2nd Edition

THE HISTORY OF SCIENCE FICTION

ADAM ROBERTS

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Second Edition

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Preface to Second Edition

The first edition of *The Palgrave History of Science Fiction* contained fourteen chapters. This second edition has sixteen. From this you may deduce that this version is longer than the first, and so it is. Indeed, adding new chapters is the least of the revisions undertaken here. Since first writing this history my ignorance of science fiction has decreased, and my views on the field have accordingly changed in various ways, and to various degrees, some smaller and some larger. I have taken this as my cue to revise this *History* in a more comprehensive manner than I might otherwise have done. Indeed, I ended up rewriting large portions from scratch. Not a chapter here is exactly as it was in the first edition. A new chapter on '21st-century Science Fiction' replaces what was in 2006 a briefly indicative coda; and a brief 'interlude' on pre-1600 SF has been fleshed-out to a whole new chapter on the medieval and early Renaissance periods. I have added many new sections, expanding discussion of (to mention only a few) neo-Latin fantasies of the 17th and 18th centuries, alternate-history, video games and comic books. There have also been developments in what might be called—though the term is a red rag to some readers—the 'theoretical' underpinnings of the study. In the first edition I sought to identify what I take to be the *systematic* nature of the science fictional imagination: the way many texts not only posit a 'novum', or new thing, but extrapolate systematically the differences such a novum would make across society and culture as a whole. I still consider systematisation to be instrumental to the way the genre works, and in this second edition I have drawn on Charles Taylor's particular ideas concerning 'mobilization' as a way of focussing more precisely the strategies and socio-cultural determinants of this way of thinking, and writing. I have included a more nuanced sense of the cultural logic of the Reformation, the parameters of the discourses of Protestantism and the way these feed through into SF. Not everybody considers nuance an unalloyed good.[1] I didn't think, though, that I could justify a revisionary move towards greater crudity, and so nuance is what I went with. That said, nuance can only go so far when the subject is so large and the discussion of individual figures so often squeezed by space. The most I can claim is: I have done my best.

When I took up the commission to write the first edition of this study, those many years ago, I assumed, without thinking too much about it, that I would begin in the early 19th century and that I'd trace SF through to the present day in a fairly straightforward manner. I thought that because almost all the critical histories of science fiction treated it that way. But actually researching that version of the book turned up such a huge mass of patently SF texts from the 18th and 17th centuries that I was compelled radically to revise my ideas. I ended up writing a study that claimed SF begins around 1600, as a distinctly Protestant kind of 'fantastic' writing that has budded off from the older (broadly) Catholic traditions of magical and fantastic romances and stories, responding to the new sciences, the advances in which were also tangled up in complex ways with Reformation culture. Of course, SF was a small-scale matter until the end of the 20th century when it breaks into the pop-cultural big time; but then again that's true of most literary cultural movements. Few SF fans are aware of it, I think, but there's a reason why modern SF returns so often to a mode of materialist sublime, which fans call sense of wonder (transcendence, infinity); why modern SF is so fascinated, often in oblique ways, with questions of atonement and the status of saviour figures. SF, I argue, is the direct descendant of the Reformation. So is fantasy I think; although that is an argument for a different book.

When this *History* first appeared my argument that SF begins out of the Protestant Reformation in Europe—a thesis I consider both original and true—met with little success. The book was occasionally reviewed, sometimes positively, sometimes less sympathetically, but its core argument has, so far, persuaded few scholars in the field. This may, of course, be because it is wrong. Most scholars of the history of SF, and most fans too, 'believe in' a shorter-scale history of the genre, dating the beginning of science fiction to the early 19th century, or to the later age of Verne and Wells, or perhaps to the 1920s. In some cases these arguments are the result of cogently worked-through theories. Often, though, I get the impression that fans simply prefer the SF written by Wells, E E 'Doc' Smith or Ursula Le Guin, to the SF written by Kepler and Cyrano. Perhaps they think it better. Perhaps they would rather read such works than wade through the tedium of 17th-century neo-Latin interplanetary voyages. Who could blame them? Such questions of taste, though, seem to me to have little to do with the actual development and history of the genre. More to the point, I think truncations of the historical narrative to a 'back catalogue' of still-readable works palatable to modern fandom does a violence to the mode. My core argument is not just that SF begins out of the Reformation; it is that the fierce cultural climate of that time *shaped* SF, wrote its DNA in ways that manifest substantively even into the 21st century. I worked on this second edition throughout 2015, a year in which SF fandom fought itself with some bitterness and to no real purpose. One of the things fans

argue over has to do with the traditions of the genre, science fiction's heritage. Some fans think the genre community has forgotten the values of traditional SF. Actually, I tend to think this is true. But that's because I consider the 'tradition' of SF to extend further back than to a bunch of white men writing in 1950s North America.

One facet of the genre that tends to get overlooked—tends, indeed, to be actively buried under that discursive avalanche called Anglo-American cultural imperialism—is that through the 17th and 18th centuries and into the 19th century, science fiction was dominated by French writers, with British, Neo-Latin and German writers also contributing substantially, if secondarily. Jules Verne is sometimes taken as the starting point of SF; the truth, ironically enough, is that he is more like the end-point, at least of a dominant francophone SF tradition. Lots of French SF was written through the 20th century of course, and continues to be written into the 21st, but the centre of gravity of the genre shifted in pronounced ways towards North America with the predominance of pulp. It's not clear to me why France slips from its position of genre prominence to its second-fiddle status; but I would say that when people talk about SF beginning with Gernsback in the 1920s they ought rather to talk about hegemonically American SF beginning then. A second, and equally major, reorientation of the genre took place in the last decades of the 20th century, as SF became less prominently a written and more globally a visual medium.

A great many people helped me work on this revision, rather more than were able to help on the first edition—a function, this, of the increased facility of connection provided by online interaction and social media. I can't list everybody but would like to thank Mark Bould, Andrew M Butler, Kim Curran, Susan Gray, Robert Eaglestone, Caroline Edwards, Niall Harrison, Maureen Kincaid-Speller, Paul Kincaid, Alan Jacobs, Jessica Langer, Scott Eric Kaufman, Camille Lofters, Ben Markovits, Rob Maslen, Glen Mehn, David Moles, Glyn Morgan, Abigail Nussbaum, Chuckie Palmer-Patel, Anne Perry, Tom Pollock, Paul March-Russell, Jared Shurin, Simon Spanton, James Smythe, Francis Spufford, Neal Tringham and Sheryl Vint. I would like to thank John Clute, who wrote a rigorously critical review of the first edition that proved genuinely helpful to me in formulating the second. In similar mode I would like to thank the anonymous reader who provided Palgrave with a lengthy and detailed report on an earlier draft of this second edition; whoever he or she is, they aided my work immeasurably and I am very grateful. Thanks also to my colleagues and students at Royal Holloway University of London and heartfelt gratitude to my family, especially to my wife Rachel. Individuals who are actually discussed in the body of this book are not thanked here, although several of them proved very helpful in the work on this revision.

