world could be solved. I stumbled forward in the dark, my arms extended in a blind embrace" (183). This statement strikes the reader as essentially mistaken optimism and, therefore, deeply ironic. He puts away the notebook of Kasperl, uneasy with its paradoxes. He does not wish to "worry about the nature of irrational numbers" (186). He is irritated by thinking

about the extent of symmetry and asymmetry. He puzzles over "what in reality a negative quantity could possibly be? Zero is absence. Infinity is where impossibilities occur. Such definitions would suffice" (186). A curious connection exists among his dead sibling, his interest in "the thing itself," and the question of mathematics. For a while, the computer is this thing in itself. In short, he is resisting observable and intellectual confusion while holding on to a symmetry–based paradigm.

This symmetry/asymmetry binarism is complicated by the oscillation between monolithic structures and pluralities. It seems that the narrator has assumed that pluralities convey some kind of hidden unity; now, the narrator posits that such plurality of data may reveal no more than a world "not simplified, but scattered" (187). While Professor Kosok is noted for his "lopsided eyesockets" (187), Gabriel feels ill at ease with his own image: "I felt as if I were a stranger, I mean a stranger to myself, as if there were two of us, I and that other, that interloper standing up inside me, shaping in secret this pillar of frail flesh and pain" (197). It is because of this deep uncertainty that the reader cautiously approaches the apparent confidence that periodically enthuses the narrator:

> Order, pattern, harmony. Press hard enough upon everything, and the random would be resolved. I waited, impatient, in a state of grim elation. I had thrown out the accumulated impedimenta of years, I was after simplicity now, the pure, uncluttered thing. Everywhere were secret signs.

> The machine sang to me, for was not I too built on a binary code? One and zero, these were the poles. (202)

By the end of the novel, we are no clearer whether symmetry or asymmetry has an upper hand. Bereft at the loss of Adele and Felix, Gabriel is cast into a conundrum when he considers the asymmetrical facts: "Two oranges and two apples do not make four of some new synthesis, but remain stubbornly themselves" (233). In leaving everything to chance, it is perhaps less a despairing gesture than an acceptance that forms, patterns, and shapes in the outer world correspond to some kind of ordered chaos, rarely glimpsed.

Asymmetry has been understood here as the relationship between double forms which appear equivalent but which relationship is actually only a likeness. This lopsidedness is further entrenched in the text of Mefisto by the metaphorical markers the narrator employs.

The narrator's use of "like" or "as" as similes, I believe, supports a neutral, after-the-fact, telling; however, his use of the consciously false proposition, "as if," I believe, supports implied invention and, therefore, negation. Though the images prefaced by "like" and "as if" may resemble each other in degree and in kind on occasions, the very fact that they are preceded by a different marker tends to convey a distinct unease in the general discourse

whether or not knowledge emanates from the observable world or from the human mind.

An anonymous review (1989) of George Steiner's Real Presences (1989) tries to account for the use of "as if" in a way that illuminates its use in Mefisto, namely, as a marker of the writer's belief in God or the very opposite, as a marker of the writer's necessity for God, even though he disbelieves in such an entity:

> The second, and new, theme in Real Presences is the theological reassurances which, Professor Steiner asserts, lies hidden at the root of all worthwhile knowledge and art. God may have become impossible, in terms of rational inquiry. But the death of God is equally impossible, in terms of all that is best in western culture. We think and act as if God were still alive. And it is this as if that is the source of intellectual integrity and artistic creativity, that distinguishes the gold from the dross, that offers moral authority. But as if can be read in two senses. The first is a conscious determination to imagine the presence of God even when it can no longer be rationalized. This position is not new. It is close to that taken by Kant two centuries ago. The second is a recognition that our whole culture, conscious thoughts and implicit routines, radical beginnings and a slowly modulated tradition is suffused by a history that is Christian (although with important classical and Jewish influences). This second as if, although incontrovertible, says very little. Unless sustained by active faith the Judaeo-Christian tradition is like a dying note on the piano, reverberating into silence. And in Real Presences there is no place for active faith. (44)

"As if" is a standard rhetorical assertion of similarity—one thing is as another—but the frequency in Banville's novel is so high that it calls attention to itself. It reflects what Susanne Langer (1967) would call the illusion

or "virtuality" of poetic/artistic experience and practice. It also reflects what Hans Vaihinger (1924; 1935) in his book on "As If" sees as an essential philosphical and scientific proposition for the advancement of knowledge. As scientist Stewart Richards (1983) remarks, "Science rather proceeds as if the external world existed and, as a working principle, as if its laws were invariable" (9). "As If" blurs, then, the line between fiction and hypothesis. (To Vaihinger, the difference between fiction and hypothesis is between theories most expedient and theories most probable.)

