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Discourses and Narrations in the Biosciences

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‘Extravagant Fiction Today, Cold Fact Tomorrow’: The Theme of Infertility in Science Fiction

I. Science and Fiction

In 1851 William Wilson defined ‘Science-Fiction’ as a new kind of literature which could interweave the truths of science with those of fiction.¹ Today the deliberate intermingling of the scientific and the literary remains a characteristic feature of the genre. The novel which best defines the advent of modern science fiction is Mary Shelley’s *Frankenstein, or the Modern Prometheus* (1818), which pre-dates by some three decades the coinage of science fiction.

What differentiates early and contemporary sci-fi is the treatment of themes. In attracting not only readers of realistic fiction and science, but also of pulp magazines, sci-fi created its own readership which came to the genre with a blend of scientific as well as literary encyclopaedic competence. Though ignored and derided for much of the twentieth century, sci-fi made a come-back with the advent of mass produced magazines and cheap, accessible paperbacks. It became a thriving genre which continues to attract an ever-increasing share of mainstream and cult attention. In exploring ‘all that we know about the universe, and what we imagine we might eventually know’,² sci-fi attracts a readership with interests that go beyond the traditional domains of literature.

The influential role played by magazines, especially in the United States from the 1920s onwards, is fundamental to the history and development of sci-fi. In 1926 Hugo Gernsback, known as the founding father of the genre in the US, created and edited *Amazing Stories*,³ the world’s first sci-fi magazine. In 1937 John W. Campbell founded *Astounding Science Fiction*, which he edited for thirty four years.⁴ If *Amazing Stories* made a significant contribution to the

1 William Wilson, *A Little Earnest Book upon a Great Old Subject* (London: Darton, 1851), pp. 138–140.

2 Greg Bear, ‘Introduction: On Losing the Taint of Being a Cannibal’, in Id., *Bear’s Fantasies. Six Stories in Old Paradigms* (Newark, New Jersey: The Wildside Press, 1992), p. 1.

3 Hugo Gernsback, ‘A New Sort of Magazine’, *Amazing Stories*, ed. by Id., 1, 1 (April 1926), p. 3.

4 John W. Campbell, *Wonder’s Child: My Life in Science Fiction* (New York: Bluejay Books,

popularization of the genre, *Astounding Science Fiction* launched many sci-fi writers who were to shape the mid-twentieth century genre. Some of these were to take the popular version of the genre to more scientific, narratologically sophisticated levels, eventually making it agreeable and acceptable to academic publishers. The slogan on the masthead of the first issue of *Amazing Stories*, 'Extravagant Fiction Today, Cold Fact Tomorrow', still carries great resonance. Sci-fi is constituted by a 'novum'⁵ of highly variable form and content which may seem 'extravagant', but which often is represented as the 'cold fact of tomorrow'.

Scientists and doctors frequently appear in sci-fi as protagonists, such as the most famous Dr Frankenstein. There are also a number of scientist-authors; H. G. Wells, who read science as an undergraduate, and Isaac Asimov, a biochemist, successfully blended scientific knowledge to their talent for suspense and storytelling. Not only does the genre feature scientists as protagonists and authors, but it assumes readers will adopt complex roles.⁶

Once one accepts the definition of modern sci-fi as 'a new kind of fiction [that combines] adventure and exploration' with 'the popularization of science',⁷ it is evident that the typology of characters found in such works will include people with a scientific or medical background. The works which fall into this genre are so numerous that it would be arduous to create a comprehensive poetics of medicine in sci-fi. However, a focus on a subspecialty of medicine – infertility –

1984). See R. Scott Latham, 'Foreword', in *Treasury of Science Fiction*, ed. by Groff Conklin (New York: Bonanza Books, 1980), p. vii: 'he changed the direction of science fiction writing. He adamantly refused to accept the tired old BEM space operas. He wanted hard, logical science, presented in the context of real, believable characters. He encouraged social and political themes; he urged [writers] to dream clearly to examine the world that was and to extrapolate what it might be'. The summer of 1939 was particularly important as the July issue featured *Black Destroyer* by A. E. van Vogt and *Trends* by Isaac Asimov, the August issue included *Life-Line*, Robert Heinlein's first story, and the September issue included *The Ether Breathers* by Theodore Sturgeon. Campbell preached his type of science fiction through his editorials and other science fiction magazines copied the style. He himself was an author and, under his influence, stories were toned down, science became more sensible, and style improved. He also paid his contributors as his publishers, Francis Scott Street and Francis Shubael Smith, were very successful. In this way, he influenced the career and thinking of virtually every major science fiction writer of the time. Moreover, readers and writers interacted by developing ideas, conventions, and images. Science fiction matured and entered its 'Golden Age' from the late 1930s to the mid 1940s. See Isaac Asimov, 'Introduction', to *Before the Golden Age 1*, ed. by Id. (London: Futura Publications, 1974), pp. xiii-xix.

5 Darko Suvin, 'On What Is and Is Not a SF Narration; With a List of 101 Victorian Books That Should Be Excluded From SF Bibliographies', *Science Fiction Studies*, 5, 1 (March 1978), 45–57. Suvin defines science fiction as a genre dominated by a 'novum', a fictional novelty that is congruous with contemporary reality and stems logically as an extrapolation.

6 Umberto Eco, 'Introduction: The Role of the Reader', in Id., *The Role of the Reader: Explorations in the Semiotics of Texts* (Bloomington: Indiana University Press, 1979), pp. 3–43.

7 John Anthony Cuddon, *Dictionary of Literary Terms and Literary Theory*, 3rd edn (Harmondsworth: Penguin Books, 1991), p. 842.

may help to define a poetics of this specific intersection.⁸ The theme of global infertility has eschatological implications which are highly amenable to treatment by sci-fi. In the sciences, worst-case scenarios are important and attractive because they represent the extreme end of a spectrum of possible outcomes which translate into narrative structures imbued with possibilities for suspense, complications of plot, and interesting resolutions.⁹

Infertility is not a particularly popular sci-fi theme, whereas the opposite eschatological scenario, the Malthusian dystopia engendered by super human fecundity, is portrayed far more frequently. The overpopulation dystopia was memorably developed in Isaac Asimov's *The Caves of Steel* (1954),¹⁰ J. G. Ballard's 'Billenium' (1961),¹¹ John Brunner's *Stand on Zanzibar* (1968),¹² and Robert Silverberg's *The World Inside* (1971).¹³ Population dynamics became a popular theme in sci-fi around the middle of the twentieth century, while in the last decade the emphasis is laid upon environmental causes, as in David Brin's *Earth* (1990)¹⁴ and Orson Scott Card's *Pastwatch* (1996).¹⁵

The theme of infertility is extensively explored in Brian Aldiss's *Greybeard* (1964),¹⁶ Richard Cowper's *The Twilight of Briareus* (1974),¹⁷ and P. D. James's *The Children of Men* (1992).¹⁸ *Greybeard* was one of the first novels to envisage the possibility of mass human infertility. Aldiss, responding to the cold-war tensions of the time, included atomic bomb testing amongst its major causes. Cowper's *Twilight of Briareus* similarly took account of contemporary research which implied the possibility of global infertility through the radiation effects of a nearby supernova explosion. The novel was influenced by the drug culture of the time and the experience of LSD 'trips' was used as a fictional means through

8 A poetics of infertility in science fiction aims to be encyclopaedic in its scope; to overview doctors and medicine in mainstream literature and in science fiction in general; and to be understandable to those in medicine and science.

