

*The Ridicule of Time*  
*Science Fiction and the Posthuman*  
 (Robert A. Heinlein to Octavia Butler)

Suppose you were a science fiction fan, a Trekkie, and a transhumanist; you once paid to attend a seminar with Raël, knew all about Extropy back in the day, and subscribed to Longevity Meme Newsletter; you have read articles about an “immortality gene” and were thrilled to see *Science* publish a genomewide association study in 2010 identifying 150 genes that might improve your chances of living to 100; and you practice extreme caloric restriction while spending a fortune on dietary supplements. Over the years, you have zealously collected the following quotes but have forgotten the sources. Which of them do you think came from classic 1950s works of science fiction and which from publications by distinguished scientists, doctors, philosophers, and law professors?

1. We, or our descendants, will cease to be human in the sense in which we now understand that idea.
2. By the standards of evolution, it will be cataclysmic – instantaneous. It has already begun.
3. The new immortals, in the decisive sense, would not be like us at all.
4. Man will go into history along with the Java ape man, the Neanderthal beast man, and the Cro-Magnon Primitive.
5. Unlike the saber-toothed tiger . . . *Homo sapiens* would spawn its own successors by fast-forwarding evolution.
6. With the great lizards, with the sabertooth tiger and the bison, [humanity’s] day is done.
7. We will see them as a threat to us, and thus seek to imprison or simply kill them before they kill us.
8. We evolved. We’re the next step up.

The odd numbered quotations are by prominent academics: John Harris, Alliance Professor of Bioethics at the University of Manchester law school; Leon R. Kass, Harding Professor of Social Thought at the University of Chicago; Gregory Stock, former director of the Program on Medicine,

Technology and Society at UCLA medical school; and George Annas, Warren Distinguished Professor at Boston University. The even numbered quotations are by some of the most revered figures in science fiction (SF): Arthur C. Clarke, Robert A. Heinlein, A. E. van Vogt, and Theodore Sturgeon.<sup>1</sup>

The boundary between science fiction and fact is often at issue in contemporary debates over the “posthuman.” Genetic enhancement and longevity research provoke fervent debate between those who favor such research and others who think it is wrong to tamper with fundamental aspects of the human. Each side thinks that distinguishing realistic possibilities from wild speculations is a priority. Comically, though, each side uses the epithet “science fiction” as a way of trivializing the positions of the other while proclaiming that the research they cite is on the verge of transforming human nature and that the future scenarios they describe are plausible and impending. This chapter brings the bioethical debate about posthumanism into contact with a massive, culturally significant body of writing on the topic, popular science fiction from the mid-twentieth through the twenty-first centuries. The nightmares of science fiction haunt the bioethical imagination, exerting a pervasive but unexamined influence on its analyses. But the failure of bioethicists to examine the images, metaphors, and storylines of the science fiction that they so frequently invoke distorts their findings and recommendations.

As is perhaps unsurprising, almost none of the people who employ SF as an epithet have the foggiest idea of what they are talking about. Most give no sign of ever having read any science fiction, unless you count *Brave New World*, which everyone invokes without fail. In addition to Huxley’s dystopia, they may have read well-publicized mainstream dystopias by established literary figures, such as Atwood’s *Oryx and Crake* and Ishiguro’s *Never Let Me Go*; most have seen a few dystopian movies (*Gattaca* is the most frequently mentioned); but there is little evidence that they have delved into other forms of SF. Hence, you see over and over again the mistaken notion that SF warns against the consequences of biotechnology. Some does, of course, particularly dystopian fictions. But dystopia is only a small sector of the science fiction galaxy, and the nightmare worlds of *Brave New World* and *Oryx and Crake* are the exceptions, not the rule, in the larger universe of SF. Popular cinema is a misleading indicator too, since the film industry relies on thriller conventions of conspiracy and disaster far more than written forms of SF. Ronald Green conveys the typical assumption when he writes, “the take-home lesson about human gene modification [in science fiction] is wholly negative” (7).<sup>2</sup> Nothing could be farther from the case.

Science fiction is overwhelmingly positive about the possibility of transforming the human. The titles of two famous works in the field capture the spirit in which SF approaches the topic: Arthur C. Clarke's *Childhood's End* and Theodore Sturgeon's *More Than Human*. These works, like so many others, look forward to the day when humans leave the childhood of their species behind and become more than human.<sup>3</sup> Let me emphasize one point, however. The interest of SF does not lie in its "take-home lessons," whether positive or negative. Nor does the interest lie in whether the genre possesses aesthetic merit. Rather, the interest for policy lies in what the genre shows about the historical contexts that produced it and in the cultural attitudes the genre reveals. Thus, it is important to focus on what Darko Suvin identifies as the "popular, 'low,' or plebeian literary production of various times," the "paraliterature" of SF (vii), as I do here. Suvin writes:

90 or 95 percent of SF production is strictly perishable stuff, produced in view of instant obsolescence for the publisher's profit and the writer's acquisition of other perishable commodities. But even this 90 or 95 percent is highly significant from a sociological point of view, since it is read by the young generation, the university graduates, and other key strata of contemporary society. (vii)

It matters whether the people who dismiss science fiction actually understand the question at hand. The erroneous belief that the genre is largely negative about biological enhancement mischaracterizes a significant strand in our culture.

The ease with which accusations of writing science fiction fit the rhetorical purposes of bioethicists is revealing. It illustrates the pervasiveness of what Istvan Csicsery-Ronay has called "science-fictional habits of mind" (2). The reach of technology into every aspect of our lives has so saturated consciousness "that we no longer treat sf as purely a genre-engine producing formulaic effects, but rather as a kind of awareness we might call *science-fictionality*, a mode of response that frames and tests experiences as if they were aspects of a work of science fiction" (2, italics in original). Others have pushed this point further. Colin Milburn argues that the field of nanotechnology "should be viewed as simultaneously a science and a science fiction" (25) not only because it employs many of the same rhetorical tropes, conventions, and narrative strategies in its promotional literature and venture capital funding proposals but also because the speculative worlds it imagines as a consequence of as yet uninvented nanotechnology help drive much of the research it undertakes. As a

consequence, nanoscientists often have to labor to disentangle their field from charges that its claims smack of science fiction. Their efforts are self-defeating, however. Milburn demonstrates at length that the very “rhetorical strategies intended to distance their science from the negative associations of science fiction . . . end up collapsing the distinction, reinforcing the science fiction aspects of nano at the same time as they rescue its scientific legitimacy” (24).