Statistically, "like" and "as if" are used as metaphorical markers with approximately the same frequency. Although I have not run Mefisto through a word frequency computer program, I have counted in part one, "Marionettes," 104 instances of "like" and ninety instances of "as if"; in part two, "Angels," I came across seventy-five instances of "like" and sixty-six instances of "as if." In general, the use of "like" is noted for short, snappy comparisons, while the use of "as if" is noted for longer, sometimes labyrinthine complexities. The following examples will clarify what I have just stated:

like a madwoman (7)

like a whip (29)

like a blind, burrowing myriapod (31)

like a ship's figurehead (41)

like a flower (126)

> like participants in a seance (136)
>
> like a vexed owl (187)
>
> like two brown water-snails (195)

For the most part, these images are concrete. The use of "as if" generally precedes a more abstract, questioning comparison. The following examples from both parts of the novel give a sense of this emphasis:

> as if being able were a trick they had mastered long ago, and thought nothing more of any more (17)
>
> as if a ghost had walked through their midst
>
> and they were pretending they had seen nothing (29)
>
> as if they might have secret significance, as if they might be insignia denoting some singular, clandestine authority (33)
>
> as if he were waiting for someone to come along and explain things to him, how all this had happened, and why (108)
>
> as if things around me were holding their breath, appalled, speechless with wonder (125-6)
>
> as if the machine's voice and the voice of my pain had found a common note (172)
>
> as if I were holding on to a tether in the dark, at any moment what was at the other end might rear up and savage me (218)

The text oscillates between the traditional statement followed by an image and a cautious statement followed by the consciously false "as if" proposition. This propensity is all the more remarkable, since The Newton Letter, also an autobiographical reminiscence, utilizes in just over eighty

pages fewer than thirty "like" comparisons and fewer than twenty-five "as if" comparisons. After eighty-five pages of Mefisto, we have seventy-nine "like" comparisons and seventy "as if" comparisons. The metaphorical overload of the text is consistent with the consciously false doubleness created by the two parts of the novel. It is also consistent with the tussles between symmetrical and asymmetrical arrangements of experience and pre-(and post-) imagined worlds.

What the above detailed discussion of similes and metaphors provokes is a sense of how science and art both use metaphor to argue an intellectual position. I. A. Richards in Science and Poetry (1926), like many other literary critics, thinks that "we believe a scientist because he can substantiate his remarks, not because he is eloquent or forcible in his enunciation. In fact, we distrust him when he seems to be influencing us by his manner" (31-2). But as Banville's tetralogy, including Mefisto, makes clear, without rhetoric, analogy, personal influences, and consciously false propositions, there would be no scientific revolutions at all for commentators Thomas Kuhn, Gerald Holton, and Stephen Hawking to discuss.

Notes to Chapter Six

[1] See the short story "Wild Wood" in Long Lankin (1970).

[2] See his Logic, Semantics, Metamathematics (1956), chapter 17.

[3] The name "Chandos" is a reference to The Newton Letter in the acknowledgements to which Banville admits being influenced by Hugo von Hofmannsthal's "Letter to Lord Chandos" which centres on the inability of human beings to express reality through language.

Chapter Seven

Banville, Science, and Ireland

I have argued so far that Banville's tetralogy examines, and then privileges, the disordered elements of all system building. It is exceedingly difficult, therefore, to come to any rounded conclusion on his work without prematurely closing the open questions his texts raise. Nevertheless, one can say that Doctor Copernicus, Kepler, The Newton Letter, and Mefisto attempt to introduce new notions of scientific history. In brief, these works try to undermine objective rationalizations on the nature of the world, and in the process utilize varied artistic forms to jog the reader out of any settled pattern. It is important for Banville to do this, since his subjects, the great astronomers and mathematicians, were great because of their ability to edit or dismiss existing paradigms and to create new ones by offering to account finally for anomalies in previous systems.

