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The Ridicule of Time: Science Fiction, Bioethics, and the Posthuman

Jay Clayton*

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 genome-wide 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 descendents, will cease to be human in the sense in which we now understand that idea. (3)
2. By the standards of evolution, it will be cataclysmic— instantaneous. It has already begun. (181)
3. The new immortals, in the decisive sense, would not be like us at all. (265)
4. Man will go into history along with the Java ape man, the Neanderthal beast man, and the Cro-Magnon Primitive. (187)

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5. Unlike the saber-toothed tiger... *Homo sapiens* would spawn its own successors by fast-forwarding evolution. (17)
6. With the great lizards, with the sabertooth tiger, and the bison, [humanity's] day is done.¹ (43)
7. We will see them as a threat to us, and thus seek to imprison or simply kill them before they kill us. (286)
8. We evolved. We're the next step up. (170)

The odd-numbered quotations are by prominent academics: (1) John Harris, Alliance Professor of Bioethics at the University of Manchester's law school; (3) Leon R. Kass, Harding Professor of Social Thought at the University of Chicago; (5) Gregory Stock, former director of the Program on Medicine, Technology and Society at UCLA's medical school; and (7) George Annas, Warren Distinguished Professor at Boston University. The even-numbered quotations are by some of the most revered figures in SF: (2) Arthur C. Clarke, (4) Robert A. Heinlein, (6) A. E. van Vogt, and (8) Theodore Sturgeon.

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 article brings the bioethical debate about posthumanism into contact with a massive, culturally significant body of writing on the topic, popular science fiction from the midtwentieth 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* (1932), which everyone invokes without fail. In addition to Aldous Huxley's dystopia, they may have read well-publicized mainstream dystopias by established literary figures, such as Margaret Atwood's *Oryx and Crake* (2003) and Kazuo Ishiguro's *Never Let Me Go* (2005); most have

seen a few dystopian movies (*Gattaca* [1997] is the most frequently mentioned). But there is little evidence that they have delved into the SF genre that they scorn. Hence you see over and over again the mistaken notion that SF warns against the consequences of biotechnology. Dystopia is a special branch of science fiction, 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).² 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* (1953) and Theodore Sturgeon’s *More Than Human* (1953). 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.³ 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, as I do here. Suvin writes: “90 or even 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 misrecognizes a significant strand in our culture.

The ease with which accusations of writing science fiction fit the rhetorical purposes of both camps is revealing. It illustrates the pervasiveness of what Istvan Csicsery-Ronay, Jr., has called “science-fictional habits of mind” (2). The reach of technology into every aspect of our lives has so saturated our 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). 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.”⁴ My point is not that the science of genetics is itself constitutively related to science fiction, as Milburn argues about nanotechnology, but that 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” 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 sciences. 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 science 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 recursive-ness" (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.⁵ 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 WWII 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.⁶ 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 article by discussing another wave of texts, this time nonfiction works published since 2002. These works fall into two groups, the first of

which consists of jeremiads by opponents of enhancement, Francis Fukuyama, Leon R. Kass, and Michael J. Sandel—three scholars who served together on the George W. Bush administration’s 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. With titles like *Wondergenes* (2003) and *Radical Evolution* (2004) these anticipations inflect bioethics with “the ludic pleasures of estrangement” characteristic of science fiction (Suvin ix).

1. Around 1953

1953 was a banner year in Anglo-American science fiction. 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 (G. 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*, which beat 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 James D. Watson and Francis 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 science fiction 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 recently 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 plans and sterilization or extermination for the unfit intensifying in the 1930s as Nazi eugenics campaigns drew increasing notice. After WWII, 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, he 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.⁷

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.⁸ *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; we learn later that he possesses a rare favorable mutation, but others in the family are more than 180 years old.

The 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 1940–1942, 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 "[a]ll 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). Lines 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 (number 2 in the list): “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 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” (1948).