Much of the ethical discourse surrounding genetic enhancement is inflected with “science-fictional habits of mind.”<sup>4</sup> My point is not that the science of genetics is itself constitutively related to science fiction, as Milburn argues about nanotechnology, but that some of the ethical discourse surrounding genetic enhancement is. The bioethicists examined here rely on sweeping analogies and engage in the kind of extrapolation that is the hallmark of SF. Their underlying syntax is the question “what if?” They ask us to “frame and test experiences as if they were aspects of science fiction” (Csicsery-Ronay) while enjoying the trust accorded to nonfiction. They constitute a rhetorical genre of science writing, the nonfiction cousin of science fiction, while borrowing their authority from the social sciences.<sup>5</sup> We should be wary of drawing ethical conclusions from science fictional habits of mind without acknowledging their character and understanding their provenance.

The ethical and policy discourse on posthumanism differs from the critical reflection on biopower and biopolitics that dominates literary studies of the topic. Literary theorists of the posthuman typically trace their lineage to a few foundational sources: Foucault’s late lectures on biopower, Donna Haraway’s writing on transgressive, hybrid creatures (both cyborg and transgenic), and N. Katherine Hayles’s work on the interpenetration of the cybernetic with the human. By and large, this body of thought wants to break down the boundaries between fiction and cultural analysis, which is very much not the case in bioethics. For example, literary critic Cary Wolfe insists that we must challenge the norms of critical analysis, putting into question categories of rationality before we can come to terms with the posthuman: “the nature of thought itself must change if it is to be posthumanist” (xvi). Wolfe’s work draws on animal studies, gender and race theory, Lyotard and Derrida on the nonhuman, Luhmann’s systems theory, as well as Foucault’s influential texts on biopower. Similarly, Bruce Clarke invokes Gregory Bateson’s remark that “the whole of logic would have to be reconstructed for recursiveness” (qtd. in Clarke 5) in justification for his belief that only systems theory can come to terms with the radical potential of posthuman

metamorphosis. This vein of theory has become virtually hegemonic in literary and cultural studies of the posthuman.

By contrast, bioethicists and policy experts mean something quite different when they speak of *Our Posthuman Future*, to use the title of Francis Fukuyama's 2002 book. Bioethicists are more likely to draw on economists, social scientists, and moral philosophers than Foucault, Haraway, Lyotard, Derrida, or Luhmann. Although few literary critics pay much attention to bioethics as a field, it is a powerful discourse in today's society, influencing important policy decisions in government agencies, medical care, human subjects research, pharmaceutical corporations, agricultural regulations, and much more.<sup>6</sup> The debate in this area turns on issues of human dignity, freedom of choice, personal autonomy, patient privacy, and informed consent, not the deconstruction of the subject. For Fukuyama, posthumanism is what you get when you threaten our shared "human nature" (129), the "human essence" (150) that "entitles every member of the species to a higher moral status than the rest of the natural world" (160). Hence, the stakes are high in suggesting a kinship between Fukuyama's conception of the posthuman and science fiction.

In the pages that follow, I trace two different phases of SF's engagement with the posthuman, showing how those phases were responses to their different historical moments and what they reveal about attitudes toward transforming the human. During WW II and the decade afterward, the so-called golden age of SF, a whole raft of short stories and novels dealt with the advent of a new species of human, what today we would refer to as the posthuman.<sup>7</sup> A second wave, equally remarkable for its coherence and prominence, began appearing in the late 1970s and 1980s, culminating in the years immediately preceding the millennium. The typical plot form in both eras involves the persecution of the emerging minority species by a terrified majority, the soon-to-be extinct *Homo sapiens*. Invariably, evolutionary change is depicted as sudden and teleological in character, resulting in a decisive step forward to a higher evolutionary stage. I conclude the chapter by discussing another wave of texts, this time speculative nonfiction works published since 2002. These works fall into two groups, jeremiads by opponents of enhancement, Francis Fukuyama, Leon R. Kass, and Michael J. Sandel – three scholars who served together on the President's Council on Bioethics. The second group endorses biological enhancement. They write in a genre of futurology for which we lack a name, but we might refer to these works as "encomia" or "anticipations" after H. G. Wells's book of that name, which inaugurated

the twentieth-century tradition of scientific futurism (Wagar).<sup>8</sup> With titles like *Redesigning Humans* (Stock 2002), *Radical Evolution* (Garreau 2004), and *Enhancing Evolution* (Harris 2007), these anticipations inflect bioethics with “the ludic pleasures of estrangement” characteristic of science fiction (Suvin ix).

### Around 1953

In Anglo-American SF, 1953 was a banner year. The culmination of important trends in hard SF that took their impetus from John W. Campbell’s editorship of the pulp magazine *Astounding Science Fiction*, the year also marked the beginning of important trends in paperback publication of SF and the professionalization of its writers. Ballantine Books published the first of its science fiction original paperbacks in 1953, Frederik Pohl and C. M. Kornbluth’s *The Space Merchants*, and ACE followed that same year with its own line of SF originals (Gary K. Wolfe 105–6). The Hugo Award for the best science fiction novel of the year was first given in 1953 to Alfred Bester’s *The Demolished Man*, beating out Ray Bradbury’s *Fahrenheit 451* and other classics of the genre, including three of the books considered here: Clarke’s *Childhood’s End*, Sturgeon’s *More Than Human*, and Lewis Padgett’s *Mutant* (all but Bester’s novel published by Ballantine). Van Vogt had inaugurated the spate of fiction about mutants in 1940 with *Slan*, and Heinlein had published the stories that would become the fix-ups *Beyond This Horizon* and *Methuselah’s Children* in *Astounding* in 1941 and 1942, while Padgett’s “Baldie stories,” the core of *Mutant*, appeared in the same magazine in 1945. But 1953 may serve as a symbolic climax for the first wave of SF about evolutionary change in humans. The publication of Watson and Crick’s landmark article describing the double helix structure of DNA in April 1953 appears to have prompted SF writers to shift their focus when writing about evolution in ways that will shortly become clear, and by the end of the decade, the genre had moved on to other concerns.

I focus exclusively on Anglo-American SF for two complementary reasons. First, the genre fiction in this line was directly shaped by the emphasis of the pulp magazines of the 1940s with which the name Campbell is closely associated. Campbell emphasized “hard science” in his magazine and encouraged writers who speculated about a posthuman species to ground their work in current understandings of evolution. Mark McGurl has noted something important about the genre status of these works: “the term *genre fiction* (its science fiction and horror variants in

particular) . . . names those literary forms willing to risk artistic ludicrousness in their representation of the inhumanly large and long” (539). That ludicrousness makes the juxtaposition with policy analysis all the more startling. Second, the threat of totalitarianism – first from the fascist right, and during the Cold War years, from the communist left – shaped the rebellious youth culture that consumed American pulp science fiction in ways that I shall shortly explore.

