Ben Bova

The Role of Science Fiction

The year 1972 was marked by publication of a controversial book, *The Limits to Growth*. This study of the world's future, done by a team of MIT scientists with the aid of computer "models" of the future of our society, was sponsored by an international organization called The Club of Rome. The study forecast a planetwide disaster unless humankind sharply limits its population growth and consumption of natural resources.

The MIT group worked out a technique for simulating certain aspects of the world's social and economic behavior, and the interrelationships among them. Thus the computer model could show how population grows when the death rate is kept low and the birthrate is unchecked, how consumption of natural resources is affected by increased population, how pollution stems from industrial output, etcetera. Putting all these factors together, the study showed that total disaster is waiting for humankind within a century.

According to the computer's model of the world, if we don't change our present style of growth-oriented society, and change it drastically, we will soon use up all the available natural resources, and produce so much pollution and overpopulation that the entire world society

will collapse. Resources will run out. Food and industrial production will tumble. The death rate will climb out of sight. Mass starvation, war, pestilence—all shown on clear, inexorable-looking graphs, straight from the computer's print-out.

The graphs show that the curves representing population, industrial production, farm output, and natural resources all peak early in the twenty-first century, then collapse. Superdisaster. And it's all very real, if you grant a few critical assumptions.

The MIT study evoked immediate howls of protest and delight. Some said the book was a mathematically accurate forecast of a doom that we must work hard to avert. Others said it was a grab bag of poor assumptions and unwarranted straight-line extrapolations. As of this moment, the debate rages on. And the clock is ticking.

Most people were caught by surprise when the book came out. Many refused to believe that disaster is possible, probable, inevitable—if we don't change our mode of running Spaceship Earth. But science fiction people were neither surprised nor outraged. The study was really old news to them. They'd been making their own "models" of tomorrow and testing them all their lives.

(Incidentally, several science fictionists—including Arthur C. Clarke—immediately pointed out that the MIT scientists automatically assumed that the earth is a closed system. The MIT team didn't consider that humankind now has the ability to draw natural resources from elsewhere in the solar system. This is perhaps the major flaw in the MIT study.)

What the scientists attempted with their computer model is very much like the thing that science fiction writers and readers have been doing for decades (or centuries, if you want to define the works of earlier writers as science fiction). Instead of using a computer to "model" a future world society, science fiction writers have used their human imaginations. This gives the writers some enormous advantages.

One of the advantages is flexibility.

Science fiction writers are not in the business of predicting *the* future. They do something much more important. They try

to show the many possible futures that lie open to us. If the history of the human race can be thought of as an enormous migration through time, with thousands of millions of people wandering through the centuries, then the writers of science fiction are the scouts, the explorers, the adventurers who send back stories that warn of the harsh desert up ahead, or tales that dazzle us with reports of the beautiful mountains that lie just over the horizon.

For there is not simply *a* future, a time to come that's preordained and inexorable. Our future is built, bit by bit, minute by minute, by the actions of human beings. One vital role of science fiction is to show what kinds of future might result from certain kinds of human actions.

Have you ever stood on a flat, sandy beach, at the edge of the water, and watched the little wavelets that play at your feet? After the breakers have dumped their energy and the water rushes as far up the beach as it can, there's a crisscross pattern of wavelets that mottle the beach. If the sun's at the proper angle, you can clearly see what physicists call *interference patterns*. The wavelets interact with one another, sometimes adding together to form a stronger wave, sometimes canceling each other to form a blank spot in the pattern.

The myriads of ideas that parade across the pages of science fiction magazines and books each month form such a pattern in the minds of readers and writers. Some ideas get reinforced, added to, strengthened by repetition and enlargement. Other ideas get canceled, fall out of favor, are found lacking in one way or another. Thus, for more than a generation now, science fiction people have been worrying about problems such as pollution, nuclear warfare, overpopulation, genetic manipulation, runaway technology, thought control, and other threats that burst on the general public as shocking surprises.

Other potential problems have been examined and dropped. Today there are few stories about invisible men seized by dreams of power. Or plagues of "space germs" infecting Earth. When Michael Crichton's *Andromeda Strain* became a vastly popular book and movie, most science fiction people groaned. "But it's an old idea!" they chorused, meaning that it's no longer

a valid idea: the problem does not and probably will not exist. But this old idea was shatteringly new and exciting to the general public.