Without exception, the “upgrade” to the species is a mental power, usually telepathy. Clarke’s children move quickly beyond telepathy to telekinesis.⁹ 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* contain 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).¹⁰

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 [1934–48]). Sturgeon explores the concept of minds merging in more psychological terms. The 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 they call *Homo Gestalt* (170). Heinlein, who loathes the idea of subordinating human individuality to a larger unit, has his long-lived Howard Families encounter and reject the temptations offered by an alien

species that exists in “rapport groups” of 90 or more minds (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.¹¹ 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.¹² Blish, who trained as a biologist at Rutgers and worked for Pfizer, may have been specially attuned to the significance of Watson and Crick’s breakthrough, but even Heinlein became interested in biomedical (in addition to evolutionary) explanations for changes to the species. In the only significant revision to the 1941 serial version of *Methuselah’s Children* prior to its first book publication in 1958, he 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” 161). In 1958, the secret has become biomedical, the transfusion of new blood produced in vitro from bone marrow (MC 154–55).

What is it about this particular nexus of themes that attracted SF writers in the years 1940–53? 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 ESP. 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 1942 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 affect of the post-WWII era.¹³

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) and *The Man in the Gray Flannel Suit* (1956), and fiction favored by teenage nonconformists such as *The Catcher in the Rye* (1951) and *Siddhartha* (1922; US publication 1951). Such phenomena help us recognize SF's vogue for telepathic union as what Fredric Jameson calls an "ideologeme," a unit of narrative that "transmits a historical or a social message" (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-WWII science fiction 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 20 years. A recent review of "Science Fiction and the Life Sciences" by Joan L. Slonczewski and Michael 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 toward 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 counter-culture 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.

2. Approaching 2001

The same themes of human species change, extrasensory communication, and collective modes of experience reappear, updated for a genomic age, in the science fiction published in the 25 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

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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 "[w]ith 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 article, not a science fiction novelist (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 descendents 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 genre fiction had joined other new social movements such as feminism, queer and transsexual politics, disability rights, and multiculturalism to stake out a distinctive, countercultural position in opposition to prevailing trends in the Nixon–Regan years. Although many women active in feminist causes reacted against invasive biomedical technology in matters of reproduction, science fiction emphasized the thematics of reproductive choice to align its brief for genetic engineering with women's rights. Octavia Butler's more complicated portrayal—the *Xenogenesis* trilogy (1987–89) supports genetic manipulation of the species but does not hide its relationship to 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 brief 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 1950s 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 life 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" (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] did produce human blastocysts and embryos reflecting potential structures atypical of the permitted spectrum of Humanity" (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 Butler. Sterling, one of the cofounders of the cyberpunk movement, and Butler, a noted African-American and 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 which 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 James 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. 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 (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” (274).

Butler’s *Xenogenesis* trilogy 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” (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.¹⁴ 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 transplanted 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 its world 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 about the posthuman. 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.¹⁵ 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 like 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 a work go unclaimed, and so gave it the Nebula Award for 2000.¹⁶ Scientific thrillers give authors more latitude for expository conversations among researchers and government bureaucrats even 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 in Washington, CDC in Atlanta, an archaeology dig in Washington state). I bring up the presence of these 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 science fiction 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, science fiction does *not* pretend to predict the future or give prophecies of things to come. By contrast, nonfiction advocacy about the posthuman does exactly that: It specializes 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 kind of 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 not to demonstrate any formal similarities—quite the contrary. My point has been the large generic discontinuity between fictional and nonfictional strategies. Nor is it to accuse this body of nonfiction of factual distortions even remotely like the speculations of SF. Despite the many thematic similarities among these books, the comparison has nothing to do with their relative accuracy. No, 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.