9 This approach has been adopted in an epidemiological paper on disease spread through mathematical calculation of the increasing presence of Zombies. See Philip Munz, Ioan Hudea, Joe Imad, and Robert J. Smith, 'When Zombies Attack!: Mathematical Modelling of an Outbreak of Zombie Infection', in *Infectious Disease Modelling Research Progress*, ed. by Jean Michel Tchuenche and Christinah Chiyaka (New York: Nova Science Publishers, 2009), pp. 133 – 150.

10 Asimov, *The Caves of Steel* (New York: Signet, 1955). See also the follow-up story *The Naked Sun* (New York: Bantam Books, 1957).

11 J. G. Ballard, 'Billenium', *New Worlds*, 112 (November 1961).

12 John Brunner, *Stand on Zanzibar* (New York: Doubleday, 1968).

13 Robert Silverberg, *The World Inside* (New York: Doubleday, 1971).

14 David Brin, *Earth* (London: Futura Publications, 1990).

15 Orson Scott Card, *Pastwatch: The Redemption of Christopher Columbus* (New York: Tor Books, 1996).

16 Brian Aldiss, *Greybeard* (London: Cox and Wyman, 1964).

17 Richard Cowper, *The Twilight of Briareus* (New York: The John Day Company, 1974).

18 Phyllis Dorothy James, *The Children of Men* (Harmondsworth: Penguin Books, 1992).

which aliens could ‘piggy-back’ additional effects of the nova’s radiation upon humans. The third novel, P. D. James’s *Children of Men*, is a deviation from her usual mystery genre; James refuses to define this futuristic novel as science fiction for fear it might be identified with a genre still regarded by some as shallow and puerile. She extrapolates current trends in declining fertility, but offers no explanation as to why this trend should increase to an absolute degree in the future.

Aldiss and Cowper, both regular sci-fi authors, were clearly influenced by John W. Campbell, who insisted on plots with scientific credibility. These two novels attempt to offer plausible causes of mankind’s infertility. Conversely, James did not trammel herself with sci-fi rules and did not put forward any detailed explanation. Her attitude typifies the mainstream authors’ disregard for the conventions of the genre. Such approaches are rare and can be found in very few sci-fi novels dealing with infertility, such as Wright F. Moxley’s *Red Snow* (1930)¹⁹ wherein a red, snow-like precipitation sterilises all women with no clear reason offered that accounts for its source.

II. Richard Cowper’s *The Twilight of Briareus*

Richard Cowper is a pseudonym used by John Middleton Murry, Jr. (1926–2002), the critically acclaimed English master of catastrophic science fiction. *The Twilight of Briareus*, generally considered his best work, focuses on mass human sterility and the potential end of the human race.

Briareus²⁰ Delta²¹ is one hundred and thirty two light years away, very close as

19 Wright F. Moxley, *Red Snow* (New York: Simon and Schuster, 1930).

20 Briareus is a creature from Greek mythology, one of the three hundred-armed, fifty-headed Hecatoncheires, son of Poseidon and Gaea and brother of Cottus and Gyges. He was called Aegaeon by men and Briareus by the gods. The most widely spread myth recounts that Briareus and his brothers were called by Zeus to his assistance when the Titans were making war upon Olympus. The gigantic enemies were defeated and consigned to Tartarus, at the gates of which the three brothers were placed. See ‘Briareus’, in *Encyclopædia Britannica*, <<http://www.britannica.com/EBchecked/topic/79185/Briareus>> [accessed 15 June 2011].

21 Ancient astronomers divided the sky into constellations according to perceived patterns of gods, men, and beasts. The brightest stars were given individual names by Arabic astronomers around the tenth century AD. In 1603 J. Bayer, a German lawyer, devised a more logical stellar naming system by using the genitive name of a particular constellation and labelling the stars with letters from the Greek alphabet. For example, the brightest star in the constellation Centaurus is Alpha Centauri, the second brightest is Beta Centauri and so on. Therefore Briareus Delta is the fourth brightest star in the constellation Briareus. See Dennis L. Mamma, *The Night Sky: An Observer’s Guide* (New York: BDD Promotional Book Company, 1993).

interstellar distances go. It becomes a supernova²² and its light and other radiation, which includes gamma and cosmic rays, reach Earth in 1999. This particular supernova emits radiation at a rate some two hundred million times that of our sun and remains visible for nine days. It knocks out communications satellites, produces magnificent auroras and causes the temporary suspension of supersonic flights on earth. It precipitates very unseasonable weather including hailstorms, tornadoes, cyclones, and hurricanes, followed by epidemics of disease in afflicted areas. The scientifically plausible impetus that sets off a dramatic chain of events in the novel is based on a contemporary eschatological hypothesis, and not created *de novo*. In addition, extrasensory perception, a popular theme of the 1970s, is brought into the development of the story. While such a form of perception appears to be ethereal, mystical, and improbable, some aspects are plausible and even government agencies have considered the hypothesis that at least a few of them may exist.²³

The 'twilight generation', conceived close to the influence of the supernova, is subtly different from the rest of humanity, because it has been manipulated by a collective psychic alien intelligence using the supernova radiation. A distinctive physical characteristic is their golden eyes. Apparently similar to the seemingly human but actually alien offspring in John Wyndham's earlier work *The Midwich Cuckoos* (1957),²⁴ the children in Cowper's novel are obvious products of the 1970s, praising peace, love, and understanding. The 'twilight' appellation may have been garnered from Rod Serling's earlier television series *The Twilight*

22 Earlier calculations from the 1970s had estimated that supernovae as far as fifty-five light years away from Earth could remove up to ninety percent of Earth's ozone layer, as proposed by M. A. Ruderman, 'Possible Consequences of Nearby Supernova Explosions for Atmospheric Ozone and Terrestrial Life', *Science*, 184, 4141 (7 June 1974), 1079–1081. However, new calculations have shown that a supernova would need to be much closer, within twenty-six light years of Earth, to significantly damage the ozone layer and double cancer-causing levels of ultraviolet radiation. This will happen only once per 670 million years. Moreover, none of the stars within a twenty-five light year radius from the sun is a likely supernova candidate. See Neil Gehrels, Claude M. Laird, Charles H. Jackman, John K. Cannizzo, and Barbara J. Mattson, 'Ozone Depletion from Nearby Supernovae', *The Astrophysical Journal*, 585 (10 March 2003), 1169–1176.

