Alan E. Nourse

Science Fiction and Man's Adaptation to Change

More than at any other time in history we are living today in an age of furious and bewildering change. Awareness of this fact, with all its disorganizing implications, is thrust upon us daily from all sides. Change permeates every aspect of our lives. In less than a single century we have moved from horse-and-buggy travel to supersonic transports and interplanetary vehicles. Simple bullets and limited battlefields have given way to hydrogen bombs and genocidal warfare. Our insular and agrarian society is rapidly vanishing, swept away by a burgeoning technology that spans oceans and continents. Our political institutions are in turmoil, our social values are shifting radically, and our ethical standards are under continuing attack. The environment of our planet is changing so rapidly that our very existence is threatened. Serious men are seriously questioning our ability as a race to survive at all for very long; others question whether we deserve to survive, or even want to, considering the fearsome nature of the future world we may have to endure. Still others, more optimistic (or more stubborn), search diligently for ways to surmount the problems of change which seem increasingly insurmountable with every passing year.

We know that much of this relentlessly accelerating change is rooted in the vast scientific and technological revolution that began three centuries ago and is still expanding today in exponential progression. We also know that different peoples have suffered differing impacts. In the underdeveloped nations today, change is suddenly uprooting whole societies and hurling millions of people overnight into an alien world they cannot begin to comprehend, much less adapt to. In such areas it has become the function of governments, for better or for worse, to force adaptation upon whole populations, and if the results have often been grisly, the need has been desperate. In our Western world the impact has been less catastrophic. For decades and centuries the winds of change have been accelerating slowly enough that orderly adaptation has been possible—up to a point. But now even here our capacity to adapt is being outpaced. We no longer have time for a slow, evolutionary assimilation of change into our daily lives. Multitudes of people are scrambling ever more frantically to find some kind of foothold, some place to stand, as they try to deal with a changing world which they can neither control nor comprehend. The popular term "future shock" is singularly appropriate: we are staggering beneath a rain of blows, both physical and emotional, as the juggernaut of technology grinds forward ever faster.

There are two ways that man can respond to the change that is thrust upon him: he can resist it, or he can try to adapt to it. Throughout history there have always been some who have found change to be challenging and exhilarating. These people, stimulated by the challenge and regarding change as beneficial, or at the very least inevitable, have searched for ways to adapt to it—that is, to alter their lives in such a way as to accommodate or even utilize the changes that have occurred. The vast majority of people, however, have always found change to be frightening, bewildering, or demoralizing. These people, typifying the forces of reaction or conservatism within the society, have sought to ignore, prevent, or control the forces of change

in order to maintain a status quo. In times when change was occurring in a slow and orderly or evolutionary fashion, these opposing forces of adaptation and resistance were more or less evenly balanced, and adaptation was comparatively easy. People had time to assimilate the changes, time to adjust themselves, time to work the implications of change into their lives, and then gently alter the way they were living to conform to the demands of change. Often the same individuals met change with both adaptation and resistance: they would adapt to change a step at a time, resisting further change until earlier change had been fully assimilated and then moving a small step further to assimilate the next change.

We can see this type of successful adaptation to change exemplified in the manner in which the automobile, with its internal combustion engine, edged out the horse and carriage as a primary means of transportation from place to place—an evolutionary process that took place with comparatively little dislocation over a period of decades in the advanced industrial societies, and which is still proceeding today in less developed areas. But as the pace of change has accelerated with bewildering swiftness in recent decades, such orderly adaptation has become progressively more difficult. More and more people regard change as threatening and catastrophic. Without sufficient time to assimilate change in an orderly fashion, even the more adaptive individuals have drawn back into a shell of conservatism, consciously or unconsciously fighting change tooth and nail, seeking desperately to maintain the status quo, however precarious it might be, and responding to the changing world with a vast conservative inertia.

