

## The End Is Near

by Richard A. Posner

*Oryx and Crake*

by Margaret Atwood

(Doubleday, 367 pp., \$26)

The genre of doom-laden futuristic fiction has its share of classics—such as H.G. Wells's *The Time Machine*, Aldous Huxley's *Brave New World*, and George Orwell's *Nineteen Eighty-Four*—and these works are now joined by Margaret Atwood's splendid novel. Extravaganzas of extrapolation, these novels identify a dominant contemporary trend and explore the ominous consequences of its being allowed to continue unchecked. For Wells, writing in 1895 and mesmerized by Darwinism, the trend was (he mistakenly thought) the polarization of England's social classes. The time traveler journeys 800,000 years into the future and discovers an England occupied by two human species, the Eloi and the Morlocks. The former are the dwarfish, childish, physically and mentally degenerate descendants of the English upper class; the latter are the equally degenerate descendants of the working class. The Morlocks live underground (Wells was struck by the tendency of manual labor, not limited to mining, to move underground) and produce the goods that the Eloi, who have no skills and do no work, need for survival. In exchange, as it were, the Morlocks prey on the Eloi, eating them when they catch them outdoors at night.

For Huxley, writing during the worldwide depression of the 1930s, the great social problem, as he and others believed (again incorrectly), was that technological progress, by enabling greater output to be produced by fewer workers, was making widespread unemployment chronic. Central planning would be needed to bring production and consumption into phase. Education would be part of the plan: it would be designed to boost consumption by inculcating a throwaway mentality (“ending is better than mending”). Technology—helping to solve the problem that it had created—would enable the creation of genetically distinct classes, ranging from high-IQ Alphas to near-moronic Epsilons, each perfectly fitted to a particular economic function, and in this way production would be rationalized.

In the 1940s, the focus of concern shifted to another type of centralization: the extinction of liberty by totalitarian governments. And so we have Orwell's vision of a near future in which Soviet techniques of social control would be perfected and universalized. (Wrong again, happily.) Now comes Atwood predicting the imminent extinction of the human race as we know it. Could she be right where Wells, Huxley, and Orwell were wrong?

In thinking about this question, we should bear in mind the precept of Atwood's teacher Northrop Frye that “poetry can only be made out of other poems; novels out of other novels.” Atwood's literary debts are numerous. Her “plebs” are Orwell's “proles”; the notion of rigid class distinctions based on intelligence rather than heredity is one that she shares with Huxley and Orwell; the technocratic elite who inhabit sealed-off “Compounds” in her novel correspond to the party members in Orwell's. The idea that animal-human hybrids (Atwood's “pigoons,” created at “OrganInc Farms”—a name that neatly capsulizes her vision of the future) acquire human cunning with no diminution of animal savagery comes straight from Wells's *The Island of Dr. Moreau*. The idea that pigs possess a sinister intelligence informs Orwell's *Animal Farm*. And Atwood's protagonist, Jimmy, who after the culminating catastrophe renames himself “Snowman” (as in “Abominable”), is a knockoff of Robinson Crusoe: the title of her last chapter, “Footprint,” is a clue.

There is more. Atwood's villain, Crake, reminds one of the villainous O'Brien in *Nineteen Eighty-Four*, while Jimmy, in his ordinariness and, after he has become Snowman, his physical decrepitude ("He looked down at his body in dismay"), resembles Orwell's hero, Winston Smith. The original title of *Nineteen Eighty-Four* was *The Last Man in Europe*, and Snowman looks to be the last man in the entire world. The idea of social control through pharmaceutical and genetic interventions, prominent in Atwood's novel, is Huxleyan, while Jimmy's tour of the "Watson-Crick Institute," in which grotesque experiments are performed, echoes Gulliver's tour of the Laputa scientific institute.

I do not note these borrowings to scold Atwood (remember Frye's dictum). And I do not subscribe to such criticisms of her book as that Jimmy lacks sufficient intellectual and psychological depth to have moral insight, or that Crake's specicide is insufficiently motivated. Moral understanding should not be confused with intellect, and the psychological springs of world-class villains are unknown. (That is the lesson of Hitler studies.) Crake is a perfectly credible twenty-first-century intellectual psychopath, with his faintly autistic, ascetic hyper-rationalism and his techie-bureaucratic talk, as in, "Let me walk you through a hypothetical scenario," or, "It was an elegant concept, though it still needed some tweaking." One knows men like Crake.