23 During the Cold War, both the Pentagon and the Central Intelligence Agency launched spying missions around the world. These missions included mind-reading and attempts to forecast the future. For a fascinating exposition on this black budget subject, see Jim Schnabel, *Remote Viewers: The Secret History of America's Psychic Spies* (New York: Dell Publishing, 1997).

24 John Wyndham's *The Midwich Cuckoos* (New York: Ballantine Books, 1957) is a science fiction classic wherein an unseen alien race with unimaginable powers somehow impregnates all women of childbearing age in several rural areas, including Midwich in England. Identical alien children are born at the same time, have golden eyes, overwhelming mental powers and a collective mind that includes the ability to control the actions of ordinary humans.

Zone (1959 – 1964).²⁵ The protagonist, Calvin Johnson, is a professor of English Literature and his wife is on the contraceptive pill. They decide to have children but cessation of the pill does not lead to conception. The supernova manifests itself at around the time when the couple visit their doctor seeking advice.

Along with doctors and scientists, the professor of English Literature also makes a frequent appearance in sci-fi. Both *The Twilight of Briareus* and *The Children of Men* feature an academic. The protagonist of the latter is:

Theodore Faron, Doctor of Philosophy, Fellow of Merton College in the University of Oxford, historian of the Victorian Age, divorced, childless, solitary, whose only claim to notice is that he is a cousin to Xan Lyppiatt, the dictator and Warden of England.²⁶

Such professions frequently entail university settings, young students and the idyllic comfort of professors' rooms in university towns; these appear not only in *The Twilight of Briareus* but also in *Greybeard*, since a part of the action is set in the ageing halls and towers of Oxford University. Oxford resonates symbolically through the three novels as the last bastion of free thought, a place which protects and supports the questioning intellect of both scientists and humanities scholars.

The writer or professional man of letters, frequently found in literature with a self-reflexive bent, became a point of reference in twentieth-century fiction, where the narrator's voices shift from a first person account or journal, which offers a limited point of view, to a third person description, which creates distance.²⁷ This diegetic feature can be found in two of the three novels under consideration here. *The Children of Men* makes use of a diary in the first part, whereas *The Twilight of Briareus* drives the narrative very deliberately through the shifting of voices, use of memory, and accounts of events, thereby introducing issues of narratological significance.

The Twilight of Briareus is written almost entirely in the first person and reports events which begin with the explosion of the supernova and extend to some months before the self-sacrificial death of the protagonist, Calvin Johnson. His questioning and hallucinogenic insights, imbued with overriding sexual stimuli, lead him to doctors and later to a 'scientific oddball'²⁸ professor based at

25 *The Twilight Zone* was a half-hour adult anthology series, one of the first which explored the bizarre and the unexpected via science fiction and fantasy.

26 James, p. 4.

27 In innumerable novels the first person and the journal create an impression of memory guiding the narrative through a very limited point of view. A seminal novel which deliberately plays with first and third person narrators, while an editorial voice explains the condition of the text, is Thomas Mann's *Doctor Faustus: The Life of the German Composer Adrian Leverkühn as Told by a Friend* (1947), trans. by H. T. Lowe-Porter (Harmondsworth: Penguin, 1968).

28 Cowper, p. 97.

Oxford. The seven chapters lead to a gradual realization of Calvin's central role and the understanding of his predicament as a 'Peripatetic diplodeviant',²⁹ a latter day Socratic sacrificial victim. The novel is preceded by an epigraph taken from Matthew Arnold's *Stanzas from the Grande Chartreuse* (1855), 'Wandering between two worlds, one dead, / The other powerless to be born'. The oscillation between two orders of reality, two states of perception, two kinds of humanity born before and after 'the twilight' conveys the same fear permeating the final lines of W. B. Yeats' *Easter* (1916), '[...] changed, changed utterly: / A terrible beauty is born', cited by the narrator.³⁰

The second narrator, Spencer Unwin, is a fictional editor commenting on Calvin's manuscript, which is the text offered to the reader. He maintains that he wrote the *Editorial Note* in Geneva on the 4th May 2016. Inserted between Chapter seven and the final Chapter eight titled 'Dawn', it explains that 'Calvin Johnson's surviving narrative ends at this point'.³¹ Therefore the last chapter consists of 'the remaining journal notebooks and the occasional loose jottings which Mr Johnson made during the period when he was engaged on his narrative'.³² The last chapter, unlike the previous seven, is a compilation of dated entries from the protagonist's journal, edited as accurately as possible some sixteen years after his death in 2000. His name, Calvin, the year 2000, and the sacrificial role bring to mind the Christian sacrifice of a reluctant messiah. The *Postscript* written in the third person, with which the novel ends, describes the events which ultimately brought about Calvin Johnson's death.

During his travels Calvin encountered Elizabeth Toombes, a girl conceived by her mother, a zeta sleeper, at the moment of the supernova's appearance. Calvin and Elizabeth, who turns out to be the only extant female diplodeviant, conceive a child and the sexual act is mentally witnessed by all zetans. Elizabeth refuses to receive proper antenatal and perinatal care. During her pregnancy, Calvin makes a form of direct contact with the Briarean agency. The Briareans, a group mind with no sense of individuality, wish to absorb Calvin who naturally fears losing his personality. After having accepted to be absorbed, he decides to commit suicide and dies exactly when Elizabeth delivers a girl, Rachel with golden eyes, signalling the start of a new era of peace on Earth. A summary of these events is given in the *Postscript* in an informative 'footnote' written in an impersonal tone.

29 It is the title of the seventh chapter, the last by Calvin. Cowper, p. 171.

30 *Ibid.*, p. 96.

31 *Ibid.*, p. 202.

32 *Ibid.*, *ivi*.

III. P. D. James's *The Children of Men*

The twelfth novel written by Phyllis Dorothy James White, more frequently referred to as P. D. James, marks an unusual departure from the detective or mystery genres with which she is most associated. *The Children of Men* revolves around mass human sterility, this time within the dystopian political context of a totalitarian England run by the Warden Xan Lyppiat and a Council of four members.