In this concluding chapter, however, I want to take a broad view of Banville's tetralogy, investigating its place in an Irish culture that has no natural home for such work. I believe the foregoing chapters have alighted upon, in varying detail, some of the potent connections between

fiction and scientific theory—the need to construct a workable but knowingly "false" framework, the use of specific images and concepts, the shifting of generally agreed-upon suppositions or paradigms, the appearance of creativity in the midst of disorder, the influence of the specific biographical situation of the scientist, and so on. What I want now to entertain is the current notion that many of Ireland's problems have resulted from the denial of a pluralistic vision, and part of this refusal lies in the resistance to a "scientific culture" which, on the surface, would appear to seek to diminish national and religious divisions. The latter two have always—certainly in my lifetime—held pride of place on the agenda of the country's affairs though not, conspicuously, to its benefit.

John Banville's interest in science can be seen briefly before the tetralogy in Birchwood (1973) and, more overtly, in the later work, The Book of Evidence (1989), but neither text relies substantially on its resonance. In Birchwood, the narrator Gabriel reveals that he has had a good mathematical education, which he uses to help seduce the girl Rosie:

> Things were looking very bad when I played what turned out to my surprise to be a trump. I told her about algebra. She stared at me with open mouth and huge eyes as I revealed to her the secrets of this amazing new world, mine, where figures, your old pals, figgers, yes, were put through outlandish and baffling exercises. Let x equal whaa . . . ? Ah yes, I won her heart with mathematics. She was still pondering those

> mysterious symbols, her lips moving incredulously, when I delved between her chill pale thighs and discovered there her own, frail secret. She snapped her legs shut like a trap and scuttled out of my clutches. . . . (63)

"Your old pals, figgers" anticipates the Gabriel of Mefisto, who also believes that life's "secret" is a soluble equation. Yet just as Rosie frustrates Gabriel, the world's intricacies confound his intellectualizing. This same double frustration is mirrored in Gabriel's relationships with Sophie and Adele in Mefisto.

Freddie Montgomery, the hero and convicted murderer of The Book of Evidence, whose life testimony comprises the novel, is a scientist by profession, working in the field of statistics and probability theory. As he explains, in a manner that could well be applied to Banville himself, "I took up the study of science in order to find certainty. No, that's not it. Better say, I took up science in order to make the lack of certainty more manageable" (18). Before his disillusion sets in, it seems Freddie believed that the world was a system which could be explained: "I did not always think of my life as a prison in which all actions are determined according to a random pattern thrown down by an unknown and insensate authority" (16). Like the Gabriel in Mefisto, he worked at various computer projects; indeed, he seems to have worked at the very same computer:

> This machine was at the centre of all our activities. Time on it was strictly rationed, and to get an uninterrupted hour at it was a rare privilege. It ran all day and through the night, whirring and crunching in its vast white room in the basement. At night it was tended by a mysterious and sinister trio, a war criminal, I think, and two strange boys, one with a damaged face. Three years I spent there. I was not violently unhappy. I just felt, and feel, as I say, a little ridiculous, a little embarrassed. (136)

Despite these resemblances and intertextual play, Banville in his recent novel is more interested in a conceptual framework which has already been worked through in the tetralogy and appears ill at ease in this text. I am not sure if readers and critics would agree with Banville's own analysis of his new novel:

> The human drama of 'The Book of Evidence' is that of a man coming face to face with the fact that there is no morality. The most important bit in the book is the question of why did Freddie give up being a scientist. What happened? What happened is that the bottom fell out of his world. He saw that all the things that he lived by were just things that he'd invented himself. . . . One of the things that fascinated Einstein was the fact that mathematics was invented by man and yet the world obeys its rules. This means either that we only see that segment of the universe that agrees with our rules or, more interestingly, that we impose something on the universe in order to see it. (O'Toole 5)

I would argue that what we see in The Book of Evidence and in the above quotation is a formal crystallization of what the tetralogy has meant for Banville the writer. Surely,

one of the most important arguments articulated by Banville's writing on science is that observation is theory-laden and, therefore, mentalism (the power of the individual mind) as part and parcel of our "objective" notions of the world needs to be incorporated consciously into our conceptual frames. To my mind, this critical point explains the dominance of the first person narrative mode in the novelist's writings, even within such apparently traditional third person narratives as Doctor Copernicus and Kepler where the Rheticus section and the letter section respectively are very prominent.