In the 1940s, the lack of knowledge about DNA’s role in evolution left SF writers with two chief mechanisms for imagining genetic change: eugenics and mutation. Eugenics had loomed large in the American consciousness in the first half of the twentieth century with debate about selective breeding, sterilization, or extermination of the unfit intensifying in the 1930s as Nazi eugenics campaigns drew increasing notice. After WW II, when word spread about the effects of radiation on survivors of the bombing of Hiroshima and Nagasaki, mutations caused by nuclear warfare became an obvious plot device for fiction about evolution.

For Heinlein, eugenics was the method of choice for changing the human species. A committed social Darwinist, a libertarian who championed freedom of the individual above all other values, and a believer (like Wells before him) in the innate aristocracy of the gifted few, Heinlein vigorously advocated only “positive” eugenics, which encouraged selective breeding through incentives rather than “negative” eugenic policies involving coerced sterilization or extermination. Self-interest and merciless competition for survival would weed out the unfit, or so Heinlein’s rugged heroes proclaimed in story after story.<sup>9</sup>

In his antipathy for coercive measures, Heinlein was in step with the growth and eventual dominance of “reform eugenics” in England and America from the mid-1930s onward (Kevles 164–75; Stern 3–4, 16–18). *Beyond This Horizon* imagines a future society where the best genetic lines are encouraged by Moderators from the Eugenics Board who employ family pedigrees and chromosome charts to encourage “star lines” to interbreed. The only genetic interventions that occur involve pre-implantation screening of embryos to select the optimum combination of genes. In imagining this future office, Heinlein reflected the cutting edge of reform in eugenics; the 1940s saw a shift away from large-scale better-breeding programs and racial hygiene, which had already become tainted by association with German eugenics, toward marriage counseling, family planning, and beginning in 1946, genetic counseling (Kevles 254). *Methuselah’s Children* similarly features incentive programs for people from chosen genetic lines marrying one another. The novel imagines the

establishment of the Howard Foundation in 1875 to support a selective breeding program for longevity. By 2136, when the novel opens, the hero Lazarus Long is 215; although we learn later that he possesses a rare favorable mutation, others in the family lived almost as long.

Suspicion of genetic engineering runs throughout the first wave of SF novels, coexisting uneasily with enthusiasm for the arrival of a posthuman stage. Both Heinlein and van Vogt inveigh against tampering directly with the germ line. Although their genetics fiction was written in 1940–42, before most of the Nazi medical atrocities had become public knowledge, the antipathy toward genetic engineering seems aimed at warding off the specter of German eugenics. Nazi coercive measures clearly ran against Heinlein's grain. *Beyond This Horizon* contains a long, clumsy passage of exposition recounting the horrors of the genetic experiments of past centuries, when the "race acquired the techniques of artificial selection without knowing what to select" (26). No free, individualistic society, we are told, would tolerate engineering humans for particular traits, which would lead either to homogenization of the species, or its opposite, overspecialization. "Only under absolutism could the genetic experiments . . . have been performed, for they required a total indifference to the welfare of individuals" (27). Similarly, van Vogt's *Slan* alludes to the infamous "blood libel" against Jews – the slans are accused of kidnapping human babies for experiments designed to create more slans – a libel that dates back at least to the middle ages but was given new life by National Socialism. To dispel such charges against his slans, van Vogt repudiates the existence of any means of artificially tampering with genes. A crucial turn in the plot reveals that "All slans are natural mutations" (175), not the product of experimentation.

A second reason for the avoidance of genetic engineering was confidence that evolutionary pressures alone would do the trick. This confidence in natural selection, though, reveals its own set of ideological confusions: like so many people of the time, SF writers saw evolutionary change as teleological, a progressive movement toward ever higher stages of life. Nature was viewed as working according to a plan, purposefully directing human evolution toward a superior species. "Our mutation wasn't due for another thousand years" (140), a character remarks in Padgett's *Mutant*, and another explains that radioactive fallout "brought us telepaths into being ahead of our normal mutation time" (146). Sentences such as these could have appeared in virtually any of the SF from the period that dealt with evolution.

A related confusion led authors to envision species change as sudden, occurring over one generation. Recall the Arthur C. Clarke quote with

which this article began (#2 in the list at the beginning of the chapter): “it will be cataclysmic – instantaneous” (181). The passage in *Childhood’s End* continues: “yours is the last generation of *Homo sapiens*. . . . You have given birth to your successors” (181). In these novels, bewildered parents discover that they have nurtured mutants with dramatic new powers. It happens not only in Clarke’s *Childhood’s End*, but also van Vogt’s *Slan*, Heinlein’s *Beyond This Horizon*, Sturgeon’s *More Than Human*, Padgett’s *Mutant*, and Judith Merrill’s classic story “That Only a Mother.”

Without exception, the “upgrade” to the species is a mental power, usually telepathy. Clarke’s children move quickly beyond telepathy to telekinesis.<sup>10</sup> Van Vogt’s *Slan* and Padgett’s *Mutant* feature two rival species of telepaths battling for dominance in the posthuman world while hiding from human pogroms. The Howard Families in *Methuselah’s Children* contains telepathic “sensitives” among their offspring, and when the reluctant hero from the “star line” in *Beyond This Horizon* finally marries his eugenically selected partner, they produce the telepathic child the Eugenics Board had been seeking. Sturgeon could be summing matters up for all his fellow authors when he writes: “The next important evolutionary step in man would be in a psychic rather than a physical direction” (109).<sup>11</sup>

Telepathy turns out to be a means to another end in most of the works: merging individuals into a larger collective mind. Clarke is the most radical. He envisions a single Overmind of all the telepathic children on earth, possessed of such awesome powers that they eventually consume the planet itself and move out into space as a disembodied being (shades of the Arisians in E. E. Smith’s *Lensmen* series, 1934–1948). Sturgeon explores the concept of minds merging in more psychological terms. Sturgeon’s novel consists of three long parts, a central section, “Baby Is Three,” that was a Hugo award-winning story about the workings of trauma, repression, and memory recovery through psychoanalysis, and two flanking narratives, somewhat awkwardly constructed to give “Baby Is Three” a backstory and a conclusion. The climax of the book is the achievement of a fused multiple identity called *Homo Gestalt* (170). Heinlein, who loathes the idea of subordinating human individuality to a larger unit, has his long-lived Howard Families spurn an alien species’ offer to join them in “rapport groups” of ninety or more minds in return for enormous power (Franklin 42–43).

The fact that science still understood little about the actual mechanism of heredity did not dim SF’s enthusiasm for plots of species evolution. Until Oswald Avery’s work in the mid-1940s, it was not even clear that DNA was the part of the chromosome that mattered in inheritance.<sup>12</sup> The

very confusions of the novels – such as their vision of evolutionary change as progressive – served the plot requirements of an action genre that had long relied on wars between alien species (the plot, complete with evolutionary themes, dates back to Wells's *The War of the Worlds* [1898]). Genetics merely gave a new air of authenticity to an old storyline. Belief that survival of one species and the extinction of another vindicated the superiority of the winner had been a common confusion since Darwin's day. Genetics allowed novelists to transpose the conflict inward. Rather than externalizing the struggle among species to interplanetary warfare, SF could bring the battle down to earth, as it were, shifting the strife to the personal realm and locating superiority in mental attributes.