Today we can see manifestations of this inertia on all sides of us. We see it, for example, in the continuing growth of huge and sprawling urban centers, spreading out unchecked into the suburban areas, while the city centers are increasingly beset with poverty, crime, and decay. We know, of course, that the cities have been vital to man's development throughout most of his history, but the city of today is unlike anything ever before witnessed. There is ample reason to suspect that the sprawling metropolis containing tens of millions of people is no longer a

serviceable or even a viable social entity, but rather that such cities today are in fact anti-survival and largely unnecessary considering the current state of our technology. Yet with enormous conservative inertia our society not only struggles to maintain existing megalopoli but allows them to enlarge further and seeks even to create new ones. In a related area, the forces of environmental destruction march on virtually unchecked by the token measures we have raised so far to block them, and any truly radical or imaginative approach to stemming or reversing these forces is met with a massive resistance. At the same time our society adheres doggedly to antediluvian values, complacently tolerating corrupt political institutions and ineffective or hypocritical ethical standards which cry out for reevaluation and true reform if the society that is founded on these principles is to survive.

There was a time when conservative inertia and resistance to change were successful in maintaining a status quo; such change as there was came slowly, was bargained with, and was assimilated a bit at a time. But unfortunately the forces of change in our society today can no longer be negotiated. Change is occurring in an ever-accelerating cycle. There is no longer time to bargain, no *quid pro quo* possible. Change is going to continue no matter how man reacts to it, and it is going to *change lives* ever more swiftly and massively, whether men want their lives changed or not. It is no longer even appropriate for us to ask whether change can be prevented, minimized, or controlled; the appropriate question is how change can be dealt with in such a way that individuals and society can survive and prosper in the midst of it. Thus it is hardly surprising that in this past half century of accelerating change a singular popular literature has emerged which deals specifically with change and its impact on human lives.

This popular literature, which we now know as science fiction, is by no means virgin to the twentieth century. Scholars can demonstrate that a literature of romantic fantasy has occupied its own special niche over the centuries. With its curious and rather special outlook on man's relationship to nature and the world, it has always stirred the imagination and evoked a

sense of wonder in the face of phenomena that were not clearly understood. But it was only in the first quarter of the twentieth century that science fiction began to distinguish itself by its recognition of science and technology as key factors molding our society. It was at the same time that science fiction became acutely concerned with rational speculation about the impact of science and technology on mankind, as opposed to the supernatural or mystical dream worlds previously explored in romantic fantasy. And just as modern science fiction has evolved side by side with the twentieth century's scientific and technological revolution, it has begun to serve as an increasingly important and singularly effective device for adaptation to changes brought about by that revolution. Science fiction today is an excellent means for pinpointing and identifying the potential hazards that may face us in the future because of accelerating change; in addition, it is also an excellent means for testing or exploring possible future solutions. And it is in this area that science fiction has a surprising potential for preparing its readers to adapt to the swiftly accelerating speed of change, to survive the future shock that this change is bringing about and to modify the untoward effects of change.

Science fiction today is still essentially a popular escape literature, unsophisticated and amusement-oriented. What, then, makes it so useful as a device to ease and abet man's adaptation to change? First, as opposed to mystery novels, western novels, popular love novels, sports stories, or other forms of popular fiction, science fiction is primarily a *literature of ideas*. Quite aside from its entertainment value, science fiction stimulates the speculative imagination. The reader of a science fiction story is invited to suspend his disbelief and embark upon an adventure dealing with events and propositions that have not yet happened but which might very conceivably occur at some time in the future, be it tomorrow or a thousand years hence. Typically a science fiction story begins with a premise which may be untrue but is at least plausible. One story, for example, might contend that the earth has been invaded by invisible aliens who can only be detected with the aid of a galvanometer. Another story might predicate that certain otherwise normal

individuals can and do exercise completely unconscious disruptive mental influences over the law of averages. Yet another story might assume a manned space flight to the planet Jupiter, and take as its premise the proposition that one of Jupiter's larger moons has engendered a life form totally different from our own yet equally intelligent. In each case the science fiction story then proceeds from its initial premise to explore what such a premise might mean, what might be expected to happen in such circumstances, how people might respond to such a turn of events, and how it might influence their lives. Once the reader has been induced to suspend his disbelief it is the *idea* in the science fiction story that becomes paramount, and "what would happen if—" becomes the main thrust of the science fictional entertainment.