Lyppiat, first cousin of the protagonist and *de facto* tyrant, rose to power in a period of faltering governance, rising crime rates and a worldwide sense of futility. A strong man of action at a time when all hope and ambition had been lost, he promised security, comfort, and pleasure. The story begins after the Warden has been in power for fifteen years, at the head of a Council that helps him to rule. He has total control over the civil service and runs England on fascist lines, with the State Security Police (SSP) enforcing his bidding, the Grenadiers being his private army. The Isle of Man is the 'Man Penal Colony' where criminals are exiled permanently in deportation fashion for minor crimes including 'crimes of violence against the person' and for 'second convictions of burglary'.³³

The story commences on the 1st of January 2021 with the death of the last person known to be born, a man now aged twenty-five years, two months and twelve days. The death occurs during a 'pub brawl'. The man had been born on the 19th October 1995; this is called 'Year Omega':

All children born in the year 1995 are called Omegas. No generation has been more studied, more examined, more agonized over, more valued or more indulged. They were our hope, our promise of salvation, and they were – they still are – exceptionally beautiful.³⁴

The tragic event coincides with the decision by the protagonist, Theodore Faron, Professor of Philosophy, to begin a journal:

As I begin writing, the three events, the New Year, my fiftieth birthday, Ricardo's death, hardly justify sullyng the first pages of this new loose-leaf Notebook. [...] If there is nothing to record, I shall record the nothingness and then if, and when, I reach old age – as most of us can expect to, we have become experts at prolonging life – I shall open one of my tins of hoarded matches and light my small personal bonfire of vanities. I have no

33 The 'Man Penal Colony' is very similar in concept to *Coventry*, a short story in Heinlein's 'Future History Series' first printed in *Astounding Science Fiction*, July 1940. The story timeline takes place between Heinlein's *If This Goes On ...* and *Methuselah's Children*, both published in *Astounding Science Fiction*, the former on Feb-Mar., 1940, the second in Jul-Aug-Sep., 1941.

34 James, pp. 13 – 14.

intention of leaving the diary as a record of one of man's last years. Even in my most egotistical moods I am not as self-deceiving as that.³⁵

The novel is not written entirely in the first person. It is divided into Book One, Omega, and Book Two, Alpha, in an obvious reversal of the usual order, which signals that the end is followed by a new beginning. Both sections take place in 2021, the first from January, when Theo begins his diary, to March, at which point he leaves Oxford for a prolonged visit to Europe, his status as the Warden's cousin still affording him benefits. The second part, Book Two, unfolds over a single month, October, when the baby boy is born.

In *The Children of Men* the trend towards a declining European birth rate is first noted in 1991 and attributed to increasing levels of birth control, abortion, and postponement of pregnancy by professional and career women coupled with a desire for smaller families and a superior life standard. The scenario is not unrealistic: it has been amply documented that male fertility has decreased drastically and has been paralleled by significant increasing incidence of male genitourinary abnormalities and testicular malignancy. These changes are almost certainly environmental; pollution, smoking, alcohol, and sexually transmitted diseases play roles.³⁶ Miscarriage is more common in women who conceive with partners with lower sperm counts or abnormal sperm.³⁷ The major cause is probably disruption of male embryonal programming and gonadal development during fetal life, due to chemicals with highly oestrogenic properties – endocrine disrupters – that adversely affect genetically susceptible individuals.³⁸ This has been matched not only by wildlife data showing reproductive and developmental problems in fish, birds, and mammals, but also by laboratory studies showing that minute amounts of oestrogenic chemicals induce these changes. In addition, many chemicals not previously suspected of being oestrogenic have been found widely in the environment.³⁹ Moreover, the Y chromosome that determines maleness in most mammals – including humans – has been shown to be shrinking progressively over the generations. Unlike all (non-sex) chromosomes, the Y does not exchange DNA with any other chro-

35 *Ibid.*, p. 4.

36 Aleksander Giwercman, Elisabeth Carlsen, Niels Keiding, and Niels E. Skakkebaek, 'Evidence for Increasing Incidence of Abnormalities of the Human Testis: a Review', *Environmental Health Perspectives*, 101, Suppl. 2 (July 1993), 65–71.

37 Mirjam Furuhejm, Birgit Jonson, and C. G. Lagergren, 'The Quality of Human Semen in Spontaneous Abortion', *International Journal of Fertility*, 7 (1962), 17–21.

38 Kirsten A. Boisen, Katharina M. Main, Ewa Rajpert-De Meyts, and Niels E. Skakkebaek, 'Are Male Reproductive Disorders a Common Entity? The Testicular Dysgenesis Syndrome', *Annals of the New York Academy of Sciences*, 948 (December 2001), 90–99.

39 C. M. Lathers, 'Endocrine Disruptors: a New Scientific Role for Clinical Pharmacologists? Impact on Human Health, Wildlife, and the Environment', *Journal of Clinical Pharmacology*, 42, 1 (January 2002), 7–23.

mosome and therefore cannot repair spontaneous mutations through genetic recombination.⁴⁰ Indeed, it has been estimated that in about 5,000 generations – 125,000 years – male fertility will be roughly 1 percent of what it is now.⁴¹ The chromosome may eventually dwindle away completely, its gender determining role being assumed by genes located on other chromosomes elsewhere in the genome,⁴² something that has already happened in two species of Armenian vole.⁴³

The Children of Men presents conflicting views about the decline in birth rate: overpopulation problems are avoided, but nations with negative growth rates are concerned, since they wish to retain their own peoples and cultures. Infertility then becomes universal and a professor of statistical palaeontology declares that humanity will have been one of the shortest lived species ever. Miriam, a midwife working at the John Radcliffe antenatal clinic in Oxford and later a member of the group of dissidents, observes that something is amiss with conceptions when she notices that there are no antenatal bookings at her hospital seven months ahead. 'It was then I knew, I must have been one of the first to know. I was there at the end. Now I shall be there at the beginning'.⁴⁴

The cause of this infertility could not be tracked down by medical science and although it was initially seen to be a disease, it was not found to be an infectious or contagious one. As Theo explains:

I clearly remember the confident words of one biologist spoken when it had finally become apparent that nowhere in the world was there a pregnant woman. 'It may take us some time to discover the cause of this apparent universal infertility.' We have had twenty-five years and we no longer expect to succeed.⁴⁵

Initially, countries coordinate research efforts and create a 'European Centre for Human Fertility'. However, international mistrust prevails and armies of spies are deployed to ensure that any possible cures will be shared. Infertility is attributed to the male half of the species (due to poor quality sperm), but banked frozen sperm also proves to be useless. All hope of racial continuity is lost when even the Omegas, on reaching puberty, are found to be infertile because they

40 H. J. Muller, 'Some Genetic Aspects of Sex', *American Naturalist*, 66 (1932), 118–138.

41 Brian Charlesworth, 'Model for Evolution of Y Chromosomes and Dosage Compensation', *Proceedings of the National Academy of Sciences of the United States of America*, 75, 11 (1 November 1978), 5618–5622. See also Bryan Sykes, *Adam's Curse: A Future Without Men* (New York: Norton, 2004).

