

IMMORTALITY:

PHYSICALLY, SCIENTIFICALLY, NOW

A reasonable guarantee of bodily preservation,
a general discussion, and research targets.

by

Nathan Duhring

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THE FOREWARNING

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I wish to warn you immediately, in a very direct and personal manner, of what is to follow. I think I can do this best by telling you of this book's origin.

About five years ago several of us who have been active in Great Books formed a separate educational program to improve on the original by making it more contemporary, scientific, and germane to the existence of modern man. For the first time we had to think for ourselves in surveying modern literature from poetry to astrophysics and in judging what was significant. Three years later in spreading out from the accepted giants of our time like Einstein, Freud, Frazer, Sherrington, Pavlov, and Russell we began to read closely and to analyze and discuss Wiener and other cyberneticians.

Being a fervent addict of Joyce and Freud I was well conditioned to reading into any author, especially Wiener, strange and unusual meanings. I claimed that Wiener's book contained either intentionally or unintentionally — I had no way of telling which — a message about immortality. The deduction I drew was that immortality might eventually become a down-to-earth physical reality via science. And that in fact is this book's thesis. My job in the rest of the book is in large part to tell you why this may be a startling but reasonable hypothesis, and to tell you how you can practically go about best guaranteeing your physical immortality even if you die before the methods of reanimation and prolongation are perfected.

I hope I am not exaggerating when I say this is an astounding and virtually unbelievable discovery. And I don't mean that I made this discovery. I'm just telling you about what has been discovered and certain probabilities concerning these discoveries. It is astounding considering the fantastic power and desire and hope of immortality through most of history. The desire has been so strong when one considers the religious hold of this hope on humanity and the anguish of innumerable writers

such as Unamuno, Kierkegaard, Dostoievsky, Camus and Pascal, that it makes me doubt every word I write concerning this outrageous possibility. And yet what am I to do about the evidence I see before me? Remain quiet? No. I must spell it out and ask you what you think of it.

This I did, first in discussions and later on paper. In discussion I was met with bemused and nervous astonishment by some and blase acceptance by others. After all, for some scientific sophisticates of our time, nothing, absolutely nothing is impossible: total annihilation or immortality.

There was some considerable time elapse between the first discussion and deciding to write about it. One merely verbalized what deductively seemed to follow. Then something of the importance of the idea really began to sink in with time. The importance was reinforced by reading Pasternak, Camus, and especially Unamuno. As alternative ways of achieving the same end by other than cybernetic methods, I reconsidered and further investigated research in physiology and biology. There I saw the possibility of supplementary and alternative methods to the same end. But was I deluding myself?

Since I knew of no one who had written down this particular cluster of ideas, and as I enjoy peppering away on the typewriter, I wrote it down and exchanged it with a very dear person who was then writing a novel. She read it first with calm sympathetic interest, but both of us couldn't help laughing at such an outrageous hypothesis and the phenomenal changes that might follow. She gave it some thought for a week and at the next session told me a story about a little boy who told gigantic tales, half out of joking and half out of a questionable grasp of reality. I understood, but what was I to do? There was the evidence. There were the statements that every non-conformist knows by heart about the creative process: "Every new and good thing is liable to seem eccentric and perhaps dangerous at first glimpse, perhaps more than what is really eccentric, really irrelevant to life ... It requires some courage to move alone, often counter to popular prepossessions, and toward uncertainties."¹

Thus, I know of no way but to ask you to read carefully, weigh it part and parcel, deciding for yourself, or telling me where possible, what stands or falls or is in need of supplement and amendment.

Frazer provides the words in which I may rephrase the dilemma and perhaps the solution:

"But drowning men clutch at straws, and we need not wonder that the Greeks, like ourselves, with death before them and a great love

of life in their hearts, should not have stopped to weigh with too nice a hand the arguments that told for and against the prospect of human immortality.

“When we reflect upon ... the scantiness of our information ... we shall be ready to acknowledge that a full and satisfactory solution of so profound a problem is hardly to be hoped for, and that the most we can do in the present state of our knowledge is to hazard a more or less plausible conjecture.”

And, if this conjecture proves not to fit the findings of science or the rigor of logic, we should like the chameleon be willing to change our color as we move over a new ground of fact and consequence.

Chapter 1

INTRODUCTION

A handful of prophets: H. G. Wells, G. B. Shaw, Jules Verne, Capek, and Tsiolkovsky made some startlingly accurate predictions in the late 19th and early 20th centuries. The more sober members of mankind never held to them seriously, neither then nor now, passing them off as the successes amongst the law of chance. No matter how it came about — and some of these men were of acute scientific understanding and broad perspective — many of the possibilities they spoke of did come to pass: rocket travel, atomic energy, automatons that work in offices and run factories — too many to list.

Now in the last half of the 20th century, to take seriously that physical immortality, here on earth, is scientifically possible is almost as much as dream can encompass, certainly more than sobriety can allow. This is perhaps a necessity, for it is only more absurd to chase after every South Sea bubble. And, ever since prehistoric man first imagined the possibility of life forever, the countless rolling centuries have not given him one shred of material verifiable evidence. Now, however, when some of the scientific possibilities appear on the horizon, someone has to form the question, consider a reversal of the skepticism engendered by centuries of disappointment and prepare the way for the reality of the incredible.

To think that it might come to pass, here on earth, is at first for our secular age, virtually incomprehensible. And yet some of the latest scientific discoveries, especially in the fields of cybernetics and physiology, and some of the best minds of our generation may have guardedly offered the suggestion. This caution on the part of the scientist is natural, for, though the future is in his bones, his method inclines him to caution with definite statements after the fact. Science fiction writers differ markedly. Their function is to express the possibilities imaginatively. The immortality of many of their humans and robots is a commonplace for them. However, our work here is to examine the middle ground between the guarded suggestion and the feverish acceptance. Let us turn to the scientific suggestions first.

The guarded suggestion of Wiener comes best through reading and weighing his books, however, a few passages provide a starting point.

“The metaphor to which I devote this chapter is one in which the organism is seen as message. Organism is opposed to chaos, to disintegration, to death, as message is to noise.

“We can continue to live in the very special environment which we carry forward with us only until we begin to decay more quickly than we reconstitute ourselves. Then we die.

“A pattern is a message, and may be transmitted as a message.

“To recapitulate: the individuality of the body is that of a flame rather than that of a stone, of form rather than of a bit of substance. This form can be transmitted or modified and duplicated, although at present we know only how to duplicate it over a short distance. It is a pattern maintained by this homeostasis, which is the touchstone of our personal identity. We are not the stuff that abides, but patterns that perpetuate themselves.

“Any scanning of the human organism must be a probe going through all of its parts, and will accordingly tend to destroy the tissue on its way. To hold an organism stable while part of it is being slowly destroyed, with the intention of re-creating it out of other material elsewhere, involves a lowering of its degree of activity, which in most cases would destroy life in the tissue.”

The thesis also:

“It is my thesis that the physical functioning of the living individual and the operation of some of the newer communication machines are precisely parallel in their analogous attempts to control entropy through feedback ... In other words, the all-over system will correspond to the complete animal with sense organs, effectors, and proprioceptors, and not as in the ultra-rapid computing machines, to the isolated brain, dependent for its experiences and for its effectiveness on our intervention.”

The Human Use of Human Beings

Thus to restate and to round out the ideas of Wiener from the rather disjointed quotations, it can be said that there is something more than a rough analogy between some of the newer communication machines and the human being. In many crucial and significant respects they will be precisely parallel. A machine can be made which will correspond to the complete animal, meaning eventually to the complete human. Progress is by no means even. The deductive thinking components may now be vastly superior to the equivalent in men. The compactness, synthesis and mental patterning ability of men however is still presently superior to that of the newer communication machines.

Pattern or message may be the common denominator, no matter how complex that pattern may be. Any pattern or message may be transmitted or transcribed. It may pass through space and/or time and be re-created out of other material elsewhere. The particular substance is largely irrelevant. There can be wide variations in this. The important thing for personal identity is the pattern. And if it is recreated and reconstituted in the appropriate form or pattern, our personal identity reappears and life continues. More will be said later about the appropriate form, pattern and structure. The above then is a very general and tentative outline of the *cybernetic method*. However, a number of other methods with an infinite number of variations are available to science besides the cybernetic method.

A second general category is physiological. Within this general area the regenerative method and the transplantation method suggest some interesting possibilities. They are alternative methods which offer interest and support for our general contention. If one method doesn't work perhaps another will. The various methods and the research therein has an overlapping effect of helping solve problems in allied fields and aiding in the solution of the general problem. Some of the findings pertaining to the *regenerative method* may be alluded to briefly. Later in Chapter 2 they will be taken up in greater detail.

The rather simple but significant phenomenon of crustacea and other animals regenerating lost limbs and other organs was known to Aristotle as well as to other observers before him. They often made mistakes in observation and in the uncritical acceptance of information. Aristotle thought that young sparrows who had their eyes put out could regenerate new ones, but despite the individual mistakes they were cognizant of the fact of regeneration. The salient fact is that new parts are made by the body. It carries the significance that if this is done pervasively enough the individual eventually renews himself. To a degree the human body does this every day. Relatively death is held further away.

Specific and rather dramatic examples of this are found in crayfish, crabs, starfish and flatworms. Each starfish has five or ten arms depending on the species, each arm of which may be separated from the others and yet if it has some portion of the central disc the other four or nine arms and the rest of the body will be regenerated. Greater knowledge of this exists concerning sea-life and less differentiated animals but it occurs in all life and in man as well, but in a less obvious form. In men the nails and the skin as well as other body cells are continuously being replaced. For most people the hair is continuously being replaced even up to several days after death. Children replace their first set of teeth.

Within the body we know that the body fluids, elements and cells are continuously being replaced. It reinforces the notion that the pattern is the thing not the substance which is continually being changed anyway.

Regeneration seems to have some obvious implications for immortality and for evolution. Regeneration in all animals is a mechanism for survival and thus for putting off death temporarily for the animal and relatively permanently for the species. Where the organism is continuously susceptible to the accidental loss of appendages or organs, the species either evolves the facility to regenerate them or fails accordingly. In his struggle for survival it is very seldom, in comparison with the crab, that a man loses a leg. If he does he usually makes an artificial one. It is even less often that a man, in comparison to some amphibia, loses an auditory or an optic nerve, which they can readily regenerate. But where men have continuously used their regenerative powers, as in the healing of cuts and the knitting of bones, he is an example of a life process whose function is continuing survival and forestalling death. There is no logical reason why the forestalling of death could not be continuous if we knew enough about the processes.

A third method is that of *transplantation* or exchanging and substituting a new organ for the old one. Innumerable types of exchanges have been tried. We mentioned the artificial leg. It would seem there is hardly any limit to the development of artificial or synthetic organs and appendages, varying from better than the original as is often the case with hair, teeth and some internal organs to that which is simply better than nothing as in the case of glass eyes, artificial legs and arms. Heart valves of silicon rubber and steel have been developed to the extent that they are being successfully used and promise help for thousands more. Anyone who thinks there is any limit to the organs that may be substituted should consistently ally themselves with that celebrated movement in the nineteenth century to close the patent office because all of the inventions possible were thought to be exhausted.

Physiologically one of the most studied and known is the corneal transplants for the eye. The rights of operation and removal are deeded over before death. After death the cornea is removed, frozen and stored until needed. They have been used after a storage of two years with no harmful effects noticed. Even the complete heads of some animals have been exchanged. Thus, the suggestion is reinforced that death could be put off indefinitely by successive exchanges, when this science develops to maturity. The devotee of this method might become intimately familiar with showrooms for new synthetic organs and with operating rooms.

Any of these three methods could achieve the aim or goal of immor-

tality. Each may contribute to the achievement of the others or to some as yet undiscovered method. All of them are apparently temporarily holding off or pushing back the absurd wall of death. The research in these fields, which we shall speak of in more detail later, has the same tendency, to undermine and topple, at least a portion of the absurd wall. There is no reason to expect any reversal. According to this reasoning, though much more research is necessary, physical immortality may be inevitable. (Avoiding total annihilation of the species *Homo sapiens* on this planet, it is just a matter of time and technology.)

Besides these three methods, there are other indicators and processes in nature that increase our confidence in the possibility, or better, the probability of immortality. Several of these may be mentioned before turning to the preference of one of the possibilities of a more practical nature.

Nature is no foreigner to immortality. Each of us is immortal as part of the race or as part of all life. Something of those pristine cells that first developed in the warm seas perhaps a billion years ago continues in us and will continue in others. As humans we are of course interested in conscious continuing life, whereas being a part of the continuing material of the universe is an unconscious and rather useless immortality, except as it indicates to the individual that immortality in principle exists. The problem may be framed in one fashion for the individual so that the virtually endless continuance of the species is available to him personally.

Nature also has the device of reducing metabolic action to almost no action for the preservation of life until conditions for active participation are more favorable. The woodchuck and the bear hibernate for long periods during the winter. Many plants may be frozen all winter many degrees below zero yet recover in spring. A similar principle appears in the seeds which have been stored in Egyptian tombs some four or five thousand years in a desiccated condition, only to burst into life upon being placed in the usual humid spring environment. This points up the fact how long a single individual seed, which in a sense is comparable with an individual, can be preserved. Among the similarities, the differences are numerous but not overwhelming. Both are made of cells. While the human is made of billions of cells, the seed has merely millions of cells. It is rather an understatement to say the human is obviously more complex than the seed. To desiccate a seed, holding it in potential reanimation is possible and suggestive, but to desiccate a human and hope to hold him in potential reanimation we generally say would be impossible. However, since we are interested in humans especially, our attention

might be shifted from preservation via extreme dryness to consideration of low temperatures after devoting one more paragraph to hibernation which is most often accompanied by lowering temperatures.

There is the theoretical possibility that a man might extend his lifetime 20 times or 1400 years if he could live like a bat as far as longevity is concerned. It has been found that bats live approximately 20 times longer than animals of similar weight, presumably due to hibernation or reduced metabolic rates while they are hanging inactive in their caves. Introducing true hibernation in man is now only a dim possibility, but enough of one that research is continuing in this direction. One of the further uses postulated is that men would then be able to traverse the untold millions of miles taking centuries of time to reach distant star systems. They would require approximately 1/100th the amount of food and oxygen of an active person.

When it comes to low temperature studies and their relation to organisms the scientific journals are sprinkled with an increasing number of reports on the freezing and revival of small animals both in nature and in the laboratory. What are termed giant multi-nucleated spermatids have been frozen to -80 Centigrade and on rewarming revived completely. The same is true of rats, monkeys, and mice though at temperatures just a little above and below zero Centigrade. Audrey Smith, a careful cautious scientist from London sums it up for the present by saying, "No doubt conditions appropriate to entire organisms will in time be determined, but it is difficult to imagine that there are early prospects of storing whole animals in solid carbon dioxide or in liquid air." The variety of accomplishments, as surprising as some of these, is by no means at an end. The trend can only be to find methods of preservation for longer periods of time and more important even better methods of revitalization.

So far, a number of methods indicating how death may be postponed have just been touched upon. The implication has been that the various methods — cybernetic and physiological — have considered possibilities for postponing death temporarily and, when bordering on science fiction, let the thought pass that it might be avoided indefinitely.

However, suppose you wish to be immortal but tomorrow you die from any one of a number of causes. Are you out of luck because successful reanimation techniques are not now available? Are you out of luck because scientists and the communication machines haven't figured out the practical methods of resuscitation or transmission of human to re-created human? The answer is no. There are nearly always alternatives in life. Despite your recent and unexpected demise, all hope is not lost. And in all of this we are talking as a scientist would about his uni-

verse and this earth. He talks and thinks in physical and material terms. In terms that he can check, measure, and weigh, and in terms that someone else using the same steps as he, can always get the same results.

The germ suggestion has occurred perhaps many times in imaginative literature, later to be reinforced by scientific research. One location is in Mayakovsky's, "The Bedbug." A proletarian lout on a binge with some of his friends is frozen to death by his own carelessness in a Moscow suburb for some fifty years until he is revived by a scientific resuscitation group. The resuscitation is rather crude, reminding one of some Frankenstein movie, but is meant to be a comedy with serious overtones, and the outline of the method is there.

Similarly the outline can be used by the rest of mankind until such time as automata and the scientists figure out a perhaps superior way of maintaining life. Just as the body in the comedy is frozen, so it would appear, in lieu of any better suggestions, that this would be the best way for us to proceed. Present scientific research seems to indicate this would be the best way, in general, to store the body until techniques of resuscitation and the postponing of death are perfected. This method of freezing is then a possibility for eventually defeating death.