The animus against genetic engineering would not survive the excitement surrounding Watson and Crick's discovery of the structure of DNA. SF quickly adopted gene "modding" as the chosen method of creating a posthuman species. James Blish's *The Seedling Stars* (1957), the last composed of this wave of SF about genetics, employs a more informed technical vocabulary and describes in detail the techniques of modifying the germ line to produce new species of humans – so-called "Adapted Men" – for extraterrestrial life on nonearthlike planets.<sup>13</sup> Blish, who trained as a biologist at Rutgers and worked for Pfizer, may have been especially attuned to the significance of Watson and Crick's breakthrough, but even Heinlein became interested in biomedical interventions that might change the species. In the only significant revision to the 1941 serial version of *Methuselah's Children* prior to its first book publication in 1958, Heinlein alters his explanation of how normal humans discovered the secret of longevity, which the Howard Families had achieved via eugenics. In 1941, the secret lay in altering the "radioactive qualities" of certain vitamins ("Methuselah's," pt. 3, 161). In 1958, the secret has become biomedical, the transfusion of new blood produced in vitro from bone marrow (*Methuselah's* 154–55).

What is it about this particular nexus of themes that attracted SF writers in the years 1940–1953? Why do fantasies of teleological evolution, species change, longevity, psychic powers, collective minds, the persecution of minorities, and the extinction of humanity come to be associated in work after work? How does this constellation of ideas reflect public knowledge of genetics at the time and what can such confused notions about genetics contribute to bioethical debates today?

One way to answer these questions is to approach science fiction as addressing larger cultural anxieties. Like the myths studied by Claude Lévi-Strauss, the books offer imaginary solutions to real social problems.

The roles of telepathic communication and collective identity have sometimes been attributed to the interest of John W. Campbell in parapsychology (Luckhurst 410). This may be the case: Luckhurst quotes Campbell's remark that he used *Astounding Science Fiction* to promote fiction about E.S.P. But the fantasy of mental communion with others responds to a wider cultural condition, the ambivalent attraction to authoritarian structures that Erich Fromm so memorably charted in his 1941 book *Escape from Freedom*. SF's depiction of merged identity speaks to both the longing and the fear provoked by the spectacle of a world confronting totalitarian regimes, whether fascist or communist, which submerged the good of the individual to that of the group. Passionately idealistic, as much SF tended to be at the time, these works responded to the urge for communal identity but simultaneously paid homage to rebellion and nonconformity. Readers felt themselves part of a communal group but only because they were among the special few. The fusion of these contradictory impulses was a major part of the genre's appeal. It was a haven for people who saw themselves as farsighted, misunderstood nonconformists persecuted by an uncomprehending majority, but who paradoxically banded together in tight-knit fan communities of fellow believers (Mendlesohn 10). Witness the subcultural phenomenon of "slan shacks," group living arrangements for SF fans who used to refer to outsiders as "mundanes" (Coger). The constellation of ideas surrounding species change spurred generic innovation in the field of SF while serving as a vehicle for the contradictory affects of the post-WW II era.<sup>14</sup>

This incoherent affect was not unique to the world of SF but surfaced as a current in other sectors of society: beat poetry and jazz circles, popular films such as *Rebel without a Cause* (1955), mainstream bestsellers such as *The Lonely Crowd* (1950), *The Man in the Grey Flannel Suit* (1955), and *The Organization Man* (1956), and fiction favored by teenage nonconformists such as *The Catcher in the Rye* (1951) and *Siddhartha* (1922; U.S. publication, 1951). Such phenomena help us recognize SF's vogue for telepathic union as what Jameson calls an "ideologeme," a unit of narrative that "transmits a historical or a social message" (*Archaeologies* 322). Fantasies of a new species, born of the union of extraordinary individuals, played to idealism about a collective society but stripped the idea of its threat to the individual and of its political dimension. The same was true of the racial allegory that ran through many of these texts. Their repudiation of racial prejudice, frequently thematized in characters who marveled at bias based on something as "trivial" as skin color, catered to the fantasy of reconciling the races without political struggle.

The ideologeme of post-WW II SF about evolutionary change thus does not have the meanings commonly attributed to it in bioethics today. Neither does the genre's short-lived antipathy to genetic engineering. Both responded to social and political concerns far removed from arguments about genetic enhancement in the twenty-first century. The temptation to use SF as a prop for advocacy for or against biotechnology fundamentally mistakes the cultural message of the genre around 1953. What the first wave of SF about genetics reveals, instead, is the importance of understanding scientific developments in their full social, political, and cultural contexts. The field of bioethics could benefit from literary approaches to science, but few of us engage with the issues that confront science policy today.

After Blish's *The Seedling Stars* (1957), there was little SF about genetics for more than twenty years. A review of "Science Fiction and the Life Sciences" by Slonczewski and Levy suggests that a growing interest in environmentalism, which intensified after publication of Rachel Carson's *Silent Spring* (1962), stimulated SF writers to turn their attention to ecological issues, producing imaginative explorations of alien ecosystems such as *Dune* (1965) and *The Left Hand of Darkness* (1969). Another likely factor was the rise of the counterculture and new social movements concerned with minority and gender issues, which led to increased emphasis on fiction about altered states of consciousness and changed racial and sexual norms, especially in New Wave SF. In any event, almost no science fiction confronted questions of evolution and genetics in any depth until the excitement about recombinant DNA reignited interest in the mid-1970s.

### Approaching the Millennium

The same themes of human species change, extrasensory communication, and collective modes of experience reappear, updated for a genomic age, in the SF published in the years leading up to the millennium. There are two crucial shifts of emphasis, however. First, because species change is brought about by deliberate genetic manipulation, there is less stress on a teleological conception of evolution. The ability to modify the genetic code means that alterations in the human form are chosen and are not the result of evolution, whether blind or directed. (Greg Bear's novels are an important exception, as we shall see). These books have fully assimilated the notion that "With our biological research we are taking control of evolution and beginning to direct it," to quote one of the bioethicists from

the beginning of this chapter (Stock 17). Second, diversity of form *within* the species is prominent. An obvious thematization of multicultural racial diversity, the plea for biologically diverse beings to find areas of commonality is framed as the only hope for descendants of humanity in a hostile universe. Transformation and species diversity are seen as survival characteristics; continuous adaptation and flexibility about the boundaries of the acceptable are primary values.