Foreign titles are given in their original forms. All translations from Greek, Latin and French are my own, unless specifically stated otherwise. I lack the linguistic facility to attempt translation from other tongues, and have relied here on the work of others, who are of course cited. I have transliterated Greek names and titles directly, except where a name is so familiar in an Anglicised form that direct transliteration would tend to confuse (so, Lucian not Loukianos). Where works have variant titles, something common in SF, I cite what I consider the title by which it is most widely known.

Note

1. See for example Kieran Healy's 'Fuck Nuance' *Crooked Timber* (August 2015): http://crookedtimber.org/2015/08/31/fuck-nuance/

Preface to the First Edition (2006)

Science Fiction is too large a thing to be represented exhaustively in a critical history, even in one as lengthy as this. The present study is not a complete account of the genre, but rather an attempt to trace a line that connects one specific mode of 'fantastic' literature—which we now call science fiction—from earliest times through to the present day. The majority of texts examined are novels, short or long, and this remains the dominant form of SF: although the short story (a slightly different thing from short novels), cinema, TV, comic books and other forms of cultural production play an increasingly large part in the later stages. As a critical history, this work also has a certain case to make. I hope to avoid tendentiousness, but my argument is not neutral (even if such a thing as a purely neutral critical argument could exist), and I sketch it out here in this preface so that readers can be forewarned, and prepare themselves to read what follows in sympathetic or hostile frame of mind, whichever suits them better.

I argue that the roots of what we now call science fiction are found in the fantastic voyages of the ancient Greek novel; I use the Vernean phrase *voyages extraordinaire*, which I find to be the most supple and useful descriptor for these sorts of texts. Narratives of travel and adventure, often with fantastic (which is to say, impossible or fantastical) interludes, were amongst the most popular modes of ancient culture. Epics provide many examples, Odysseus' encounter with the Cyclops, or with the goddess Kirke who turned his men to pigs, for instance. Nor is this a surprising cultural development, given that the Greeks were a culture in which actual travel and exploration played major roles. I argue that amongst these many accounts of lengthy and entertaining sea voyages, or treks by land, is a category of *voyages extraordinaire* of a different sort: voyages into the sky, and especially voyages to other planets. It was possible for a Greek, in theory, to charter a ship and travel to the Sicily, to the Gates of Herakles, or even (we can hypothecate in the absence of evidence that such voyages took place) beyond the setting sun to the Fortunate Islands, to America or the Arctic wastes. This is merely to say that the technologies of travel available to the Greeks enabled such voyages. But it was, of course, not possible for

these people to travel to the Moon, as Antonius Diogenes's protagonists do. Moving the journey in this upwards direction represents a radical departure in the mode of traveller's tales.

In other words, the ur-form of the science fiction text is extraordinary travel, with stories of interplanetary travel the most influential. It still seems to me that stories of journeying through space form the core of the genre, although many critics would disagree with me. Travels upwards through space, or sometimes downwards into hollow-Earth marvels (distinguished from more conventional, ordinary travels over the surface of the globe) are the trunk, as it were, from which the various other modes of SF branch off. Speaking broadly, these other branches are twofold. First there are travels through time as a corollary of travels through space. It is not, I think, coincidental that this sub-genre of SF comes into being and rapidly becomes vigorous in the late 19th and throughout the 20th centuries—which is to say, at that time when science was establishing the intimate inter-relations between these quantities of time and space. A second branch, a major bough in fact (to continue the metaphor), is stories about technology. Because long-distance travel already involves a range of complex technologies—as, for example, sail-ships, technologies of long-term life-support away from land, navigation, military ordnance and various others—it is, again, not surprising that tales of technology begin as embedded elements in extraordinary voyages. The android-woman, fluent in all the world's languages, encountered in Charles Sorel's novel *Gazettes et nouvelles ordinaires de divers pays lointains* (*Gazettes and News from Various Faraway Countries,* 1632) represents an early instance of this sort of SF, and through the 19th century this mode of SF can be seen separating itself off from the voyage to become a more distinct sub-genre. Jules Verne is the first great genius of technology fiction in this mode, and by the 20th century techno-fiction had, arguably, become the dominant form of SF. In my first chapter I discuss science fiction and technology fiction as deserving equivalent theoretical attention.

These three forms, broadly conceived, delineate my rough sense of what science fiction is: stories of travel through space (to other worlds, planets, stars); stories of travel through time (into the past or into the future); and stories of imaginary technologies (machinery, robots, computers, cyborgs and cyberculture). There is a fourth form, utopian fiction, which is often discussed by critics of science fiction as belonging to any reasonable definition of the form. My assumption in this study is that utopian fiction is indeed science fiction extrapolated from philosophy and social theory rather than items of hypothecated technology or wholly new destinations. Some critics prefer to exclude utopias from a discussion of SF on the grounds that utopian extrapolation tends towards satire; which is to say, utopia must be satiric insofar as it takes its force from the implied contrast between the ideal society being described and the imperfect world in which the author and his/her readers actually live. I have some sympathy for this view, since I cling, perhaps naively, to the belief that the worlds encountered in SF's best texts are more than simply modified forms of *our* world—which is to say, that the genre embodies

a genuine and radical will to otherness, a fascination with the outer reaches of imaginative possibility. Not all utopias partake of this alterity. But utopias ought to be bracketed with SF nonetheless. For one thing, many practitioners of SF have regarded utopian fiction as part of their practice, and have themselves written utopias. For another, as SF developed it became more and more concerned with the intricacies of world building, in which writers construe alternate but self-consistent societies. Utopia's satirical impulse achieves its effects by actualising a world-building novum, and such world building has now become one of the most prized things that SF provides its readers: not just novums, but novums systematically extrapolated and integrated into a whole vision. 'Mainstream' SF is full of detailed, immersive world building and much of the grammar of such constructions derive from utopian fiction.[1]

This thumbnail sketch already implies one of the major questions that must be addressed by any historian of science fiction. We may take the form as commencing with the interplanetary *voyages extraordinaire* of the Ancient Greek novel. We may then trace the development of these ideas through 17th-century works such as Johannes Kepler's *Somnium* (1634), Godwin's *The Man in the Moone, or a Discourse of a Voyage Thither by Domingo Gonsales* (1638) and Cyrano de Bergerac's *L'autre monde ou les états et empires de la lune* (1657). From this period to the present day it is possible to identify an effectively unbroken line of continual textual production in the science-fictional mode. The question, then, is: why is there so pronounced and so lengthy a gap in the record between the Greeks and the Renaissance? Over a thousand years pass between these two periods in which science fiction is not written. Why?