42 Douglas Fox, 'The Descent of Man', *New Scientist*, 2357, 24 August 2002, p. 29.

43 Walther Vogel, Silke Jainta, Wolfgang Rau, Claudia Geerkens, Annette Baumstark, Lina S. Correa-Cerro, Carolin Ebenhoch, and Walter Just, 'Sex Determination in *Ellobius Lutescens*: The Story of an Enigma', *Cytogenetics and Cell Genetics*, 80, 1–4 (1998), 214–221.

44 James, p. 214.

45 *Ibid.*, p. 7.

have no viable sperm production. Individual and mass suicides result, especially among the younger age groups.

Book One outlines Theo Faron's involvement in the dissident plot which sought to stop the Man Penal Colony, the Quietus, and the mistreatment of workers, called the Sojourners, brought in from other countries. Being the Warden's only living relative and 'the only one in England he's ever listened to',⁴⁶ Theo meets the Five Fishes, formed by his ex-midwife Miriam, Julian, her husband, Rolf (the ambitious natural leader of the group), the Roman Catholic priest Luke and the young Gascoigne. Rolf explains that only Luke and Julian are Christians and they meet in Churches because these are the only available buildings. When Theo returns to England and decides to join the Five Fishes, religious symbolism increases. After the priest Luke is killed by the Omegas ('the painted faces') as a sacrifice, Julian, who is expecting a baby by him, escapes with the rest of the group. Theo, in love with her, is cast in the role of Joseph, who seeks to protect her – even with his own life – and stands by at the birth of a baby boy in a forest, on a bed of wood shavings. He then kills Xan Lyppiat and, while taking the ring from his dead hand, plays with the idea of replacing him so as to protect the baby, saviour of the world.

The Twilight of Briareus and *The Children of Men* end with an unexpected birth, in both cases delivered within the context and symbolism of Christianity. Other details such as Theo's name, Greek for God, and the Five Fishes, an early symbol of Christians, allude to Christian themes.

IV. Brian Aldiss' *Greybeard*

The sci-fi writer and critic Brian Aldiss was one of the first to envisage the possibility of mass human infertility in a dystopian global setting. *Greybeard*, written in 1964, portrays the cold-war tensions of the time and identifies them as the causes of human infertility. Nuclear bomb testing progressively contaminates the earth, radioactivity affects the entire animal kingdom and the first space explorations conducted both by western and communist countries are used to test nuclear weapons in orbit.⁴⁷ Whereas in the two novels previously discussed the writing of journals and accounts emphasises the narrator's limited

⁴⁶ Ibid., p. 81.

⁴⁷ Aldiss was almost certainly influenced by the then ongoing United States atomic bomb testing in the Pacific. In 1958, Operation Argus consisted of three separate tests with an explosive yield of 1–2 kilotons each, while Fishbowl consisted of five separate tests, the largest of which was 1.4 megatons detonated at a height of 248 miles. See Marc Trachtenberg, *A Constructed Peace: The Making of the European Settlement, 1945–1963* (Princeton: Princeton University Press, 1999).

point of view, *Greybeard* is written entirely from an omniscient third person perspective, the action moving primarily through dialogue and characters.

Although Algernon Timberlane (known as Greybeard) and his wife Martha spend some time at Oxford University, he is not an academic, but rather ‘an intellectual trouble maker, a spy maybe from London’.⁴⁸ In *Greybeard* religious symbolism is not central, but still is evident in allusions and significant names, among which is Martha. However, the emphasis is on life conditions, the physical and psychological effects of an ageing population, and the immanent end of the race.

The United States creates DOUCHE: Documentation of Universal Contemporary History, that will record the end of humanity. Various governments attempt to prolong life through intensive research programs. Initially, malformed⁴⁹ babies are not cared for at all in developed countries, while in developing countries they continue to be nurtured. The Western world then rapidly undergoes a paradigm shift whereby the few babies who are born are viewed as a precious commodity, with the hope that on reaching puberty they would be able to breed and breed true. Western forces therefore create the ‘Infantop Corps’, a military branch entrusted with the collection of children from developing countries and their transfer to hospitals in the West, ‘Operation Childsweep’. However, wars are fought over such children and the losers resort to senseless bombing and killing. Epidemics of disease deal the final blow to civilization. In 2018, cholera sweeps through the United Kingdom and martial law is declared. Anarchy sets in and by 2029 human beings are all reaching their dotage and living in small communities in the countryside.

In the late 2020s Greybeard and his wife live in the village of Sparcot, which is run as a gerontocratical dictatorship. He is on guard duty, because a neighbouring community has been overrun by a large pack of stoats. While the lower animal orders such as rabbits and rats have recovered their fertility, mass human infertility has an immense social and political impact. Individuals fail to see the point of going to work, and government slowly begins to break down. Famine is predicted and, as food quality deteriorates, vitamin pills become a common part of meals.⁵⁰

The author stresses the ageing population demographics, with a mean age in

48 Aldiss, p. 66.

49 Mutations are permanent, transmissible changes to genetic material, that is, to cellular DNA or RNA. They can be produced in various ways, such as copying errors or spontaneous mutations in genetic material during cell division, and by exposure to mutagens such as radiation, chemicals, or viruses. Contrary to what happens in sci-fi, most mutations have no significant effect on the organism or the species.

50 The addition of vitamins and other micronutrients to food is a well-established practice where food quality is poor or inadequate, such as in developing countries. See Steven A.

the high seventies. The youngest age group is in their fifties, which makes Greybeard one of the youngest men alive. The vicissitudes of old age in Sparcot are repeatedly highlighted, but there are also hints and rumours of rare births, and sightings of gnomes and goblins, a possible reference to children.

At the end of their journey, the Timberlanes discover a group of small feral children. Their existence is explained by the fact that excess ambient radioactivity has been 'absorbed' by women, who in very biblical matriarchal manner now suddenly begin to conceive and bear children, even though they are in their sixties. Their children run wild and gang together in the forest shunning adult human contact, as a consequence of the fact that pregnant women hide in the forests and give birth there, away from other adults who are potentially their offspring's worst enemies. The apparent explanation is that human nature being what it is, other adults are very likely to exploit both mothers and offspring.