Both of these developments – acceptance of artificial reproduction and respect for diversity – are signs of how the subculture of SF had joined other new social movements such as feminism, queer and transsexual politics, disability rights, and multiculturalism to stake out a distinctive, counter-cultural position in opposition to prevailing trends in the Nixon–Reagan years. Although many women active in feminist causes reacted against invasive biomedical technology in matters of reproduction, SF emphasized the thematics of reproductive choice to align its positive attitude toward genetic engineering with women’s rights. Octavia Butler’s more complicated portrayal – the *Xenogenesis* trilogy supports genetic manipulation of the species but does not hide this intervention’s kinship with other kinds of violence against women – stands out in contrast to some of the other SF of the period. In the 1990s, transgender, transsexual, and prosthetic choices grew in prominence, particularly in cyberpunk fiction, though this theme had influential precursors in the fiction of Ursula K. Le Guin and Joanna Russ. The advocacy for diversity *within* the species was less conflicted. If the racial politics of the first wave of posthuman SF was predominantly liberal (or sometimes libertarian) in its advocacy of equal rights and tolerance, the sexual and racial politics of the second wave reveals its affinities with the new left in its embrace of hybridity.

Both the continuity and the difference between the two phases can be brought out by comparing the last of the fifties SF in this vein, James Blish’s *The Seedling Stars* (1957), with an early example of the later phase, John Varley’s *The Ophiuchi Hotline* (1977). Blish’s *Adapted Men* did not evolve through natural selection but were engineered in the laboratory for survival in alien environments. Outlawed and hunted on Earth, they become the pioneers of humanity’s expansion into space. Foreshadowing later SF motifs, they prosper in all their myriad forms, growing into the majority and leaving the “basic human type” (Blish 156) behind. The moral could not be stated more plainly: “It’s only sensible to go on evolving with the universe” (151).

Varley’s novel opens with criminal charges alleging that the heroine “did willfully and knowingly conduct experiments upon human genetic

material ... [and] produce human blastocysts and embryos reflecting potential structures atypical of the permitted spectrum of Humanity" (*Ophiuchi* 1). This felony is one of the few offences punishable by death and the total eradication of all copies of the criminal's genotype, preventing future cloning of the miscreant. The ban on radical genetic experiments had been meant to be only a moratorium, but it had hardened into a prohibition that lasted for 500 years. (This detail alludes to the voluntary moratorium on recombinant DNA research that led up to the historic Asilomar Conference of 1975, a gathering of scientists and ethicists that developed guidelines for how to pursue further research in the area safely.) As any veteran SF reader would anticipate, the rebel against the novel's genetics laws turns out to be one of the saviors of humanity, which was dooming itself in its struggle against alien invaders by clinging to human racial purity. The moral in this case is as plain as in Blish's earlier novel: "You will have to cease defining your race by something as arbitrary as a genetic code, and make the great leap to establishing a racial awareness that will hold together in spite of the physical differences you will be introducing among yourselves" (Varley 159).

The renewed surge of interest in genetics picked up speed in the second half of the 1980s with the publication of influential fiction by Bruce Sterling (*Schismatrix* [1985] and five related stories) and Octavia E. Butler (*Xenogenesis* trilogy, 1986–1988). Sterling, one of the cofounders of the cyberpunk movement, and Butler, a noted African American feminist writer, stretched the boundary of the genre in several ways. Sterling's future interplanetary society, nicknamed the Schismatrix, is divided between posthumans who have used cyborg implants to transcend the human body and others who have used genetics to the same end. Warring with one another, the two camps (and other splinter factions) live in the shadow of alien Investors, possessing vastly superior technology that they use to promote their interstellar trading empire. Bruce Clarke reproaches Sterling for retailing "an all-too-human oppositionalism" in the war between the two camps (160), reflecting the tendency of literary theorists of posthumanism to evaluate SF according to how staunchly it resists the tendency to fall back into humanism (Milburn levels similar charges against Blish's "Surface Tension," 96–106). But Sterling's solution to the dilemma of unifying the species after it has splintered apart into incommensurate posthuman forms rejects this "oppositionalism" and adopts instead a posthuman philosophy developed by the (real-life) complexity theorist, Ilya Prigogine (1917–2003). Prigogine's version of complexity offers the characters in the fractured world of the Schismatrix a

model of self-organizing structures, which become intelligible only from the perspective of a higher level of organization. "By the term *we*, I don't mean . . . humanity," one character remarks (Sterling, "Cicada" 273). *We* can be applied to any group of beings that has organized itself on a sufficient level of complexity, regardless of their external form. "It's time we learned to stop looking for solid ground to stand on. . . . Posthumanism offers fluidity and freedom" ("Cicada" 274).

Butler's *Xenogenesis* series adopts the motif of interstellar Traders too (a familiar topos in SF, not a borrowing from Sterling). The Oankali travel the galaxy in search of interesting genomes with which to merge their own. "We trade the essence of ourselves. Our genetic material for yours," one of the Traders explains. "We do what you would call genetic engineering. . . . It renews us, enables us to survive as an evolving species instead of specializing ourselves into extinction or stagnation" (*Dawn* 39). They create new, hybrid species, a mixing that captures the spirit of postmodern theories of deterritorialization, fluid economies, and hybridity, as Gabriele Schwab and many others have pointed out (Schwab 215).<sup>15</sup> The unfortunate consequence, from the humans' perspective, is that humanity disappears as a species, merging into the new Oankali/human hybrid. (Echoing the resolution of other SF works in this vein, a tiny remnant of old humanity is given the option of going its own way by being transported to Mars.) Butler's novels embrace this prospect for humanity, welcoming a posthuman future as the only possible mode of survival for a species that has already destroyed the planet through nuclear warfare and is on the verge of extinction. Humanity is doomed because of its deadly combination of intelligence and the instinct for hierarchy.

By now, it should be apparent that acceptance, even advocacy, of a posthuman future is the norm, not the exception, in SF. We have seen it throughout the first and second periods of interest in this topic – perhaps most memorably enshrined by the conclusion of Clarke's *Childhood's End*, when humanity's child, the Overmind, consumes all the substance of Earth and sets out for the stars.<sup>16</sup> At the end of the third volume in Butler's series, the hybrid descendants of what used to be the Oankali and human species accept a similar fate for Earth – they will consume the planet for fuel, leaving behind a cold, lifeless husk when they depart for the stars. What is distinctive about Butler's handling of this plot is how nakedly she depicts the violence of these conflicts, the racial hatred, the fear of difference, the brutality of strong against weak, the ineradicable stain of sexual violence, the hierarchical impulse that condemns the old species, our species, to extinction.