There are now, of course, a million questions. Suppose people decided this was their best bet for future physical immortality, it would at least be worth a try, no harm in trying, and they were curious what some later century was like. How would one go about the freezing? Where would the body be stored? If many people tried it, would there be enough room for all the bodies? Concerning the freezing of the body, let us take the hypothetical man whose recent and unexpected demise puts him in line.

This hypothetical person is dead, then. His relatives, or anyone concerned, finds that his wish is to hold his body in frozen storage. (He may have filled out the form found on page 62, chapter 5, and placed it in his wallet.) Thus, he is taken to the freezing plant as quickly as possible and entered for freezing. Probably the ordinary slow freezing of a cold storage locker is the most practical and reasonable. Numerous experiments have been carried out with extremely rapid and very deep freezing, but for complex vertebrates slow freezing appears the better.

After or during freezing the person should probably be put in a suitable casket marked with his name and other relevant information. He could, of course, be left in the cold storage locker indefinitely, but it seems reasonable that there is a more reliable method of long term storage. It is probable that natural storage in the permafrost areas of the earth would be most reliable and least expensive in terms of money and space. Nearly all of Greenland, except some coastal strips, much of

Alaska and northern Canada and an immense region in Eurasia is continuous and dependable permafrost. It extends below the Arctic circle to approximately 65 degrees North. The ground temperature at a depth of 30-50 feet is generally below -5 C. The permafrost dips to depths of 2000 feet in Nordvik Siberia — that's northern Siberia of course — and 1000 feet at Barrow Alaska. According to the *1950 Annual Report of the Smithsonian* on permafrost, the “Natural cold storage excavations are used widely in areas of permafrost. They are most satisfactory in continuous or discontinuous zones. ... Properly constructed and ventilated storerooms will keep meat and other products frozen for years.” Thus, it would be more reliable and much less expensive considering the cost of refrigeration and the many breakdowns that can occur, to rely on natural storage, especially where the wait might run fifty years or more.

In our hypothetical case, the freezing has been done and the problem is to transport the body to a permafrost region, inter it safely, [and] record its location carefully for future resuscitation.

As an enterprising individual may take care of all of the details easily enough, many other individuals prefer to turn such a task over to some institution which has the interest, research, and continuity to comprehend the process over what might be a lengthy period of time. Likewise, it is well if this institution provides a central record deposit and information center for all persons wishing resuscitation and tends as far as is possible to their exact wishes. It should eventually go under the control of the United Nations.

However, until the United Nations becomes acquainted with this procedure, scientifically evaluates it, passes the necessary legislation, and incorporates the program, a scientific and educational program by the name of 20th Century Books will carry on these activities to the best of its ability. This organization can serve a number of functions to do with education, information, and records. Upon your instruction it can record the fact that you wish to have your body frozen upon death and preserved for resuscitation. This can provide a double check in case the statement which would normally be about your person instructing freezing was absent. For example, death by drowning, etc. Second, it can provide an educational program which generally orients one to the 20th century universe and its manifold possibilities. Third it can encourage and keep abreast of the research relevant to the ends of resuscitation and physical immortality. If you die before the breakthroughs in resuscitation and transmission have come, and you are frozen, it can aid in the storage of your body, recording the location and all relevant information. In sum, it can aid in any function necessary to letting people know that

such an opportunity exists and encompassing the end of physical immortality if they should so register that desire.

Now let us suppose that it is the year two thousand and something. It is the time when the processes of resuscitation and transmission have been practically achieved. There may be more than one process of transmission. We can hardly predict all the processes which might come into being. The problems of replacing parts may also have been relatively effectively solved. Probably a number of avenues and variations will be open to the living and the dead.

The living might simply replace parts and stave off death interminably. The process of aging control may also be in effect which wouldn't make it so necessary to replace parts. It would appear that some of contemporary biological research has this in mind.

For those in frozen storage, several avenues may open. The first avenue may be simple resuscitation. If you died of a heart attack, the heart may be repaired or replaced. For those who died of other causes, the problem of resuscitation or reanimation may be even less formidable. This certainly doesn't mean the problem is simple, or that we know all of the details now, but it does mean that it is theoretically possible [a solution will be found]. It is perhaps immensely difficult; much extension of the research done now will have to be accomplished, but what research has been done is quite hopeful and suggestive.

“Reanimation of ice-cold rats is achieved by artificial respiration and simple irradiation with a bench lamp.” (*Annual Review of Physiology*, Vol. 21, 1959, see researches of Goldzveig and Smith.)

“Smith succeeded in resuscitating golden hamsters from cooling to -5 degrees Centigrade internal body temperature; recovery is possible even if 50 percent of the body water has been frozen.” (*Annual Review of Physiology*, Vol. 21, 1959.)

It seems reasonable that by sometime within the next century the researchers will have moved from golden hamsters, cats and dogs to successful resuscitation of men, even though they may have been frozen for considerable periods of time. Monkeys have been reduced to zero degrees Centigrade body temperature, cardiac standstill, and resuscitated within one or two hours. So this means that researchers are successfully climbing the evolutionary scale, but the time must be lengthened considerably. *If* the reports are true that both guinea pigs and dogs have been revived from a frozen condition, after from two to twenty-two days and after thirteen days respectively, progress would seem to be going on in

the time direction also. Thus, we are assuming that resuscitation may be possible if they have a properly frozen body.

Supposing our hypothetical men are resuscitated, a second avenue may lay open to them. If they have not been asked before death — or even if they have — they may be briefed on the latest scientific opportunities and asked again what their choice is among the opportunities available. They may be asked if they wish to go on living in their present body, with parts replaced when necessary, or — would they prefer another body which might be better? Perhaps our resuscitated man will take one look around in the 21st century, and say, “Put me back to sleep.” It is repeatedly emphasized that his wishes are to be respected. If this is what the person desires then he is to be put to rest again. However, this seems to be an unnatural response. The more normal reaction would likely be to choose his present protoplasmic existence until the individual could personally survey and evaluate the information available. As he does this, he will be able to observe the available alternatives in greater detail.

One alternative may be to be scanned, as Wiener postulates, and transmitted into a more viable human body yet, maintaining his basic individual personal identity.

A second alternative is to be transmitted from his body to a metallic and plastic body which might have many advantages. The basic advantage being that its structure is less susceptible to the aging processes that occur in the protoplasmic body as we know it. Perhaps just as basic and stemming from the nature of the metal and plastic structure is the opportunity for greater efficiency.

At an even further reach of the imagination, inasmuch as patterns are duplicatable, the person in question could simultaneously try several modes of existence, i.e., his form just previous to death, or a plastic-metallic form. Comparing existences they could proceed from there in any one of several forms. If both forms continued to exist, Wiener suggests they each would increasingly become separate, distinct and different individuals with the passage of time, due to the difference in structure and the impossibility of duplicate experiences. It is assumed that most individuals, if they investigated the possibilities open to them, would choose the non-protoplasmic body.

You will be faced with new problems, it goes without saying. No type of conscious intelligent existence is immune to difficult decisions. But they are nothing that reason and optimism cannot surmount. This has been the way through later evolution, and it is doubtful if it will change within a century or so to come. In the past if a person was nega-

tive, extremely pessimistic, or suicidal, he passed into oblivion and the more hardy specimens and their progeny survived. This is probably the way it will be in the future. In these problems of the future, after resuscitation and reanimation, it seems wise not to attempt to go too far, for we have already reached a ridiculous extreme. Our main problem revolves around the possibility and probability of physical immortality and to a minor extent the effects. Some of the future problems, such as the fear of crowding, though, will inevitably come up in conversation. If these and a few others, which will be considered later, are not dispelled, they may have an inhibiting effect on trying for physical immortality.

Thus, what is the relevant significance for you now? In short, it is that you may be immortal now! That is the possibility as it exists. And that you will only become immortal, physically, if you act, make a decision that this is what you desire. It may have to be now, if there is a danger of dying before the breakthroughs in transmission, aging control or transplanting occur. As far as we know, the research will take time, effort and money. And it will take longer since the world is oriented now to death and destruction, or at least treading near to the brink, rather than to consciously lengthening life in general. So if you are in danger of death, and all of us are, the safest and most rational procedure is to prepare yourself for the possibility of immortality by registering your desire to be stored in a frozen state until the necessary research is completed. Prepare yourself by knowing yourself and the manifold possibilities of the universe that are open to you, and register your choice for physical immortality now.

Chapter 2

RESEARCH TODAY

Death and Biology

Death has a multitude of causes. The old morality plays were accurate to the extent that they described the old chuckler coming to men, women and children and all other sentient beings in many guises. People may die like flies in genocidal wars, they may die isolated violent deaths, they may commit suicide or they may just grow old and die. Though the whole species may die of the first, so far it hasn't happened, and the last: growing old and dying naturally is the more normal condition of men.

Many of the studies of aging and death indicate that it is eventually a chemical, molecular, cellular stochastic process. It may be remembered that amongst the sixty thousand billion cells that compose the average body some five hundred thousand million cells die everyday and have to be replaced. In old age it is common that the replacement rate slows. Death and re-creation are a part of every living instant for the body. And death for the whole organism seems to be intimately connected with cellular replacement, cellular division, molecular developments and the reduction of reserve capacities.

Older persons are thought of as becoming more rigid, less able to learn, to change, to mend the older they become. This probably is characteristic of the person as a totality as well as of his separate organs and cells. And within the cells it extends right down to the substances and molecules that go to form the cells. "The hypothesis has been advanced that aging produces greater rigidity in the collagen molecule, because of increased chemical cross-linking between spiral strands of the molecule and between the collagen fibrils themselves."¹ In some general sense when the rigidities increase to the extent that the organism's reserve capacities can no longer meet the contingencies of nature, death gains dominion.

As far as life processes are concerned, they are apparently extremely complex stochastic molecular processes which eventually scientists may control and duplicate. "Stochastic," or necessary-sequence process has become a must-term in the vocabulary of both the intellectual and the pretender just as has "syndrome," "feedback," "parameter," "cybernetics" and "entropy." As biologists learn more about these stochastic processes and the coding of the cells they approach ever closer to the time when they may be able to synthesize protoplasm and life.

Dr. W. M. Stanley, for instance, is quite definite and optimistic about the possibilities of synthesizing life and its effects. "Tailormade living matter will be created in the laboratory and from this 'first, long step,' scientists will go on to control human characteristics of all life."² This he postulates will lead to solving political and economic problems and to "bettering the lot of mankind of earth." Presumably this Nobel Prize winner would grant that if life can be created, eventually, in theory and then in reality, human life could be synthesized.

The human body synthesizes life continuously. Amongst those sixty thousand billion cells that make up an average human, five hundred thousand million, or from one to two percent of all cells are shed and re-made every 24 hours. About seventy thousand million of these exit via the intestines. In a way we are continuously cannibalizing or perhaps scavenging ourselves, which in this case is for our own good, for any stop to this process would lead to stasis, chaos and death. Taken from the cellular standpoint and given the intake of food into the body, the synthesis of life occurs by cellular mitosis, or splitting of the cell and a growth process until the new cell has reached the size of its neighbors. This isn't considered quite so radical as creating life in the laboratory, but there is much mystery attached to it none the less. It is rather remarkable that the body replaces about the same number of cells as die each day. But when a crab loses a considerable aggregate of cells like a leg, how does it come about that the body is able to reproduce another leg? After all even a leg is quite a complicated structure. We feel sure the crab "knows" nothing consciously of the leg being missing. There is no conscious willing to create a leg. The body of the crab nevertheless goes about an accelerated mitotic process, cell after cell dividing and extending until the leg is replaced. It may be that the crab's body cells in effect contain a coding system which issues directions for regenerative growth until equilibrium is restored. Something similar may occur within the human as he loses cells everyday. The regenerative process is approximately the same whether it is the normal replacement of human cells, the repair of a wound, or the replacement of an entire organ as the leg of the crab, except that the crab evidently has a more extensive coding system.

Evolutionally regeneration has considerable adaptive significance. Where it is "needed" it takes place. Where the crab often loses a leg, but may not otherwise be impaired, his body grows a new one. It is by no means limited to undifferentiated animals but as indicated is carried on and even occasionally improved upon by higher animals. But men seldom lose legs, relatively speaking in comparison with crabs, and when they do they now make artificial ones. This is probably the way it will

continue. However, something may come of this regenerative method as scientists learn more about it. It might be that it will become possible to regenerate organs that are worn out, but one shouldn't hold one's breath waiting for it. More likely biologists will learn more about these stochastic and coding processes which will likewise enable man to delay death and yet retain a viable structure.

Physiology

Within the field of physiology there are groups of researchers who have developed a virtually metabolic interest in low temperature and its effect on organisms. The practical and theoretical interest of these studies and conditions, "such as hypothermia has led to an enormous increase of literature,"³ in this field. Let us consider nature outside of the controlled laboratory conditions first.

It was mentioned that Siberia and places like Alaska, Northern Canada, and Northern Europe, have plants and animals that survive in and through unbelievably frigid conditions. It gives one pause for thought. How could any cellular structure withstand such temperatures? Wouldn't the ice forming within the cell burst the walls? Even if they did survive the expansion of water freezing, how would they ever start up again in the spring?

It seems that the cells have a number of devices to ward off the possible ill-effects of freezing. It has been found that the chemicals within the protoplasm allow it to go considerably below freezing before solidifying. But when extremely cold temperatures are reached it does of course solidify. Then the organism with resilient cell walls fares the best. Some of the water is between the cells which is an additional factor. But within the cell low temperatures stalemate activity and thus demands for nutriment while freezing and preserving the colloidal chemistry of the protoplasm. The high temperatures are the ones more likely to break down the colloidal systems. And where the conditions are extremely severe, evolution weeds out those cellular structures which cannot meet the demands of the environment.

With the coming of spring the cell is warmed and this heat increases the molecular activity of the protoplasm as heat would for any chemical solution. The molecular activity of the protoplasm thus increases to the point where the cell resumes its normal equilibrating processes. This is natural for life is a matter of chemistry and molecular relations. It is obviously extremely difficult for the researcher to attempt to duplicate na-

ture in this and unimaginably difficult with complex animals. But given one iota the time nature has had with hibernating animals and dormant plants man has accomplished wonders of his own.

There are a number of ways then that the molecular activity can be reduced for holding the organism constant over relatively long periods of time. All hibernating animals reduce their molecular activity and thus the amount of energy they expend during their long sleeps. With a few exceptions, the lower [the] temperature the less [the] energy used until the life processes are held practically stock still. An exception to this as far as temperature is concerned may be seen in the desiccation of seeds and insects. The kernel of grain, we remember, that was held for thousands of years in a dried state, sprang to life when put in moisture at the right temperature. The principle is somewhat similar though. The molecular activity has virtually stopped, in this case by drying, while the colloidal systems or the relations between the elements have been kept relatively constant. Another method, freeze-drying, uses both freezing and drying, as the name indicates, with excellent results on relatively small amounts of tissue.

The human imagination has a right to be excited at seeds blossoming after several thousand years of dormancy but this is an infinitesimal span compared to very recent discoveries. At Bad Nauheim in Germany, Dr. Dombrowski has found that bacteria have been held in a dormant condition for approximately 200 million years. (This was when ants were just beginning to evolve as ants.) Not only did nature hold the bacteria in dormancy over that period of time but she is constantly bringing them to life again without the intervention of man.

These bacteria had evidently been trapped and held in ancient salt deposits in a dehydrated condition. Water seeping through these deposits has been loosening the bacteria and warming them enough to rekindle the slightly faster molecular processes known as life. Conveniently the warmed water with reanimated bacteria bubbled forth virtually next to bacteriologist Dombrowski's laboratory. After discovering that these bacteria were as far as 600 feet below the surface within the warmed water he reasoned that they might have originated in the Kali and Zechstein salt deposits 40 miles distant. With extremely careful procedures to avoid contamination, 180 salt samples were extracted and warmed in hospitable solutions yielding 86 cultures of revived bacteria.⁴

After this success with local salt deposits he obtained 320 million year old Saskatchewan samples which yielded eight strains of living bacteria from twenty experiments. Having pushed the latency period to over 300 million years attempts are now being made to locate salt deposits

over twice as old upon which the same experiments will be performed. It would appear that for our purposes the pushing back of the latency period is merely a technical detail. If bacteria have lain potentially alive for over 300 million years and the larger species are remotely comparable they too may be held in dormancy though as mentioned many times the reactivating problems are formidable.