Second, science fiction stories deliberately and specifically look to the future. This is not, as many believe, an attempt at prophecy or specific prediction; rather, it is an attempt at rational speculation about the various patterns the future might assume, given what we know about the present. Writers and readers of science fiction accept as an unspoken premise that what might happen tomorrow is directly related by cause-and-effect to what is happening today. The invisible aliens are discovered among us only because our scientific and technological advancement has provided us with an instrument—the galvanometer—by which we can detect them. Perhaps these invisible aliens have been among us for centuries without our having any awareness of their presence before this momentous discovery is made. Conceivably this unsuspected presence could explain multitudes of phenomena which hitherto were recognized but totally unexplained. But the story's concern is what the discovery may mean in human terms *tomorrow* and what human beings *tomorrow* are going to do about it. Similarly, in the story of the man whose mind unconsciously influences the law of averages, the story is concerned not so much with the phenomenon itself as with implications, speculating as to what influence such an individual might have on the world at large. It is assumed that the hero's extraordinary mental powers have evolved from certain characteristics or qualities already known

to be present in humans, or else to have appeared according to the rules of genetic variation and mutation; there is nothing magical or supernatural about it. And granted this cause-and-effect premise, the story then concerns itself primarily with what this suddenly appearing mental power might mean to its possessor or to other human beings around him, what changes it would necessitate in society, and *how man might adapt* to the appearance of such a phenomenon if it were to occur.

Thus science fiction is predominantly a *speculative literature* in which the reader is invited to ponder in some detail the effect that a given advance, change, discovery, or technological breakthrough might have upon society as we know it and upon human beings as we know them. While engaging in such speculation, however, science fiction clearly recognizes the importance of future variables in the lives of men. In particular it takes into account the appearance of *unpredictable variables*, such as might arise as a result of rapidly accelerating and unexpected change, and then seeks to predict where such unpredictable variables might reasonably lead. For example, it is not at all implausible that a virulent mutated virus might appear as an unpredictable variable in our own immediate future, and could lead to massive changes in the lives and health practices of whole societies. Science fiction can imagine such an unpredictable variable and then, given the premise that such a mutated virus had appeared, can ask what our society would and should do about it, how we should deal with it, and how we might work to resist it or to adapt to it. Similarly, the unexpected discovery of physical principles that could make faster-than-light travel possible by one means or another might very plausibly appear as an unpredictable variable in the world we know today. Such a variable would have a profound effect upon man's ability to explore and possibly better understand the universe. Science fiction has long been speculatively concerned with precisely such exploration, even when its concepts of what such an exploration might mean and the conclusions it might arrive at may be extremely provincial and naive.

But how can a popular literature which is often regarded as "crazy" or "fantastic" by those least acquainted with it actually

equip its readers to adapt to social, cultural, or technological change? First and foremost, science fiction prepares the minds of its readers with certain concepts or attitudes toward change that are not always widely shared by others. For example, the science fiction reader is powerfully acclimatized to the underlying idea that *change is going to come about, come what may.* There is no nonsense in his head about resisting, thwarting, or evading change. The science fiction stories he reads dwell upon future societies that *have* changed from the present. In these stories change is regarded as inevitable; indeed, science fiction frequently predicates rapid, radical, or abrupt change as probable in the pattern of the future. From his experience with the simple process of extrapolation—taking current trends and patterns and tracing them to their possible logical future implications—the science fiction reader *knows* that the changes proceeding about him today, however sweeping they may be, are as nothing compared to the changes that may be expected in the near and distant future.

Second, the science fiction reader is encouraged by his reading not to fear or dread change, but rather to accept it as a fresh and exciting challenge. After all, science fiction seems to say, the winds of change—however violent they may seem—are of man's making in the first place, and it should be within man's power to temper them. This is not to say that the science fiction reader necessarily *likes* the idea of change, or welcomes it, or even approves of it. He may well react quite negatively. He may elect to move heaven and earth in an effort to modify its impact, but total rejection is unlikely to enter his head. Rather, his thinking will be directed to identifying *what might be wrong* with a specific direction of change, which kinds of change to resist and which to applaud, what deleterious influences might come about as a result of change, and how those undesirable effects might be prevented from happening. Indeed, there are a number of prominent science fiction writers, and multitudes of their readers, who quite actively detest the process of technological change and the direction in which technology seems to be drawing mankind. But even the most adamantly pessimistic of these "anti-science" writers neverthe-

less recognize the inevitability of change and seek in their writings to modify its impact rather than to attempt to turn the clock back. And even at that, these writers and their readers are the exception rather than the rule. Most science fiction writers and readers approach the idea of change not with the negative mental set of "what can we do to halt it or minimize it?" but rather with the more optimistic mental set of "how can we use it, adapt to it, make our lives with it, around it, or in spite of it? How can we deal with it most effectively?"