The great anomaly among the second phase of SF novels about genetics is Greg Bear's two-part series, *Darwin's Radio* (1999) and *Darwin's Children* (2003). Although the novels incorporate all three of the main thematic concerns – sudden species change, extrasensory communication, and group consciousness – and feature plots involving persecution of the posthuman minority by humanity, they differ from their contemporary peers by attributing species change not to genetic engineering but to evolution and by reasserting the directed nature of speciation. Bear updates the evolutionary paradigm by recourse to cutting-edge but sometimes controversial research; the result is an effective appearance of a scientific rationale for directed evolution. In an afterword, Bear forthrightly admits that “it is very likely that many of the speculations here will turn out to be wrong” (*Darwin's Radio* 527), but the speculations stem from extrapolations from current research.

Bear's novel was billed as a crossover work, a techno-thriller in the mode of contagion narratives such as Michael Creighton's *The Andromeda Strain* (1969) or Robin Cook's *Outbreak* (1989) rather than a work of science fiction, but the SF community was not about to let such an accomplished work go unclaimed and gave it the Nebula Award for 2000.<sup>17</sup> Scientific thrillers give authors more latitude for expository conversations among researchers and government bureaucrats than SF because the technical information itself is seen as a source of the genre's appeal, and both of Bear's novels end with glossaries of scientific terms. Thriller conventions differ as well from mainline SF in featuring capsule character sketches whenever a new actor comes on the scene; gratuitous sex scenes; point of view shifts to facilitate speed of narration; and quick cuts between exotic locales, each labeled with a place heading (the Alps, Tbilisi, New York, NIH headquarters, the CDC, an archaeology dig in Washington state). I bring up the presence of these thriller conventions in Bear's series not only as an aesthetic issue but to underline the point that this fictional genre – like SF with its reliance on different narrative formulas – is immediately recognizable *as* fiction despite its parade of scientific information.

The truth is, scientific thrillers and SF are better suited to this kind of thought experiment than most of the nonfiction about posthumanism that aims to influence public policy. The formal conventions of fiction alert readers to the provisional nature of analogy and extrapolation. As many critics have pointed out, SF does not pretend to predict the future or give prophecies of things to come. By contrast, nonfiction anticipations of the posthuman do exactly that: they specialize in prophecies and predictions.

This difference is part of what is at stake in emphasizing SF's fictionality. Coleridge famously wrote that literature required a "willing suspension of disbelief," but the act of willing oneself to enter an imaginary world affords a safeguard against taking *possible* futures as inevitable (or even probable in any testable way). Fiction does not have to pass a test of verifiability; it has its own procedures for establishing what counts as plausible, and one rarely mistakes those procedures for truth claims. Ironically, nonfiction about the posthuman is more susceptible to the ridicule of time than works of SF.

In the next section, I turn to nonfiction prophecies of the coming posthuman age. The purpose of this juxtaposition is both to demonstrate their kinship to SF and to note the poor use they make of SF's formidable powers of world building. The truth is that these nonfiction texts fail to employ the narrative resources literature has at its disposal. Their future scenarios are thinly imagined. They lack the narrative coherence, the careful development of motifs, and the richly textured world building that gives plausibility – even integrity – to good fiction. Yet these nonfiction texts rely utterly on the expectations that readers bring to their future scenarios from SF. The grounds of comparison lie in the rhetorical dependence of this body of nonfiction on modes of reality testing and future thinking developed by science fiction.

### Jeremiads and Anticipations

Prophecy courts the ridicule of time, and those who dream of tomorrow often wake to laughter.

In a celebrated work of American studies, Sacvan Bercovitch coined the phrase "American jeremiad" to describe an eighteenth-century genre of political sermon that set the tone for much brooding upon the destiny of our nation for the next two centuries. The New England Puritans intended their mode of public exhortation "to join social criticism to spiritual renewal, public to private identity, the shifting 'signs of the times' to certain traditional metaphors, themes, and symbols" (Bercovitch xi). The result was to construct a "myth of America" and "clothe history as fiction," but the myth succeeded "in proportion to its capacity to help people act in history. Ultimately, its effectiveness derive[d] from its functional relationship to facts" (Bercovitch xi).

Bercovitch's account of the American jeremiad indicates what I mean by calling the writings on posthumanism by Leon Kass, Michael Sandel, and

Francis Fukuyama “jeremiads.” The rhetoric is fierce enough to qualify. Kass compares “posthuman Brave New Worlders” to “inhuman Osama bin Ladens” and maintains that genetic engineering fosters a “soft dehumanization” as pernicious as “the cruel dehumanization of Nazi and Soviet tyranny” (*Life* 4, 7); Sandel talks of “designing parents,” of “hubris,” and of “the one-sided triumph of willfulness” (Sandel 46, 85); Fukuyama chooses “Transhumanism” as his contribution to a series on “The World’s Most Dangerous Ideas.” But it is not merely fierce rhetoric that revives the spirit of the Old Testament prophet; it is the ambition to spur spiritual renewal through social criticism and to counter shifting signs of the time – genetic enhancement, longevity research – by recourse to traditional metaphors, themes, and symbols.

The new wrinkle that scientific jeremiads bring to the genre is their covert relationship to SF. The works’ ability to spur people to act in history depends on inducing readers to frame and test experiences as if they were aspects of science fiction (Csicsery-Ronay). Their effectiveness depends on a certain *functional* relationship to facts, as Bercovitch said of the Puritan sermon. That functionality relies on readers who are accustomed to taking fantastic futures seriously. The power to mobilize citizens comes from the ease with which readers have learned to extrapolate from facts that could entail an imagined future. Of course, the same facts could entail a radically different future or be largely irrelevant to what eventually occurs. But the call to action in scientific jeremiads elides such possibilities.

There is an important place in bioethics for thinking about the consequences of new technologies, of course. But researchers in the field expect predictions about the social implications of scientific developments to be grounded in evidence and to employ testable methods such as economic modeling, surveys of attitudes and trends, studies of how technologies are used by different populations, or historical analyses of medicine and science. Research-based attempts to forecast future trends are often framed in a distinctive vocabulary: they are termed projections, and their predictive character is subject to disconfirmation by new data.<sup>18</sup> By contrast, scientific jeremiads rarely restrict themselves to the evidence base or to projecting trends. They are the “scare-mongering” pole (Carter, Bartlett, and Hall) of what has variously been called “anticipatory” or “speculative bioethics” (King, Whitaker, and Jones; Brey; Racine et al.; Schick). Instead of using forecasting methodology, they rely on blurring the genre between research-based projections and scientific fictionality.

One sees the power of scientific extrapolations when one comes up against communities in our nation who do not give them credence. Think

of how bewildering it strikes most Americans when climate change skeptics deny the long-term forecasts of environmental science or fundamentalists espouse an eschatological vision involving imminent Rapture. Trust in a scientific vision of the future, though, has never depended on one's ability to assess the science itself, something beyond the reach of most people. Rather, it comes from the "willing suspension of disbelief" in extrapolation, a suspension Coleridge saw as crucial to our response to fictive, not factual, writings. Climate skeptics treat scientific projections as if they were fictions they can choose to "believe" or not. Authors of scientific jeremiads treat fictions as if they were scientific projections.