V. Common Endings

In all three novels, medical science attempts to prolong life but with negative results and humanity is seen to drag on as an ageing dinosaur, extinct but not yet quite ready to face the fact. Aldiss depicts most graphically and pragmatically the ravages and tribulations of old age. James mentions them, but not as frequently or pessimistically, and Cowper does so, too, but without dwelling on these aspects, probably due to the optimistic 'new age' influence under which the book was written.

Despite the dystopian scenarios and extreme consequences which feature as recurrent themes, a common sci-fi trope is, surprisingly, the happy ending. The sci-fi novel functions as a cautionary tale in which the dystopian events are resolved due to the agency of a *deus ex machina*. Humanity does eventually regain its fertility and is therefore saved from extinction, having somehow been taught a moral lesson.

Aldiss foresaw more disasters for the medical profession, with outbreaks of epidemic disease caused by the collapse of health care and sanitation services. The Zetas in *Twilight of Briareus* and the Omegas in *Children of Men* are humanity's last hope for fertility and continuation of the human race: both groups are a great disappointment when, on reaching puberty, they are found to be infertile.

Abrams, Alex Mushi, David C. Hilmers, Ian J. Griffin, Penni Davila, and Lindsay Allen, 'A Multinutrient-fortified Beverage Enhances the Nutritional Status of Children in Botswana', *The Journal of Nutrition*, 133 (June 2003), 1834–1840.

VI. Infertility and Radioactivity in *Greybeard*

In *Greybeard* Aldiss speculates that orbital nuclear explosions cause the Van Allen belts to oscillate, contracting and shrinking, and in consequence bathing the Earth's surface in radiation. This is impossible for two reasons. Firstly, the Van Allen belts are actually the result of earth's magnetosphere, the magnetic field that surrounds the Earth. Since the earth's magnetic field is generated by its core,⁵¹ no amount of orbital nuclear detonations could affect the earth's magnetic field in this way. Secondly, even if the magnetosphere were to contract, it would only bring the charged particles that comprise the Van Allen belts into contact with the upper reaches of the atmosphere, where the effect would probably be that of aurorae on a massive scale. The upper atmospheric layers would prevent the charged particles from sleeting through the lower atmospheric layers at the earth's surface due to their shielding effects.⁵² A more plausible way in which orbital detonations could indirectly affect the earth's surface would be through radioactive fallout, the accidental effects of which are well documented.⁵³ Moreover, high altitude atomic explosions would cause devastation of electronic equipment from electromagnetic pulse generation (EMP).⁵⁴

Aldiss recounts that women miscarried and that children carried to term were born malformed, an exaggeration that is not borne out in observational studies on Japanese atomic bomb survivors.⁵⁵ Miscarriage rates in pregnant women exposed to radiation are low, as are malformation risks. However, the development of the central nervous system *in utero* may be significantly affected.⁵⁶

51 The earth comprises three main layers: the crust, the mantle, and the core, which contains iron and generates its self-sustaining magnetic dynamo. For the geodynamo theory see B. A. Buffett, 'Earth's Core and the Geodynamo', *Science*, 288, 5473 (16 June 2000), 2007–2012.

52 Cosmic radiation is a diverse collection of different types of radiation from many different types of sources. See Stefan Roesler, Wolfgang Heinrich, and Hans Schraube, 'Calculation of Radiation Fields in the Atmosphere and Comparison to Experimental Data', *Radiation Research*, 149 (1998), 87–97.

53 Ralph E. Lapp, *The Voyage of the Lucky Dragon* (New York: Harper & Brothers Publishers, 1958).

54 EMPs devastate electronic circuits. See Trachtenberg.

55 It was largely assumed that many of the children conceived by the survivors of Hiroshima and Nagasaki would be deformed as a consequence of radiation-induced mutation. However, even at the time experimental data, albeit largely limited to studies of the *Drosophila* fruit fly, did not support this public impression, as exhaustively reviewed by William J. Schull, 'The Children of Atomic Bomb Survivors: A Synopsis', *Journal of Radiological Protection*, 23, 4 (2003), 369–384.

56 Ionizing radiation on the embryo or fetus may cause miscarriage, fetal growth retardation with permanent height impairment, congenital malformations, especially microcephaly, mental retardation, and an increased risk for childhood cancer. See *Pregnancy and Medical Radiation*, ed. by Jack Valentin, Annals of the International Commission on Radiological

Aldiss also depicts acute radiation sickness as a flu-like illness, but this too is incorrect, as respiratory tract symptoms are rare.⁵⁷ There is also no evidence that the young are more severely affected by acute radiation exposure in the short term than the elderly.⁵⁸ Aldiss considers whether global exposure may have any possible ameliorating effects due to hormesis, according to which there is a benefit to health, or a decrease in biological hazard from toxins, including radiation, as the toxin dose is increased up to a certain threshold.⁵⁹ He speculates

Protection, 30, 1, ICRP Publication 84 (Oxford: Pergamon, 2001). Before about two weeks of gestation, radiation-induced non-cancer effects are unlikely to occur, irrespective of the radiation dose, because at this stage the embryo is made up of only a few cells, therefore damage to one cell, the progenitor of many other cells, can cause the death of the embryo and the developing blastocyst will fail to implant in the uterus. For fetuses exposed between 8 – 26 weeks of gestation, atomic bomb survivor data indicate an approximately linear decline in IQ score with radiation dosage, less pronounced at increasing gestational age. See 'Prenatal Radiation Exposure: A Fact Sheet for Physicians', Centre for Disease Control, <<http://www.bt.cdc.gov/radiation/prenatalphysician.asp>> [accessed 15 June 2011]. There is also a slightly increased risk of childhood cancer and leukemia independent of gestational age at which radiation exposure occurs. Atomic bomb survivor data also suggest a 3 %–4 % reduction of height at age 18 years with significant radiation dosage, especially when the exposure occurs in the first 13 weeks of gestation, and this appears to be dose related. See also William J. Schull, *Effects of Atomic Radiation: A Half-Century of Studies from Hiroshima and Nagasaki* (New York: Wiley-Liss & Sons, Inc., 1995).