3. Jeremiads and Encomia

In an influential 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 Kass, Sandel, and 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” (4, 7); Sandel talks of “designing parents,” of “hubris,” and of “the one-sided triumph of willfulness” (46, 85); Fukuyama chooses “Transhumanism” as his contribution to a series of articles in *Foreign Policy* on “The World’s Most Dangerous Ideas” (2004). 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 science fiction. 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.” 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. There is an important place in bioethics for thinking about the consequences of new technologies, of course. But researchers in the field expect future scenarios to be grounded in evidence and to employ testable methods such as economic modeling, surveys of attitudes and trends, studies of how technologies are actually used by different populations, or historical analysis 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. By contrast, scientific jeremiads rarely restrict themselves to the evidence base or to projecting trends. Instead they rely on blurring the genre between research-based projections and scientific fictionality. The power to mobilize citizens comes from the ease with which readers have learned to extrapolate from facts that could entail a particular 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.

One sees the power of this disposition toward scientific extrapolation when one comes up against communities in our nation who do not share it. Think of how bewildering it strikes most Americans when a fundamentalist espouses an eschatological vision involving imminent Rapture or when climate-change skeptics deny the long-term forecasts of environmental science. Trust in a scientific vision of the future, though, has little to do with one’s ability to assess the science itself, something beyond the

reach of most people. Rather, it comes in part from a willing suspension of disbelief in scientific extrapolation.

For scientific jeremiads, the rhetorical challenge is to counter science-fictional scenarios with a set of 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 terms as *concepts*, not metaphors, and the extensive debate about their work has largely taken them at their word, investigating logical flaws in their arguments.¹⁷ But the rhetorical power of the terms functions independently from their logical coherence.

The rhetorical elements 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 their arguments 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 new reality science fiction 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 science fiction, can only be tested by recourse to the sensibilities one uses to judge SF. Is the novum believable? The jeremiad, however, has designs on the reader—it calls on one to accept a science fiction novum as a reason to act in history.

The rhetorical strategies the genre of scientific jeremiads uses 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* (2009), 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” (10). The latter is made up of “scientists and biotechnologists, their entrepreneurial backers and a cheering claque of sci-fi enthusiasts, futurologists and libertarians” (6). His group, by contrast, “sees all too clearly where the train is headed”; his group “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” (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 tautology about being a *friend* of humanity: “No friend of humanity cheers for a posthuman future” (6).

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” (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 do not debate whether these arguments hold, but 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. Students of romanticism have long been aware of what Paul de Man termed the “intentional structure” of the organicist metaphor, which underlay so 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 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” (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 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 much of its power.

Let me turn to the other side, the pro-enhancement books that have glutted the market. The same rhetorical elements can be found in these texts, too. The group of encomia or anticipations of scientific developments are, if anything, more dependent than the jeremiad on the habits and sensibilities cultivated by science fiction. The language of their titles is rich with tropes that evoke a novum: Genetics will enable us to redesign humans, make better people, exploit our wondergenes, reach our inevitable genetic future, assist in radical evolution, and design our babies.¹⁸ The three strategies of performative speech, symbolic oppositions, and organicist metaphors are deployed just as prominently. On the surface, the kinship of anticipations with science fiction would appear to be greater than that of jeremiads, but both nonfiction genres are the cousins, 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*. Both Kass and Fukuyama devote substantial parts of their opening chapters to discussing Huxley's dystopia, and Stock, Mehlman, Garreau, and Green all take time to distinguish what they are advocating from Huxley's vision. 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 science fiction 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 in the Future" (1923), and Silver's imaginings are every bit as speculative. Fukuyama, however, references this future scenario 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* (1895). 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, scientific anticipations 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. They traffic in mundane predictions, 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 (and he had an unusually high record of successes). Both jeremiad and the encomia have their uses, but the latter especially courts the ridicule of time.