This first person tendency draws us closer, however, to a very idiosyncratic view of scientific practice. Banville's efforts seem more ambitious than merely to highlight major scientists. He wants to consider their professional utility within a geopolitical framework. I do not think, for example, the writer wishes to give the impression that the more science in Ireland the more cultural amelioration will result—far from it. If Banville's novels tell us anything, and if the international history of science "proper" unfolds a persistent theme, it is that all brilliant scientific ideas have to be socially negotiated. In other words, the provincial, the national, and the religious divisions in the worlds experienced by Copernicus, Kepler, Newton's biographer, and Gabriel Swan have a direct effect upon the way scientific ideas are

formed, disseminated, and received. Rather, Banville seemes to prompt us to consider why science has been neglected.

Dorinda Outram's essay "Negating the Natural: or why historians deny Irish Science" (1986) questions the almost active denial of science in Ireland by revisionist historians. Revisionism here is understood as those writers, such as Foster (1988), who have begun to reassess the nationalist ideology and, to some extent, the unionist agenda. As she states, "Few Irish historians have challenged this state of affairs, because to do so would be to challenge the 'deep structures' not only of Irish history, but of Irish historical scholarship and of Irish culture" (45). These "deep structures" involve the near stranglehold of the ideology of nationalism and the Roman Catholic Church over Irish culture. Such a self-conscious examination would raise the thorny issue how historians have tackled society's major institutions; and to do so, may very well cast into doubt the "legitimacy" of claims for a united Ireland.

Outram mentions in passing that the Royal Irish Academy's History and Philosophy of Science Committee draws its members from both sides of the border. This fact appears to suggest the way science's history could provide a different model for Ireland, one of co-operation rather than of confrontation.

Outram could be labelled a scientific feminist. She believes, with much justification, that Ireland's interaction with Nature, loosely defined, is often merely

reduced to consideration of the human body. Furthermore, this view is determined by the Irish Roman Catholic Church, where we see "the now traditional Catholic equation of moral theology with the control of bodily events—conception and its controls, birth and its prevention, sexuality in all its aspects, illness and surgical intervention, death and decay—in the shape of hospital Ethical Committees" (47).

Mentioning Bamville's Doctor Copernicus and Kepler, Outram rightly finds it curious that it has been left to literature to explore the ramifications of a scientific vocation, and to construct scientific models. As Outram declares, "we need to know, for given periods and places, the number and nature of scientific 'practitioners'; the audience for science; the public image of science; its place in government policy and funding" (48). With this knowledge, Outram argues, Ireland, particularly the Republic, can truly emerge from its colonial status by creating its own models, for "without such an historical understanding of attitudes to nature, we lack a crucial perspective on current struggles" (49). What Outram means here is the struggle of contemporary Ireland to modernize within the EEC while still trying to hold on and use romantic and nostalgic nationalist visions, which include eventual hegemony over the North.

What, precisely, is this "crucial perspective"? I believe that part of the answer is provided by Gordon L. Herries Davies's essay, "Irish Thought in Science" (1985).

In this detailed, empirical study of "scientists who were born in Ireland and who spent the greater part of their lives within the land of their nativity" (294), Herries Davies shows that science in eighteenth-century and nineteenth-century Ireland was extremely active. It is often forgotten that in the late eighteenth century, the number of inhabitants in Ireland compared with that of England and Wales was nearly the same. The following quotation gives a sense of this writer's impressive historical research. I limit myself to astronomers, though I could have quoted a piece about mathematicians:

> Irish scientists were gazing towards the heavens and two of these Irish astronomers must hold our attention: William Parsons (1800–1867), third Earl of Rosse, of Birr Castle, County Offaly, and Edward Joshua Cooper (1798–1863) of Markree Castle, County Sligo. It was early in the 1830s that Parsons decided to devote himself to astronomy and, more especially, to the improvement of the reflecting telescope. He worked at Birr producing his own innovative designs; he trained his estate-workers in the crafts of telescope construction and he built in the grounds of Birr Castle all the furnaces and machinery appropriate for the task; and by 1839 he had completed his first reflector incorporating a 36-inch (91.4 centimetre) speculum. But this first instrument failed to satisfy his lordship's ambitions; he wanted a much larger telescope. Between 1842 and 1845 he and his men therefore built a gigantic instrument containing a 72-inch (182.8 centimetre) speculum—an instrument which was very appropriately named 'Leviathan'. Until the commissioning of the Hooker reflector at the Mount Wilson Observatory in California in 1917, the Birr Leviathan remained the world's largest reflecting telescope. . . .
>
> Our second observational astronomer—Edward Cooper—assumed responsibility for his family's estate at Markree Castle in 1830 and he immediately resolved to there establish a fully equipped astronomical observatory. Within

> twenty years he possessed what was widely regarded as the world's finest private observatory, and on 25 April 1848 Cooper and his assistant, Andrew Graham, discovered the new minor planet Metis. Cooper's best known work, however, was the compilation of a catalogue of stars located within three degrees of the ecliptic, the catalogue being published at government expense in four volumes between 1851 and 1856. It records the position of 60,066 stars only 8,965 of which had previously been known. (303–304)

What major conclusions does Herries Davies come to? First, that there is most definitely a missing link in Ireland between Roman Catholicism and science. The vast majority of scientists in nineteenth–century Ireland were Protestants. The decline of Irish science in the late nineteenth century and on into the twentieth century can be traced to the depopulation of the Protestant community in the Twenty Six counties——from half a million in 1861 to a quarter of that number by 1961. The reasons for this demographic change are both economic and political. The setting up of the Irish Free State which turned into a Republic "failed to create an atmosphere in which good science could flourish. Perhaps the young state was too introspective to display much enthusiasm for the thoroughgoing internationalism basic to science——too concerned with Irish language revival and literary censorship to be aware of the momentous scientific developments taking place elsewhere" (309–10). The one fascinating exception is the agreement in the 1940s between Northern Ireland and the Republic of Ireland to co–operate on the Armagh–Dunsink–Harvard telescope positioned in South

Africa. Hughes (1988) remarks that this scientific treaty was the only major joint effort between the two states in the 1940s, suggesting perhaps that science can be a political umbrella. [1]

Second, as an extension to the above, it was politically convenient to downplay any Protestant contribution to the country's make-up. But by doing so, science became marginalized. As Herries Davies laments:

> Many Irish historians of the nationalistic school have been well content with their representation of the nineteenth century struggle for national independence as having occurred in a downtrodden, impoverished, starving, and underprivileged nation. Any allusion to the flourishing state of Irish science throughout the greater part of the nineteenth century serves only to raise doubts as to the validity of that well-established picture of nineteenth century Ireland as the seat of tragedy, gloom, and despair. (310)

It may seem from the above quotation that Herries Davies is taking a sectarian position, but I think he merely points out the way any dominant political force in a society--in this case nationalism--is reflected and mediated in the cultural productions which emanate from that ideology. The stranglehold is complete when one discovers that some of the major Irish historians--Beckett (1966), Brown (1981), Lee (1979), Lyons (1971), and Foster (1988)--seemingly find it foreign to their nature to accommodate science in their works. This situation elevates Banville's tetralogy, since there is simply little work by Irish writers on science this century.

Roy Johnston's recent article "Science in a Post-Colonial Culture" (1990) takes up Dorinda Outram's challenge to some extent by mentioning the names of some Irish scientists, but spends most of his time pointing out inadequacies in previous "cultural articles." Johnston is intent on supporting the notion that science is culture, that we need to study the interaction of technology and society far more. These are laudable aims, but even the sympathetic critic can see the problems ahead. If we have suffered a divide between what is, in effect, Wayne Booth's "scientismic" and "irrationalist" models—the "facts versus values" argument—(Booth 1974), then we require a major revolution to re-orient our thinking, so as to obviate the paralyzing statement that only scientists can discuss science and only men and women of letters can discuss art.

Of course, C. P. Snow—to whom I referred in chapter two—has addressed the same argument. In this confused operatic space, Banville emerges as almost a lone singer of an unusual aria. Most decidedly, his is a blended artistic and scientific voice. At an initial glance, a casual reader could say that Banville takes the artist's licence of freedom to delve into medieval Europe, with Doctor Copernicus and Kepler and, inexplicably, returns to twentieth-century Ireland for The Newton Letter and Mefisto. Yet there are political connections between and among these novels to make the tetralogy cohere, and these works do confront the debate raised by Outram and Herries Davies.