- 57 Early effects of radiation exposure include nausea, vomiting, loss of appetite and diarrhoea, fatigue, itchiness of the skin, inflamed eyes, and cataracts. Later effects include sore skin, hair loss, temporary sterility, areas of skin turned dark brown by beta ray burns, eye and ear discharge, jaundice, liver inflammation. Bone marrow suppression and a fall in white cell count result in immunosuppression, anaemia, and fall in platelets leading to a haemorrhagic tendency. See International Atomic Energy Agency, *What the General Practitioner (M.D.) Should Know about Medical Handling of Overexposed Individuals* (Vienna: International Atomic Energy Agency, 1986).
- 58 Children experience effects which are unique to their age-group, such as poor linear growth. See Raphaël Rappaport and Raja Brauner, 'Growth and Endocrine Disorders Secondary to Cranial Irradiation', *Pediatric Research*, 25, 6 (June 1989), 561–567. In addition, a high enough dose of radiation will induce lifelong sterility and inability spontaneously to progress into puberty. See Scott A. Rivkees and John D. Crawford, 'The Relationship of Gonadal Activity and Chemotherapy-induced Gonadal Damage', *Journal of the American Medical Association*, 259, 14 (8 April 1988), 2123–2125. Moreover, although radiation exposure increases the risk of cancer in all age groups, individuals who are older at the time of exposure are more likely to die from intercurrent disease before radiation-induced cancer appears, therefore children have an overall higher risk of developing malignancy. See Douglas G. Gold, Joseph P. Neglia, and Kathryn E. Dusenbery, 'Second Neoplasms after Megavoltage Radiation for Pediatric Tumors', *Cancer*, 97, 10 (30 April 2003), 2588–2596.
- 59 See Klaus Becker, 'Threshold or No Threshold, That Is the Question', *Radiation Protection Dosimetry*, 71, 1 (1997), 35. The theory that a potentially toxic effect acts like a stimulant in small doses and like an inhibitor in large doses goes against the dogma that all ionizing radiation is harmful, an extrapolation based on higher doses of radiation, the so-called linear no-threshold (LNT) hypothesis, according to which at even low doses there is a linear relationship between dose and risk – specifically, the probability of cancer induction, all the way down to zero. For the LNT hypothesis, see *Recommendations of the International*

that reindeer, unlike other mammals, having already been heavily contaminated with strontium from nuclear fallout, readily tolerate extra radiation exposure. This confirms that the hormetic hypotheses are applicable to this scenario, because above a certain threshold the harmful effects of large doses of radiation would unequivocally outweigh any potential beneficial hormetic effects.

Although the psychological effects of infertility have been well studied, the effects of mass sterility are unknown, as real-life data are limited. Mass despair would indeed be likely, potentially leading to a spate of suicides. The closest parallel we can draw is with the 'infertility belt' of sub-Saharan Africa, where up to one-third of all couples are unable to conceive. This is mainly due to infectious diseases acquired sexually, post-partum or post-abortion. Male infertility contributes to more than half of these cases but is rarely acknowledged. In highly pro-natalist cultures infertility can be tragic, especially where parenthood is culturally mandatory and childlessness socially unacceptable. Couples turn not only to traditional doctors but also to faith healers, causing tremendous stress to both partners.

VII. Infertility in Other Science Fiction Novels

Even though infertility is not a recurring theme in science fiction, various scenarios, often on a global scale, do arise. In *Greybeard*, *The Twilight of Briareus* and *The Children of Men* infertility is brought about either by nuclear, chemical or biological causes. Post nuclear-war infertility dystopian scenarios are not uncommon. In John M. Harrison's *The Committed Men* (1971)⁶⁰ a future Britain is awash with radioactivity. Sterility is common, and the protagonists, a doctor and several companions, attempt to deliver a mutant baby to a group of its own kind, likely to become the successors of ordinary humanity.

The erroneous belief that high levels of ambient radioactivity would generate a common set of mutations characterizing an entirely new species is most fa-

Commission on Radiological Protection, Annals of the International Commission on Radiological Protection, 21, 1–3, ICRP Publication 60 (Oxford: Pergamon Press, 1991). However, there is an ecologically based argument for hormesis in that humans are best adapted to background low levels of ionising radiation and other naturally occurring potential carcinogens in the environment. A few animal studies have supported this theory, others have not. See Lennart Johansson, 'Hormesis, an Update of the Present Position', *European Journal of Nuclear Medicine and Molecular Imaging*, 30, 6 (June 2003), 921–933. Some support for radiation hormesis has also been gleaned from atomic bomb survivors who received significant but low levels of radiation. See Wolfgang F. Heidenreich, Herwig G. Paretzke, and Peter Jacob, 'No Evidence for Increased Tumor Rates below 200 mSv in the Atomic Bomb Survivor Data', *Radiation and Environmental Biophysics*, 36, 3 (October 1997), 205–207.

60 John M. Harrison, *The Committed Men* (London: Hutchinson, 1971).

mously mooted in J. G. Ballard's 'The Voices of Time' (1960).⁶¹ In Janet Morris's *Returning Creation* (1984)⁶² the human colonists on the planet Silistra waged a vicious war that left a legacy of infertility for centuries afterwards. This leads to fundamental alterations in Silistran society in that the most prized abilities become fertility and sexual prowess. The survival of just one fertile man in the entire world as a result of a nuclear disaster is the novum of Pat Frank's *Mr. Adam* (1946).⁶³

Biological warfare has also been depicted as a threat to human fertility and one of the first instances in science fiction is Frederic Carrel's *Paul le Maistre* (1901),⁶⁴ where the 'Orientals' invade the West by releasing a sterility-inducing plague. Chemical warfare is in the core of D. F. Jones's *Implosion* (1967),⁶⁵ where the USSR contaminates Great Britain's drinking water, leading to almost universal and irreversible female sterility.

Infertility caused by pollution features prominently in Margaret Atwood's *The Handmaid's Tale* (1986).⁶⁶ Chemical wastes and nuclear accidents have widely contaminated the environment and drastically reduced fertility. Fertile women, 'handmaids', are slaves used for breeding purposes by a fundamentalist governing elite, whose practices are condoned through reference to the Old Testament.

Infertility may also be an involuntary iatrogenic event, as is the flawed cure in Llewellyn-Thomas's *The Douglas Convolution* (1979),⁶⁷ *The Bright Companion* (1980),⁶⁸ and *Prelude to Chaos* (1983),⁶⁹ where 22nd-century humanity suffers from widespread female infertility brought on by the use of a contraceptive agent. A twist on the theme is that of infertility deliberately induced by the government to stop overpopulation. Contraception is imposed by the state in George Orwell's *Nineteen Eighty-Four* (1949),⁷⁰ and infertility is caused by the deliberate and unconcealed sterilisation of embryos in Aldous Huxley's *Brave New World* (1932)⁷¹, which also anticipates the social impact of improved reproductive technology.

The state decides to limit births according to eugenic principles in Walter M.

61 Ballard, 'The Voices of Time', *New Worlds*, 99, 33 (October 1960), republished in Id., *The Four-Dimensional Nightmare* (London: Victor Gollancz, 1963).