In this article, I have attempted to demonstrate that literary approaches to the posthuman have much to contribute to the debate over genetic enhancement. Literary analysis could help prevent policy makers and social commentators from generalizing glibly about cultural attitudes from a sample size consisting of a few decontextualized novels and films. The relationship of science fiction to concepts of the posthuman is only one example of the

many ways literary critics could enrich the discourse around important social issues. Experts in bioethics and medical humanities are generally receptive to literary approaches to the questions they study. It is our own discipline that has been slow to take up the challenge. Literary reflections on the posthuman have much to offer society. It is up to us to bring the analysis of posthumanism to bear on problems with tangible impact on patients, health-care providers, and scientific policy.

Notes

1. From Heinlein's *Methuselah's Children* (1958).
2. The irony is that Green is one of the few bioethicists to discuss SF at any length. He is to be commended for providing thoughtful examinations not only of *Brave New World* but of works by Nancy Kress and Octavia Butler, as well as short comments on Greg Bear, a story by Ursula K. Le Guin, more mainstream works such as *Oryx and Crake*, *Never Let Me Go*, and *The Time Machine*, and the films *Gattaca* and *The Boys from Brazil*. All the same, he thinks that Kress and Butler, his principal examples of SF, are outliers in the genre when the reverse is the case: Disaster scenarios are the outliers.
3. The phrase "more than human" also serves as the title of a recent book advocating biological enhancement, although the author does not think it worthwhile to nod to Theodore Sturgeon. See Ramez Naam's *More Than Human: Embracing the Promise of Biotechnology* (2005).
4. The forgettable 2009 science fiction film *Surrogates*, starring Bruce Willis, makes apparent the connection between "science fictionality" and the predictions in this academic field by intercutting news clips from interviews with noted bioethicists, including Gregory Stock, one of the authors quoted above.
5. Cary Wolfe, one of the few literary critics who has explored this field, accurately notes that the "institutionally powerful forms of bioethics" are "less an ethics per se than a branch of policy studies" (xxvii). I treat the two fields, bioethics and policy studies, in tandem.
6. As was common in the field, most of these works were serialized in pulp magazines, in many cases years before they appeared reworked as novels (or "fix-ups," as the fan phrase had it). *Methuselah's Children*, for example, first appeared as a novel in 1958, even though it had been serialized in John W. Campbell's *Astounding Science Fiction* over three installments in 1941.
7. For an account of social Darwinist themes throughout Heinlein's canon, see Philip E. Smith, "The Evolution of Politics and the Politics of Evolution: Social Darwinism in Heinlein's Fiction" in Joseph D. Olander and Martin Harry Greenberg's *Robert A. Heinlein* (1978). Heinlein's advocacy of free enterprise, his role as an anti-communist Cold Warrior, and his often sexist portrayal of women have been frequently canvassed (see Franklin, David Seed's *American*

Science Fiction and the Cold War: Literature and Film [1999], and Frank H. Tucker's "Major Political and Social Elements in Heinlein's Fiction," also in Olander and Greenberg's text).

8. See Kevles 164–75 and Alexandra Minna Stern's *Eugenic Nation: Faults and Frontiers of Better Breeding in America* (2005), 16–18.

9. Bruce Clarke provides a good reading of Arthur C. Clarke's novel as shaped by a "kind of Anglo-American United Nations wish fulfillment" that portrayed telepathy as "the social communication needed to heal the divisions of a Cold-Warring and decolonizing world," brought down from "the galactic first world to the underdeveloped backwater of Earth on wings of mystic good will alone" (38).

10. Another landmark SF novel from 1953, Bester's *The Demolished Man*, winner of the Hugo Award for that year, also revolves around a minority population in the future that possesses telepathic powers. Although the novel does not explore evolutionary themes or the posthuman, eugenics plays a peripheral role. The Esper Guild's "Eugenic plan" attempts "to bring Extra Sensory Perception to everyone in the world" (18). The closest the novel comes to the major themes explored here is a comic aside: "Those damned mindreaders are supposed to be the greatest advance since Homo sapiens evolved. E for Evolution. Bastards! E for Exploitation!" (8–9).