To communicate the ideas, the fears and hopes, the shape and feel of all the infinite possible futures, science fiction writers lean heavily on another of their advantages: the art of fiction.

For while a scientist's job has largely ended when he's reduced his data to tabular or graph form, the work of a science fiction writer is just beginning. His task is to convey the human story: the scientific basis for the possible future of his story is merely the background. Perhaps "merely" is too limiting a word. Much of science fiction consists of precious little except the background, the basic idea, the gimmick. But the best of science fiction, the stories that make a lasting impact on generations of readers, are stories about *people.* The people may be nonhuman. They may be robots or other types of machines. But they will be people, in the sense that human readers can feel for them, share their joys and sorrows, their dangers and their ultimate successes.

The art of fiction has not changed much since prehistoric times, mainly because man's nervous system and the culture he's built out of it have not basically changed.

From the earliest Biblical times, through Homer to Shakespeare, Goethe, and right down to today's commercial fiction industry, the formula for telling a powerful story has remained the same: create a strong character, a person of great strengths, capable of deep emotions and decisive action. Give him a weakness. Set him in conflict with another powerful character—or perhaps with nature. Let this exterior conflict be the mirror of the protagonist's own interior conflict, the clash of his desires, his own strength against his own weakness. And there you have a story. Whether it's Abraham offering his only son to God, or Paris bringing ruin to Troy over a woman, or Hamlet and Claudius playing their deadly game, Faust seeking the world's knowledge and power, Gully Foyle, D. D. Harriman, Montag the Fireman, Michael Valentine Smith, Muad'Dib—the stories that stand out in the minds of the readers are those that are made incandescent by characters—people—who are unforgettable.

To show other worlds, to describe possible future societies and the problems lurking ahead, is not enough. The writer of science fiction *must show how these worlds and these futures affect human beings.* And something much more important: *he must show how human beings can and do literally create these future worlds.* For our future is largely in our own hands. It doesn't come blindly rolling out of the heavens; it is the joint product of the actions of billions of human beings. This is a point that's easily forgotten in the rush of headlines and the hectic badgering of everyday life. But it's a point that science fiction makes constantly: the future belongs to us—whatever it is. We make it, our actions shape tomorrow. We have the brains and guts to build paradise (or at least try). Tragedy is when we fail, and the greatest crime of all is when we fail even to try.

Thus science fiction stands as a bridge between science and art, between the engineers of technology and the poets of humanity. Never has such a bridge been more desperately needed.

Writing in the British journal *New Scientist,* the famed poet and historian Robert Graves said in 1972, "Technology is now warring openly against the crafts, and science covertly against poetry."

What Graves is expressing is the fear that many people have: technology has already allowed machines to replace human muscle power; now it seems that machines such as electronic computers might replace human brainpower. And he goes even further, pointing a shaking finger at science as the wellspring of technology, and criticizing science on the mystical grounds that science works only in our usual four dimensions of space/time, while truly human endeavors such as poetry have a power that scientists can't recognize "because, at its most intense [poetry] works in the Fifth Dimension, independent of time."

Graves explains that poetry is usually the product of intuitive thinking, and grants that some mathematical theories have also sprung from intuition. Then he says, "Yet scientists would dismiss a similar process . . . as 'illogical.'"

Apparently Graves sees scientists as a sober, plodding phalanx of soulless thinking machines, never making a step that hasn't been carefully thought out in advance. He should try working with a few scientists, or even reading James D. Watson's *The Double Helix*.

As a historian, Graves should be aware that James Clerk Maxwell's brilliant insight about electromagnetism—the guess that visible light is only one small slice of the spectrum of electromagnetic energy, a guess that forms the basis for electronics technology—was an intuitive leap into the unknown. Maxwell had precious little evidence to back up his guess. The evidence came later. Max Planck's original concept of the quantum theory was also mainly intuition. The list of wild jumps of intuition made by these supposedly stolid, humorless scientists is long indeed.

Scientists are human beings! They are just as human, intuitive, and emotional as anyone else. But most people don't realize this. They don't know scientists, any more than they know much about science.