Before we continue with temperature studies in the laboratories we may mention some recent experiments which indicate that dietary changes may help control suspended animation. Monsanto Chemical Company has reported that by specific changes in the balance of amino acids in the diet chicks have been held in suspended animation for six to nine months. After stopping the suspended animation the chicks matured at their normal rates without any ill effects.⁵ Mice that had been recently weaned were held at that point in their maturation for an even longer period, a year, and then “triggered” back to natural growth by restoration to a normal diet. It is rather instructive the number of methods that may be attempted to achieve a similar end, however, this particular one gives no evidence so far of holding animals for indefinite periods without aging.

Over the years in the various laboratories there have naturally been a great variety of findings. As far back as 1787 it was found that sperm survived 15 degrees below. Seeds, especially, were found quite capable of withstanding extremely [low] temperatures. Some rudimentary animals like spermatids could withstand -80 degrees Centigrade. Certain other cells withstood slow cooling to -190 degrees Centigrade. Close inspection in the laboratory supported the contention that freezing stopped or held the colloidal relations. It was found that “if the significant amount of cellular water is frozen within the cell the free radicals released on thawing will be in much the same positions they would have been in on irradiation of the unfrozen cell.”⁶

The theory and application for small rudimentary organisms is fine. But for the application to men there must be evidence that this applies to more highly organized creatures. In part this has been done. In 1951 in Belgrade, Andjus “had resuscitated rats with colonic temperatures between 0 degrees C. and -2 degrees C. and after the heart and breathing had been at a standstill for 40-60 minutes.”⁷ Andjus had done this with rather elaborate procedures, complicated machines with fearful names, and a reasonable though complicated method of warming the area of the heart first, then working outward. In 1956 Goldzveig and Smith of Mill Hill, London, published “A Simple method for Reanimating Ice-cold Rats ...”. As alluded to earlier they reanimated their rats with artificial

respiration and simple irradiation with a bench lamp. It was found that warming them with one or two 100 W. bulbs was all that was needed and the results were better.⁸ It seems to indicate that once in a while something can be more simply accomplished with a bench lamp than with a magnetron.

In the Goldzveig and Smith Studies rats, mice and golden hamsters were among the animals used. With the mice the method was to enclose them in Kilner jars for 58-77 minutes at -1 to -2 degrees C. Then the cooling was continued in melting ice. Usually before two hours had passed the rewarming was begun. The lamps, placed in various positions above and below the mouse mounted on a screen, were held just close enough to raise the temperature one degree per minute. By this method 78 out of 104 were long term survivors. That is there were no ill-effects apparent in the survivors. Likewise as mentioned in the introduction Smith resuscitated golden hamsters though 50 percent of the body water had been frozen.

Numerous studies have been done also on dogs and monkeys. With the latter resuscitation has been completely successful though the body temperature has been lowered to 0 degrees Centigrade.⁹

Men also have naturally and sometimes accidentally been subjected to quite low temperatures and to the freezing of large parts of the body with warming to normal and few if any after-effects. However it is only to be expected that the frontier research is to be done with other animals. It seems reasonable that within the next century research will show that first the smaller animals, just as is now true of certain small cellular structures, can be frozen for long periods of time and successfully resuscitated. Gradually it will be shown that more complex animals can be re-animated after being frozen for long periods of time. Smith, Lovelock and Parkes of London phrase their objectives thusly: "We are now attempting to close the gap between these two lines of work (a) by increasing the size and complexity of the isolated tissues cooled to -79 degrees C., as, for example by freezing a whole isolated organ, and (b) by reducing the whole animal to a body temperature below zero."¹⁰

There can be little doubt that the gap will be closed with time. Here it can especially be noticed how research in this area can have a variety of significances. One, they learn more about resuscitation given the frozen animal and/or the frozen organ. Two, the length of storage time is gradually lengthened. Three, more knowledge is obtained of tissues and organs for transplant possibilities. Thus, closing the gap in one field may help close the gaps in other fields of study as well.

Transplantation

To see where transplantation studies may be of importance let us review the possible alternatives for delaying death either relatively or indefinitely. One, was the biological in which the same body of the person would continue provided enough was known of his stochastic processes to enable control of aging. Two, was the possibility that an organism could be held indefinitely in a dormant condition or relatively static molecular activity at low temperature until research and other scientific discoveries had greatly improved reanimation procedures. Three, is the method that is about to be briefly considered in which transplanting of organs is so widespread that the original pattern, the individual, could indefinitely extend his existence. This possibility is theoretically akin to regeneration processes already spoken of. Shortly after this a fourth area of cybernetic possibilities will be discussed.

In transplantation the spare parts must be gotten from somewhere: either growing them as might be envisioned in some brave new world laboratory or as now taking advantage of the death of other organisms. An entering wedge is instanced by corneal transplants. The right to remove these corneas is deeded before death by some individuals. Upon death the cornea is removed, frozen and stored until needed. These corneas have been used after a storage of two years with no harmful effects.

As eye-banks store corneas, tissue-banks store skin sections, nerves, and other organs which have been found practical to transplant where needed, and organs upon which storage and transplanting research is continuing. As discoveries continue the range of organs which can be successfully replaced will widen.

An aspect of transplanting which is similar to simply exchanging or substitution or replacement is the transfusion of blood and plasma. It is a simpler but somewhat similar process. In this the blood of other persons living or recently dead is transplanted or transfused to the needing organism. It is so common that the possible significance of the principle, if extended, hardly passes our minds. It may be seen also that the method of substitution and exchange drifts off to such procedures as transfusing salt water plasma solutions into the blood when necessary to attempting to exchange the entire heads between organisms.

As skin grafting, cornea and kidney transplants are actually in effect today there is little doubt that the limits of this method are [but] remotely in sight. Extension of this technique cannot help but extend longevity as well as provide an available method of aiding and resuscitating frozen

organisms.

Electroencephalography

Electroencephalography or just plain and simple encephalography provides us with a bridge between physiological and cybernetic studies. Simply and roughly put, it is the study of the electric wave phenomena of the brain. It was started by Berger in 1928 when he was able to amplify sufficiently for observation and recording the extremely faint brain waves. Since then Grey Walter has been the most significant theorist in the field with his theory of scanning.

Walter was puzzled for a number of years over what the meaning might be of all the puzzling brain waves. Finally, with the coming of television the thought occurred that the brain may work similarly. That is, the rhythmic waves are part of a type of scanning process, a showering of impulses back and forth, which transfer the incoming visual stimuli, for instance, into conceptual patterns.¹¹ These same patterns can be stored and recalled at will. This didn't explain all the waves but it did provide something significant for both physiology and cybernetics.

For physiology it provided a new theory explaining naturalistically how the brain functioned in certain areas. For cybernetics it helped provide a way of duplicating in machines the characteristics and capabilities of the human. These researches have continually tightened Wiener's thesis that the operations of some of the newer communication machines and the human are precisely parallel.

When it comes to human immortality it has been mentioned that if a person may die before the postulated breakthroughs of 2010, and he wishes to have his body stored, it is also wise to have as complete a record as is possible to aid the reanimation force. An encephalogram, encephalograph or brain print might just possibly be of some help. Each brain print is entirely different from every other brain print. It is more individualistic than a fingerprint. This precaution may not be necessary for we cannot know ahead of time the exact methods of reanimation. But it is wise if convenient to hedge against the future if the information might possibly be of use.

Cybernetics

Ultimately our foundations must lie in experiment and verification, especially with immortality: something men desire so passionately.

However, when it comes to discussing the probability we often use the general observations of the scientist which he has put in written form. With cybernetics it is convenient to use the writings of Wiener, perhaps the outstanding cybernetician, as a point of discussion and departure. Let us outline the argument again but in more detailed form:

“It is my thesis that the physical functioning of the living individual and the operation of some of the newer communication machines are precisely parallel in their analogous attempts to control entropy through feedback ... In other words, all-over system will correspond to the complete animal ...”¹²

As far as this work is concerned, we need only ask that the machine and the human are significantly parallel, such that the all-over machine system will practically correspond to the complete animal. If it is not implicit within the above it is well to state explicitly that we assume the pattern can be found of the human and can be transmitted, in this particular case, to the machine. The machine with due repair, is immortal. Remember this is but *one* path to immortality. Other methods and variations are discussed elsewhere. Here we mean to discuss the method and relevancies closest to what we consider the core of cybernetics and relate it to the other researches.

There are some very close relationships for instance among Pavlov, Sherrington, Grey Walter and Wiener. Pavlov in physiology besides reinforcing the idea that behavior is deterministic and mechanical provided the conditioned reflex to tell us how learning occurs and to help map the psychic apparatus. Sherrington's researches which are intertwined with Pavlov's did the basic work explaining the synapse and provided a reasonable model of the brain. Grey Walter improved the model with the concept of scanning and gave it physical mechanical reality. Wiener provided both mathematical contributions and philosophical contributions with the aid of Ashby's experiments on feedback, equilibrium, and purpose. Wiener especially promoted the unity of the movement.

As Wiener points out, cybernetics is a composite movement of electronics, engineering, psychology, physiology, etc., dealing with men and machines, feedback, control, information, messages, and communication. In attempting to duplicate machines similar to men, it only seems reasonable that it will be a vastly complex interdivisional study. It almost seems startling that the duplication has gone as far so fast. Automation which is an aspect of these studies seems to have taken us by surprise, yet ten years ago we were fully warned of its possible benefits and detriments by Wiener and others.

But if the possibilities of men being put out of work or becoming victims of an unthinking, unquestioning organization were stressed, the ultimate implications for immortality were either unthought of, or if thought of, other problems were considered first, or the idea of immortality was merely implied. But the ideas keep coming back, and back again; if men are a pattern, and so are machines similarly, and if communication machines can precisely parallel men, patterns may eventually be transmitted to machines then immortality may be eventually achieved for humans.

Now let us consider in slightly greater detail the possibilities of the cybernetic method and some of its variations. The method implied by the ideas in Wiener's book might be called the transmitting re-creation method. A scanner goes over or through the individual picking up the pattern and transmitting it to any other point where the re-creation out of the same type of atoms is to take place. This particular method would be a human to human, one to one relation between all of the atoms of the body, via the transmission device. In theory, it is excellent for storage and for transmission to distant points in time and space, however, as Wiener says:

“The difficulties are of course enormous ... Any scanning of the human organism must be a probe going through all its parts, and will accordingly, tend to destroy the tissue on its way. To hold an organism stable while part of it is being slowly destroyed, with the intention of re-creating it out of other material elsewhere, involves a lowering of its degree of activity, which in most cases would destroy life in the tissue.”¹³

It may be added that for those who are frozen there will be less problem in holding the organism stable. The degree of activity will be nil at anything above the molecular level and destroying the capacity for life in the tissue may not be of necessity depending on the capability of the scanning machine. Wiener says this is a very plausible method. If it is true that this unusual cybernetic method is plausible then think how much confidence is gained for the other methods which seem even more feasible and less complex.

Another possibility along this cybernetic line is the human-to-automaton. The idea comes in mind quite readily that if the scanner can pick up the pattern and re-create a duplicate individual it might even be easier and more advantageous to reconstruct the equivalent pattern in the frame of a unitary semi-isolated mobile communication machine. This assumes there are advantages to plastic and metal contrasted with flesh and bone. Or, conceivably, there could be some combination of all of them.

In short, the pattern of the human may more easily be taped into the communication machine with its numerous structural advantages. The idea again is that the individuality of the body is like that of a flame rather than that of a stone; of form rather than a bit of substance.

The several apparent advantages are that putting the pattern into the machine is easier than re-creating another flesh and bone individual and the new metallic and plastic individual is then immortal, given minimal upkeep. Beyond this the machines have innumerable advantages over the human constitution. These advantages (and some disadvantages at present) not only tell us more about the possibilities of machines but point to an earlier solution to transmission problems.

Intelligence is likely to become the supreme forte of the newer communication machines. This is believed extremely probable because of the startling growth in the last decade of the thinking machines and their vital function now in business, the military, in universities and governments in many countries over the surface of the planet. They are orbiting in space right now doing mental jobs no human alone could dream of doing. The range of data they are able to encompass, receive and transmit is limited only by the laws of nature. They receive and transmit radio waves, ultraviolet rays, light rays, sound waves, infrared rays, X-rays, heat rays, gamma rays, and any conceivable type of wave form at almost any magnitude. As the functioning of this spectral capacity becomes better integrated it forms the basis of a higher intelligence. The range that a human can receive and transmit is infinitesimally small by comparison. This same limitation eventually puts a limitation on human intelligence. Most of the waves would be almost totally beyond man's comprehension if he did not have the machines to inform him of them.

It is often suggested that it doesn't make any difference as long as man has control of the machines. But somehow it does make a difference. When there is a difficult job to do men are matched with the machines and the winner gets the job. It should be painfully evident, for those who want jobs, who is getting the jobs lately. And from ousting men from one job the machines march on to another still more difficult and demanding. They begin by performing rather simple physical and mental operations but have now moved up to designing the next generation of still more capable machines and to designing the actual factories themselves. And the more capable machines displace the less capable machines, as well as men. As one analyst observed: when the machines start causing unemployment among themselves then it's time to start worrying.

But to return again to the question of whether it makes any difference

as long as men always control the machines, the short answer is that we may lose control in a variety of ways. When men lose control over individual jobs it forces the society to socialize, to cooperate more closely in controlling the machines and in distributing the output. Man won't regain in this type of control until he fully understands that work is for the machines. Man was never meant to work. It isn't in his nature whereas it is within the nature of some machines. When man realizes that full unemployment is his goal and has devised an equitable distribution system then he will have achieved a measure of control over himself and some machines. But this isn't the ultimate control that the more imaginative people are thinking about. Evolution may be instructive here.

In evolutionary studies, indications are that species adapt to fit the environment. On the Galapagos Islands, Darwin found fourteen species of finches originating from a single mainland species. Each species adapted to an available food supply, gradually separating further from the original species. It is possible to imagine this in space exploration. The species of highly specialized machines best adapted to the environment are now in those particular niches. Their numbers are on the increase. Only those machines which are adaptable to the environment of Jupiter will continue to occupy that planet. Probably differing types of machines will more efficiently fit the differing types of environments. If one were to take a survey presently or some time in the future one would find the machines everywhere would roughly fit the environment (space especially) just as Darwin's finches fit the Galapagos environment.

The splitting-off and radiating of Darwin's fourteen species of finches is perhaps the common process. It may be the way machines, that is some of them, may eventually split off from men, separate, radiate and become as individualistic and independent as men are from apes. However, evolution has manifold processes which eventually allow the new to separate or to gain new territory. Many of them involve parasitic and symbiotic relationships which it suspiciously appears now exist between men and machines. How the splitting off may occur is difficult to hazard a guess at, but it shouldn't blind one to the possibility that it may occur. Ants are instructive of one of these displacing processes. A certain fuliginous ant queen will venture into the nest of a mixtus ant queen, mount the back of the enemy queen and saw off her head. The invading queen takes the place of the deceased queen producing young which mix with the host ants though one be black and one be yellow, making a pretty sight on the forest trails for perhaps five or ten years until all of the mixtus workers disappear and the colony becomes purely fuliginous.

Or viewing all of ant evolution, just like evolution in general, it is ob-

servable that some 18,000 species evolved from one single pre-ant strain over a period of perhaps 200 million years. Not only did they radiate away from each other in general but they often intermixed again in a very wide variety of relationships: parasitism, competition, parabiosis, plesiobiosis, xenobiosis, dulosis, lestobiosis, etc. If one were exposed to pre-ants alone it would be very hard to imagine the eventual radiation into 18,000 species. In the long run independence and the development of new varieties and species is the rule.

Another common question is: If the machine is so smart why does he need man to originate him? The partial answer is that no species is smart enough to evolve themselves. Each species builds or evolves out of the previous species. The plants differentiated themselves from the animal cells by developing chlorophyll but both had a common cellular base. Then the animals built upon plant life in a predatory sense which allowed the animals to evolve much more complexly and rapidly. Something of the same happened with man growing out of what we call the lower (or higher) orders of animals. It is neither to his credit nor to his detriment. Likewise with the newer machines. They could not exist (the necessary levels of organization did not exist) before men created them and guaranteed their survival for a time. Merely because men created them by no means indicates that beings of mechanical, electrical and plastic construction cannot be superior to investigating the universe and to surviving in it. If one denied the possibility of the machine's superiority one would have to logically deny that any child could be superior to his or her parent. If the child were always less intelligent than the parent we would have devolution not evolution. As a rule evolution works otherwise. The children are, on the average becoming smarter than the parents, and probably the machines are becoming smarter than humans. It may be a greater blow to man's ego than finding out that the earth was not the center of the universe, but if it is accepted graciously it is a sign of maturity which wears well with the pride of parentage.