**D**issatisfied with the human race, Crake sets out to destroy it and replace it with one of his own design. (He may have been pushed over the edge by disgust at his inability to master his feelings toward Oryx, the former child prostitute with whom both he and Jimmy fall in love.) Illustrative of the efficiency-enhancing features of this new designer race is the ability to process "caecotrophs." These consist of "semi-digested herbage, discharged through the anus and reswallowed two or three times a week . . . a way of making maximum use of the nutrients at hand. Any objections to the process were purely aesthetic. That was the point, Jimmy had said. Crake said that if so it was a bad one."

There are terrific lesser characters as well, such as Jimmy's father and stepmother and his high school "Life Skills" teacher. It is the psychological verisimilitude of the characters in the novel that makes it seem that it is our world that is being ruined, and not some future world. But Atwood has written satire, not journalism or science, and she must be allowed liberties that are less forgivable in other genres, notably the liberty to exaggerate. The world that *Oryx and Crake* depicts is a recognizable version of today's United States, but it is also a caricature—how much of one is the question. The destruction of the nation's coastal regions (Harvard gone the way of Atlantis), and the horrific daily thunderstorms, and more ("as time went on and the coastal aquifers turned salty and the northern permafrost melted and the vast tundra bubbled with methane, and the drought in the midcontinental plains regions went on and on, and the Asian steppes turned to sand dunes"), exceed most pessimists' estimates of the effects of global warming. Yet even those who doubt many tenets of environmentalism, such as Bjørn Lomborg in his book *The Skeptical Environmentalist*, acknowledge that global warming will mean more rain and, owing to the effects of temperature on water, may endanger our coastal regions.

"ChickieNob" is "a large bulblike object. . . . Out of it came twenty thick fleshy tubes, and at the end of each tube another bulb was growing. . . . Just the breasts, on this one. . . . That's the head in the middle. . . . There's a mouth opening at the top, they dump the nutrients in there. No eyes or beak or anything, they don't need those." This horror is a plausible extrapolation from current genetically modified organisms, as are the pigoons and wolvogs and other animal hybrids in which the novel abounds. Even such creations as the Crakers, the designer race that features such improvements, besides a diet of caecotrophs, as skin impervious to the elements (so Crakers do not need clothes, and perhaps we are to think of them, in their nudity and radical innocence, as a parodic version of Adam and Eve), and a regular rutting season to eliminate romantic entan-

gements such as the Crake-Oryx-Jimmy triangle, and a horror of violence, are on the scientific horizon—as are the geekocracy (my word but Atwood’s concept) in its gated Compounds; the complete destruction of privacy by the electronic media (Crake and Jimmy frequent such websites as “nitee-nite.com,” where one watches people commit suicide); and the permeation of the atmosphere not only by pollutants but also by new germs, including human-engineered ones.

The world of *Oryx and Crake* is even more ghastly than that of *Nineteen Eighty-Four*. Yet what is particularly interesting in a comparison of the two novels is how Atwood has turned Orwell on his head. As in a number of recent science-fiction novels and movies (Atwood bristles at being called a “science fiction” writer, because the term, like “detective fiction,” connotes a lack of literary distinction), her concern is with the consequences not of the excessive centralization of power but of its excessive decentralization. That is the difference between a Cold War dystopia such as *Nineteen Eighty-Four* and a post-Cold War dystopia. The Soviet Union’s collapse is merely the most dramatic of the changes that have led to our current international system, with its proliferation of small nations, and its weakened governments and alliances, and consequent reductions in the efficacy of government regulation both national and international, and concomitant increases in the autonomy of markets, many of them global in their scope or effects. These interlocking developments (partially offset, to be sure, by the growth of the European Union) have been furthered by technological advances, particularly in the production and the dissemination of information (in the broadest sense, including entertainment) and in the creation of new biological entities. And the rate of scientific and technological progress in this new brave new world is accelerating.