Third, science fiction readers in general are equipped by their reading to accept scientific and technological discovery and advancement as a major and potentially beneficial instrument forcing change. Rather than ask, "Why do we need this advancement?" they are asking, "Why haven't we had this advancement sooner? Why aren't we applying it more widely? Why didn't we recognize its potential twenty years ago, and why aren't we using these changes to better advantage?" There are very few "back to nature and the simple life" thinkers among science fiction readers, very few hand-wringers, very few indeed who are concentrating on past faults, failings, and frailties of mankind. Thus, for better or for worse, science fiction readers are probably more realistically oriented to the inevitable forces of change than most other people. At the same time, science fiction readers are prepared by their reading to cope with the natural ambivalence that scientific and technological change generates in people's minds. These readers clearly recognize that all scientific and technological progress is not necessarily good, and that for every benefit of science there are likely to be hazards or disadvantages. Thus they are able to direct their thinking toward neutralizing or counteracting these hazards or disadvantages while at the same time nurturing and developing the benefits. And if worst comes to worst, science fiction readers are prepared *to accept the worst and deal with it.* They are long familiar with the ironic concept of Finagle's First Law as scientists and engineers apply it to any scientific experiment in the laboratory: *If something can go wrong, it will.* But the science fiction reader is also aware that this perverse principle applies just as universally to life situations as it does to scientific or engineering experiments in the laboratory.

In short, science fiction prepares its readers for successful adaptation to change first by accepting the fact of change, whether desirable or not, as inevitable; second, by seeking to adjust to the change wherever possible; and third by modifying the change when possible or necessary in order to reduce its negative impact on our lives. On the other hand, much adaptive failure arises, first, from refusing to accept change as an inescapable factor; second, fighting against *all* change, the good as well as the bad; and seeking to resist or negate changes in attempting to return to or to restore past circumstances that are more familiar and comfortable. The non-adaptive individual is frightened by the unfamiliar and seeks unsuccessfully to resist it. The science fiction reader is dealing constantly with the unfamiliar and is equally constantly, and successfully, seeking familiar patterns or trends in it.

Thus we can say that science fiction engenders a *positive adaptive attitude* in the minds of its readers. What is more, it furthers adaptation toward change by developing in its readers the elasticity of mind—the sheer imaginative grasp—to enable them to grapple with change constructively. The typical science fiction reader is capable of conceiving many possible futures, each different from the other, and is comfortable dealing with change one step at a time in approaching these possible futures. Critical to constructive adaptive thinking is the sort of elasticity of mind typified by the concept of fairy chess—a modification of the classic game in which an already complex game operating within a rigid framework of rules is made even more mind-stretching by the simple expedient of arbitrarily modifying certain of the rules at the beginning of each game. Thus in fairy chess the players might agree that for the purposes of the game they are about to play the knight will always have the option of moving either two spaces forward and one to the side or three spaces forward and one to the side, thus significantly altering and extending the ordinary power of the chessboard knight. All other rules of the game remain unchanged from the classical pattern. In another game the players might

agree that the pawns can move only on the diagonal and capture only straight ahead, directly the opposite of the classical rule. Each such minor modification presents the players with an unfamiliar context that still bears familiar patterns or trends. It also forces the players to stretch their minds beyond the limits of the normal chess game and to cope effectively with the unfamiliar. On a somewhat similar level, the introduction of wild cards into a poker game is a clear extension of the fairy chess concept, and players in such a game are forced with each declaration of a wild card to adjust their thinking with regard to the odds and the values of cards and hands. The adaptive player grapples with such unfamiliarity, learns to calculate the shifting odds, and wins; the non-adaptive player cannot cope with the change, gets his toenails trimmed, and returns to the more familiar classical pattern of the game as quickly as the deal comes his way.