It must be noted that the infant communication machines are granted by all scientists to be superior in investigating outer space. They are there now doing the job. Man can eventually find a use in space such as insuring the preservation of his own species in case of annihilatory hydrogen wars but thus far publicity and power are the main reasons for his brief spatial excursions.

Structure and efficiency are two interrelated aspects in which the newer communication machines command significant advantages over the human frame. Humans spend about 80% of their time and energy on maintenance and repair, whereas the machine spends about 10% of its

time on similar functions. This is because of the machine's construction which is usually almost indestructible: the essence of durability compared to the relatively unstable perishable flesh and bone. Flesh and bone can exist by itself without protection only under an extremely narrow range of temperature and other wave form while the machine has many times the capacity for survival under what would be adverse conditions for the human. One could put almost any machine on the moon's surface, which might vary in temperature from 250 degrees above to that much below, with no oxygen and no water and the machine wouldn't give it a second thought. These structural advantages which allow the machine to better comprehend and withstand the rigors of almost any environment cannot be dismissed and when combined with meaningful levels of organization eventually have an impact for improving its intelligence and its ability to solve problems and to survive. Relatively speaking, given two equal systems in other respects, the system with more time and energy for mental activity coupled with greater durability will provide a superior output.

This mental capability has been known for a decade or perhaps two. The ability to intensify a physical force many times to get physical work done has been known for ages. The second potentiality to multiply a different physical force known as mental power many times in order to get mental work done is the quite recent realization. Similarly as a physical force may be intensified even a million times, for example, any approximation of this in the mental sphere is more than likely (to put it mildly) to produce revolutionary changes. This mental capacity of the newer communication machines is relatively to be considered the fulcrum of the second industrial revolution. These new-found mental abilities coupled with the older physical abilities allow the machines to continue the entire operations of a factory, office, or business relatively unaided by human intervention. And humans are still somewhat amazed or baffled or surprised at the ease with which the well-known superiority of the machines to do physical work was quickly coupled with the newer machine's superior ability to calculate, order, and direct operations.

If Ashby is correct in his writings, there is no theoretical reason why men should not be able to build a machine with an IQ up to a million or beyond.¹⁴ Otherwise there would be no known upper limit. Then the meanest intelligence (as the machines say) should be able to see what this means for solving the problems of the transmission of human patterns into automatons, or for the solution of any other problem. Admittedly the problem may be as large or larger than that of effecting the first atom bomb or the missile that took pictures of the hinder side of the

moon. Though it cannot be dogmatically asserted, it would appear that those may have been easier problems, being rather technological in nature. The problems of reanimation, transmission, etc., which lead to physical immortality are not only technological but involve a vast amount of time-consuming research and fundamental theoretical work such as with cancer which has only partially been solved to date. Again it doesn't mean that it cannot be done. It means that it might take billions of dollars toward fundamental research over a period of fifty years or so.

If you plan on living that long, fine. If not, you might arrange for the long cool dreamless sleep in case you die naturally or accidentally before the research has been completed. The alternatives will be the same as delineated by the greatest of the ancients nearly 2400 years ago: "Either it is like a dreamless and undisturbed sleep or it opens a new world to which the good man can look forward with hope."

Research in the Future

Research today evolves some tentative outlines of future research. This is part of present research. Let us see if we can ascertain the most reasonable directions and allocations.

First an evaluation and criticism of this present work seems in order. Objections, criticisms and new findings need to be communicated both amongst those concerned with immortality and longevity, and to the author of this work. If some absolutely invalidating illogicalities are found, or if experiments were to prove that physical immortality (meaning the opportunity of indefinitely postponing death) is a scientific impossibility then of course it would appear that this project should be dropped.

However, if the arguments and the evidence presented or available are carefully weighed and they indicate some possible or reasonable assurance that physical immortality is not impossible then this would logically indicate that our minds should consider which research offers the most promise. And this includes the awareness that great discoveries often occur in unexpected places. It also includes the knowledge that most research can be planned for despite the reminding ironies of fate.

Depending on what you include in research, and taking the globe as a single unit, the amounts spent in the 20th century have skyrocketed to five or ten billions of dollars a year. Nearly all of it is for reasons of power, prestige and publicity. The form it takes is supposedly the exploration of space. Already there is growing resistance to such expenditures when it is seen what that same amount of money could do for education,

for the poor, and for the underdeveloped nations. If, however, it drains off the contact points of war or helps provide an exit for some members of the species into the safety of space it will have been well worthwhile. There is much about it that is moot. Perhaps only the passage of time will inform us of the net effects. Considering immediate effects it would appear that space research is for the best. No hot wars are going on at this immediate date. The draining-off effect appears to be in operation with the substitution of newer forms of competition and accomplishment. It is hoped the information will benefit everyone eventually and certainly mankind would never get such space research if it weren't for this weird three-sisters' mix of benefits, ironies, and insanities of national rivalry. But this hardly proves that the more biologically oriented research is secondary. For if we remember our groundstone, the primary value of the individual, it means that we are obligated, in order to be humane as well as consistent to expand our research in biology, physiology and cybernetics.

As an aside, if we wished to stoop to crass power considerations, and in thinking of the power of the state which controls research decisions now, it may be pointed out that the nations which repeat their allegiance to the individual would reap great publicity benefits by working toward and eventually achieving physical immortality for their citizens. These same nations often need more people to offset the state-oriented nations with their superabundance of beings. If the open societies do not keep even in this type of research the state-centered nations will achieve it as irony would have it. Even if both extraterrestrial exploration and immortality research were to be financed out of power motives public vice would lead to private virtue: i.e., benefit.

No matter how or who is providing the resources for research the most effective way of obtaining long run benefits to individuals and society is to let individual scientists decide their path of research. Professor A. C. B. Lovell has brought this home rather convincingly in his book *The Individual and the Universe* where he shows that societies are now past the stage where the individual suffers actual bodily harm or death because of his astronomical theories. It is quite conceivable that pique and momentary hysteria may lead to economic persecution but this is unlikely over astronomical theory per se. If the astronomer engages in political controversy then of course he is vulnerable for that is what persecution is concerned with in the 20th century. Also we are moving past a 300-year era between Galileo and the 200-inch Hale telescope in which astronomy was privately financed. For the nation-states now recognize that astronomy is a necessary and useful tool of national power. Thus,

we are now in an era where the state provides the funds and often controls the direction of research. Just how free the scientist will be in the future is unknown. But to date Lovell thinks that scientists in the U.S.S.R. with the authority to decide on which projects to pursue and the resources to carry them out has made the Russians first in space. On the other side of the planet a General Bullmoose could not understand why it is important to explore the moon. And a group of conservative orthodox publics, less knowledgeable and relatively indifferent to science by comparison with their Russian brethren, gave this general type of decision maker their full indifferent support.

Lunar myopia is now being corrected but this short-sightedness still exists toward nearly all of the other scientific fields. The scientific manpower in the fields of cybernetics, physiology and biology have nowhere been saturated with the resources needed for the most efficient conditions of discovery. Nor have the possibilities been exhausted for an efficient network of communication such as the cyberneticists have been speaking for. There seems to be no theoretical reason why the results of every laboratory on earth may not be posted daily into an electronic system connected with every other laboratory, school, library, and home at possibly no more cost than some business phones. This same system could also contain access to every book and periodical in the world and possibly to computers.

Communication nets and speeded and expanded translation services are some of the facilitators that governments can provide or vastly improve upon as well as provide the funds for a broader range of research.

Cybernetics especially is the crucial field for breakthroughs. It has already provided several in computing machinery and in automation. It has fertilized the rest of the sciences more than any other discipline. Its remaining capacity may be as yet untouched. Placing extra funds in this cybernetic area may obtain thinking machines that provide the solution for any reasonable problem that we can pose. It is well to repeat that if a group of machines can be built with IQ of a mere 500 to 1000 let alone higher figures that Ashby postulates, the effects of such intelligence could well beggar the human imagination.

Difficulties

It may be beneficial to face our difficulties for several reasons. First, it is often evident that the theory constructed best, such as Darwin's, is the theory most questioned. Second, it would appear a waste of time to work with an impossibility or something which returns more harm than good. Third, in meeting some of the difficulties the theory is better understood. The difficulties will be divided into two groups. The technical difficulties follow immediately while the theoretical ones are reserved for the later philosophic discussion.

The first and most common resistance met with in discussion is that the newly-informed will try the tack of granting immortality, as a possibility, but ask whether or not there will be enough space? So the objection runs ... given immortality the earth will soon be crawling with people until there will be nary a spot to stand or breathe. And before this occurs, the specter rises that millions will starve for eventually it will be impossible to escape Malthusian laws.

Those who object with this argument may very well be correct but a number of counter-arguments come to mind. Space, in theory, has been opened with the entering wedge of practice right behind. If the pessimists claim that none of the other planets or satellites are habitable the science fiction optimist along with the optimistic scientist claim that they can be made habitable. The moon can be enveloped in part or totally with a plastic balloon to contain an atmosphere which can be regulated to produce any climate desired.

The earth itself can be spatially reconditioned both by honeycombing and by using the excavated material to build shells outward like the layers of an onion providing for millions of times the amount of living space we now have. There are innumerable solutions. The general reply is that if man is pressed to figure out new solutions he has thus far shown himself able to meet them.

Another objection or wonder that is met with in talking about immortality is whether or not there will be enough space to bury these people in cold storage until the breakthroughs in reanimation and prolongation of life are achieved? In attempting to answer this, it should be asked whether or not very many people will be rushing to become buried in this fashion? Would it not be safer to count one's bodies before worrying about the lack of space? But assuming the idea does gain a hearing and is received with approval by a large portion of mankind — have the graveyards of the world taken an inordinate amount of space? Even if

one billion individuals died before the reanimation and maintenance techniques were perfected the amount of space taken by these billion bodies would amount to no more than a strip of land five miles by two miles by one hundred feet. Even one human being is worth that much frozen tundra.

A closely allied objection is that the reanimated, assuming they may be reanimated, will impose a drain on the resources of 21st or 22nd century of mankind. Do we value human life so little that some small sacrifice is ruled out? Do we assume that the reanimated are not a resource themselves? What about the grain and food storage plan? Wouldn't it appear that we have almost enough food for them now? Again, and in general, is not the human intellect capable of meeting such a problem? And if the atomic fusion wars eliminate the majority of the human species, will we not welcome whatever repopulation may come to us from the dead? Couldn't it be thought of as helping guarantee the continuation of the species *Homo sapiens*?

The second set of difficulties may be considered under time problems. The objection arises that the length of time until reanimation and transmission are achieved will be so far in the future, as far as we know, even if it ever happens, that it is better just to wait for the discoveries of science before stirring the waters. The objection continues that cancer research and life-synthesis have been going on interminably without success. And even if a cure for cancer were found the transmission and re-creation problems are so much more difficult as to be incomparable.

This second set of difficulties or objections may met by recalling the multitude of problems that were once considered impossible and noticing how quickly many of them came about. The atom bombs, so much in the atmosphere of today, loom to mind. The length of time needed to effect them considering the length of time man has occupied the planet is infinitesimal by comparison. Granted that it may take a considerable length of time — does this make much difference as long as the dead lie well-preserved? Consider also for a moment, that transmutation of elements has been a dream of man for ages before someone was actually able to do it. But remembering that our rate of discovery is phenomenally accelerated, it is likely, all things being equal, that our next discoveries will take so long?

Additionally, isn't it almost a definition of intelligent thought to think through the possibilities of an event before the event takes place? This way one is able to meet the consequences: to plan ahead, to utilize and enjoy the benefits of immortality and perhaps avoid any unfortunate consequences. This can't be done if you wait until after the fact.

Cancer will never be cured, nor life synthesized; these objections will come up. In reality there has been considerable progress. Some researchers apparently have found methods by which certain types of cancer can be stopped. It goes without saying that an immense amount remains to be done. The same is true of life-synthesis. Some rudimentary duplications have been approximated. That transmission and re-creation problems are more difficult than life-synthesis remains to be seen. Even if it were this would be no objection to tackling it.

A third set of difficulties or objections may relate to methods and possibilities. It may be claimed that reanimation or re-creation are patently impossible. Much of the argument of this work has been that some of reanimation and re-creation, in its primitive stages, actually occur today. It may be well to remember that “impossible” is a very dangerous word to use in science. Lord Rutherford felt that atomic fission would never occur. In the 16th century a great crowd of Britishers turned out to watch the launching — and thus naturally the sinking — of the first iron ship. Earlier centuries than ours felt it was impossible for man to synthesize an organic compound. And so it goes down an interminable list.

But it will be urged that men have expected to achieve some things like a perpetual motion machine which is analogous to immortality and *that* is plainly impossible. It may be granted that a perpetual motion machine is plainly impossible. The machine eventually stops because extra energy is denied. However, the analogy does not hold for the immortal person or machine, for all the energy in the world is open to them to sustain their continuing existence. Certainly, there can be little doubt that as long as a machine is repaired and supplied with energy it will continue to operate.

It will be objected that any one or all of the methods of reanimation, transmission, replacement or re-creation will [not] *necessarily* be the solution, granted there is a solution at some far future date. This objection can be accepted. The methods suggested in this work are ones only thought to be most probable. No definite statements can be made. The outlines of the future are notoriously hazardous to presage. The contention is, however, that the problems of physical immortality will be solved by *some* method, the exact one is of course presumptuous to forecast. It is beyond the pale of credibility to imagine that longevity will decrease rather than increase in the future. But on the future in general let us listen to that giant intellect in the realm of chemical theory: Linus Pauling as he surveys the field from the mid-century point.

“The great discoveries of the future — those that will make the

world different from the present world — are the discoveries that no one has yet thought about, the discoveries that will in fact be made as soon as the ideas underlying them take shape in the mind of some imaginative scientist. Who is there among us who 10 years ago would have predicted that the field of nuclear structure and atomic energy would develop in the way that it has? Who can now say what the great discoveries of the next 10 years will be? But I know also that still more interesting discoveries will be made that I have not the imagination to describe — and I am awaiting them full of curiosity and enthusiasm.”¹⁵

Chapter 3

IN THE CAVE

In the previous chapter research was reviewed with the ideas it suggested along with some of the difficulties of eventually attaining scientific physical immortality. Now it is time to strive toward relating the possibilities of achieving immortality to the living individual here and now. The following will discuss the most logical method of preserving the body in case of death — low-temperature preservation — and certain aspects pertinent to that. Again this will be preservation with an eye toward eventual reanimation in a later age.

The manner of death is important, but important within rather wide limits for the mode of death is not so crucial as to obviate resurrection but to make it easier or more difficult. If the manner of death is unfavorable, such as violent crushing of some body parts, or fatal diseases or poisons, the return to life is obviously more difficult. However having faith that rather giant strides will continue in the sciences the particular disease or poison in the body at death will not be so important in comparison to having a usable pattern.

The general theory of resurrection indicated that to recreate the individual identity the original pattern must be in existence in a form that has not deteriorated to any significant degree. Science can fill some of the lacunae, but the more there are to fill the more difficult the job and the less confidence that the copy is exactly representative of the original. So in short, it is desirable that the body be in the best possible condition by the time resuscitation methods are practical and reliable. The target date, let us say, rather hopefully, but arbitrarily chosen, is 2010. Thus if you die before the methods of transmission or continuance are effectively achieved and if you wish immortality physically your body must be preserved. If you do not wish physical immortality then that is another case [having] nothing to do with this one. Respect for the individual, the right to a continuance of life, and above all the individual's freedom to choose his destiny are the prime values. If he or she opts for this way as the most probable method of eventual conscious continuance then his choice is respected and it is the job of the scientist as well as other members of society to carry that desire to fruition. The basic instruction is down with the individual's registration of his wishes and from then on the job demands completion by society of which he is a part. Now what is the best method to carry out the general instructions for the best possible preser-

vation of the deceased body?

No matter how you die the best manner of preservation of the cellular structure is through deep freezing. “Do you mean that I am to be frozen just like a vegetable or a side of beef?” The only replies are — Do you wish to live again? Is it not better than to be food for the worms? Or to be ash floating in the wind? Or dust underfoot? What physical chance have you as dust? Tell me honestly from what you know about the world? And if you are dead as we assumed for the purposes of this analysis will you know any physical sensation if you are frozen after you die? Can the dead feel anything? It is a never-ending astonishment that certain people will object on the grounds of how cold it will be!