Several possible answers suggest themselves. In the present work I argue a particular line, and it happens to have important consequences for my definition of Science Fiction. Accordingly it is worth rehearsing here. In brief I argue that the re-emergence of Science Fiction is correlative to the Protestant Reformation. During the late 16th and early 17th centuries the balance of scientific enquiry shifted to Protestant countries, where the sort of speculation that could be perceived as contrary to biblical revelation could be undertaken with more (although not total) freedom. Descartes, for instance, settled in Holland in 1629, in part because his native Catholic culture was proving itself hostile to his scientific enquiries. In Descartes' mind was the recent condemnation of Galileo's astronomical work by the Catholic Church, a shocking development for many scientific thinkers at that time. Indeed, there were more shocking developments than this, especially for the more imaginatively minded (which is to say, science fictional) thinkers.

A little-known, but nonetheless key, development in the history of the genre, I would argue, occurred in 1600 when Giordano Bruno the Nolan was burnt to death by the Catholic Inquisition in Rome. Bruno's crime had been to argue that the universe was infinite, and that it contained innumerable worlds—an example of speculative rather than empirical science, and accordingly science-fictional. Bruno died for contradicting the teaching of the Catholic Church, but it takes a moment's consideration to realise why the idea

of innumerable inhabited worlds was deemed so shocking. Dante, for instance, postulated inhabitants on the various worlds of his cosmos (though in a Ptolemaic rather than a Copernican solar system), and his writing was considered to be rather pious than otherwise.

The problem can be put in these terms—summarised by William Empson in his posthumously published *Essays on Renaissance Literature* (1993): if there are many worlds, with many populations of beings upon them, then this tends to deny the uniqueness of the crucifixion, and so devalue Christianity itself, perhaps terminally. The Church teaches that God sent Christ to Earth to save humanity, a race created in his image. This was a singular, miraculous event, a sacrament that connects humanity to God or, more strictly speaking, provides humanity with the possibility of that connection. But if humanity is but one amongst many populations of beings in the cosmos, what of the others? Have they too been redeemed by their own Christs? If so, then would this not fatally degrade the uniqueness of Christ's sacrifice on *this* world? Or has God simply omitted to provide them with salvation—which would paint God in a very cruel light? Under the logic of the Ptolemaic system the solar system is a sort of extension of the Earth, inhabited by human souls or angels created directly by God, and the stars are a fixed sphere, a sort of immense decorative backdrop. In this cosmos a single Christ can redeem everything. But if the cosmos is infinite, this becomes difficult to sustain.

The revolutionary point of the Copernican cosmos is wholly to reconfigure the focus away from Earth and mankind. Either Christ died only once and God has ignored the rest of this vast creation, or else he died on every possible world. As Empson puts it, 'either the Father had been totally unjust to the Martians, or Christ was crucified on Mars too; indeed, on all inhabited planets, so that his identity in any one appearance became precarious' [Empson, 1:130]. Half a century later this idea was still so shocking, and so destabilising to Catholic orthodoxy, that Bruno could be burned to death for implying it.[2]

This may seem like an obscure point of theological quibbling, but I suggest that it marks a crucial point of cleavage in the development of Western science fiction. To an orthodox Catholic imagination a plurality of inhabited worlds becomes an intolerable supposition; other stars and planets become a *theological* rather than a material reality, as they were for Dante—a sort of spiritual window-dressing to God's essentially human-sized creation. But to a Protestant imagination (or to a sceptical humanist Catholic imagination, such as Descartes' or Voltaire's) the cosmos expands before the probing inquiries of empirical science through the 17th and 18th centuries, and the imaginative-speculative exploration of that universe expands with it. This is the science fiction imagination, and it becomes increasingly a function of Western Protestant culture. From this SF develops as an imaginatively expansive, and materialist mode of literature, as opposed to the magical-fantastic, fundamentally religious mode that comes to be known as fantasy. In saying so, I do not mean to suggest a priority of value or merit of one mode over the other. I read fantasy just as avidly as I read science fiction.

This, in turn, connects with another form of definition often applied to the mode; science fiction, in contemporary publishing and bookselling practice, is contradistinguished from fantasy, the latter involving tales of a fantastic or non-realist cast in which the narrative facilitator is magic rather than technology. The key text in the development of 20th-century fantasy (a genre of astonishing and continuing fertility) is Tolkien's *Lord of the Rings* (1952–3): elves, men, dwarves and hobbits, aided by a wizard, battle malign orcs and monsters as part of a cosmic war between the forces of good and the forces of evil. There are very few machines in *Lord of the Rings*, and most of those that do appear are aligned with the forces of evil. Instead it is magic that operates in the world, to good or ill effect. The action revolves around a golden ring imbued with magical powers, a device that renders the wearer invisible but also grants him or her enormous power to command.

The Lord of the Rings is a profoundly Catholic work, not so much in terms of conscious allegory (Tolkien always expressed 'cordial dislike' for allegory), as in its detailed working-out; a drama of fall and redemption, in which a saviour returns to overthrow evil. The use of a sacramental symbol—the gold band symbolising marriage in Christian service—as the core element of the fantasy is also significant. From a Catholic perspective something magical is involved in marriage, magical in the forceful sense that Jesus's miracles can also be described as magical. To a Catholic the communion bread actually becomes the body of Christ during mass; transubstantiation is a real process, another magical sacrament. To a Protestant worshipper the bread is *symbolic* of Christ, but is otherwise wholly material and bready.