Science fiction readers are constantly playing fairy chess with their reading. The rules are ever-changing. The notion that "nothing is certain" or that "nothing is quite what it seems" becomes familiar and acceptable; the stretching of the mind is challenging and exhilarating, not frightening or demoralizing. Indeed, it is this very mind-stretching quality of science fiction that draws the great majority of its readers to this literature.

Consider for a moment how the rules for adaptation that we have been discussing might apply specifically to a broad and emotionally loaded area of change facing us as individuals in the future: the part that computerization is destined to play in the area of health care. To a non-adaptive the notion of introducing a machine, however complex, into the human equation of health care is anathema—a repugnant and threatening concept. It does not matter to the non-adaptive that the pattern for this change is already set, and that computerization of many areas of medical care is inevitable if universal, expert, and inexpensive health care services of high quality are to be made widely available. In spite of all this the non-adaptive fights doggedly to resist the change. He seeks to retain or to restore the ancient and comfortable concept of human ministration and laying-on-of-hands by the personal, concerned physician,

even when it can be demonstrated that today's physician equipped with today's medical knowledge cannot possibly do as good a job using only the classical techniques of medical art and science as he could do by availing himself of modern computerized services. The adaptive individual, on the other hand, sees clearly that computerization offers certain very major advantages and opens the door to immensely more competent, comprehensive, and scientifically thorough health-care services, *together with certain built-in losses and disadvantages as well.* He recognizes clearly that the human physician working in close partnership with the computer can practice a far superior quality of medicine than the physician working alone, but that certain human touches in the doctor-patient relationship, a certain element of human concern on the part of the physician for his individual patient will very probably be lost. The adaptive then says, "How can we avail ourselves of all the advantages while taking the rough edges off the disadvantages?"

For a simple example, consider the matter of medical history-taking. A patient's medical history—a summation of all past illnesses, a discussion of apparent symptoms of the present illness, if any, an accounting of family and social history and a careful review of symptoms relating to the various organ systems—has always been the solid core, the *sine qua non* of accurate diagnosis. This is the patient's opportunity to tell the doctor what is wrong with him, and the doctor knows that somewhere in this mass of data he will find the diagnostic clue he is seeking. Yet the physician approaching a difficult diagnostic problem knows that it is unlikely that he will be able to elicit a *complete* medical history no matter how painstaking and thorough he may be. Such a medical history would require hours of penetrating interview with a patient, hours that no physician has available to spend and that no patient can afford to pay for. Thus at best the physician can take only an abbreviated medical history, and although he may be carefully trained and widely experienced in eliciting useful data quickly, vital bits of information may elude him. The computer, on the other hand, can be programmed to take an utterly exhaustive medical history and, through the utilization of time-sharing principles, can in

fact take medical histories from dozens or hundreds of patients simultaneously while each individual patient has the illusion that the computer is devoting its full and entire "attention" to him. What is more, the computer can easily be programmed to flag for the doctor's attention *precisely those items of medical history data that are most likely to help him reach an accurate diagnosis.* In truth, the doctor-computer team can achieve a level of competence and efficiency in diagnosis that no doctor can hope to achieve any other way.

Obviously, then, it can be a very real advantage to the patient to have computerized history-taking facilities available. Despite these advantages, however, the non-adaptive individual objects to the coldness, the impersonality, of the machine-taken history. He does not like the idea of a machine asking personal questions; he does not trust the utilization of the information given to the machine. Early attempts to computerize medical history-taking ran aground on precisely such objections as these; the results were anything but satisfactory and the prospect seemed discouraging. Fortunately a form of science fictional thinking suggested a solution to the dilemma—a solution which is currently under intensive development and appears likely today to guarantee that computerized medical histories will soon completely replace the human physician's history-taking. The solution was simply to make the computer seem "more human" to the patient—that is, to program into it an element of superhuman courtesy, superhuman patience, expressions of consideration and concern—in short, to create an illusion that the computer was very much like a person with a very human concern for the individual patient, even as the patient knew quite rationally in a corner of his mind that the machine really did not and could not have such a concern.