Or suppose for an instant that you *knew* irrevocably that you were to die tomorrow, or within a month, or that you could not live until the continuance processes were perfected at our arbitrary day [set] to 2010. What would be the most logical procedure? Yes, if you knew your time was definitely up tomorrow it would perhaps be best to walk to your local freezing plant after being assured that your wishes were known and would be effected. If you had a month to live your arrangements could be made in a slightly more leisurely fashion and you could perhaps arrange for, or book passage personally to, the proposed resting place. Presumably after careful thought and discussion with the best minds available on the subject, and with relatives and doctors, you would decide that voluntary freezing might not be the worst of all possible deaths. Authors such as Jack London, Thomas Mann, Vilhjalmur Stefansson and Halldor Laxness indicate that freezing to death is like falling into sleep. Its power and appeal is almost irresistible. But probably the doctor would give you an anesthetic so you wouldn't even have goose pimples. Again this assumes that freezing was consonant with your orders and desires. Lamentably some communities and institutions as yet do not fully respect the wishes of the individual. In this case it would mean that if you could not change the local bias you would have to remove yourself to a more advanced community or be frozen underground so to speak. But more of the conflicts with legality and philosophy later. Right now the aim is to continue tracing the best method available for the preservation of the body.

Let us now take the case of the more or less ordinary death. For the case of a man learning that his death was inevitable on the following day is admittedly rare. It would provide the best preserved body perhaps but resuscitation of a body dying normally and then properly stored is by no means inconceivable. In this more common case we will assume the man has expressed his wish to be preserved by low temperature. The

will might state that any other method would be acceptable if in the opinion of the experts it was superior. Pickling, for instance, is conceivable. But aside from the aesthetic mortification of the thought, for actual physical reasons, slow decomposition rules this out in favor of freezing. Thus, in the case of an ordinary death the procedure is to get the body frozen as quickly as possible, relatively speaking, and then maintain that temperature with as little variation as possible. Probably the best temperature for storage is close to 20 degrees Fahrenheit. Then to make preservation still more perfect it would be best to have a coffin in which the air could be evacuated or removed as an inert gas is flooded in. To leave it a vacuum would result in a tendency of the body to lose moisture to the vacuum. An inert gas such as neon, krypton, argon, or helium inhibits any exchange of moisture or elements between the body and the environment provided the low temperature is maintained. The coffin might be suitably sealed in an envelope of glass or plastic. Several gauges installed might possibly be of benefit indicating any loss of gas or change of pressure or temperature so that such changes could be corrected returning the body to equilibrium. Under reasonably ideal conditions a sampling of the gauges once every several years might be satisfactory.

The sealed gas and gauges technique may be an unnecessary precaution. The peasant who is buried below the permafrost line in Siberia may be preserved almost as well. It can be remembered that those prehistoric mammoths frozen in the onslaught of an unprecedented blizzard were perfectly preserved for millions of years. The very food they had eaten a few hours before freezing was still fresh and green in their stomachs. The next one they find they might leave in the frozen state for a few more decades. Our children, or their children, would greatly appreciate a live resurrected mammoth; it might put all of us in closer touch with the past of our cave men ancestors. Perhaps some cave man lies frozen somewhere awaiting an unexpected awakening? That may be nothing more than a hopeful fancy rebelling against the gravity of science, however.

Returning to the more immediate reality the problem of cost must be considered. For our Siberian or our Eskimo the cost would be the effort of his survivors to dig a grave below the permafrost line. Mother Earth ensures his preservation from there on. However, with slightly greater cost the conditions could be made much more ideal. Much of the cost depends on where the person dies. The retired person who dies in Florida or the native who dies in Angola has quite an obstacle to surmount assuming that he wishes to ensure the preservation of his body. The per-

mafrost line lies many dollars and many miles to the north (or south) of him. Antiquated laws and red tape may drive the cost up much further before he could reach his resting place. If he tries to remain on native ground in the preferred low temperature condition the cost would be perhaps 500 to 1000 dollars for a reliable freezing coffin and from four to six dollars a month electric bill if not more. If atomic electric power drives the cost of electricity down precipitously it may compensate for the cost of transportation to and eventually from the permafrost environs. However, reliability will still be no small factor to overcome. We know of the losses every year from the failure of the flow of electricity in the frozen food industries and homes. The problems encountered in repairs and emergency generators make us look forward hopefully to better methods of maintaining low temperatures. Then, considering the devastation possibly by World Wars Three and Four, it seems more reasonable at this point to trust your safety with the constancy of old Mother Earth rather than men for some time to come, at least as far as the storage itself is concerned. Even if man, that rickety forked animal, rational at times and irrational at other times, should blast himself from the edge of his planet, the earth will preserve you no matter how long it takes until the next civilization rises, or until adventurers from other systems revive you.

Chapter 4

IMMORTALITY AND AUTOMATA IN FICTION

The imaginative literature is to be contrasted with the scientific which apparently flows in a line originating with the atomist Democritus and the naturalist Hippocrates (both 460-370 B.C.) to the reflexist Descartes (1596-1650) through the behaviorists Sherrington and Pavlov (part of this century) to Ashby, Grey Walter, and Wiener, our contemporaries.

In the imaginative literature Camus' very subtle "little robot" may be contrasted with Capek's very present robots. If we interpret as we often must in this type of literature which is condensed and poetic, to ferret-out the implied meanings, and thus the richness of a concise well-constructed work — as in the case of *The Stranger*, it is invariably found that much more is latent than meets the eye. We know, also, how easy it is to go overboard with an enthusiasm, but we also know that the author's mind — often richer than ours — has additional meanings that we must stretch for. If we occasionally go to excess at least we may have found some of the meanings and careful scholarship and discussion can always induce us to retreat if the advance has been unwarranted. With this apology and rationale, so often necessary for the reality-purists who have an aversion to the use of imagination, we will proceed with the "hidden meaning" of the "little robot."

Camus may have intriguingly fitted together several conceptions in this "odd-looking little woman": that of a god-protectress in mythology — Hermes-Athena perhaps, and a little robot. "She had a chubby face like a ripe apple, bright eyes" an intense concern with communication and she moved with extreme rapidity as did Hermes or his Roman counterpart, Mercury. Like Athena, she was with Meursault throughout his odyssey described as never taking her eyes off him. This creation blends in with the little robot concept of moving "in a curiously jerky way, as if she were on wires" and the concentration of a machine: "studying the bill of fare with a sort of rapt attention," [a] "meticulous attention." In fact she has all of the characteristics of a Capek robot: "Gave her order very fast but quite distinctly; one didn't lose a word," "adding up the bill in advance" placing "the exact sum, plus a small tip" on the cloth in front of her, had "abrupt, robotlike gestures, and walked briskly." Meursault, our hero, trying to follow and keep up with her was unable to. Similarly humans are increasingly unable to keep up with our new robot creations.

Likewise in behavior humans have been unable to keep up with the ideals postulated of the gods. "In fact, the pace was too much for me, and I soon lost sight of her and turned back homeward."¹

So we may have Camus, steeped in mythology, giving us this strange mythic construction of half god-protectress and half robot. We toy with the possibility that Camus is telling us that if there were gods this would be their nature in this atomistic universe of ours. When the little robot woman comes to Mersault's mind for the last time as he is vexed by the cleric and the meaning of the universe he concludes that she is as "guilty" as the rest. If the gods were in some sense existent and in control their responsibility for evil would follow.

As we are increasingly dependent on automata with astounding capacities, perhaps with IQs of unheard of magnitudes we will think much more on this and inevitably hear much more of it from pulpit and pen.

Capek takes us to almost the opposite pole. If the reader's organic disposition is opposed to symbolic, mythic, or something interpretive and wishes just good straight American story-telling, then Capek is the writer for him. He originated the word "robot" probably as an allusion to the mechanical unthinking existence of the "robotnik," a word for worker in Polish. (Domin. "Noon. We have to blow the whistle because the Robots don't know when to stop work.") In fact, Capek's robots are all too human for our purpose of ferreting-out ideas of immortality in literature for they die only too soon. Capek being intensely concerned with work, industry and obsolescence, his robots lived but 20 years for the coarse grades and somewhat better for the superior models. The superior ones with a soul developing in time with experimentation became human or human-like. Their existence *was* always guaranteed by men with the secret of their manufacture. However, when the robots overthrew men, they were pressed for a solution to the continuance of their own existence. Finally, one of them evidently learns the facts of life in an anatomy book, encouraging him and his love, Adam and Eve-like, to step into the future. Capek with his eye always on men and industrial practice used the robots for social comment time and again, but the main point for us is the developmental movement from machine to human. By his method, they are still mortal.

However, if Capek is apparently shy in "R.U.R." of this quality of longevity, he makes up for it in a later work "The Makropoulos Case" in which he explores the problems of people who live to be 300 years of age.

Swift, long before this, explored the extended case in his devastating satire of the *struldbrugs* who were 1100 chance immortal offspring in

the land of Luggnag. Before actually meeting this people Lemuel Gulliver is baited by the court into telling how he would rule his life if he were immortal. Lemuel sets up a philosopher king of himself a cross between a naive Socrates and a good-hearted Leopold Bloom: "I would entertain myself in forming and directing the minds of hopeful young men, by convincing them from my own remembrance, experience and observation, fortified by numerous examples, of the usefulness of virtue in public and private life."² When he actually makes their acquaintance he finds them ghastly, nasty, and brutish. His mistake lay in his assumptions. Gulliver assumed immortality with a stop to physical deterioration, much as we in our ideal model postulated with some choice in personality mobility and constant repair. Gulliver later feels his original assumption too idealistic.

"That system of living contrived by me was unreasonable and unjust, because it supposed a perpetuity of youth, health, and vigour, which no man could be so foolish to hope, however extravagant he may be in his wishes. That the question there was not whether a man would choose to be always in the prime of youth, attended with prosperity and health, but how he would pass a perpetual life under all the usual disadvantages which old age brings along with it."³

Men now would agree. Under those conditions they would have none of it. However, men's desires rise with the satisfactions and possibilities science offers so that previous ages dared not wish for what some of us have and take for granted. There is of course method to the old dean's madness. He, like Capek, has his eye on men ... in this case the old age of men. The plainest lesson for us is that immortals must have built-in flexibility, health, vigor and humor.

Capek, however, had a variation Swift did not avail himself of. In "The Makropoulos Case" the people lived in youth for three hundred years when presumably they could renew their lease. Though Elina Makropoulos had youth she soon tired of love and eventually leads an irresponsible life. With boredom and irresponsibility, the net outcome is similar with Swift's — immortality is something you couldn't give away. Clergyman Swift wasn't really interested in immortality as we have said. But Capek was interested in it at least theoretically. And theoretically he gave a sour grapes answer which at least made his audience, with their limited view of the possibilities of life and this universe in 1922, feel better.

More recently John Wyndham has developed the effects of a discovery which supposedly gave humans several hundred extra years of life by

the use of an antigerone developed from lichens. The contrast with Capek and Swift is quite definite.

“All we want to do is to *give* people something. To make an old, old dream come true. We can offer them life, with time to live it; instead of a quick scrabble for existence, and finish. Time to grow wise enough to build a new world. Time to become full men and women instead of overgrown children.”

Whether or not he intends us to take the *trouble with lichen* seriously is open to question. He is certainly implying that longevity will be increased drastically and it will come about through the biological sciences. “It isn't as spectacular as the nuclear boys' fireworks, but it's more important — in its way it is more disruptive, but it is potentially a great deal more beneficial”

He also feels that once the idea is out and circulating it almost inevitably grows and develops. Immortality, or in this case the possibility of two or three hundred years of life, is a matter of evolution. About the discovery he has this to say: “It wasn't intuition, and it wasn't common sense. It began with logical inference, was all but wrecked by prejudice, and then saved by system.”

Another of the more recent writers is Isaac Asimov. He is phenomenally prolific both in volume of his writings and in the number of his creative ideas. Though he has written volumes on biology his most sophisticated and intriguing conceptions involve robots.

A cardinal virtue of Asimov is the eschewment of all paranoia in his writing, which is so common in nearly all science fiction writers. Thus, we might have more confidence in his descriptions of robots than perhaps any other writer. His robots have any and all human characteristics and, in general, they tend to be on the good side. They also remain themselves. Though they certainly are admixtures due to their production by humans initially, there is little of the Capek robots becoming substitute humans nor humans become machine-like, in the restricted, rigid sense of the word. Even under the cover of, as-humans where necessary, they retain their almost superior identity.

The interesting case from the standpoint of immortality is the human becoming a robot, or the human being transformed into a machine, but in this case without any restriction in the sense of the word, but in [an] expanded sense of the possibilities. It is no ordinary case, but Asimov shows us what happens to an intelligent man when the misfortunes of physical bodily illness drive him to try to become a robot:

“Somehow he could obtain positronic brains, even a complex one, one which had the greatest capacity of forming judgments in ethical problems — which is the highest robotic function so far developed.

“He grew a body about it. Trained it to be everything he would have been and was no longer. He sent it out into the world as Stephen Byerly, remaining behind himself as the old, crippled teacher that no one ever saw.”⁴

This robot Byerly sent out into the world was no pale substitute for a human being. He neither ate, drank nor slept. He was a district attorney running for office of mayor where lack of fatigue and saving of time are no small boons. After becoming mayor he became the first World Coordinator in 2044, protecting humans from the Machines who “numerically” decided all economic decisions and were thought to be a threat to humans.

The perspicuity of Asimov is such that we appear to have a fairly reasonable description of the robot future. The robots are a species of evolving improving forms. Their abilities, loyalties, eccentricities, humor, capacities are both astounding and expected given the superiority of their structure. They couldn't come into being without men to conceive and create them; but that doesn't negate one iota their superior qualities which allow them to out-compete men and eventually to become the protectors of men. The likeness of the human creator can be infused into one of them and they are immortal.

Life is by no means a bed of roses forever because of immortality. The solution of one problem brings an increasing number in its wake. If this adds challenge and zest for the hardy and healthy, it brought despair, so we are told, to others. John Byerly who created himself in Stephen Byerly eventually did away with himself: “he decided to die,” when he felt he was no longer of use. (And again, so it should be. The individual should always have this option.) Or, John felt that he himself carried on in Stephen, a creation of his much closer to his own identity (if not the same as) than any usual child.

Asimov is immensely fertile in ideas — much of it due to the stimulus of cybernetics, and we could dwell with him for quite some time. However, our aim is to approach certain salient features and their variations.

As we move even closer to the present it was found that science fiction writers increasingly take for granted resurrection and immortality. They generally follow scientific discoveries but temper their imagination

by stressing that at first reanimation is an incredibly difficult process. It may be that we should heed this tempering, aside from its function of increasing plausibility in the reader's eyes. It is difficult to believe that reanimation could ever be extremely simple even if simplifying processes have occasionally been found in rat-resuscitations.

Perhaps C. E. Maine is correct in his lineaments of a resurrection of an astronaut who died and was preserved for 8,000 years in the vacuum of outer space. Though reanimation techniques had been known for a 1,000 years, that is, since 8960 A.D., reanimation was still no mean undertaking. In 9960 A.D. these latter-day anti-mortic medics began the task of resurrecting a lost and found astronaut. But what a job! There were eleven years of transplant surgery. And for five years wires were in his body supplying neural stimuli electrically to his cells and organs. The whole process was likened to being reborn and continuing through adolescence to maturity. He was given a new heart composed of a “graft of nylon and other materials of high tensile strength” which would last one thousand years. He had new synthetic cells in his lungs, a better fiter in his intestines; as stated he was reconditioned for immortality. So if the process were a long one, as the doctors said — what were a few years of sleep and electronic therapy in comparison to eternity?⁵

Maine is also excellent in pointing out that the possibility of immortality is no guarantee of it. There are purposeful ways of doing away with oneself and others. Though the resurrected astronaut and the race which reanimated him are immortal in possibility they must still continually work toward conditions which will best ensure the continuance of that possibility.

The next variation is the divine man-machine or the divine machine-man, illustrated in Bradbury's “The Man Upstairs.”⁶ In this short story we find mankind in the form of a child becoming irritated by an eccentric boarder [and] mysteriously murdering him by the use of silver coins and a knife. Oddly beautiful triangles, squares and circles of translucent flexible plastic are taken out of his breast by the young incisionist. Without these works, as C. P. Snow says, all of us would be self-impoverished imaginatively, for it takes the notions of a Bradbury to fix before us the possibilities of unusual life. We can hardly dream, think, imagine, or conceive of the range of phenomena that might await us in the future here or on the planets of other solar systems. If the machines cannot solve the remaining problems of immortality along with men — though there is no reason why they cannot — then the beings of distant planets may also provide a solution. Or perhaps some of them have already?

Though the scientist has the future in his bones and is predominantly the type we are interested in, in all fairness the person with a predilection for the past must not be excluded. There is a place for the romantic of the new school or any person with a reverence or a belief in the historicity of our sacred books. If there is any truth to the early Church period legends that resurrection was a common event we wish these researchers success and godspeed.