This is to revisit the very rationale of the Protestant Reformation itself. Norman Davies, for instance, summarises the movement in the following terms:

> The Protestant movement contained a very strong impulse to 'take the magic out of religion' … none the less, in the fifteenth, sixteenth and seventeenth centuries Europe continued to be devoted to every form of magical belief. The landscape was filled with alchemists, astrologers, diviners, conjurers, healers and witches … Magic held its own through the Reformation period. In this respect, therefore, the Protestant onslaught on magic enjoyed only partial success, even in the countries where Protestantism was to be nominally triumphant. But the intentions of the radicals were unmistakable. After Wyclif came Luther's attack on the indulgences (1517) and Calvin's dismissal of transubstantiation as 'conjury' (1536) … Protestant Christianity was supposedly magic-free. (Davies, 405)

Davies goes on to point out that magic remained, stubbornly, even in this supposedly purged religion of rational and conscious belief ('it proved virtually impossible to abandon the consecration of church buildings, of battle standards, of food, of ships, and of burial grounds'). But a separation begins here in the broad stream of fantastic, or non-realist, fiction. Catholic imaginations countenance magic and produce traditional romance, magical-Gothic, horror,

Tolkienian fantasy and Marquezian magic realism. Protestant imaginations increasingly replace the instrumental function of magic with technological devices, and produce science fiction. This present *History* depends, then, upon a historicized definition of SF as that form of fantastic romance from which the magic has been replaced by the materialist discourses of science.

To say this is not to deny a distinctive Catholic strand in science fiction; indeed, on the contrary, I argue that this strand is present in the vast majority of good SF, whether written by Catholic authors or not. If I am asked to boil it down in a single sentence, my thesis is that science fiction is determined precisely by the *dialectic* between Protestant and Catholic imaginariums that emerged out of the particular cultural-ideological context of the 17th century. SF texts mediate these cultural determinants with different emphases, some more strictly materialist, some more mystical or magical. Many of the most celebrated works of what is sometimes called Catholic SF are deeply embedded in this sacramental, magical vision—it is this, I would argue, rather than a fascination with theological questions as such, that distinguishes Catholic SF. So, for instance, Walter M. Miller's *A Canticle for Leibowitz* (1960) spreads its narrative over many centuries, from the aftermath of a nuclear war in which society is reduced to primitivism, the gradual rebirth of civilisation and the growth of technology to the point where mankind once again plans rocket trips to the stars, and once again threatens to destroy itself with nuclear weapons. The coherence of this long narrative is provided by its focus on a group of monks in the American desert, and in large part Miller inhabits a detailed, realist-manner description of their quotidian life. But the novel also depends on several magical turns of events. One is the character of Leibowitz himself, a hermit in the post-nuclear desert who seems immortal (the same character appears in each of the chapters, though they are separated by centuries), and is indeed specifically identified with the Wandering Jew. As the bombs fall for a second time, a mutant head-like growth on the shoulder of a woman apparently comes to life. The magical element is not merely dropped into the novel for the sake of bizarreness. It functions as an endorsement of the supernatural, the presence of God, in a world that had been atom-bomb ruined by societies too purely secular and rational. Gene Wolfe's *Long Sun* tetralogy (1993–96)—one of the masterpieces of 20th-century SF—features as its hero a humble priest with many Graham Greene-like Catholic trappings, although the religion he serves is not Catholicism. The novels take place on a gigantic spaceship, tubular and revolving to provide gravity to those living on its inner surface. This ship is on a generations-long journey to a new world, and indeed, the journey has been so lengthy that the passengers have forgotten they inhabit a spaceship at all. The religion to which Silk, Wolfe's priest-hero, belongs is one in which 'windows' (advanced TV screens) display the personages of the gods themselves; but over the course of the novels these supposed gods are revealed to be nothing but the downloaded personalities of ancient individuals, several of whom have gone mad in their electronic environment. The overall trajectory of this series presents the unmasking of features of the world that had been

taken to be natural and supernatural, revealing them to be nothing but technological—a plotline we might term, utilising this crude binary, Protestant. Yet Catholic Wolfe cannot abandon magic; a mysterious and non-technological numinous being, 'the Outsider', lurks behind Silk's actions all through the book, and the first novel opens with a revelation experienced by Silk in which—magically—the Outsider reaches through into the world of the long sun and provides insight. Wolfe's most famous tetralogy, *The Book of the New Sun* (1980–87), is also science fiction figured as fantasy. Severian rises from apprentice Torturer, to Torturer proper, and eventually to world-emperor, travelling through a world so far into the future its bizarre rituals and paraphernalia seem magical. The fantastical-magical elements predominate, and the far-future technological features can never quite be reduced to a materialist explanation; appropriately so because, in a manner of speaking, the protagonist, Severian the Torturer, is Christ.

The narrative of this *History*, in other words, sees a nascent form of SF in Ancient Greece that disappears, or becomes suppressed, with the rise to cultural dominance of the Catholic Church; and which re-emerges when the new cosmology of the 16th century inflects the theology of Protestant thinkers in the 17th. The death of Bruno in 1600 is a sort of shorthand for this crux, and the doctrine of the plurality of worlds that engages 17th-century thinkers informs almost all the newer interplanetary texts that SF from this period involves. This means that when interplanetary travel romances return to Western culture in the 17th and 18th centuries, they are all vitally concerned with the *theological* implications of the aliens they describe. Where a modern-day rocket-man might greet extraterrestrials with some benign liberal platitude ('we come in peace'), star-travellers in stories from this period are all keen to hear the answer to one crucial question: 'Do you believe in Jesus Christ?' When Francis Godwin's hero travels to the Moon and meets space-aliens therein, his first words are 'Jesus Maria'.

> No sooner was the word Jesus out of my mouth but young and old fell all down upon their knees, at which I not a little rejoiced, holding up both their hands on high, and repeating certain words which I understood not. [Godwin, *Man in the Moone*, 96]

This is important because, for Godwin and his audience, space-aliens are not esoteric curiosities, but crucial proofs or disproofs of divine truth. In Godwin's work, his Lunites are closely enough associated with the Earth to be able to share in the earthly Christ's redemptive power. Wilkins's *Discovery of a World in the Moone* (1638), for instance, postulates lunar inhabitants, immediately worrying whether such beings 'are the seed of Adam, whether they are in a blessed estate, or else what means there may be for their salvation'. Wilkins quotes Tomasso Campanella to the effect that lunarians must be 'liable to the same misery [of original sin] with us, out of which, perhaps, they were delivered by the same means as we, the death of Christ' [Wilkins, 186–92]. The

topic re-emerges regularly in SF throughout the 19th and 20th centuries. C S Lewis's trilogy of science fiction novels (1938–45) are all concerned with these sorts of theological issue, and his solution to the problem is to argue that Christ is unique to Earth because only Earth has fallen into the clutches of the devil. The priest-protagonist of James Blish's *A Case of Conscience* (1958) is wracked with doubts because the aliens of the planet Lithia, living sinless lives in a terrestrial paradise, have no concept of God or soul. In a preface to a reprint of the book, Blish notes that he received letters from 'theologians who knew the present [i.e. 1958] Church position on the problem of the "plurality of worlds"', and quotes the opinion of Gerald Head:

> If there are many planets inhabited by sentient creatures as most astronomers (including Jesuits) now suspect … [a suspicion, I suggest, available to an orthodox Catholic thinker only relatively recently] …then each one of such planets … must fall into 'one of three categories':
>
> (a) Inhabited by sentient creatures, but without souls; so to be treated with compassion but extra-evangelically.
> (b) Inhabited by sentient creatures with fallen souls, through an original but not inevitable ancestral: so to be evangelized with urgent missionary charity.
> (c) Inhabited by sentient soul-endowed creatures that have not fallen, who therefore
> (i) inhabit an unfallen, sinless paradisical world;
> (ii) who therefore we must contact not to propagandize, but in order that we may learn from them the conditions … of creatures living in perpetual grace. [Blish, 9]

Blish adds the following comment to Head's assessment: 'the reader will observe … that the Lithians fit none of these categories'. Ruiz-Sanchez, the Jesuit protagonist of the novel, comes to believe that the rational, civilized Lithians have in fact been created by the Devil in order to tempt Earth into disaster. At the novel's end (in a passage a non-believer will tend to read as a monstrous celebration of genocide) Ruiz-Sanchez exorcises the entire world literally *out of existence*, his rite of exorcism happening to coincide with a nuclear chain reaction set in motion by Earth workmen exploiting Lithian natural resources. The actual violence of this conclusion picks out a buried strain of hostility to the very notion of a 'plurality of inhabited worlds'. Blish's addition to Gerard Head's theological analysis of alien life (which might read something like '(d) Inhabited by sentient creatures without souls who have been produced by Satan to try and damage God's creation'), by pointing up other 'omissions' from the orthodox Catholic analysis, necessarily suggests yet another category, that other worlds may be inhabited by creatures that have nothing to do with, and were not created by, the God of the Earthly Bible. Since this same logic can be applied to Earth as well, it is corrosive of theological certainty; which is presumably why the church felt it had to kill Bruno. My point is that to read *A Case of Conscience*—a Hugo award-winning novel, and a highly regarded

example of science fiction—from a Catholic perspective is a different experience to reading it from a non-Catholic one. Under the logic of the former the novel is an interesting exploration of a theological conundrum; under the logic of the latter it is a heartbreaking story of human arrogance and short-sightedness, with the blameless Lithians terrible victims.

More recently, Dan Simmons' prize-winning *Hyperion* (1989) opens with a story about a priest haunted by precisely this question: whether Christ is a universal saviour, or merely a parochial earthbound figure. He travels to a distant corner of the galaxy and finds there a race of seemingly idiot aliens who all carry a glowing cross upon their torsos. The priest, ecstatic, lights on this as proof of the universality of Christ. In the event, the cross shape turns out to be an especially pernicious alien parasite, only coincidentally cruciform, and the priest is disillusioned. But this theological opening to the *Hyperion* sequence of novels is appropriate. *Hyperion* establishes that a sadistic creature called the shrike is kidnapping and inflicting terrible pain upon various inhabitants of the planet *Hyperion*; in the novel's sequel, *The Fall of Hyperion* (1990), it becomes apparent that malign machine intelligences are using the shrike to summon a numinous spirit of compassion from its hiding place (the bait being a larger and larger quantity of suffering human beings) so that they can destroy it. That there is a mystical principle of compassion behind the events of the cosmos, in conflict with a ruthless opposite principle, casts this pseudo-Christian battle between (in all but name) Christ and Satan onto a galactic stage.

By asserting that this opposition of Protestant/humanist technology and Catholic magic is radically constitutive of science fiction (and perforce, therefore, contradistinguishing SF from fantasy), I may be reminding readers of Arthur C Clarke's famous dictum: 'any sufficiently advanced technology is indistinguishable from magic' (Clarke, *Profiles of the Future*, 1969). But it hardly needs pointing out that, far from co-opting magic into SF, Clarke's statement reduces all magic to technological reality. What seems at first glance to be miraculous becomes, when properly analysed, actually technological, albeit technology of a wonderfully advanced sort. In effect, Clarke denies Catholic SF altogether; for him it is always and inevitably Protestant-humanist SF in disguise, something manifested in Clarke's own SF corpus, where the apparently transcendent (for instance, the ending of *2001: A Space Odyssey*) is later rationalised in materialist, technological terms (in the three sequels to that work). In other words, I'm suggesting here a modification for the crude distinction between magical fantasy and scientific SF. It is not the fact that fantasy is magical *as such* that distinguishes it from SF. It is the fact that it is *sacramental*. Fantasy is supernatural, SF extraordinary, and there is the world of difference between the two terms. Once we accept that a wizard is a form of priest, we see that there is always a priest in fantasy. This priestly role is almost always taken (in effect) by a technological artefact in SF.

It is the argument of the present critical *History* that post-1600 SF has been intimately shaped by this dialectic between magic and technology. Indeed, the sub-divisions of the field popular amongst fans map out positions on the line

from magical to technological: 'hard' SF aligning itself closer towards the latter term; 'soft' SF towards the former. The later chapters of this history present the case that this dialectic between science and magic (or 'fact and mysticism' or 'rationalism and religion') actively informs all the major classics of 20th-century SF; that *Metropolis* or *Dune* or *Star Wars* or Kim Stanley Robinson's *Mars* books or the *Matrix* films all articulate precisely this dynamic, and do so for deep reasons connected to the determining history of the genre.

I would like, in this preface, to say only one further thing, in partial defence of the scope of this critical history. Brian Aldiss traced the origins of SF to Mary Shelley's *Frankenstein*; Thomas Disch to Edgar Allan Poe; Patrick Parrinder to Wells and Verne; Samuel Delany thinks 'there is no reason to run SF too much back before 1926 when Hugo Gernsback coined the … term'—powerful critics all, who find the sort of proto-science fiction given so much attention in this work incongruous to their definitions of the form. Delany, for instance, has argued that 'More, Kepler, Cyrano … would be absolutely at sea with the codic conventions by which we make sense of the sentences in a contemporary SF text' and branded 'these preposterous and historically insensitive genealogies with Mary Shelley as our grandmother or Lucian of Samosata as our great-great grandfather' as 'just pedagogic snobbery (or insecurity)' [Delany, 25–6]. I have been, in my time, persuaded by these arguments. I am no longer. It now seems to me that the fact that (say) Phidias would probably be baffled by the work of Henry Moore does not mean we can usefully deny that both figures were practitioners of sculpture. To say that Lucian would probably be baffled by Delany's *Dhalgren* is only to say that forms evolve and change, and that full comprehension requires a certain attention to these changes and evolutions. Science fiction has certainly evolved, but the fact of this does not deprive its earlier manifestations of a place in the tradition of SF, and it is that tradition this study seeks to explore, along the lines outlined in the previous paragraph. It seems to me, having read many critical-historical works about SF in preparation for the present study, that critics exclude SF written before 1926 (or 1870, or 1818, as the case might be) not because there is a coherent rationale for limiting SF to works written after such a date, but rather because the individual critics *prefer* the later writing, and don't much enjoy reading, so-called, proto science fiction. There's no disputing *gustibus* in such matters, of course, although it is worth stressing that a particular individual's lack of enjoyment in reading Kepler's *Somnium*, or Rétif's *La découverte australe* is not *by itself* a reason for excluding such works from a comprehensive history of SF.