C. P. Snow pointed out two decades ago that there is a gap between the Two Cultures, and Graves's remarks show that the gap is widening into a painful chasm. Graves is a scholar who should know better. He's justly renowned for his work in ancient mythology, where he's combined his gifts of poetry and historical research in a truly original and beautiful way.

But he doesn't seem to understand that scientists do precisely the same thing. Because he doesn't understand scientists.

Since the prehistoric days of tribal shamans, most people have held a highly ambivalent attitude toward the medicine man-astrologer-wizard-scientist. On the one hand they envied his abilities and sought to use his power for their own gain. On the other hand, they feared his power, hated his seeming superiority, and knew damned well that he was in league with dark forces of evil.

There has been little change in this double-edged attitude over the centuries. Today most people still tend to hold scientists in awe. After all, scientists have brought us nuclear weapons, modern medicines, space flight, and underarm deodorants.

Yet at the same time, we see scientists derided as fuzzy-brained eggheads or as coldly ruthless, emotionless makers of monsters. Scientists are a minority group, and like most minorities they're largely hidden from the public's sight, tucked away in ghettos —laboratories, campuses, field sites out in the desert or on Pacific atolls.

Before the public can understand and appreciate what science can and cannot do, the people must get to see and understand the scientists themselves. Get to know their work, their aims, their dreams, and their fears.

A possible answer to this problem of humanizing science and scientists comes from the field in which Graves made his major contribution: mythology.

Joseph Campbell, professor of literature at Sarah Lawrence College, has spent a good deal of his life studying humankind's mythology and writing books on the subject, such as the four-volume *The Masks of God*, and *Hero with a Thousand Faces*. He has pointed out that modern man has no real mythology to turn to. The old myths are dead, and no new mythology has arisen to take their place.

And man needs a mythology, Campbell insists, to give a sort of emotional meaning and stability to the world in which he lives. Myths are a sort of codification on an emotional level of man's attitudes toward life, death, and the whole vast and sometimes frightening universe.

An example. Almost every primitive culture has a Prometheus myth. In our Western culture, the Greek version is the one most quoted. Prometheus was a demigod who saw man as a weak, starving, freezing creature, barely able to survive among the animals of the fields and woods. Taking pity on man, Prometheus stole fire from the heavens and gave it to man, at the cost of a horrible punishment to himself. But man, with fire, became master of the Earth and even a challenge to the gods.

A typical myth, fantastic in detail yet absolutely correct in spirit. One of man's early ancestors "discovered" fire about half a million years ago, according to anthropological evidence. Most likely these primitive *Homo erectus* creatures saw lightning turn shrubbery into flame; hence the legend of the gift

from the heavens. Before fire, our ancestors were merely another marginal anthropoid, most of whom died out. With fire, we've become the dominant species on this planet.

The Prometheus myth "explains" this titanic event in terms that primitive people can understand and accept. The myth gives an emotional underpinning to the bald facts, ties reality into an all-encompassing structure that explains both the known and the incomprehensible parts of man's experience.

Much of today's emotion-charged, slightly irrational urge toward astrology and the occult is really a groping for a new mythology, a mythology that can explain the modern world on a gut level to people who are frightened that they're too small and weak to cope with this universe.

Joseph Campbell's work has shown that there are at least four major functions that any mythology must accomplish.

First: a mythology must induce a feeling of awe and majesty in people. This is what science fictionists call "a sense of wonder."

Second: a mythology must define and uphold a system of the universe, a pattern of self-consistent explanation for both the known and incomprehensible parts of man's existence. A modern mythology would have a ready-made system of the universe in the continuously expanding body of knowledge that we call science.

Third: a mythology must usually support the social establishment. For example, what we today call Greek mythology apparently originated with the Achaean conquerors of the earlier Mycenaean civilization. Zeus was a barbarian sky god who conquered the local deities of the matriarchal Mycenaean agricultural cities. Most of the lovely legends about Zeus's romantic entanglements with local goddesses are explanations of the barbarian, patriarchal people overwhelming the farmers' matriarchies.

Fourth: a mythology must serve as an emotional crutch to help the individual member of society through the inevitable crises of life, such as the transition from childhood into adulthood, the adjustments of the individual to his society, the inescapable prospect of death.