62 Janet Morris, *Returning Creation* (New York: Baen Books, 1984).

63 Pat Frank, *Mr. Adam* (New York: Lippincott, 1946).

64 Frederic Carrel, *Paul le Maistre* (London: John Long, 1901).

65 D. F. Jones, *Implosion* (New York: Putnam, 1967).

66 Margaret Atwood, *The Handmaid's Tale* (New York: Ballantine Books, 1986).

67 Edward Llewellyn, *The Douglas Convolution* (New York: DAW Books, 1979).

68 Llewellyn, *The Bright Companion* (New York: DAW Books, 1980).

69 Llewellyn, *Prelude to Chaos* (New York: DAW Books, 1983).

70 George Orwell, *Nineteen Eighty-Four* (New York: Harcourt Brace, 1949).

71 Aldous Leonard Huxley, *Brave New World* (London: Chatto & Windus, 1932).

Miller's *Conditionally Human* (1962).⁷² A chilling and drastic solution to an overpopulation problem is envisioned by Lee Hoffman in *Soundless Evening* (1972),⁷³ where surplus children are legally and painlessly poisoned. State-devised measures can be even more cruel: in Alan E. Nourse's *Bladerunner* (1975)⁷⁴ medical care is granted to those who consent to medical sterilisation, in Joe Haldeman's *The Forever War* (1976)⁷⁵ homosexuality is induced in order to limit births and in Alain Doremiex's *The Vana* (1965)⁷⁶ human beings are strongly encouraged to mate with aliens.

A spaceship does not permit any sort of 'overpopulation' and in Poul Anderson's *Tau Zero* (1976)⁷⁷ contraception is enforced by the ship's medic: infertility is an occupational requirement. Frederik Pohl's *Man Plus* (1976)⁷⁸ features NASA converting astronauts into cyborgs where part of the conversion process is castration. The state may, however, feel that it has to enforce infertility on selected high-risk individuals – usually those exposed to radiation – in order to preserve the genetic *status quo*: in Arthur C. Clarke's *Rendezvous with Rama* (1975)⁷⁹ the sperm of the astronauts is frozen before sterilisation.

An excess of one or the other gender is a frequently recurring theme which entails homosocial or, more frequently, homosexual issues. While female-only societies are fairly common, male-only societies are much rarer for obvious biological reasons. In Cordwainer Smith's *The Crime and the Glory of Commander Suzdal* (1964)⁸⁰ human settlers of an alien planet discover that femininity is virulently carcinogenic to all earthly species and the only solution is to turn all human females into males and to learn how to carry babies to term in a male abdomen. The result is the creation of an entirely male planet.

In John Wyndham's *Consider Her Ways* (1979)⁸¹ males have all been accidentally destroyed by a man-made virus. Women-only worlds arguably represent the ultimate feminist fantasy. While examining the construction and enforcement of gender roles, feminist sci-fi writers maintain that personal identity and socio-political power are not only biologically determined, but also cul-

72 Walter M. Miller, Jr., *Conditionally Human* (New York: Ballantine Books, 1962).

73 Lee Hoffman, *Soundless Evening*, in *Again, Dangerous Visions*, ed. by Harlan Ellison, Book 2 (New York: Doubleday, 1972).

74 Alan E. Nourse, *The Bladerunner* (New York, Ballantine Books, 1975).

75 Joe Haldeman, *The Forever War* (New York: Ballantine Books, 1976).

76 Alain Doremiex, *The Vana*, in *13 French Science-Fiction Stories*, ed. by Damon Knight (New York: Bantam, 1965).

77 Poul Anderson, *Tau Zero* (New York: Berkley Books, 1976).

78 Frederik Pohl, *Man Plus* (New York: Random House, 1976).

79 Arthur C. Clarke, *Rendezvous with Rama* (New York: DelRey, 1975).

80 Cordwainer Smith, *The Crime and the Glory of Commander Suzdal*, in Id., *Under Old Earth* (London: Panther Science Fiction, 1970), pp. 139–153.

81 Wyndham, *Consider Her Ways*, in Id., *Consider Her Ways and Other Stories* (Harmondsworth: Penguin, 1979).

turally constructed. Fertility and reproduction play key roles in the utopian world portrayed by Ursula Le Guin in *The Left Hand of Darkness* (1969)⁸² or in the dystopian one predicted by Atwood in *The Handmaid's Tale*.

Immortality and infertility are often brought to play upon one another. Sterility thus becomes a form of chastisement for humanity's overreaching ambitions. In Kate Wilhelm's *Welcome, Chaos* (1985)⁸³ scientists develop a drug that kills half of the individuals who ingest it; and it confers immortality on the extant ones by immunising them against disease, radiation, cellular breakdown, and ageing.

A further variation is infertility inflicted on animals, aliens, and computers. Humanoid creations are infertile, as shown in Mary Shelley's *Frankenstein*, where Victor Frankenstein rejects his creature's request to create a partner, for fear that the monsters engendered by such a couple would overwhelm mankind. Infertility in animals has also been developed in Damon Knight's *Auto-da-Fe* (1966),⁸⁴ in which a future humanity modifies dogs, making them intelligent and able to speak, but their fertility is at a complete standstill because of contraceptive drugs that are dripped into their food at the behest of the last surviving human.

Furthermore, infertility is also depicted as the inevitable consequence of races evolving and becoming less 'vital'. Sci-fi authors invariably neglect the fact that such advanced races would be in possession of equally sophisticated reproductive aids and techniques. In *Twilight* (1976)⁸⁵ Campbell portrays aliens who, after having depleted their resources, want to conquer the Earth like the Martians famously portrayed in H. G. Wells's *The War of the Worlds* (1898).⁸⁶ Frightening scenarios and a frequent happy ending: it is the coexistence of fear for and projection towards the future that makes science fiction a popular genre in today's world, a panacea that simultaneously fans and soothes our visions of where scientific society's *hubris* may lead us.

82 Ursula K. Le Guin, *The Left Hand of Darkness* (New York: Ace, 1969).

83 Kate Wilhelm, *Welcome, Chaos* (New York: Berkley, 1985).

84 Damon Knight, *Auto-da-Fe*, in *Turning On*, ed. by Id. (New York: Ace, 1966).

85 John W. Campbell, *Twilight*, in Id., *The Best of John W. Campbell* (London: Sphere, 1976). For an opposite proposed ending to a future humanity, wherein humanity degenerates back to subhuman cavemen along with decreased fertility, see Ballard, 'The Voices of Time.'

86 H. G. Wells, *The War of the Worlds* (London: Heinemann, 1898).

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