For jeremiads about genetics, perhaps the chief rhetorical tactic is to counter the science fictional metaphors of posthumanism with rival metaphors derived not from the future but from the past, metaphors chiefly concerning human nature, natural rights, and human dignity. As philosophers and political theorists, these writers give accounts of their central terms as *concepts*, not metaphors, and the extensive debate about their work has largely taken them at their word, investigating conceptual flaws in their arguments.<sup>19</sup> But the rhetorical power of these terms functions independently from their logical coherence.

The rhetorical tropes in the works are legion: hyperbole, personification, analogy, guilt by association, symbolic opposition, performative speech acts, leading questions, organic metaphors, and more. But all writing is figurative, and identifying such tropes will hardly surprise readers. It is not the constitutive role of figurative language in the jeremiads that matters, but the functional motivation of these tropes. Scientific jeremiads attempt to motivate people to act in history – to resist a feared future – by conjuring a "novum," to use Darko Suvin's term for the novel reality SF creates. These jeremiads warn against an "alternate reality logically necessitated by and proceeding from" a fiction (Suvin 75). This totalizing rhetorical strategy, as effective in nonfiction as in science fiction, can only be tested by recourse to the sensibilities that one uses to judge SF. Is the novum believable? The jeremiad, however, has designs on the reader – it calls on one to accept a SF novum as a reason to act in history.<sup>20</sup>

The rhetorical strategies these jeremiads about genetics use to create a novum can be reduced to three basic forms: (1) performative speech, (2) symbolic oppositions, and (3) metaphors of organicism. Sandel is the great practitioner of performative rhetoric. Again and again, dozens of times in his very short book, *The Case against Perfection*, Sandel states that "we" are made uneasy by some aspect of genetic enhancement, asserting in a performative speech act what he ought to be proving. The basic rhetorical

move goes like this: “And yet something about the ad leaves a lingering moral qualm” (3); “And yet there is something unsettling about the prospect of genetically altered athletes” (8); “There is something unsettling about the specter of genetically altered athletes lifting SUVs or hitting 650-foot home runs or running a three-minute mile” (12). He never makes any effort to document that people are made uneasy by such phenomena. Some people may be, although it is clear from the clamoring voices in favor of enhancement that many are not. Hence, it is incumbent on Sandel to demonstrate rather than just assert that “we” are queasy. Instead, he immediately follows up these assertions with leading questions: “But what exactly is troubling about these scenarios?” (12); “Is the scenario troubling because the unenhanced poor are denied the benefits of bioengineering, or because the enhanced affluent are somehow dehumanized?” (15–16). Any possible answer grants his premise.

Kass deploys symbolic oppositions pitting “us” against “them” with similar fluency. One of his favorite moves is to sort those who agree with him into a valorized group and those who disagree into people “who can’t see or don’t care about what lies ahead” (*Life* 10). The latter is made up of “scientists and biotechnologists, their entrepreneurial backers and a cheering clique of sci-fi enthusiasts, futurologists and libertarians” (*Life* 6). His side, by contrast, “sees all too clearly where the train is headed”; his side “can distinguish cleverness about means from wisdom about ends, and we are loath to entrust the future of the race to those who cannot tell the difference” (*Life* 6). If one differs from Kass, then one is either blind or uncaring, and in any event, cannot tell the difference between means and ends. The passage concludes with a ringing tautology: “No friend of humanity cheers for a posthuman future” (*Life* 6).

Kass’s oppositional rhetoric is apiece with the underlying time structure of scientific jeremiads. His temporal model conforms to the paradigm that Catherine Gallagher has described as a “Y-shaped pattern” (16) where a single time track splits into two. Gallagher’s subject is alternative history narratives, so her article is concerned with plots that “undo” some event in the past to demonstrate what the present might be like if a critical event or choice had gone another way. This same Y-shaped model of time is implicit in scientific jeremiads but to less salutary ends. Whereas the plot of undoing aims to highlight or (in the political arena, remediate) historical injustices, a similar logic when applied to the future reduces a plurality of possible outcomes to two stark alternatives.<sup>21</sup> Science fictions about time travel have sometimes engaged in a similar reduction of temporal alternatives, particularly those that involve the so-called grandmother paradox in

which the protagonist travels back in time and accidentally marries a grandparent. But more commonly, SF stories about time travel, parallel worlds, and multiverses have opened onto an infinity of possible universes – think of classics like Fritz Leiber’s *The Big Time* (1958) or more recent stories like Greg Egan’s “The Infinite Assassin” (1991), not to mention nongenre works such as Borges’s “The Garden of Forking Paths” (1941). Kass’s model of the future, by contrast, depends on the same either/or choice that is echoed in his us-against-them rhetoric.

What Bercovitch says about the Puritan jeremiad applies as forcefully to Kass’s book: “The rhetoric plainly substitutes symbolic for social analysis” (Bercovitch 177). Here’s how Bercovitch explains the problem with this procedure:

Symbolic analysis . . . confines us to the alternatives generated by the symbol itself. It may suggest unexpected meanings, but only within a fixed, bipolar system . . . We can understand what is being represented only by measuring it against its opposite, or by placing it within a series of comparable and related oppositions. (177–78)

It is hard to think of a better example of how symbolic analysis confines a person to alternatives generated by the symbol itself than a line such as this one in Kass: “Because to say ‘yes’ to baby manufacture is to say ‘no’ to all natural human relations” (*Life* 19). *All* natural human relations?

Fukuyama’s *Our Posthuman Future* is the most temperate, thoughtful, and persuasive book of the three, but it is a jeremiad all the same. The core of the book is a carefully argued set of chapters defining and defending what Kass and Sandel leave vague, the concept of human nature. His arguments draw on evolutionary biology and psychology to provide a ground for speaking of human nature without resorting to religious assumptions. I will not debate whether these arguments hold up but will only focus on the rhetorical moments where his quasi-biological defense of the concept of “human nature” slides into generalizations about what it is “natural” to desire, think, and do – moments, that is, where statements about human nature become motives for action.

Students of romanticism have long been aware of what Paul de Man termed the “intentional structure” of the organicist metaphor, which underwrote much literature and philosophy of the period. The characteristic effect of this metaphor was to import a temporal dimension into a substantive quality, giving to a concept such as “nature” the appearance of entailing (“intending”) particular ideas, feelings, or modes of being. Something is “natural” because it appears to originate in nature, not

because it differs from the artificial or the unnatural. Clearly, if one thinks about it for a minute, one realizes that artificial things trace their origins back to nature. Everything *originates* in nature, even society (if a religious origin is discounted, as it is by Fukuyama). This is as true of cloning as it is of queer sexuality or anything else that a conservative commentator might want to condemn as “unnatural.” You cannot call something “natural” merely because it originates in our shared biological nature – you must find some other way to define the unnatural if that is your agenda.