We are not speaking now of some crude punch-card system, or a list of multiple-choice questions for the patient to answer. Rather, we are considering now a highly sophisticated computer carefully programmed for medical interviewing. Such computers are being developed and tested for everyday use even today—computers that have all the time in the world to spend with a given patient, and to which a patient can pour out

his heart as the computer listens and listens and listens. Computers of this sort have been programmed to be so warm, so understanding and "human" that patients in test programs have actually preferred them to the living physician. Such a computer encourages the patient to talk about himself; it gently prods his memory; it sympathizes with his discomfiture; it offers him a cup of coffee; it urges him not to feel rushed; if the patient seems tired, the computer suggests a five-minute break and plays pleasant music for the patient while he's resting; it is polite, solicitous, concerned. Indeed, the computer can be programmed in such a way that when a patient has finished giving the computer his medical history the patient knows in his heart that that computer *really cares* about him and his health, and *really wants to help him.*

Of course we know rationally that the machine cannot really care about anything. It is merely doing what it is told to do—but if it is told to act uncannily like a concerned human being, that is precisely what the machine will do. And if, by utilizing such a "humanized" machine to elicit medical histories, we can promise a vastly larger number of sick people a vastly more careful and accurate diagnostic work-up than can conceivably be possible in the traditional doctor's office, with vastly less likelihood of human error, misdiagnosis, or omission, then surely this is a change which offers far more advantages than disadvantages. Indeed, under such considerations, the disadvantages that the non-adaptives fear and rail against may actually seem quite superficial. Once again the reader of science fiction is encouraged, through his reading, to look beneath the superficialities of impending change, to look deeper and to imagine in greater detail the more profound implications which cursory attention or superficial consideration might miss. In short, the reader is encouraged not to fear change simply because it is change, but rather to think more lingeringly on its implications for good as well as for ill.

We can find many examples of science fiction-inspired adaptation to change both in the past and in the present. For example, very few science fiction readers indeed were startled at the launching of the first Sputnik in October of 1957. They may

have been frustrated and disappointed that the first such earth-orbiting satellite should have been launched under the auspices of Soviet technology and not our own, but to these readers the accomplishment itself, in all its implications, had been taken for granted as an inevitable eventuality for decades. Science fiction readers, indeed, had gone from the first German buzz bombs of World War II to the orbiting-earth satellite in a single leap. These readers assumed and accepted this eventuality as a matter of time and nothing more; by the time it had occurred they knew and understood the physics and technology behind it; they were fully acquainted with the logistic requirements of such a shot; they had already explored—and largely discounted—the military implications of such an accomplishment (a widespread but superficial and shortsighted concern) and instead were quite accurately recognizing the Sputnik as a first solid step in man's eventual exploration of the solar system beyond the earth. What is more, throughout the subsequent fifteen years that ultimately led to the first moon landing, science fiction readers were continuously far in advance of others in their thinking and acceptance of the implications of the space program. By the time the first exploring party finally did set foot on the moon, science fiction readers had long since been working out the logistics of permanent moon colonies, debating specific techniques for interplanetary exploration elsewhere in the solar system, and were chafing at the apparent physical limitations which seemed to make travel to other star systems something less than practical as a short-term goal.

By the same token, few science fiction readers were seriously startled at the emergence of the uranium fission bomb on the scene in 1945, or at the subsequent staggering technological developments that made fission and fusion weapons such an unparalleled influence on the course of human affairs in the twentieth century. At the time the first fission bomb was released, science fiction readers were already fully aware of the unthinkable quantities of energy trapped in the atomic nucleus. Indeed, in their speculative explorations they had already moved on to consider not only the enormously horrifying military aspects of these power sources, but also the enormously

beneficial aspects as well. They had been prepared by their reading to assimilate the concept of nuclear weaponry, on the one hand, and to adapt to the idea of nuclear power as an immensely important energy source of the future on the other hand.