Notes

1. See Darko Suvin 'Science Fiction and Utopian Fiction: Degrees of Kinship' in *Positions and Presuppositions in Science Fiction* (Macmillan 1988). Chris Ferns's *Narrating Utopia: Ideology, Gender, Form in Utopian Literature* (Liverpool University Press 1999) is a detailed and perceptive study that covers much of this ground.

2. Umberto Eco neatly dramatises this anxiety in what is surely his best book, *L'isola del giorno prima* (*The Island of the Day Before*, 1994). The character Saint-Savin is talking about the theological difficulty of a universe of infinite inhabited worlds: 'was Christ made flesh only once? Was Original Sin committed only once, and on this globe? What injustice! Both for the other worlds, deprived of the Incarnation, and for us, because in that case the people of all other worlds would be perfect, like our progenitors before the Fall … Or else infinite Adams have infinitely committed the first error, tempted by infinite Eves with infinite apples, and Christ has been obliged to become incarnate, preach, and suffer Calvary infinite times, and perhaps He is still doing so, and if the worlds are infinite, His task will be infinite too. Infinite his task, then infinite the forms of His suffering: if beyond the Galaxy there were a land where men have six arms … the Son of God would be nailed not to a cross but to a wooden construction shaped like a star—which seems to me worthy of an author of comedies.' At this point his interlocutor screams in rage at his blasphemy and attempts to stab him with a sword [Eco, 139–40].

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Contents

CHAPTER 1

Definitions

Three Definitions

The obvious place to begin a critical history of science fiction is with a definition of its topic. This, though, is no easy matter. Many critics have offered definitions of SF, and the resulting critical discourse is a divergent and contested field. One approach that has proved influential amongst critics of the genre is that of Darko Suvin, who calls SF.

> a literary genre or verbal construct whose necessary and sufficient conditions are the *presence and interaction of estrangement and cognition, and whose main device is an imaginative framework alternative to the author's empirical environment.* [Suvin, 37]

Suvin goes on, usefully, to isolate what he calls 'the novum', the fictional device, artefact or premise that focuses the difference between the world the reader inhabits and the fictional world of the SF text. This novum might be something material, such as a spaceship, a time machine or a faster-than-light communications device; or it might be something conceptual, such as a new version of gender or consciousness. Suvin's cognitive estrangement balances radical alterity and a degree of familiar sameness, such that (in the words of Patrick Parrinder) 'by imagining strange worlds we come to see our own conditions of life in a new and potentially revolutionary perspective.' [Parrinder, 4].

Critic and novelist Damien Broderick has developed and refined Suvin's insights. He notes that the flowering of SF in the 19th and 20th centuries reflected the great cultural, scientific and technological upheavals (he calls these 'epistemic changes') of those eras, and seeks to pin down with more precise language the strategies employed by the majority of SF texts:

> SF is that species of storytelling native to a culture undergoing the epistemic changes implicated in the rise and supercession of technical-industrial modes of production, distribution, consumption and disposal. It is marked by (i)

A. Roberts, *The History of Science Fiction*, Palgrave Histories of Literature, DOI 10.1057/978-1-137-56957-8_1

> metaphoric strategies and metonymic tactics, (ii) the foregrounding of icons and interpretive schemata from a collectively constituted generic 'mega-text' [i.e. *all previously published SF*] and the concomitant de-emphasis of 'fine writing' and characterisation, and (iii) certain priorities more often found in scientific and postmodern texts than in literary models: specifically, attention to the object in preference to the subject. [Broderick, 155; my addition]

Both these definitions focus primarily on the *content* of SF texts. Writer and critic Samuel Delany has, on the other hand, challenged the validity of defining SF in terms of its subject matter, suggesting instead that SF is 'a vast play of codic conventions', a shared game of signification that readers can apply to texts at the level of the sentence as much as the level of the text, to social performance and semiotic engagement. He suggests that sentences such as 'her world exploded' or 'he turned on his left side' *mean* differently, depending upon whether a reader approaches them as SF or ordinary fiction; in a realist text the former would be metaphor and the latter a reference to posture, where in SF the former could be literal and the latter involve a switch activating the left-hand portion of the body as some kind of machine. He suggests: 'most of our specific SF expectations will be organized around the question: what in the portrayed world of the story, by statement or implication, must be different from ours in order for this sentence to be normally uttered?' [Delany, 27–8, 31]. For Delany, in other words, SF is as much a *reading strategy* as it is anything else.

Many other critics have attempted a definition. Brian Stableford, John Clute and Peter Nicholls, in their lengthy entry 'Definitions of SF' in Clute and Nicholls' *Encyclopedia of Science Fiction* (3rd edition 2011) quote sixteen separate definitions, from Hugo Gernsback's in 1926 ('a charming romance intermingled with scientific fact and prophetic vision'), to Norman Spinrad's more recent 'science fiction is anything published as science fiction' [Clute and Nicholls, 311–14]. There is amongst all these thinkers no single consensus as to what SF is, beyond agreement that it is a form of cultural discourse (primarily literary, but latterly increasingly cinematic, televisual, comic-book and gaming) that involves a world view differentiated in one way or another from the actual world in which its readers live. The degree of differentiation—the strangeness of the novum, to use Suvin's terminology—varies from text to text, but more often than not involves instances of technological hardware that have become, to a degree, reified with use: the spaceship, the alien, the robot, the time-machine and so on. The *nature* of differentiation, however, remains debated. Some critics define science fiction as that branch of fantastic, or non-realist, fiction in which difference is located within a *materialist*, *scientific* discourse, whether or not the science invoked is strictly consonant with science as it is understood today. This means faster-than-light travel (impossible, according to contemporary scientific orthodoxy) is a staple of science fiction, provided that such travel is rationalised within the text through some device or technology. A tale in which a character travelled from Earth to Mars simply by wishing or imagining the journey might be defined as fantastic or magic

realist rather than strictly science fictional. On the other hand, few SF texts adhere with complete consistency to the scientific, or pseudo-scientific logics of their conception. It would, for example, be perverse to deny that Edgar Rice Burroughs's *A Princess of Mars* (1912) is a work of science fiction, and yet the protagonist travels from Earth to Mars precisely by wishing the journey.