The combination of international capitalist competition unshackled by governments with rapid technological progress is a libertarian’s dream. Yet realists understand that there is a dark side. Individuals, corporations, and nations tend out of a natural selfishness not to internalize (that is, to take into account in their decisions) the full costs that their activities impose on people with whom they have no actual or potential contractual relations. A polluting enterprise, even if it is untrammelled by law or regulation, will consider the effects of its pollution on its workers, whom it may have to compensate in the form of a higher wage; but it is unlikely to consider the effects on society as a whole, let alone on the inhabitants of foreign nations or the members of remote future generations. That is the rationale for imposing legal and other regulatory limits on pollution and other “negative externalities,” such as methods of computer encryption that might insulate criminal conspiracies from surveillance by law enforcement authorities; or, conversely, methods of surveillance that enable corporations and police to manipulate and intimidate the population; or experiments that could inflict cataclysmic harm.

Free markets have many good effects, and most of the attacks against them, and thus against “capitalism,” are wide of the mark—but the absence of an international environmental protection agency and other global regulatory mechanisms leaves unsolved the problem of negative externalities that spill over national borders. The dangers are increased by the fact, paradoxical as it may seem, that technological advances can outrun scientific knowledge. We can build accelerators that cause particle collisions at greater and greater speeds, but according to the physicist Sir Martin Rees, Britain’s astronomer royal, in his new book, *Our Final Hour*, the physics of subatomic particles is not so well understood that the following end-of-the-world scenario can be dismissed as total fantasy. Very high energy accelerators (higher energy than what we have today, but possibly feasible in the not-too-remote future) might conceivably cause quarks, the building blocks of atoms, to “reassemble themselves into a very compressed object called a strangelet. . . . The strangelet could, by contagion, convert anything else it encountered into a strange new form of matter. . . . A hypothetical strangelet disaster could transform the entire planet Earth into an inert hyperdense sphere about one hundred metres across.”

Rees considers this “hypothetical scenario” exceedingly unlikely, but he points out that even a probability of one in a billion is not wholly negligible when the result, should the improbable materialize, would be the destruction of the world.

An economist would be inclined to add that even if the expected cost of a catastrophe is slight because the probability of the catastrophe (calamitous as it would be if it occurred) is minuscule, that slight cost might still outweigh the expected benefits of the project that created the danger, for they, too, might be slight. The benefits of more-powerful particle accelerators, minus the considerable costs in construction and in scientific manpower, may be small or even negative. (Or they may be great, especially if such accelerators increased our knowledge of physics to the point of enabling us to ward off other extinction events, such as a collision with an asteroid.) But no international institution is empowered to compel a cost-benefit analysis of such projects, and since they have potential military applications, it will be difficult to control them by treaty.

Rees, who is no crank (the title of the original British edition of his book was a less alarmist *Our Final Century*), also worries about the potential effects of nanomachines. These tiny devices—their size is measured in billionths of a meter—can in principle, and soon perhaps in practice, be engineered to resemble living cells, and, as Rees explains, conceivably could be “designed to be more omnivorous than any bacterium, perhaps even able to consume all organic materials. Metabolising efficiently, and utilising solar energy, they could then proliferate uncontrollably, and not reach the Malthusian limit until they had consumed all life.” Also in the offing are robots with human and eventually, perhaps, greater than human intelligence. Human beings may turn out to be the twenty-first century’s chimpanzees.

A more modest version of Rees’s strangelet doomsday scenario, yet still a frightening portent, concerns the AIDS drug ritonavir (trade name Norvir). Two years after Abbott Laboratories began commercial production of the drug in 1996, a previously unknown—and, characteristically, more stable—polymorph (that is, a different crystalline form of the drug) appeared in Abbott’s Illinois plant, and immediately the old form began converting to the new until the plant’s entire inventory had converted. This precipitated a market crisis, because the new form did not have the therapeutic properties of the old one. Fortunately (or so it seemed), the new form had not yet been observed in the plant in Italy where bulk ritonavir was produced. But shortly after a visit to that plant by Abbott scientists from Illinois, the new form showed up there too, probably as a result of the “seeding” of the plant by minute crystals that had adhered to the scientists’ clothing. As a result, the plant could no longer produce the old form. (The analogy of both ritonavir and Rees’s strangelet doomsday scenario to “ice-nine” in Kurt Vonnegut’s *Cat’s Cradle* is irresistible.) Such conversions are becoming more common, apparently because the conversion from one crystalline form to another is impeded by impurities—and impurities in the manufacture of chemicals are becoming rarer because of advances in the technology of manufacturing.