Firstly, after a reading of the four texts, we are very conscious of the importance of religion in blocking scientific progress. Copernicus is afraid to some extent of his fellow canons and superiors within the Church, should his work be greeted badly. He relies, ironically enough—though consistent with Herries Davies' emphasis on Protestant scientists—on the Protestant Rheticus to copy and oversee the publication of his great work. This Protestant is, however, denied recognition, just as the Protestants in Ireland vis à vis science have been denied full recognition. Kepler is a totally different matter. Here, we see a successful Protestant astronomer/mathematician/scientist, but one who is constantly hounded by Catholic authorities. His individualism is not politically helpful. In The Newton Letter, the narrator, a Catholic historian, admires the Protestant Isaac Newton, and, when faced with the Big House of Ferns, assumes its occupants are part of that Protestant heritage. His error bears out Herries Davies's point that Catholics refuse to see themselves wearing comfortably the mantle of a scientist. This unease can be extended to buildings—the Big House is often associated with Protestantism, while the gate-keeper's lodge, where the narrator chooses to stay at Ferns, is often associated with Catholic servitude. With Mefisto, it appears that the first Irish Catholic mathematical genius has arrived. But he is taught by foreigners and treated as an outsider by his compatriots.

Banville emphasizes this alienation by Gabriel's mutilation, his aborted computer work, and his rejection of the Priest who tries to "save" him.

As evidenced by these novels, religion is thus part of the social negotiation of science and scientific figures. Another part of the process are the geopolitical realities. Both Copernicus and Kepler travel a great deal, crossing many boundaries, sometimes by necessity because of persecution or because of orders from above. With the revolutions of 1989 in Eastern Europe in mind, it is not hard to imagine the confusion and excitement such numerous states and statelets must have caused Copernicus and Kepler. This is a point worth dwelling on.

For scientists to work efficiently, they must have a model or framework on which to base their hypotheses. This framework is always tentative, for the scientist secretly desires to change it by the force of his own discoveries. Much in the same fashion, a dictator may set out to restructure the geopolitical framework he has inherited. I have pointed out in a previous chapter that the many statelets in Copernicus' time can be likened to the planets in a star system which demand arrangement and rearrangement to be continually understood. To some degree, Copernicus and Kepler experience both in their life and work the machinations recommended in Machiavelli's The Prince.

Science is thus an attempt to escape geopolitics but invariably becomes part of it. The confident rearrangements

of observed phenomena into different configurations signal a paradigm leap of political as well as scientific proportions. The analogies between geopolitics and science are extended by Banville to literary structure and narrative strategies. The shift from the city to the country in The Newton Letter and from the country to the city in Mefisto raises questions of changing, ordering, and reordering experience to fit with intellectual positions and conceptual frames. In the latter two texts of the tetralogy, the respective narrators put a group of characters into various configurations, hoping to solve the various equations and permutations troubling their own intellectual work.

The only other contemporary writer in Ireland who seems to have promoted the scientific issue (as distinct from writers such as Beckett and O'Brien, who have parodied science and mathematics), and in a more narrowly defined manner than Banville, is Ronan Sheehan, in his lengthy story "Boy With An Injured Eye" (1983). The underlying opposition at work in this tale is that between Gaelic mysticism and Protestant rationalism. Sylvester O'Halloran becomes famous for his theories and experiments on the eye. He deals with the outer eye, not the inner eye of the poet, his Uncle, Sean Clarach MacDomhnaill. He owes his success as a "castle Catholic" to his sister's compliance with the advances of an English soldier. Though O'Halloran receives only elementary schooling from his uncle in languages, particularly Irish, it remains embedded even after "proper" scientific training

at the hands of a Protestant Clergyman. However, as a Roman Catholic at the time of the penal laws, he is barred from entering Trinity College, Dublin and must seek further training abroad. His return to a practice at Limerick is helped by his sister's continual accommodation with "colonization." O'Halloran's gradual possession of an "inner eye" enables him to embark on a historical, cultural and literary endeavour in his History of Ireland. He reappropriates Irish culture from the colonizers. In the process, Sheehan seems to privilege O'Halloran as a Renaissance man, who combines the arts and sciences with a sense of political morality. The Protestants in this constellation are marginalized as the "enemy." This bias is the weak part of Sheehan's tale, for in reclaiming his Gaelic sense, O'Halloran must forsake the rich Protestant and scientific heritage.