When Fukuyama claims to have proven that human nature “serves to provide us with guidance as to what political orders won’t work” (*Our Posthuman Future* 127) because they are not “natural,” we see the organicist metaphor structuring his thought. The “failure of communism” occurred because of the “failure to respect the natural inclination to favor kin and private property” (127). When he says, “Human beings have been wired by evolution to be social creatures” (124), he makes a statement about what human nature *is*, based on claims put forward by evolutionary psychology. When he moves on to say that humans have “natural tendencies” and “natural human desires” (126–27), he makes a different kind of statement about where certain tendencies and desires originate. The intentional structure of the metaphor of organic growth lends the latter statement its only power.

Let me turn to the other side, the proenhancement books that have glutted the market. The same rhetorical elements can be found in these texts too. The group of anticipations concerning developments in genetics are, if anything, more dependent than the jeremiads on the habits and sensibilities cultivated by SF. The language of their titles is rich with tropes that evoke a novum: genetics will enable us to redesign our species, enhance the human, make better people, upgrade the brain, reach our inevitable genetic future, assist in radical evolution, and design our babies.<sup>22</sup> The three strategies of performative speech, symbolic oppositions, and organicist metaphors are deployed just as prominently.

The rhetoric of proenhancement anticipations warrants somewhat less detailed treatment since it lacks the call to action characteristic of jeremiads and dystopias. That is, encomia to genetic engineering generally lack a compelling demand to act in history. Rather, they seemed designed to wow the reader with the present than to shape the future. In the crassest cases, the intent seems to be to make money off of the author’s own science by publishing a trade book. The impulse may be venal, but it is relatively harmless.

On the surface, the kinship of the genre of anticipations with SF would appear to be greater than that of jeremiads, but both nonfiction genres are the siblings, as I said earlier, of the SF they scorn. An unmistakable sign of their affiliation lies in their continual invocation of Aldous Huxley's *Brave New World*. Whereas Kass and Fukuyama devote substantial parts of their opening chapters to discussing Huxley's dystopia as a warning about our future, Stock, Garreau, and Green all invoke Huxley's vision to distinguish it from what they claim are more probable futures. The continuity they assume between a renowned *fictional* future and their own nonfiction scenarios makes the point. Science fictional habits of mind are implicit preconditions of all these texts. If Huxley's looming shadow is not enough, there is another piece of SF that is invoked several times, although none of the authors make clear that they are quoting a fiction. Lee Silver frames his anticipation of genetics, *Remaking Eden: How Genetic Engineering and Cloning Will Transform the American Family* (1998), with an amusing fiction in the form of a commission report in the year 2350, detailing worries about the GenRich and the Naturals diverging to form two incompatible species. Silver cribs the idea of an imaginary future lecturer from J. B. S. Haldane's "Daedalus, or, Science and the Future" (1923), and Silver's imaginings are every bit as speculative. Fukuyama, however, references this future vision without letting on that it is a fiction. Ronald Green, at least, follows his discussion of Silver's "troubling prediction" (Green 135) by a discussion of H. G. Wells's vision of the Morlocks and Eloi in *The Time Machine*. But Green never directly states that Silver's worry is a fantasy, not a prediction. Such slippage illustrates the kinship these works bear to our culture's science fiction.

Like jeremiads, positive anticipations of our genetic future aspire to be prophetic, but theirs is a more prosaic form of prophecy, one that cannot trace its lineage from the warnings of Biblical seers and Puritan preachers. Anticipations traffic in scientific razzle dazzle, and their attempts to inspire awe at biotechnology's wonders sometimes result merely in the feeling of gee whiz. Their predictions risk being disproven by the next twist or turn of history; the best they can aim for is the hit-or-miss success rate typical of Wells's prognostications in *Anticipations* (1901), and he was unusually successful. Both jeremiads and encomia are vulnerable to disconfirmation, but the latter especially court the ridicule of time. They are the dreamers who risk waking to laughter. Disconfirmation of a jeremiad grants a feeling of relief. There but by the grace of God, we sigh.

The few worrisome problems that encomia present differ in kind from jeremiads too. They are more immediate and tend to call for practical

solutions. Several commentators are concerned that unduly optimistic expectations can raise false hopes in patients or result in disillusionment when technologies do not fulfill these promises in a timely fashion. As a result, “an emerging technology can be smothered or hampered . . . by the weight of enthusiastic speculative expectations (such as has arguably been the case for genomic medicine)” (King et al. 147). Others have argued that the debate about hypothetical outcomes of technologies still on the horizon “bypasses the present as a site of moral agency,” diverting attention away from more urgent current concerns (Schick 226).

Perhaps the most troubling issue with scientific anticipations is that they often fall prey to a temptation embedded in the very structure of genome time. That temptation is the millenarian impulse, the dream of sudden, radical transformation of the human. We saw it on display in the rhetoric of the “new immortals,” “fast-forwarding evolution,” and taking “the next step up” listed in the quotations at the beginning of this chapter. This dream has given rise to the discourse of transhumanism and talk of the coming singularity. It lies behind the belief that we are “the last humans,” now “poised to transcend our current form” (Stock 1). Millenarian thinking is teleological and proceeds in stages with pronounced emphasis on beginnings and ends. John Harris is not shy about proclaiming the teleological goal of “making better people.” He writes: “I propose both the wisdom and the necessity of intervening . . . to improve things by taking control of evolution and our future development to the point, and indeed beyond the point, where we humans will have changed, perhaps into a new and certainly into a better species altogether” (4–5). For many, the magnitude of this change can only be grasped by invoking the dawn and the end of life as we know it. Like Kubrick in *2001: A Space Odyssey*, Stock imagines two cataclysmic stages of transformation on our planet:

A momentous transition took place 700 million years ago when single cells came together to form multicellular life . . . Today we are in the midst of a second and equally momentous evolutionary transition . . . Humanity is moving out of its childhood and into a gawky, stumbling adolescence in which it must learn not only to acknowledge its immense new powers, but to figure out how to use them wisely. (Stock 16–17)

Shades of Arthur C. Clarke’s *Childhood’s End*. Science fiction has given us richer, more fully imagined visions of such change, but there is a difference between fiction and scientific anticipations, or there should be. That difference is one of genre, and understanding the power of genre to shape our response to genome time speaks directly to the value of literary studies

for bioethics and public policy. Literature makes it hard to forget the human component that is the reverse side of genome time: not only the incomprehensible eons Stock evokes, but also the arc of individual lives; not only the birth of multicellular organisms, but also the legacy of our recent historical past, the quotidian circumstances of the present, and the near-term prospect of what lies ahead. In literature, we encounter the full resonance of genome time – both the millenarian or dystopian transformations to come and the incalculably precious lives lived one moment at a time.