Some critics are comfortable defining as SF a range of texts more normally classified as magic realist or fantastic. In part there has been a reaction to the perceived ghettoisation of SF, by which the literary establishment in America and Europe dismisses texts by category, privileging, so-called, literary fiction over, so-called, genre fiction (as if the category of literary fiction were anything other than a genre!), and in many cases ranking science fiction as especially juvenile and valueless, below historical fiction and crime fiction in their notional pecking orders. This perennial prejudice does actual harm by creating a climate in which it is harder for writers to work and gain recognition, thereby damaging literature in general. Polemic is probably out of place in a critical history, so we can limit ourselves to observing how perniciously ridiculous these notions are, and (perhaps) to pitying the blinkered attitude of literary editors, reviewers and the intelligentsia literature that has been influenced by them.[1]

This present study has been unable to avoid the, often, tedious debates concerning definition, but my aim is to present a historically determined narrative of the genre's evolution rather than offering an apothegmatic version of the sentence 'SF is such-and-such'. This narrative is outlined in the chapters that follow and it sees SF as a specific and, as it happens, dominant, version of *fantastic* (rather than *realist*) literature; texts that adduce qualia that are not to be found in the real world in order to reflect certain effects back upon that world. The specificity of this fantasy is determined by the cultural and historical circumstances of the genre's birth: the Protestant Reformation, and an attendant cultural dialectic between Protestant rationalist post-Copernican science on the one hand, and Catholic theology, magic and mysticism on the other. Those texts where the latter term predominates are often called fantasy; those largely or wholly under the aegis of the former term are called hard SF. In between—the majority of texts with which we will have to deal—we find SF as it is broadly conceived. But it is one of the theses of this present study that pretty much all the classic texts of SF articulate this fundamentally religious dialectic. In saying this I am not saying, as some critics have done, that SF embodies religious myth, or secularises religious themes. SF may, of course, do either of these things, but this is not my argument. My thesis is that the genre as a whole still bears the imprint of the cultural crisis that gave it birth, and that this crisis happened to be a European religious one. SF begins as a distinctly Protestant kind of fantastic writing that budded off from the older (broadly) Catholic traditions of magical and fantastic romances and stories, responding to the new sciences, the advances of which were also tangled up in complex ways with Reformation culture. Of course, SF was a small-scale matter until the 20th century, when it broke into the pop-cultural in a major way. But still, this study seeks to show that philosophical and theological ideas which emerged half a millennium ago

are vital ones for an understanding of what is happening in SF. Few genre fans are aware of it, I think, but there's a reason why modern SF returns so often to a mode of materialist sublime, which fans call 'sense of wonder'; why modern SF is so fascinated, often in oblique ways, with questions of atonement and the status of saviour figures. This is, I think, worth stating unambiguously at the beginning of the study, so that the reader (who may well and profitably disagree with the emphases that follow) can position herself with respect to the argument. No critical history of science fiction could be wholly consensual, and nothing I argue here will please all, or perhaps even many, critics in the field.

The Reformation was not a sharp punctum, neatly separating a magical Catholic medieval past from a scientific quasi-Protestant modernity. It happened at different rates in different zones, and in many places in the world didn't happen at all, or else was unworked by effective Counter-Reformation strategies. Many Catholics were (and continue to be) fruitfully engaged in science and modernity; many Protestants were (and are) committed to older, magical and medieval cultural modes. More, the Reformation itself took place against a cultural backdrop of cultural inertia and resistance. J J Scarisbrick's judgment of attitudes to the Protestant Reformation in England can be extrapolated across Europe as a whole: 'on the whole, English men and women did not want the Reformation and most of them were slow to accept it when it came'. Nonetheless, and aptly, Scarisbrick calls the Reformation 'the supreme event in English history'.[2]

One reason why the Reformation had such a shaping effect on science, and therefore on science fiction, was what Canadian philosopher Charles Taylor describes as a shifting of the *adverbs* that relate the divine. The earliest Protestant Reformers argued that human beings should accept 'with humility the nature God has given them'; but the longer-term consequences of the Reformation generated, through people like Francis Bacon and John Locke (both discussed below), 'a new transposition of the theology of ordinary life'.

> In this version, we come to God through reason. That is, the exercise of rationality is the way we take part in God's plan. … in Locke's new transposition of the ethic, the crucial adverbs are shifting. Where in the pure Reform variant, it was a matter of living worshipfully for God, now it is becoming a question of living rationally. [Taylor (1989), 242]

Taylor's larger argument has to do, as his book's title makes manifest, with 'the sources of the self, the making of modern identity'. And it is the stress on the adverbial nature of this 'making', as much as its focus on a new mode coming into being, that is of particular relevance to the development of science fiction. SF is adverbial upon science, modifying and qualifying in expressive ways the nounal facticity of science itself. I will have more to say about the valence of the Reformation, but having invoked science more than once it may be worth pausing to consider what that word means. Common sense suggests that deriving a sense of that will be important to any account of a genre of literature called science fiction.

The Scientific and the Technological I: The Scientific

For some critics, the identity of science, as it modifies the fiction part of SF, is the crucial definitional question for the genre. Brian Aldiss's influential argument that SF begins with Mary Shelley's *Frankenstein* in 1818 (although Aldiss himself lists numerous important ancestors) depends upon the assumption that SF could not have originated any early than the 19th century precisely because it is only in the 19th century that science, as we now understand the term, obtained widespread cultural currency. To quote Peter Nicholls: 'SF proper requires a consciousness of the scientific outlook … a cognitive, scientific way of viewing the world did not emerge until the 17th century, and did not percolate into society at large until the 18th (partly) and the 19th (to a large extent)' [Clute and Nicholls, 567–8].