11. Heinlein's assumption that every cell contained 48 rather than 46 chromosomes reflected an ongoing debate among scientists as late as the 1950s, and a character's remark that "Genetics remained practically at a standstill for a century before ultramicroscopy reached the point where genes could really be seen" (*Beyond* 142) must have seemed plausible a full decade before Rosalind Franklin's X-ray photographs captured the helical structure of DNA.

12. "Surface Tension," the third chapter of the published novel, was written before Watson and Crick's discovery came out, but the only trace of genetics in the 1957 version of the story comes in the "Prologue," which was a piece of the connective tissue added in 1957 to "fix-up" the five separately published stories for release as a novel.

13. The affective appeal of this self-contradictory stance helps explain notorious elements of SF in the period, such as Heinlein's celebrations of group love and shared consciousness (recall grokking in *Stranger in a Strange Land* [1961] or the orgies of *Time Enough for Love* [1973]), side by side with his Cold War paranoia about communist mind control in *The Puppet Masters* (1951) or the hive mind in *Starship Troopers* (1959). Franklin comments on Heinlein's inability "to reconcile this vision of extreme individualism with his belief in social cooperation" (87).

14. See Schwab's "Ethnographies of the Future: Personhood, Agency, and Power in Octavia Butler's *Xenogenesis*," *Accelerating Possession: Global Futures of Property and Personhood*, ed. Gabriele Schwab and Bill Maurer (2006). But also see Molly Wallace's "Reading Octavia Butler's *Xenogenesis* after Seattle" in *Contemporary Literature* 50 (2009): 94–128, who argues that the *Xenogenesis* trilogy deterritorializes identity only to reinscribe genetic essentialism within the bounds of neoliberalism. Her strong reading of the novel testifies to the tenacity

of genetic essentialism as an ideological construct in spite of Butler's posthumanism.

15. Stanley Kubrick's *2001: A Space Odyssey* (1968), cowritten by Arthur C. Clarke, reflects Clarke's roots in the science fiction of the 1950s. The conceit of sudden species change brought to humanity by a superior alien intelligence draws on motifs from *Childhood's End*, while its depiction of the embryonic posthuman in the film's final sequence universalizes evolution's next step rather than emphasizes diversity. The movie *2001* ends up portraying the posthuman in very different terms from the SF that is published in the two decades approaching 2001.

16. *Darwin's Radio* conforms to the paradigm of the contagion narrative described by Priscilla Wald in *Contagious* (2007). Heather Schell discusses the "socially conservative ideas about gender, race, imperialism, and human society" encoded in Bear's novel (806) in "The Sexist Gene: Science Fiction and the Germ Theory of History," *American Literary History* 14.4 (2002): 805–27. Lisa Lynch joins Schell in criticizing Bear's work as a "sociobiological celebration of human development" and sees "[t]he generic collapse between the outbreak thriller and the science-fiction novel" as a sign of how a medical story about containing an epidemic can become "a rallying cry for the arrival of the posthuman" (71, 73) in "'Not a Virus, but an Upgrade': The Ethics of Epidemic Evolution in Greg Bear's *Darwin's Radio*," *Literature and Medicine* 20.1 (2001): 71–93. For my own reading of *Darwin's Radio*, see *Charles Dickens in Cyberspace* (2003).

17. John Harris has presented the most thorough account of what he sees as the inadequacies of Kass and Sandel's arguments concerning human nature and human dignity. See also Steven Pinker's "The Stupidity of Dignity" in the 28 May 2008 issue of *The New Republic*.

18. See Gregory Stock's *Redesigning Humans* (2002), Maxwell J. Mehlman's *Wondergenes* (2003), Joel Garreau's *Radical Evolution* (2004), Ramez Naam's *More Than Human* (2005), John Harris's *Enhancing Evolution* (2007), and Ronald M. Green's *Babies by Design* (2007).

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