Abbott managed to create a new crystalline polymorph that possessed the therapeutic properties of the form which had disappeared through conversion. Yet the costs of eliminating the hazards thrown up by modern technology can be staggering. According to Lomborg, the costs of arresting global warming could be many more trillions of dollars than the costs of global warming itself. This is in contrast to the modest costs of substitution for the aerosols that threatened to destroy the ozone layer in the stratosphere. That substitution is the success story of international efforts to limit environmental hazards. But according to Rees, “it was a technological accident and quirk of chemistry that the commercial coolant adopted in the 1930s was based on chlorine. Had bromine been used instead, the atmospheric effects would have been more drastic and longer-lasting.”

Lomborg is Greenpeace’s *bête noire*, an “anti-gloom environmental propagandist,” in Rees’s words. Yet even Lomborg accepts an estimate of the social costs of global

warming (discounted to present value) of \$5 trillion. (William Nordhaus, the leading economic expert on global warming, estimates those costs at “only” \$4 trillion.) So what Lomborg is really pointing to is an absence of institutional controls that has let global warming get out of hand. That is no surprise; the obstacles to the creation and the enforcement of such controls are formidable. They include scientific uncertainty about the unintended physical consequences of new technologies and also about their social consequences (who foresaw that labor-saving household appliances and advances in contraceptive technology would transform the social role of women, or that modern technologies of food preparation, transportation, and work would unite to produce a nation of fatties?); the scientific illiteracy of most officials and of the population at large; and the fact that many dangerous technological innovations have a considerable upside that make them difficult to block, and the related fact that international competition limits the power of any nation, even the United States, to regulate technology (the limits our government has imposed on stem-cell research are causing that research to migrate to Britain). Other factors include the steep discounting of future consequences by politicians because of limited terms of office; the tendency for technologies having military applications to set off arms races; the continuing acceleration of scientific and technological progress; and the fact that certain particularly dangerous activities, such as the production of new biological entities, require little investment and so are feasible projects for terrorist groups and even individuals, rather than only for nations, which are more easily deterred. Optimists will point out that science and technology have conferred more benefits on humanity than costs, and that is indeed true; but the balance may need to be re-struck now that human extinction is becoming a feasible scientific project.

The helplessness of government to control the manifold and terrifying threats posed by today’s and tomorrow’s technology is an implicit theme of *Oryx and Crake*. Government is almost invisible in the novel except as an extension of business. There are no courts or regulatory bodies, and even the omnipresent security organ, the “Corp[orate]-Se[curity]Corps,” seems not to be a public agency. The Greens, as a potential counterweight to irresponsible capitalist enterprise, filling a gap created by the attenuation of government, are depicted as hopeless. In futile protest against a new genetically modified coffee (“Happicuppa”) that is putting small coffee growers out of business, “a Boston Coffee Party sprang up.”

There was a staged media event, boring because there was no violence—only a bunch of balding guys with retro tattoos or white patches where they’d been taken off, and severe-looking baggy-boobed women, and quite a few overweight or spindly members of marginal, earnest religious groups, in T-shirts with smiley-faced angels flying with birds or Jesus holding hands with a peasant or God Is Green on the front. They were filmed dumping Happicuppa products into the harbour, but none of the boxes sank. So there was the Happicuppa logo, lots of copies of it, bobbing around on the screen. It could have been a commercial.

So Atwood is not an orthodox liberal. The herbivorous Crakers are a parody of the liberal conception of unspoiled human nature; the vegan who burns Jimmy’s imitation-leather shoes is one of the targets of her satire; and the atheist intellectual is put on a par with the soulless corporation as a menace to humanity. Social conservatives will relish Atwood’s association of pornography (in which the future is awash) with moral decay. Yet her focus remains steadily on extinction, not on decay; nor is it clear that Crake’s moral deformity is a product of his culture. There have always been Crakes; only now they are much more dangerous, and there are more of them. And the more scientific

brainpower that is deployed to fight them, the more scientists there will be who, like Crake, know how to use technology to commit terrorist acts of appalling magnitude.