Finally, in a society which to date is still very much shaken and disturbed by the sudden emergence of the computer as a frighteningly competent partner to human endeavor, science fiction readers have moved further than anyone else in their acceptance and adaptation to the idea of a massively computer-oriented society of the future. Here again we are speaking of a change the pattern of which is already set. Perhaps the most revolutionary and far-reaching of all technological changes destined to take place in our society in the next quarter century will be the introduction of modern and sophisticated computer terminals into the individual home, operating on a time-sharing basis with existing telephone lines and television cables for input and output communications. To vast multitudes of people today the computer is still a mysterious and threatening device that seems tolerable at all only at a vast distance from everyday experience. Yet science fiction readers have long since looked beyond the superficialities to recognize the home computer terminal as a vital partner to human endeavor with profoundly beneficial potentials, a device that is destined to become as important and as necessary to the average household as the telephone, the television set, or the electric refrigerator. Already aware of the vast potentials of such a device and experienced through his reading in exploring adaptations of its use to his everyday life, the science fiction reader has already adapted. He may not understand precisely how the computer will function, nor by any means everything that it may be able to do or enable him to do, but he does see it as an inevitable adjunct to his everyday life in the future. And by the time this is reality he will be prepared for its use and able to modify it splendidly to his needs.

As a potent device for enabling man to adapt to change, science fiction today deserves far more serious attention than it has yet received. Yet for all its potential, and for all its growth

in popularity, science fiction suffers from one grievous limitation which severely restricts its successful application. This limitation lies in the imaginative fertility, the inventiveness, the emotional and literary maturity, and the insight of its writers. For all its inventive and imaginative *potential*, science fiction has actually proven discouragingly mundane in many areas. Only a few of its writers have begun, most tentatively, to grapple with human beings as human beings rather than as caricatures or stereotypes. Far too much modern science fiction is more empathetic to scientific advance and technological progress than it is to human beings dealing with human problems. Too often science fiction's insights into human psychology are embarrassingly naive, and its grasp of sociological implications are distressingly provincial. And although multitudes of imaginative problems may be explored in science fiction, the solutions all too often fail to stand up to mature scrutiny. Thus, for all its speculation about future societies and future problems, as far as I can recall science fiction has failed to come up with a single new concept for a plausible alternative political or social organization since the utopian novels of the 1920s.

Fortunately, a few writers of science fiction are beginning to grasp this limitation and are seeking to do something about it. But far more writers must join in this effort if science fiction in the future is to have the beneficial impact which it ought to have. If science fiction is to realize its potential as a powerful force for adaptation to change, its writers must vastly expand their horizons and their imaginative and inventive capacities. At the same time, the readers of science fiction must immensely expand the demands that they place upon the science fiction medium. In its present state of evolution modern science fiction is a sleeping giant, a medium of immense but largely unrealized potential. Whether the writers and readers of the future will surmount these limitations and bring about appropriate changes in the medium is a matter for grave speculation today.

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Alan E. Nourse was born in Des Moines, Iowa, in 1928, and spent his childhood in Iowa, New York, and New Jersey. After graduating from high school, he started his pre-medical studies at Rutgers in 1945, but these were interrupted by two years in the Navy's hospital corps. In 1948, he returned to Rutgers, where he received his B.S. in 1951, and was admitted to the University of Pennsylvania School of Medicine. After getting his M.D. in 1955, he interned in Seattle, and then devoted two years to freelance writing before entering general practice at North Bend, Washington, in 1958. In 1963, he returned to full-time writing.

His first national publication was a short story, "High Threshold," published in *Astounding* in 1951, and this was followed by some sixty sf stories and novelettes which appeared in virtually all the magazines of the time. In addition, he published a short novel, *A Man Obsessed* (Ace Books, 1954) and wrote *The Invaders Are Coming* (also for Ace) in collaboration. His writing, at the time, helped to pay for his medical education, and of course still reflects a strong medical orientation.

Nourse has published fiction and nonfiction in a great many magazines: *Saturday Evening Post, Playboy, Argosy, Ellery Queen's Mystery Magazine, Better Homes and Gardens, Boy's Life,* and so forth. At present, his work in progress includes (in addition to fiction) two medical guides: *The Ladies' Home Journal Family Medical Guide* and *The Outdoorsman's Medical Guide* (both for Harper & Row) and *The Backyard Astronomer* (for Franklin Watts).

He lives in North Bend with his wife and four children, and also maintains a writing retreat in eastern Washington, where much of his work is done. His hobbies include reading, fishing, hunting, and backpack hiking in the mountains.

NONFICTION

Nine Planets: Astronomy for the Space Age, 1960 and 1970 (Harper & Row) and 1962 (Pyramid Books)

The Management of a Medical Practice, 1962 (Lippincott); with Geoffrey Marks