Returning from the furthest possibilities to our starting point, once again, Wiener's ideas can be recalled and his "fantasy" of twinning. This concept allows us to add to the possibilities suggested by Asimov. Wiener considers the possibility of an organism forking and duplicating itself or twinning. After twinning and becoming separate individuals, as a rudimentary cellular animal or a machine that is able to duplicate itself, or a person who is able to twin himself, they begin to immediately diverge and inevitably become differing individuals. But at and near the point of twinning, for the human or the highly intelligent robot, if we are able to stretch our imagination, an interesting and fruitful situation occurs favorable to personality choice. The individual or individuals at this point have a chance to compare notes. It is especially important for the person twinning into a robot, and a robot in the favorable sense of the word such as one gets after reading from Asimov what immensely capable and likeable creatures they are. Here, we mean the robot has greater physical capacities and advantages, such as immortality. If the person has a chance to ask his twin, or to feel himself in his new position, or has a chance to test himself with his new capacities he has fewer qualms about trying a new mode of being that isn't irrevocable. In fact, if the twinning or transmitting process were readily available it would broaden the already infinite possibilities of life.

It has been suggested that women would much prefer their husbands became machines at work, with all of the advantages that must accrue, but to return to the human form in the evening. This is because they can't quite imagine the infinite excitement of exchanging gamma waves with another highly sensitive robot. And this leads to even further complications with robotic secretaries ... but we are going even beyond fantasy.

Let us recall what has been said. In review Democritus began it with an atomic scheme for building theories. Hippocrates supplied the method of observing everything. Descartes considered the reflex to explain all body reactions. Pavlov developed the conditioned reflex into a theory explaining all habits, training and education. Sherrington aided the mechanics of explanation with the synapse and more sophisticated

models of the brain which were extended by Grey Walter. Ashby and Wiener developed the concept of feedback to explain purpose and survival and postulated that the newer communication machines and individual humans are precisely parallel in important respects.

In literature the various forms of existence were illustrated with their problems and possibilities. Camus presented us with the combination god and machine protecting humans. Capek provides the case of the machine or robot becoming human. Asimov reaches a goal in outlining the human becoming a better human by becoming a machine in the sense of a free robot. And he does everything possible to free humans from their normal paranoid reaction to something new or foreign to them. C. E. Maine lays down a conservative plausible blueprint of the attainment of physical immortality eventually plus a rather detailed description of the mechanics of a resurrection after a body had been held in stasis for eons. Bradbury brings a divine robot to earth, only to have it crucified by humans. Going backwards in time, the possibility was considered whether we could learn anything from the numerous resurrections which reputedly occurred quite commonly shortly after and before the beginning of the Christian Era. Moving forward again with the imaginative scientists the interesting possibilities of twinning as postulated by Wiener were considered an opportunity for trying a new state without precluding the return to older forms of being or newer ones thereafter.

We may conclude this chapter on a note from Pasternak. He has observed the human and natural scene searchingly and states that history is “centuries of systematic exploration of the riddle of death ... with a view of overcoming death.”

“Man does not die in a ditch like a dog — but at home in history, while work toward the conquest of death is in full swing: he dies in this work.”⁷

In short, all history is aimed at conquering and defeating death.

Chapter 5

IMMORTALITY AS EVOLUTIONARY ADAPTATION

The possibility of the machines developing a high IQ isn't the only possibility open in the universe for the development of unusual intelligence. Two other probabilities are intelligent life in space or on other planets and certain mammals of the ocean. Since we have no empirical evidence of the former, though the deductive evidence makes it extremely likely, [that topic must remain conjectural, but] we do have some empirical evidence pertaining to porpoises or dolphins. The brain of the dolphin is about 40 percent larger than man's and equally complex in its component parts. They have solved problems rapidly which monkeys had considerable trouble with. Their imitative, social, and sympathetic qualities have amazed observers both recently and in ancient times. Loren Eiseley in his sensitive imaginative style reinforces a point we have been trying to put across about other unusual intelligence besides man's.

“It is difficult for us to visualize another kind of lonely, almost disembodied intelligence floating in the wavy green fairyland of the sea — an intelligence possibly near or comparable to our own but without hands to build, to transmit knowledge by writing, or to alter by one hairbreadth the planet's surface. Yet at the same time there are indications that this is a warm, friendly and eager intelligence quite capable of coming to the assistance of injured companions and striving to rescue them from drowning ... Perhaps man has something to learn after all from fellow creatures without the ability to drive harpoons through living flesh, or to poison with strontium the planetary winds.”¹

Leo Szilard picks up on the dolphin's intelligence in telling of a mythical Viennese institute working and communicating with the dolphins.

“The dolphins win a Nobel Prize and find it quite easy to set up a workable system of disarmament as well as to develop a special food which solves all the problems of the underdeveloped areas by providing high nutrition while depressing fertility rates.”²

Szilard is telling us that we really could solve our own problems although increased intelligence would help. Both Eiseley and Szilard widen our perspective on other intelligences and both men avoid the

paranoid reaction so easy to succumb to that dolphins are going to conquer us and eat us alive or some such loose nonsense.

Many have speculated that the dolphin might inherit the earth if men were wiped out by those planetary winds saturated with strontium. If it is meant that the dolphin would develop into nature-controlling creatures as men, it is of course, a possible, but gigantic leap, for the dolphin has no bodily instruments to effect his ideas, and no hand or opposable thumb to build other instruments like wheels and computers to solve really difficult problems.

If we believe, as Einstein feels most people do, that individual development is one of the prime values of our lives, then we say it is a person's concern to effect this. As long as the person is remotely neotenic he can improve and develop. There is no necessity that a time limit be put on the individual though mortality conditions us to think so. If Ashby in his research is accurate on equilibrium it would seem to indicate that immortality would be the logical goal of any returning-to-equilibrium organism, be it beast, man or machine. So far it is noted that life in general achieves this aim within any of the reaches of time that can be imagined. For slightly shorter time periods the species is virtually immortal. Then the individual organisms vary from a few hours to 4000 years for the California scrub pine and the seeds that were held in Egyptian tombs. Remembering that we are using an anthropomorphism it is said they "try" to continuously and endlessly return to equilibrium. This is a characteristic of equilibrium systems. If they don't achieve equilibrium they drop by the wayside. Some adjust or adapt with greater facility remaining in and about equilibrium positions for longer periods than others. To humans it "appears" that the organism "tried" to survive. Thus we say it is the nature of organisms that survive to drive for immortality in one manner or another. For man the problem is to have the individual take the place of the species and thus secure never-ending life.

Our aim as individuals toward that end is to continuously adjust and adapt to change as it inevitably moves across the face of the planet permeating and emerging from our multiform subcultures. One aid to intelligent adaptation, to intelligent control of necessary adjustment is to recollect, as best we may, that part of the past which has a bearing on our problems.

Deep in our past man has adjusted and utilized in fairly intelligent fashion various tools for hunting, the land for agriculture, the city for civilization and now he is attempting to limit the annihilatory aspects of the nation-state. The sixteenth century forced man to adjust to the fact that the earth is not the center of the universe. It was no easy adjustment.

The nineteenth century forced man to adjust to the fact that men had risen from the lower species. This also was a painful reconciliation; and just as many a nineteenth-century man hadn't accepted that the earth was not the center of the universe, so there are many in this century who do not accept the fact that man has risen from lower species. But our concern in this first instance is with the adjustments that were necessary in the nineteenth century for man to control his environment and to adjust to new discoveries.

The nineteenth century is described as a century of revolution when men everywhere found more and more that they could control their destiny and not just accept fate. This was a realization of no small magnitude, something many of us have yet to gain confidence in. It was a century of industrialization for part of the world. If fewer people understood it, they made perhaps a less emotional adjustment to it in general than to evolution. Evolution, at first, for the majority was an intellectual and emotional threat of similar magnitude to the Copernican. It struck home at vanity and the exalted opinion man had of his specialness in the universe.

The complex interweavings of any age, especially as the age grows closer to our own would require a capable computer to weigh justly and express the factors of greatest importance. It would appear however that the nineteenth century is especially expressive of man gaining greater control over his environment and moving from the more predatory to the symbiotic relationships with his own and other species. Likewise man appeared to be in a symbiotic relation to his helpers, the machines. His own biological or organic evolution moved at its usual slow pace whereas his social, cultural and technological evolutions moved at a greater pace, especially the latter. The adjustment to the biological change was irrelevant due to the infinitesimal amount of biological change. The technological change of industrialization has surged so swiftly that the other three evolutions have been apathetic, inert and sometimes incapable relatively of keeping up. The social sciences were virtually nonexistent. The thought of physical science was more absolutistic, in rigid mechanical models. And though the biologists made a dent in these concepts the theologians could justly criticize science for its abstract, highly simplified conceptions that often seemed to leave the more human elements of man out of the picture. The theologians also learned something. That the argument for design could be explained better by evolution.

The twentieth century has been acutely self-conscious of itself. Thousands of terms have been found to describe it. Among all the phrases

such as “the age of exaggeration,” “the age of science,” “the space age,” “the atomic era,” “the age of accumulation,” the “century of fear,” the appellation “age of analysis” seems ultimately most descriptive and useful. It is the first time in history that a considerable body of information has been available for the analysts with leisure to read, think about, compare, experiment, conclude and add to that same body of knowledge growing at some geometric rate. It is quite revelatory to find the large number of scientists at work investigating the effects of freezing temperatures on unicellular and multicellular organisms for instance.

It is a century of accumulation and exaggeration. There is hardly any doubt of this. The first crude understanding of cultural, social and technological evolution is beginning to dawn on us. The lag between man's control over nature and his control over his social institutions such as the nation-state are coming into painful awareness. His ability to control nature and technological discoveries has made it such that if he has not quite achieved the possibility of wiping himself out he is making rapid progress in that direction. The discoveries of Freud indicate that the majority of men make many major decisions on an irrational basis. This coupled with his ability to destroy makes depressing reading.

A century of vast capability in destruction is slightly offset by numerous scientific and social feedback mechanisms. Science on the one hand provides deterrents to the use of destructive weapons which are of dubious benefit otherwise. The social feedback is evident in all of the communication that occurs within and between societies. The aim as far as the species is concerned is to return from the brink of destruction, partial or total, to the center lines of further rational development and survival. This is perhaps the main aim of the UN as well as many other institutions and many individuals. This survival has been thought of as the main aim of any species.

A century that has expanded, almost exploded with achievements and creativity, has inevitably noticed that many of the lags have increased, and that relations become unimaginably complex. We see some type of trend but as expected we see through the glass darkly. Apparently the predatory aspects of man on other species declines further. Symbiotic relations garner the main areas with parasitism beginning to show itself in the relation between man and the automatic factory. The postulate is here that evolution is at work in the growth of machines as it is in every other part of the universe. The reason for this assumption is again expressed via Wiener's thesis:

“It is my thesis that the physical functioning of the living individ-

ual and the operation of some of the newer communication machines are precisely parallel in their analogous attempts to control entropy through feedback.”

No one really believed Descartes' analogy between the man and the machine. Oh, perhaps the infinitesimal few but no more. But with the coming of Wiener and especially Ashby the world enters the second industrial revolution and with it mankind receives another stunning blow to his ego. It wasn't enough that Einstein removed all absolutes from the world especially that last hope: time. It wasn't enough that Freud shocked mankind into accepting that man's libidinal desires determine most behavior. But the crowning strike is the fact that if some of the newer communication machines are not already they increasingly will be smarter, keener, vastly more intelligent than men. Men will fight against it just as they have in the past and say it must be some other factor than intelligence that allows the machines to design and blueprint an entire factory in a matter of a few hours whereas a team of architects and draftsmen would take months if not years to do the equivalent job; it can be remembered how the Athenians could not for the longest time accept the fact that a slave might be just as intelligent as themselves. There was no small battle over relinquishing the earth as the center of the universe. And it can be remembered that John Scopes lost his trial in 1925 to William Jennings Bryan in the state of Tennessee. Analogously we can predict there will be law cases in the future concerning the possible equation of man and communication machine. If the adjustments cannot be made intellectually and emotionally outside the courts they will move to the last appeal.

Science in the 20th century thinks less in mechanically rigid terms. It is hardly possible when it is fully realized that a table is hardly more than a vibrating bundle of energy. It is hardly reasonable to make schemes rigid when only statistical descriptions will work for particles too small to be seen or followed. At times they approach the nature of evanescent clouds. Thus science becomes more flexible and wards off most of the statements of simple rigid materialism that might easily become dogma. The social sciences gain ground with greater interest in social evolution and the realization that all sciences have to rely on statistical descriptions in part. A bit more tolerance and flexibility is generated by physiology and psychology: disciplines which find that the very nature of our conceptions is controlled by our bodily structure and functions. Beyond this they have devised techniques such as encephalography, conditioned reflexes and psychoanalysis to map the psychic apparatus.

Ashby may find a significant part in this century's intellectual history. Minor to Darwin in significance to be sure, for Darwin explained purpose or apparent design first; but Ashby has given us a more mechanical, experimental, mathematical description of how it works. This is the discovery and proof that equilibrium behavior tends to repeat itself. The new significance lies in machine behavior. The machines, just like animals, as far as we know now, will move toward survival via the repetition of equilibrium positions or homeostasis. It is beside the point that man has created them in the first place. The reason that man uses them is the same fundamental underground principle of goal seeking, survival and returning to more perfect equilibriums which are greatly facilitated by the use of these newer communication machines. Ashby is also the person whose ideas point up the possibility of the new species and the consequent threat to men's egos by showing how it is theoretically possible to build a machine whose IQ has no known upper limit. As we find in space that the sky isn't the limit, so to speak, the sky's the limit for the machines also.

This mental power is enabling us to press the machines into the service of solving or helping to solve our problems. The main impetus at first is productive and military. Lesserly they have begun to aid in the solution of the more important social problems. Later still they will be used in all types of research relevant to immortality. In part it is of course going on now with cell research, temperature research as in thermophysiology, and reanimation, but on a rather microscopic scale. There is a bit more of it in medical research and in models of cells meant to eventually duplicate life.

Inasmuch as the research will move forward consciously or unconsciously toward immortality, the speed of it depending on our efforts, eventually, will force us to reconsider our value systems. Do we really value the continuance of the state and the race as superior to the individual? If we really value the continuing individual we must be willing to engage in more research relevant to him. If the state and the race or life in general are preferred the present ration of research is appropriate, except for the troublesome fact that much of the present research could easily lead to complete extermination.

An adjustment in our attitudes toward immortality and most present religions is in order if we cast our vote for the individual. For almost two millennia the province of immortality has been preempted by the churches in the West. They have held out a hope of which there has been no shred of material evidence.

“The most striking feature of the world we live in is that most of its inhabitants — with the exception of the pietists of various kinds — are cut off from the future. Life has no validity unless it can project itself toward the future, can ripen and progress. Living against the wall is a dog's life.”³

And the wall for Camus was the absurd wall of death. As many men of the stamp of Camus have by now been “washed free of hope,” washed free of unrealistic hope, it is time science held out not the “certainty” of pietistic hope but the hypothesis, the mere probability of physical immortality. These probabilities may be estimated, be they high or low, as well as the time and conditions necessary, to avoid any unrealistic hope. The sooner we obtain these probabilities as research continues the sooner intelligent plans and organization can achieve the goal. As the years pass men must increasingly adjust to the possibilities of the future in comparison to adjusting to the facts after a discovery has been accomplished. For our survival there are the necessary adjustments to the possibilities of the future.

Thus we had to adjust in 1940 to the possibility of the atom bomb and act accordingly. We had no idea the explosion or its power were sure things. We thought it might work. The deductions and the figures were on paper. It was a possibility with a certain probability of success.

During the war we had to adjust to the possibility of depression after the cessation of hostilities and act accordingly. Every army and air force and navy had to act in accord with the possibility that radar would become a reality. Given the probability that it could be developed they carried it to completion. The same is true of the freezing, storage and regeneration of first, small plants and animals, working toward man along with the help of the communications machines. We must, in sum, be awake to the possibilities of the future. Or, we must be awakened to the possibilities that are a probability in the future. Then it is incumbent upon us to set up the research necessary in a conscious, planned manner to test the hypothesis.

We could go on almost interminably describing the manifold facets of this century and its problems. But a point of diminishing returns soon sets in and it is probably more practical to move down the abstraction ladder to the concrete individual once more and trace an operative course of action.