Atwood probably is right to treat biological terrorism, even of the one-man variety illustrated by Crake's concealing an Ebola-like pathogen in a popular new happiness pill, as a greater threat to humanity than the continued proliferation of nuclear weapons. Nevil Shute was wrong in *On the Beach*: even an all-out nuclear war, though it would kill millions and even hundreds of millions of people, would be unlikely to extinguish the race. But a synthesized or genetically modified germ just might. True, Atwood slights the fact that the more lethal a germ is, the more likely it is to kill its host before the host infects anyone else, while the slower it is to act, the more time there is to find an antidote. Yet one can imagine a new, lethal virus that would be more contagious than HIV (because airborne), but that like HIV would have a long infectious incubation period (the period during which a carrier, though still asymptomatic, can infect others). In such circumstances, the entire human population might be infected before the new virus was discovered, let alone an antidote or a cure developed. One might think that if such viruses were possible, evolution would have produced them already; but evolution by means of natural selection has design limitations—it has yet to produce an animal with wheels, for example—that science can overcome. Reducing the risk of biological terrorism to an acceptable level may require the abolition of all privacy rights and most other civil liberties as well—another example of the very high cost of controlling the hazardous side effects of modern technology.

I have said that our current era of global free-market competition might seem a libertarian's dream. But libertarians can be realists, too, and so here is an assessment by David D. Friedman, a prominent libertarian economist who began his professional life as a physicist:

The next century or so is radically uncertain, with plausible outcomes ranging from the extermination of our species to the conversion of humans to more or less immortal near-gods. But it isn't clear that increasing "regulation" makes the adverse outcomes less likely or the good outcomes more. We don't have a decent mechanism for centralized control on anything like the necessary scale. What is true is that our decentralized mechanisms, which work well on a large scale, depend on a world where there is some workable definition of property rights in which the actions that a person takes with his property have only slight external effects, beyond those that can be handled by contract. Technological progress might mean that no such definition exists—in which case we are left with zero workable solutions to the coordination problem.

So Margaret Atwood's pessimism is not a mere literary flourish. It probably will not be taken seriously, though—nor, for that matter, will Martin Rees's bleak book, despite its lucidity and its author's imposing credentials—because of the terrible record of prophets of doom, both fictional and ostensibly factual. The former can be "saved" by treating future-catastrophe fiction as satire aimed at the author's own society, with the future setting serving as a literary convention, or by treating it as warning rather than as sober prediction. Yet it is evident that Wells, Huxley, Orwell, and others in the literary tradition had a very imperfect handle on the future, and Atwood's gift of prophecy may be no better. The survival of their novels and hers may depend on their literary merit rather than on their social insight.

The abysmal predictive records of "serious" scientific doomsayers, such as Paul Ehrlich, the Stanford biologist who at the time of the first "Earth Day" in 1970 made a rash of quickly falsified predictions concerning worldwide famine, lethal water pollution, human life expectancy, and even sport fishing, are a problem of a different order.

Their incessant crying wolf has made it difficult to convince people to take seriously the threat that the uncontrolled progress of technology poses to human civilization and even survival. Yet it is not a negligible threat, as Atwood's novel can help us feel. Science and technology are moving rapidly to a point at which nations, gangs, and even individuals will be able to wield destructive forces of unprecedented lethality, and innocent activities will have equally lethal if unintended potential, all in a context of international anarchy.

The mistake of Atwood's novelistic predecessors (and of Ehrlich, too) was to ignore the fact that problems beget solutions. Some harmful trends are self-correcting; others are stoppable by determined collective action. But no longer can such observations be of much comfort. It is increasingly difficult to imagine feasible solutions to the problems created by the scientific-technological juggernaut—the problems dramatized by *Oryx and Crake*. We must not forget that it is in the nature of prophecies of doom that all but the last are falsified.

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