Science fiction, when it's at its very best, serves the functions of a modern mythology.

Certainly science fiction tries to induce a sense of wonder about the physical universe and man's own interior private universe. Science fiction depends heavily on known scientific understanding as the basic underpinning of a universal order. Science fiction does not tend to support a given political establishment, but on a deeper level it almost invariably backs the basic tenet of Western civilization: that is, the concept that the individual man is worth more than the organization—whatever it may be—and that nothing is more important than human freedom.

Whether or not science fiction helps people through emotional crises is more difficult to tell, and probably the only remaining test to the genre's claim to mythological stature. It is interesting that science fiction has a huge readership among the young, the adolescents who are trying to figure out their own individual places in the universe. And how many science fiction stories about superheroes and time travel and interstellar flights are really an attempt to deny the inevitability of death?

On this emotional level, science fiction can—and does—serve the functions of mythology. On a more cerebral level, science fiction helps to explain what science and scientists are all about to the non-scientists. It is no accident that several hundred universities and public schools are now offering science fiction courses and discovering that these classes are a meeting ground for the scientist-engineers and the humanists. Science *and* fiction. Reason *and* emotion.

Science fiction can also blend reason with emotion in another way: to show the true beauty and grandeur of the universe, whether it's a galaxy full of stars or a drop of water teeming with delicate, invisible life.

How many young students have been "turned on" to science by reading science fiction? Most of the men who have walked on the Moon's surface trace their careers back to early readings in science fiction. For, in addition to examining the problems of the future, science fiction opens the door to the widest of all possible worlds. The bone chess cities of Ray Bradbury's Mars,

the galaxy-spanning adventures of E. E. Smith, the quietly extra-ordinary pastorals that Zenna Henderson writes, Asimov's robots, Dickson's droll aliens—the canvas available to science fictionists is as wide as the universe and as long as time itself. And by showing this marvelous, varied, puzzling, colorful universe—and humanity's role in it—science fiction stories give their readers the kind of excitement that simply does not exist elsewhere.

And there's more. By showing the wonders of the physical universe, science fiction also tends to show the beauty of this system of thought that is called science.

The essence of the scientific attitude is that the human mind can succeed in understanding the universe. By taking thought, men can move mountains—and have. In this sense, science is an utterly humanistic pursuit, the glorification of human intellect over the puzzling, chaotic, and often frightening darkness of ignorance.

Much of science fiction celebrates this spirit. Although there are plenty of science fiction stories that warn of the dangers of science and technology—the Frankenstein, dystopia stories—there are even more that look to science and technology for the leverage by which human beings can move the world. Even in the dystopia stories, where the basic message is usually, "There are some things that man was not meant to know, Doctor," there is still an aura of striving, an attempt to achieve greatness. Very few science fiction stories picture humanity as a passive species, allowing the tidal forces of nature to flow unperturbed. The heroes of science fiction stories—the gods of the new mythology—struggle manfully against the darkness, whether it's geological doom for the whole planet or the evil of grasping politicians. They may not always win, these Kimball Kinnisons and Charlie Gordons and James Retiefs. But they always *try*.

This attitude may stem from science fiction's long ghetto existence in the pulp magazines. But it is very much the same attitude that motivates scientists. As Einstein once said, when struggling with a particularly difficult problem in theoretical physics, "God may be subtle, but He isn't perverse." The problem may be tough, unsolvable even; but men still try, through the application of human thought.

That's what is behind this elusive quality that science fictionists call "the sense of wonder." When a Larry Niven hero detours his spaceship so that he can take a look at the complex beauty of the double star Beta Lyrae, when James Blish creates a detailed and marvelous world of intelligent creatures of microscopic size whose world is a tiny pond, when A. E. van Vogt's time traveler swings across the aeons to trigger the creation of the universe—the sense of wonder inspired in the reader is twofold. First is the sheer stupendous audacity of the writer in attempting to create such exciting settings, and getting away with it! But at a deeper, perhaps unconscious, level is the thrill of realizing that the human mind can reach this far, can encompass such ideas, can both produce and appreciate such beauty.

Understanding and appreciation: two more words that help define the role of science fiction.