In his tetralogy, Banville is more circumspect, more international, and yet the metaphorical and theoretical applicability to Ireland seems to me obvious and rich in suggestion. The writer attempts to come to terms with the problems perceived by Outram and Herries Davies.

Banville's tetralogy is a double fiction because it argues within its narrative frame (the first fiction) that scientific theory is a necessary fiction or a series of fictions (the second fiction). That, in fact, when one creative leap or paradigm change results, it is usually the case of a better fiction replacing a previous

one. What is the role of hypothesis in science, if not to give the fictional element some authority? One is reminded of Popper's paradox: that a theory can only be judged a real theory if it can be proved false by observation. Once the leap of fiction has been made, then an algorithmic process, the step-by-step logical mechanics, takes over, which seeks to validate that leap. Later refusal to return to first principles is proof of the strength of the "Cathedral of Science," a term coined by Daniel Dennet (1989):

> This is the highly structured, beautifully articulated amalgam of "what everyone should know" about science, crowned by the inscrutable but talismanic formula "$e=mc^2$". Its facade, visible to the general public, is popular lore: familiar and decorative items of information and misinformation about the Galilean physics of everyday objects, cartoon-style renderings of black holes and language-using chimps, and pock-marked with such tidbits as "you only use five per cent of your brain" and "no two snowflakes are alike". Items in this layer are easily replaced or swept away, but underneath it lies the scientists' (and philosophers') much denser version of the same material, created largely of the remembered oversimplifications of university level textbooks, supplemented by New Scientist and Scientific American articles, and such other high-quality interdisciplinary communications as the books just mentioned. This material forms the communally shared understanding on which everyone relies while working on their more particular specialities. (1055)

This "Cathedral of Science" amounts to what Kuhn means by normal or traditional science with which "revolutions" must break. The refusal to accept totally received wisdom or the

need to question what appears to be obvious often marks the scientific genius's path.

More generally, I believe that Banville's tetralogy, taken up as it is with flexible scientific imaginations, theoretical systems, paradigm changes, and the like, has an intellectual and political basis which can be regarded, if we so choose, as specific to Ireland. On the one hand, it shows that the superior ideas of geniuses have to be negotiated through a network of interest groups. Science is inevitably a political process. But on the other hand, it can rise above such limitations to suggest directly that model-making, the making of fictional constructs, is a fruitful procedure.

We are in Ireland too set in certain frameworks. The Irish Republic comprises twenty-six counties, yet claims constitutionally, however unrealistically, the full thirty-two. The name of "Ulster" historically refers to nine counties but is understood today to mean the six counties of Northern Ireland. The Catholic and Protestant religious divisions, of majority and minority, in the North and the South mirror each other. Equally disproportionate divisions exist between the populations living in the cities of Ireland and those living in the country.

These problems, it might be argued, require a scientific-like revolution, a paradigm leap, which by definition is nonlinear. The potential theoretical flexibility of the scientific imagination has been played

down in Ireland, with the result that leading policy makers in the twentieth century have been impoverished (with the curious exception of De Valera, who had a fascination with astronomy and promoted the Armagh—Dunsink co—operation mentioned by Hughes (1988) above). Banville's work seems to me to pose this very dilemma, particularly in The Newton Letter and Mefisto and, more obliquely, in Doctor Copernicus and Kepler.

Through the individual creativity of Banville's heroes, the collective can exercise choice over a greater field of possibilities. Analogy, intuition, and personal biography, among other factors, are seen to contribute to the cultural development of society, not merely to the evolution of a specific scientist's ideas. In sum, Banville's tetralogy demystifies science's marginalization and attempts to insert its artistic and theoretical potential back into general cultural commentary. Banville's "scientific art" challenges us to make intellectual and social bridges where previously none were thought possible.

Notes to chapter seven

[1] For a fuller discussion of the history of astronomical observation in Ireland, see McKenna (1968).

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