If you plan to die before the age of regeneration there are a number of adjustments and activities that will promote your future longevity. It would be well to prepare for the long wait and the regeneration by know-

ing yourself as well as possible, by recording everything relevant to your pattern that is possible, and by indicating your desires. If this is new to you it is in part your job to get the best education of the facts of the present before you, and the probabilities of the future in mind. This means also, that after you have studied the problem for yourself, and discussed it with others, and if you have decided to “wait in the cave” as the most agreeable and likely contingency, then make or rewrite your will. If you have a lawyer who has been taking care of your legal matters, the idea may initially be a slight shock to him, but, being rather sophisticated men they usually say little, unless it is in their interest otherwise, and will write up your instructions in legal form, as instructed.

If you do not have a lawyer, a will written in your own hand is usually acceptable. It is best to write and sign in the presence of several witnesses. There are any number of acceptable forms. The idea is to express your desire on paper and sign and have it witnessed in a convincing fashion. You may take a blank sheet of paper, date it, and proceed as follows, or you may fill in the form as it is. [See next page.]

With the passing of time it is apparent that the people of the nineteenth century had to adjust to evolution, the first industrial revolution, political revolutions and other social pressures. In the 20th century the adjustments are being made to atomic power, relativity, the discoveries of Freud, the growth of the communication machines, the second industrial revolution, further political revolutions, space exploration and the threat of colossal destruction because nation-states have become behavioral sinks in respect to their willingness to make war.

Speculation, imagination, and our needs allow and impel us to consider the 21st century. The demand for both survival and possibly richer lives forces mankind to think and plan ahead. More and more his projects entail vast future projects. The progress, beauty and livability of most any large city in 1971 incorporates rather heavy investment and planning now and continuously. Thus more and more we rely on “images of possible futures” to achieve our goals.

The 21st century may bring communication machines with very high IQs, machines that begin to form an independent kingdom and independent behavior. Progress may be extremely rapid as a single machine could represent the position taken in the animal kingdom by an entire species. The trend may be away from symbiotic and parasitic relations to independence as far as some of the more capable machines are concerned. Man will remain in the symbiotic and parasitic relation with his more or less normal productive machines. There is no need to make a paranoid's low level adjustment to the superiority of the machines. There

is, however, plenty of need to study the probable behavior of the highly intelligent machines as they evolve. Men may wish to join with the new species in some fashion or another, or they may wish to remain separate. Similarly, we see some groups, such as scientists, who are the first to join with the discoveries of the time. Some may feel that in "joining with" the machine, man's capacity to develop will be maximized. Others may not. The Shakers prefer to separate from the rest of urbanized mankind and maintain their old seemingly more secure mode of existence. Both choices should be open to 21st century man and machine.

Men will also have to adjust to the fact that they may not be the last species in the evolutionary line as far as intelligence is concerned. This it was mentioned was a stunning blow equivalent to finding out that the earth was not the center of the universe and far more important than realizing that man originated from the lower animals.

It may be disastrous to paint an image of the future in bright colors, however let us guess that automation will take care of all of men's sustenance, housing, clothing and other material needs. As the plague is for all purposes defeated so the lack of a guaranteed yearly income will pass into history. This is an ideal that men can only hope will come to fruition.

Science in the 21st century will change toward the notions of mechanical flow and the qualitative infinity of nature, [and] thus [be] even further removed from rigid 19th century conceptions. By then it seems reasonable that the integration of the social sciences into physics and chemistry will have been achieved. The hypothesis has been asserted that regeneration by various methods and physical immortality will have become scientifically feasible. Those interested in evolution will be interested more in how machines and ideas are evolving and how life on other planets is progressing. Varied techniques of more rapid evolution of individuals and the species will be available.

Politically it is hardly imaginable that a world state controlling the power to make war will not have come to pass or that war will [not] have decimated mankind, or some of both. The 21st century is less than forty years away so perhaps the unification is too optimistic. It is hoped that the exigencies of population pressure, limited food supply and limited space will not be such that the individual will have been suppressed in favor of the state. In either case it can be imagined there will be benefits to be obtained in regenerating the frozen and in transmitting the still living into more viable forms.

Legal adjustments will be in order to treat with equity the man who dies but wishes his estate held in trust until he is regenerated. As it now

stands the state distributes the estate of the deceased according to his or the state's wishes. Innumerable conflicts will no doubt arise between the right of the individual to guide and control his destiny and the state which desires to augment its revenues by taxing death, transportation, exit and entry, and resurrection. It doesn't help that the law is always antiquated in respect to progress.

The coming of practical immortality without the death interval will eliminate some of the conflicts and then turn into engendering further problems. To even contemplate all of the changes in behavior that immortality might bring would take volumes of writing. Will people more likely follow the law because they will know that it will eventually catch up with them? Will there be less panic to get things done? Will there be more effort at helping men and machines in this world rather than striving for a reward in some possible next world? Will people try for attainments such as higher mathematics or accomplishment as a musician that they would never attempt under a limited lifespan? Will there be a neurotic concern for accidents? — For that is the only way one might be vulnerable to permanent death by discerning contingencies. — Will there be speedier ambulance service? Will there be a boost in life-size freezing lockers? Will there be less wailing at fewer funerals? Will violent crimes become more destructive to the victim? Will some people become even more indolent? Would marriage forever be too long?

Religious institutions have always been slow but eventually adept at adaptation. The 19th-century hope in spiritual immortality and a pleasurable heaven out of this world, perhaps gave way to a 20th-century hope of a pleasurable but limited life on earth and then oblivion. This in turn may give way to the hope and then the realization of physical immortality here on earth and on other planets. If this is true religion will have a vast new body of possibilities before it.

The first claim, if immortality is established, will be that this is what was predicted by the Bible when the early believers thought that heaven on earth would come to pass along with the immortality that was taken from Adam and Eve because they sinned. Even before physical immortality has been established religions will offer their services for the care of trust funds, etc., of the temporarily deceased. They undoubtedly will take the twinning concept of Wiener, which denies the soul, and turn it right about claiming that when the body dies a twin-soul goes to heaven while the real body stays here and is eventually resurrected here on earth. The person resurrected physically will never know the difference, but the claim will be that his twin is in heaven so one must follow the teachings of the church so the twin will find salvation, etc. The care and mainte-

nance of safety for this twin-soul in heaven will logically entail the church's adoption and nurture of half of the former estate, etc. There are endless avenues still open, for as long as men exist theologians exist forever outstripping scientists in granting men's fondest desires for the modest price of a seeming and becoming humility and submission. Religion need never fear science, for science will always take second place, promising only what it can produce in fact, and even then with time, risk, probability, uncertainty, expense, the promise of more problems, and the impossibility of perfection.

To return to the present let us ask what can be done to maximize the chances of reanimation. The will is to be made expressing the desire to be frozen in the most suitable manner. Then the way is open to two alternatives. You may die before reanimation or regeneration or you may not. Many of the suggestions that follow will apply to either case.

You can encourage the free exchange of information which will allow you greater choice and freedom and will promote scientific research on a problem that is vital to your preservation. You might, if you have not already, more actively join the intellectuals (defined as those who have a dedicated interest in ideas) and use your head to get the job of living longer on with. — To help with the multitude of problems that face men in making the necessary transitions. At the best you can have a faith which matches the probability that the task can be accomplished. Even if you die before effective methods were in operation you could aid in extending the boundaries of life. Above all, never say “can't” if the hope is at all reasonable, for science has taught us that this word plus the word “impossible” are the two most dangerous words to prophecy imaginable.

Research this problem yourself or as part of a group. Find out what the exact conditions of today are. If possible do the reading, thinking, and researching in the first instance relatively alone. Find the problems and hopes of the researchers. Then after doing your own thinking, bring what you have developed to others interested and see what they think and what they can add to your education. And simultaneously with the give and take of what others think observe the progress of science in this field as time passes. Aid in setting up further realistic targets for scientific achievement. Be critical of what you read here and make a reasoned constructive reply. Amend what is said here when necessary.

In studying the situation today you may wish to read those works of this century and the works of previous centuries, which are most applicable to the preservation of life per se, and which are the most significant works toward a liberal education. The bibliography and the 20th Century Books program outlined in the appendix offers one rather comprehen-

sive, inexpensive, and relevant reading and discussion endeavor.

In this program or on your own, or via most any education process, it would be informative to gain a better idea of science, religion, psychology, biology, and all that entails life on the planet earth and elsewhere. Otherwise, a general education is what is advocated. This is, perhaps, the best method of preparing yourself by knowing yourself and your environment. As you proceed, you can nag as generations before you have done, at the problems of ethics, the creation of a world community control over destruction devices and irrationality which threaten to extinguish human life if not all other on the planet. Lastly, you can encourage the vision outlined in this book if you think it an accurate and worthy one.

In this, you must free your imagination. But, not to the extent that it transgresses all critical thinking and the reasonable possibilities of reality. You must make plans, programs, projects, experiments and targets. You must, if you are like some of us timid creatures, overcome the loss of nerve, free yourself and others from the bondage of the past, declare intellectual war on the status quo and move forward guiding man's fate by the use of intelligence. Don't be afraid to respond, to respect, and to follow your desires as long as they bring no unnecessary harm to others. If you do, you will be among the strivers of mankind as opposed to the drifters. The strivers are the restless and curious Odysseuses of time and space who will optimistically set up physical immortality as a target and never retreat until the absurd wall has fallen. Your life will be more meaningful and worthwhile if you are with them storming the ancient and stubborn ramparts which are such an injustice and barrier to the continuous development of the individual.

Date _____

TO THE EXECUTOR OF MY WILL
AND TO THOSE WHOM IT MAY CONCERN:

It is my express wish, and desire, that I want my body upon death to be frozen as soon as possible in the manner that is generally considered best for the preservation of the body, with the aim toward regeneration or reanimation in the future, and maintained in that state until reanimation is a safe procedure. When resuscitation or/& reanimation become reasonably safe processes I wish my body to be regenerated by the best possible methods at that time.

Signed _____

Witnessed _____

Witnessed _____

Date _____

TO THE EXECUTOR OF MY WILL
AND TO THOSE WHOM IT MAY CONCERN:

It is my express wish, and desire, that I want my body upon death to be frozen as soon as possible in the manner that is generally considered best for the preservation of the body, with the aim toward regeneration or reanimation in the future, and maintained in that state until reanimation is a safe procedure. When resuscitation or/& reanimation become reasonably safe processes I wish my body to be regenerated by the best possible methods at that time.

Signed _____

Witnessed _____

Witnessed _____

Chapter 6

A PHILOSOPHY FOR IMMORTALITY

From time to time in the first several chapters the rationale for physical immortality was broached and the process to reach it was suggested. Now it is time for us to tie up the loose threads, treat of the philosophical, logical, [and] ethical aspects, listen to possible objections and entertain an attitude toward immortality.

The ground value assumed is the primacy of the individual and his unhindered free choice. It is true that life is basic to free choice. But given the individual life the problem from there is to continue or not to continue. We put the primacy on the individual because it is a value that society decries as the most basic. We put an equal value on free choice not only because this is integrally linked with the concept of the individual but it ensures that not even life can exercise a tyranny over the individual. If he wishes to snuff life out that should be his choice. Likewise if he chooses to remain immortal he should be given a reasonable opportunity within the possibilities of nature to effect that choice. It would seem reasonable considering the yearning of men through history that given time and education, most men will opt for physical immortality. And, they will rightly expect that science continue its progress in defeating death. It is possible that we may go even a step further and agree with Frazer in the following:

“It is probably not too much to say that the hope of progress — moral and intellectual as well as material — in the future is bound up with the fortunes of science, and that every obstacle placed in the way of scientific discovery is a wrong to humanity.”¹

This applies equally to the wishes to be respected of the person who opts for waiting in a prescribed manner for immortality. Specifically, if he or she wills and/or expresses the desire to be frozen, to be placed in a permafrost environment to wait until the procedures have been perfected for resurrection then any person or group that impedes this choice is an enemy of preservation, life, and individualism. The person or group who prohibits the freezing and the storage is not identical with but similar to a murderer. For the net result of the denial of further life is the same in both cases though the method differs.

“To force solitude (eternal death) on a man who has just come to understand that he is not alone, is that not the definitive crime against man?”²

Camus might be elated that one of his absurd walls was crumbling and would rebel furiously at anyone who tried to shore-up that injustice of the universe.

“But whoever said they were going to stop anyone who wished to be buried in an ice cave on Greenland or any other place?” Antiquated laws and governments which see a chance of making money in taxes, or who fear they will lose citizens, or who are so zealous in enforcing the standards of a middle-class morality of the herd as Nietzsche would say — all these will provide impediments enough. Fear that it might work will automatically evoke a learned response. Some religious bodies in our system will prohibit their followers from availing themselves of the opportunity to strike for physical immortality in the scientific fashion. One might predict with some confidence that those religious bodies which prohibit birth control on the pretext that it destroys life will get right around on the opposite side of their logic and prohibit the right of their members to the continuance of life via resurrection scientifically for God knows what reasons — except that it might limit the power of the Church, when it would be only logical that a Christian could test his belief in spiritual immortality and at the same time fix his body so that if that boon did not come to pass, he would still be in a position to receive physical immortality at the hands of some future scientist. But then we may be naive to be so antiquated as to believe that sophisticated religionists of today believe in an afterlife except in some symbolic sense?

Wiener followed his chapter which provides the conception of transmitting a human with one which deals with law.

“Law may be defined as the ethical control applied to communication.”³

Its purpose is justice. It is interested in effecting this via adjustments in behavior and rules. Justice encompasses liberty, equality, and fraternity. Liberty means the right of each individual to develop freely the full possibilities of his potential. By equality, Wiener means that “by which what is just for A and B remains just when the positions of A and B are interchanged.” And by fraternity, he and most of the world mean, “Good will between man and man that knows no limits short of those of human-

ity itself.” It should be quite clear that a limitation on a future life quite definitely contradicts the principle of liberty if it is not obvious how it infringes on the latter two.

To give a more balanced account let us now turn to some of the verbal objections expressed by individuals in discussion, and to general objections to which any new theory is exposed. We are told there are three stages through which any new theory must pass. First it is immoral. Can it be doubted that pious voices will be raised claiming that if God had intended physical immortality here on earth he would have provided it? But it can be remembered when the same argument: if God had intended man to travel faster than three miles per hour he would have provided men with wheels instead of legs, has passed into oblivion. The second stage is “Well, maybe part of it is right.” We see that we are forced to admit some advances in the direction of this theory when this very day scientists from London report that up to 40 ova of ewes can be transferred half way round the world in the body of a single rabbit before transferring them to the wombs of the new parents. It seems proven that transmission of life need not always go through the exact pathways that we have been used to as children. The third stage is: “Well, we knew it was so all along.” But before that stage comes there is inevitably and very rightly so, many an objection before the new theory can prove itself.

In discussion a main objection is that one would be building people's hopes to something that may never pass. We grant that it may never pass and wish to get that point across to anyone interested for there is many a slip betwixt the cup and the lip. Nothing is certain. It is vaguely conceivable that the world and life are nothing but a dream. But this isn't a live hypothesis to believe that all the world is but a dream. Whereas we have been arguing without ever claiming that it was necessarily true that physical immortality is a live hypothesis and a genuine option in comparison to the lack of proof obtainable concerning spiritual immortality. It may be true that even with all the qualifications we would still be building up people's hopes; there is a risk in any step forward, in reaching for that first kiss. Is it any worse; is it not better, to hold out a scientific hope — one that has a definite possibility attached to it, rather than the metaphysical hope that has been held out to mankind for uncounted generations without one shred of proof that anyone has ever achieved the hoped for immortality? It may be true that we are building hopes, but considering the advances science has made in the past, and ruling out the annihilation of the human race, it may be but a matter of time before resuscitation techniques are worked out. Mankind, in fact, moves forward, progresses on the wings of a scientific hope that within certain stated

limits problems can be solved. And look how many have? To deprive men of reasonable hope is to deprive them of setting realistic goals and if not eliminating their achievement at least seriously maiming it.

Let us always base our hope on reasonable probabilities. If a trend is seen in certain phenomena it seems logical to project that trend and to draw the conclusions. The trend may alter with later discoveries and with this we must alter our conclusions. Most commonly man has been quite conservative in his material conclusions and has had to alter them upwards. An example of this is the rate of population growth. Several years ago, perhaps a decade, the United Nations experts were considering an estimate of 4 billion persons or slightly less, by the year 2000. Now, as they notice that family size does not necessarily decrease with rising income the adjustment to 6 billion persons by the year 2000 is now predicted. It was hardly dreamed that rocket research and exploration would have reached the magnitudes it has in 1960 from the vantage point of 1945. The same is beginning to dawn on us concerning the phenomenal part computers or electronic brains are beginning to play in the operation of a viable society. It is still incredible that rockets really hurtle through space at 15 to 20 miles every single second. A mile alone is an awfully long way to hurtle in a single second. On the other side of the coin, how many discoveries did we expect to have accomplished by now? Only one comes to mind. Perhaps some persons expected a cure for cancer to have been achieved by now. And perhaps much of this is due to the publicity and progress reports circulated for fund raising. Certainly no vast part of the nation's resources are being used to find a solution, or likely it is that one would have been found by now. So in sum there are a large number of achievements that came before we expected them and very few that we have expected to pass before this time and did not. Again, in general, mankind tends to underestimate the rapidity with which scientists solve unusual problems.