Science, as the term is generally understood, means, roughly, a discipline which seeks to understand and explain the cosmos in materialist rather than spiritual or supernatural terms. This is not to deny that spiritual and supernatural accounts of the universe may have affective, and even explanatory, validity, but it is to insist that such accounts cannot be evaluated meaningfully according to the protocols of science—a deductive, experimental discourse characterised by what Karl Popper called 'falsifiability', whereby the accumulation of empirical data can disprove, but never actively prove, theories. Because this version of science is instrumental, it aligns the discourse closely with technology, specifically with the enormous technological advances associated with the Industrial Revolution. This sense of science may explain why 19th- and 20th-century SF is so much more fascinated with items of technology than it is with less applied forms of scientific discourse (mathematics, biology, geography, chemistry, psychology, geology and the like) Of course, there are examples of SF that take the term in this proper sense; Abbott's *Flatland* (1884), for instance, exemplifies a vigorous little tradition of SF based on mathematical premises. But the great majority of SF written in the 19th and 20th centuries is less science fiction and more extrapolated technology fiction.

Then again, *something* happens to science in the Victorian age. To be precise, with the 19th century's conception of science comes a cultural division into arts and sciences, a perceived separation between what C P Snow in his influential 1959 lectures called *The Two Cultures.* Stefan Collini, in an introduction to a recent reprint of Snow's text, points out that the term scientist was first proposed in 1834 along the lines of artist:

> The lack of a single term to describe 'students of the knowledge of the material world' had bothered meetings of the British Association for the Advancement of Science in the early 1830s, at one of which 'some ingenious gentleman proposed that, by analogy with artist, they might form scientist' [Snow, xii]

This is indicative of the sense, growing in culture through the mid-19th century that art and science form a binary, to which is inevitably attached, in the words of Caroline Jones and Peter Galison, 'the economy of the binary':

> Like all binaries art and science needed to be yoked together (yet held apart) in order to accrue the strengths of their polar positions: soft versus hard, intuitive versus analytical, indicative versus deductive, visual versus logical, random versus systematic … two things seemed clear [in the mid 19th century]: art occupied the domain of the creative, intervening mind, and the scientific ethos seemed to demand precisely the suppression of such impulses [Jones and Galison, 2–3]

The drift of the modern mind, informed by this cultural tradition, defines science *in opposition to* art, such that science becomes inimical to aesthetics, a lamentable state of affairs for an art like SF that seeks precisely to explore the aesthetics of scientific premises. Taking SF out of the ghetto becomes part of the larger project of breaking down this fell pseudo-distinction. It seems natural to us; it is inscribed into our educational syllabi from the earliest schooling and is reinforced by many aspects of culture. But it is nonetheless a 19th-century cultural construction rather than a 'natural' state of affairs.

A fuller sense of the possibilities of the genre is unlocked by taking science fiction back past the 19th century, and exploring ways in which earlier notions of science informed fiction—to deconstruct, in other words, the logic of cultural binarism that wants to make science and fiction mutually exclusive terms. Indeed, it can be asserted that science fiction itself, as a broad statement of aesthetic strategy, has always sought to resist the notion of the two cultures. SF is the place where art and science connect. SF is empirical proof that arts and science do not constitute a binary economy.

It helps, in working through the implications of this, to understand how notions of science have shifted in the last century or so. Older theories of science tended to assume, in an unembarrassed way, that science provides systematic generalisations that explain the truth of the material world. For Bertrand Russell in 1931, for instance, scientific method involved a straightforward passage from observation to generalisation, although with 'a careful choice of significant facts on the one hand, and, on the other hand, various means of arriving at laws otherwise than by mere generalisation' [Russell, 3]. That this definition depends upon a rather arbitrary consensual sense of what distinguishes scientific generalisation from mere generalisation is one of its problems. Another is the belief that data leads by accumulation to water-tight generalisations, or truths. This rather woolly sense of science was challenged in the 1930s by German philosopher Karl Popper.

Popper's insight was that science does not produce theories that explain or determine the world, since all scientific theorising is empirically contingent. Any theory can never be proved, it can only be falsified. Observing a thousand two-legged penguins does not prove that penguins have two legs, although observing a single three-legged penguin falsifies that theory. What follows from this is the notion that a scientific theory (for instance, that penguins have two legs) is not 'the truth', but instead a contingent explanation for the data as they stand. American philosopher Robert Nozick neatly summarised this school of thought, which he called 'the standard model of science' in our post-Popperian culture, although he went on to challenge it on a number of grounds:

> Karl Popper presents an appealing picture of science as formulating sharp theories that are open to empirical testing and to empirical refutation. Scientific theories are not induced from the data, but are imaginative creations designed to explain the data. [Nozick, *Invariances*, 103]

One of the most appealing consequences of Popper's position is its unstated implication that SF is *a mode of doing science* (or philosophy, more generally conceived), as well as a mode of doing fiction. An important aspect of this is holding at arm's length the notion that science, because it treats in facts, is a necessarily neutral discourse. One of the ways science has increasingly been theorised in the 20th and 21st centuries has been to foreground the way science manifests the ideological and other preconceptions of the scientists who compose it. The influential French sociologist Pierre Bourdieu gained his influence, in part, through the rigorous and persuasive ways he demonstrated that science is not an edifice of disinterested objectivity, but inevitably bears the impress of the social class and ideological preconceptions of the people who do the science.[3]

Not all philosophers of science, or indeed all scientists, find this idea palatable. Popper himself could see no place for imaginative creation—at least in the sense of 'the innovative, ingenious imaginative leap' that is the currency of SF—in his version of science:

> The question of how it happens that a new idea occurs to a man—whether it is a musical theme, a dramatic conflict, or a scientific theory—may be of interest to empirical psychology; but it is irrelevant to the logical analysis of scientific knowledge. [Popper, 31]

One objection to the idea that SF might count properly as science, as well as being a literature, is that fiction, and other such cultural-artistic discourses (such as cinema, TV, the graphic novel and the like) operate according to aesthetic rather than logical-deductive processes. The force of this objection depends upon a belief that the *process* of fiction, reading and writing, whilst occasionally deductive, is more frequently intuitive, metaphoric, metonymic, suggestive, psychologic and imagistic. Even the hardest of hard SF will partake of these soft, or aesthetic, elements. But there are philosophers of science who believe that it is a mistake to reduce scientific process purely to logic. Ernest Nagel, for instance, stresses the importance of analogy to scientific practice; his example is 'the kinetic theory of gases', which is often theorised as if the particles acted 'like billiard balls' [Nagel, 110]. For Nagel, analogies and hypotheses, whilst having obvious limitations, nevertheless 'can serve as fruitful instruments of systematic research' [108]. Similar modular thinking, whereby a model is constructed of a particular system, 'may be intrinsically valuable because it suggests ways of expanding the theory embedded within it' [117]. Several critics have seen SF as a modular system, with fictive worlds modelling reality on a range of different