But perhaps the most important aspect of science fiction's role in the modern world is summed up in a single word: *change*.

After all, science fiction is the literature of change. Each and every story preaches from the same gospel: tomorrow will be different from today, violently different perhaps.

For aeons, humankind accepted and expected that tomorrow would be very much the same as today. Change was something to worry over, to consult priests and oracles about, to fear and dread. Today we talk about "future shock" and long for the Good Old Days when everything was known and in its proper place.

Science fiction very clearly shows that changes—whether good or bad—are an inherent part of the universe. Resistance to change is an archaic, and nowadays dangerous, habit of thought. The world will change. It is changing constantly. Humanity's most fruitful course of action is to determine how to shape these changes, how to influence them and produce an environment where the changes that occur are those we want.

Again, in this attitude, science fiction mirrors science itself. Lewis M. Branscomb, former director of the National Bureau of Standards, has said:

Technology has brought us changes, most of which we should welcome, rather than reject. Wealth is the least important of these changes. Of greater importance is change itself. Those young humanists who think themselves revolutionaries are nothing compared to technology.

Perhaps this is the ultimate role of science fiction: to act as an interpreter of science to humanity. This is a two-edged weapon, of course. It is necessary to warn as well as evangelize. Science can kill as well as create; technology can deaden the human spirit or lift it to the farthermost corners of our imaginations. Only knowledgeable people can wisely decide how to use science and technology for humankind's benefit. In the end, this is the ultimate role of all art: to show ourselves to ourselves, to help us to understand our own humanity.

Science fiction, with its tremendous world view, with all of time and space to play with, gives its adherents a view that spans galaxies and aeons, a breadth of vision that exposes provincialism and prejudice for the petty concepts that they are This is the world view that a modern mythology must have

And this is what makes science fiction so much fun.

Ben Bova

Ben Bova is editor of *Analog Science Fiction-Science Fact* magazine, the most widely read and influential science fiction magazine in the world. He succeeded the late John W. Campbell, Jr., in this post in 1971.

A prolific writer of science fiction and science fact himself, Bova has also been a working newspaperman, an aerospace executive, and a writer of teaching films. As Manager of Marketing for Avco Everett Research Laboratory, in Massachusetts, he has worked with leading scientists in advanced research fields such as high-power lasers, magnetohydrodynamics (MHD), plasma physics, and artificial hearts. Prior to joining Avco, he wrote motion-picture scripts for the Physical Sciences Study Committee, working with the MIT Physics Department and Nobel Laureates from many universities. Earlier, he was a technical editor on Project VANGUARD with the Martin Co. in Baltimore. He also worked on several newspapers and magazines in the Philadelphia area.

Bova has lectured on topics ranging from the history of science fiction to the future of America's cities. His audiences have ranged from junior high students to the New York Academy of Sciences. He was born in Philadelphia, where he attended Temple University and received a degree in journalism.

His short stories and science articles have appeared in all the major science fiction magazines, as well as the *Smithsonian Magazine*, the *IEEE Spectrum*, and many other technical journals. His book, *The Fourth State of Matter* was honored as one of the top one hundred science books of the year, in 1971, by the American Library Association. *Starflight and Other Improbabilities* was selected as a Junior Literary Guild book in 1973.

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Frederik Pohl

The Publishing of Science Fiction

Although science fiction exists in many forms—film, television, radio, the graphic arts, and the think tanks—and, in fact, one writer defines *science fiction* as a method of looking at the world, still when most of us use the term science fiction we mean to describe some story that, in some form or another, we have read.

In order for a story to be read by any sizable number of people, it has to be published.

The basic fact that one must realize about the publishing business is that it is a business. It happens to be a business that is devoted to the preservation and circulation of an art form, namely writing. Nevertheless publishing itself is not an art, and like every other business it is basically concerned with earning a profit. There are exceptions. Some kinds of publishing companies are subsidized (university presses, denominational presses, and the like), and a few are run as hobbies—most of these latter are small, although from time to time the odd Texas oil millionaire will buy himself a book firm or a magazine to get rid of some of his surplus cash. But by and large publishers who do not show a profit do not survive. Once one gets this fact firmly in mind, a lot of questions that