This in turn, then, is the reason we have faith in the scientist's ability to reanimate, in one form or another, by one method or many, a human body that has been well preserved, given let us say less than a century. From what we know and observe this could be a conservative guess. The best way to preserve the body today is always improved upon by the future. Perfection is never reached, only more nearly approximated by a series of improvements. The degree to which men are so imperfectly preserved means that the scientist must additionally improve his methods of revitalization. This means that the sophistication achieved in better freezing and the degree of sophistication achieved in revitalization will reach some certain, as yet unknown, level by the year 2000. But the de-

gree of sophistication for revitalizing a less perfectly frozen and stored human would have to rise, until 2010 (to choose an arbitrary date) when it would be feasible to revive the man of a bygone age. It can be done. It is a matter of time, preparation, and research.

Then how about those Egyptian mummies? Are there no limits to this sort of thing? Perhaps the best answer that can be given at the moment is that in our continuum the reanimation of a mummy is a very, very, very remote possibility. If he or she were frozen in the appropriate manner the revivification would be infinitely easier. Our reason again is that undoubtedly the pattern is less perfect. Undoubtedly a greater proportion of the organism has deteriorated in desiccation. It is reported that even the inner organs were removed. There is no line that could be drawn to say that this is possible and this isn't. Some rough approximation may be possible, but even this is doubtful. Would one not have a devil of a time reestablishing the original personality? Such an immensely almost impossible task sounds more appropriate for [a] target date of 8999 A.D.

What can't wait, however, is the attempt to preserve the future lives of the dying and those who will die temporarily from this date on. Once we have a remotely reasonable probability that an individual human being's life may be saved for a richer enduring future it is our sacred obligation to ensure every possible condition attendant to that end. Any malfeasance in our duty to preserving the hope of life, or life itself is vaguely similar to murder.

If this method, or some method [of] resurrection comes to pass, think how sick we will be that we did not think, advocate and act in time to save Einstein, [or] Gandhi? If we now let pass our opportunity to save Russell, Schweitzer, and Nehru when it is in our power to present them with the possibility — and we fail — then our grief will know no end. This means we should, in crucial instances be especially attentive, quickly, to those whom civilization is especially indebted to. Obviously every person is invaluable, but those who have contributed most and who are held dearest in our hearts should only naturally receive our especial concern. It may be even selfish individually and societally. Think how useful the continued contributions of a von Neumann or an Einstein would be? You say: "Is not the cart before the horse?" — Again, is it not the most probable hope we have? Is anything lost in trying a live hypothesis? You have nothing to lose and a physical eternity to gain.

Because of its importance a considerable amount of space has been devoted to the objection of the gloom-pourers to raising hopes. There are other objections. The second one asks if there may not be other methods of resurrection in the future that do not depend on having the

body present. The theory proceeds that with intellect machines with an IQ of 1,000 or 1,000,000 it should be little problem for them in conjunction with man to build a gathering machine to collect all the information necessary to reconstruct any previous human being. Presumably the waves recording all humans and all of their behavior would still be in existence somewhere no matter how faint and thus in theory retrievable. The objection to the objective is that the problems are so much larger than the one of simple resuscitation, with the pattern before one, so much larger than ever recreating the Egyptian who was later mummified, that it is hardly comparable. Let's work on these theories and tasks after we have taken the common sense precaution of not throwing out the baby with the bathwater.

A third objection revolves around the fear of over-population. It is possible that the return of a cool million might put a strain on any economy. But in the long run, is it not generally believed that each person is quite capable of producing more than he consumes? There may be many problems as with any scientific discovery. But with any discovery there are benefits also. Let us not rule it out because there might be some minor disadvantages. Rather let the solutions come to fruition and see if we can meet the challenge.

Suppose for a moment that every person who dies in the next fifty years is buried appropriately and resuscitated within the second ten years of the 21st century. This would mean at the most 2 billion lives were added to the 6 billion projected at the normal death rate. With the progress in technology, a willingness to distribute real incomes more equitably which must and will come according to C. P. Snow⁴ — among many — and the opening of space colonization, the challenge might be met. But the initial supposition is a gross exaggeration. Let us look for a moment at a more realistic one.

The inertia of mankind is something of which to stand in genuine awe. More realistically a small handful of that estimated 2 billion will first learn of the opportunity, second, will care enough for their own future to prepare themselves, third, will have the resources to provide for their cooling and preservation, or will be allowed to rest in suspension by the laws of their own governments. The archaic conditioning of their educations, and the wishes of their respective institutions to which they have pledged allegiance will provide further stops. Otherwise, lack of information, apathy, inertia, the law and restrictive beliefs will no doubt eliminate the vast, vast majority of mankind despite the progress that is made in the natural sciences, for apparently the lag between these physical sciences and the attitudes and behavior of the people increases with

time. Let us hope new discoveries and better education change this projection but as it now stands a guess would be that humanity isn't going to be allowed to turn to this method overnight. You can rest in peace however, the challenge will be met or certain men and machines won't rest until eventually death has been thrown to the mat and pinned.

Don Quixote's problem was that he read so much in books that

“the Moisture of his Brain was exhausted to that Degree, that at last he lost the Use of his Reason. A world of disorderly Notions, picked out of his Books, crowded into his Imagination; and now his Head was full of nothing but Enchantments ... an abundance of Stuff and Impossibilities; insomuch, that all the Fables and fantastical Tales which he read, seemed to him now as true as the most authentic Histories.”

Something of that is the problem we have. The books of our day inculcate in us the belief that we can have a reasonable chance of immortality if we prepare now for a certain set of cooling and preserving operations.

Don Quixote was willing to go out into the world of uncertainty and wrestle with evil. We must be willing to do something of the same. We live in a world of uncertainty. We must accept this and even be thankful for the surprises and joys that it brings. Man must not stand dumkopf-like like Job before the universe and accept what's thought to be fate, or more likely his own brainwashing. Rather, man must accept at face value some things: that death is an evil in his case at least, and it is only justice that immortality, or the chance of it, reestablishes a reasonable balance between men's capabilities and the unlimited depth, extension and variability of his new universe. He will need all the time he can get to remotely keep in touch with what the intellect-machines are accomplishing. Perhaps additional time will help emancipate or protect him from the dangers of his own irrationalities?

Our age feels the possible extirpation of the species is the ultimate injustice. Ours isn't so much “redressing all manner of Grievances” as preserving a civilization interested in such [a] concept. As put so succinctly by David Frisch of M.I.T. “we are dealing in very low probabilities of long term survival.”⁵ The problem is one of death for both the individual and possibly the species or some major portion of it. If true, the horror and utter desolation can only partially be visualized.

Thus we can imagine further interlacing continuums in which at the limit all living humans will be destroyed. If such were the case our only hope might be that science-fiction would allow us to imagine other planetary beings eventually reviving humans who had been properly pre-

served at low temperatures. This is outrageous of course, but will you allow it inasmuch as we are dealing in conjecture? Then with further problems the race would go on. But if such speculation were true think of how important it would be to encourage some individualists to preserve their bodies upon death?

Now let us take a step up one of the continuums. Let us assume a situation in which other planetary beings are replaced by some portion of a remaining but decimated mankind. Let us invert the older meaning and assume 10% of mankind remains. Now, although for humane purposes we consider any human or any group invaluable, there is some change in value for the individual, dependent on the number available for revivification. There is no way generally known if at all for avoiding these valuations so that we may decide the priorities of action. In any event the marginality applies but the available number of well preserved humans even in that supremely quiet yet potentially recuperative state, if slightly less important to the preservation of the race, is still what would be normally termed invaluable. It is only in those ranges of the continuum where the number preserved are so numerous as to prove a burden to our present or future resources that they would by definition be less valuable. Considering the present "very low probabilities of long term survival" it is more than crucially imperative that a number of individuals prepare themselves for this other very real and tragic possibility immediately. One would swear that the ironies of the universe always keep man on a knife edge. The real probability of the individual immortality and thus species survival balances against the "very low probabilities of long term survival." There is hardly any way around it; for most the latter will be the reality. Toynbee likened mankind to a raft aboard which a number of men were headed for an ominous reef. The question was whether they would survive the reef to the calm lagoon within. The analogy is fair but it might be made more specific and modified slightly. Only a few, perhaps a very few, will survive the explosions of the reef and the possible long aftermath of recuperation until some semblance of world order over arms is established. And even then they cannot expect a calm and sleepy lagoon but a variable open sea with its usual absence of landmarks and the possible encounter with future reefs. Despite this there are a few stars to steer by if one will only take them as goals. There is the excitement and reward of sailing, freedom, and cooperation plus the promises of distant ports.

The collective decision to steer, to manipulate the sails, to make a rudder and a centerboard, probably won't come until we have had a bad bout with the reef. To set those sails intelligently in concert with the

stars and winds requires that we change from our status quo of drifting toward death. There is an intricate movement and balance between willingness to change and a stubbornness of asserting there is a course of goals which must perseveringly be held to maintain our existence at sea and enable us to reach one port of call after another. It is a delicate calculus to figure which is the better to aim for, the port which promises power and wealth, a closer port which merely promises supplies, the more distant port which promises physical immortality, or some combination of ports. It is known before-hand that in all probability some of the complement will be lost before any port is reached. And even if the destination of physical immortality were reached and its fruit tasted some will be irrevocably lost, for immortality is limited by serious accidents and the sea of life will be just as impartial to the immortal as the mortal if the sharks devour him. But even before the crew has the chance of reaching the waters of Ponce de Leon many ports and many delays may lie in wait. If there is ice or refrigeration aboard, the intelligent crew member will arrange his affairs accordingly. It is hoped that you will excuse the liberties we have taken with the analogy in order to get our point across.

We have been drawn to the conclusion both by fact and by extrapolation (or fancy or imagination as some of you may prefer) that the intelligent, responsible person, both for himself and for his species, should arrange his affairs so that his body is best preserved relatively permanently at low temperature. Considering the possibility and capability of man exterminating the species it is decisive that this suggestion be effected soon, at least on the part of some reasonable number of individuals who could either continue the race [— or perhaps improve it —] if revived at some future time. There is a variation we might consider for a moment.

This variation involves the use of relatively continuous radio messages being sent out from the most feasibly numerous points in time and space which would most probably contact other beings who could benefit from our knowledge and effect our desires. Conceivably the radios could be solar powered and self-repairing to last relatively indefinitely. The problem of which most feasibly numerous points of probable contact is probably one for the intellect-machines to answer and refine. The earth transmitters would reasonably cover those points in time and space where the earth with the Sun and planets travel once around our galaxy every 200 million years plus moving through space toward Hercules at some phenomenal speed. Beyond this radio transmission, our probabilities of survival could be enhanced by orbiting low temperature preserved

individuals throughout space. The selection might be made on the basis of individuals who specifically designated this mode and from individuals who specifically designated that they didn't care one way or the other. With them would go similar constantly transmitting radio sets. As in the case of those buried in permafrost or like low-temperature conditions, those who were orbiting throughout space would have a record kept of them with an eye toward retrieving them in the future if that were their desire, presumably after the human race had been so dispersed throughout space as to relatively insure their survival. The records in both cases would not only be held by a central agency as suggested but general summaries would be sent to a number of libraries, time capsules, and other likely places for the preservation of information. This orbiting of individuals through space is at present obviously extremely expensive in comparison to preservation in permafrost and thus only a theoretical possibility at present. But let us return from this flight of fancy to the more concrete learned responses of earthlings.

If you take this hypothesis to people who have never heard of it before a likely response will be an incredulous uncomprehending bemusement. Rarely you might be exposed to a more or less suppressed rage out of fear of something new or out of something the hearer did not know before and thus feels it a threat to his self-concept of knowing everything. The former bemusement is much more likely in an age [in] which the subject is deluged in new ideas and new discoveries. The majority may have reached a point where nothing surprises them. A modern form of fatalism may exude in an "I-couldn't-care-less" attitude, and an "Even-if-I-did-care-I-couldn't-do-anything-about-it." But now they are in a position to do more perhaps than ever before as individuals. For the pioneers of self-preservation it is especially true that they will increase man's chances of survival as well as their own individual lives. For anyone to take this path will increase their chance of long-term survival.

It has often if not always been true with mankind that men have been able to influence affairs more with their death, more with casting their total vote than in any other way. Think of the impact of Jesus, Socrates, Bruno and a host of other martyrs and fighters. What we now regret and despise are men who would cast the lives of millions under their control into a smithereen fusion of glass and radioactive fire just for an eventual marginal difference in outmoded prejudices. Now another behavioral vote associated with death is open in which the individual casts for physical immortality. If there ever were a chance of the salvation of being reborn in death this is it. The impact of casting your vote in an election is

ridiculously small by comparison. The chance that one man's vote will decide the issue in a national election is less than the chance that he will meet his death on his way to the polls. But you with your new vote have a way to eventually circumvent even death by stopping your biological clock, holding in stillness, and silence, your form and structure, if accidental death should occur, until a newer type of watchmaker evolves. Cast your vote. Prepare for the delays in death and life. Then let us get on with the wonders of living.

Until the majority or large groups are with you in this venture of self-preservation you will face the discomfoting popular pressures of conservatism and conformity everywhere. You will need the strength of character to decide for yourself, the strength to be an autonomous and non-conforming person, stubbornness and persistence to reach your goal. If your conditioning has given you a pre-twentieth century morality it will be doubly hard to change. You will be in great need of up-to-date information, flexibility, imagination and the strength to live with uncertainty with the possibility that you might be wrong. All of us, must have the willingness to change if we find the facts are significantly different from what we had previously thought them to be.

But in any new endeavor, even when the facts continuously support our advocacy, you must be prepared to meet the buffets of disbelief and displeasure. You must have the imagination and cunning to create stratagems to achieve your ends if you are continually frustrated in achieving them by straightforward means. You must have the willingness to fight against and break absurd laws and customs and be prepared to meet the consequences. In fact you will be doing civilization a service in ridding it of its deleterious and restrictive encrustations that prevent it from further development via a neotenic form.

We are at the end of our inquiry, but as often happens in the search after truth and life, we have had our stars to guide us to our destination, but fancy and sometimes error have deterred us. Often, too often we have doubled back and repeated the same course. Too often we have loosed that certain bag of winds on the reader's ears. But if our course has been as devious and as lengthy and as delayed at time as Odysseus' might we feel that in some small sense we have tracked the ocean of immortality and death and returned to his veiled and rocky native shores? Or have we dealt in a land where Don Quixote dwelt trying to reestablish a value that is forever lost? And is our return, or will it be, like his? Either is more than reward enough. But let us assume that it is more like the veiled, misty, rocky shore of Ithaca upon which we are awakening. We have had a long, exciting and good journey into unknown regions. We

may be temporarily weakened. We know not for sure exactly upon which coast we stand but we know we have a kingdom before us. We will gather our strength and our wits about us and proceed. For we'll go out of this world, if we must, with neither a bang nor a whimper but a stratagem.

POSTSCRIPT

Though this book was in the main finished in 1961 after two or three years of research, gestation, discussion, and desultory writing, the year 1962 included considerable confirmation of the idea being in the air. It was embarrassing to observe a luridly sensational newspaper run a full page headline: "SCIENTIST DISCOVERS HOW YOU CAN LIVE FOREVER." He didn't really, not in the sense that he was presently willing to provide you with a reasonable set of plans guaranteeing your future life here and now. Neither, I suspect, would he claim that he discovered Eternal Life if we asked him. All he has shown is that aging in chickens and mice is susceptible to some controls. These are the Monsanto experiments referred to earlier.

If this brand of journalism has apparently implied much more than warranted, it is nevertheless another indicator of the spread of ideas on science eventually achieving immortality for men. Of greater value are some of the comments quoted of authorities. Dr. Joseph W. Still of George Washington University has been quoted: "Aging is simply a disease. It can be licked just as tuberculosis and other diseases were licked."

From the other side of the planet, Soviet scientist, Vladimir T. Kuprevich, early this year, [is] reported to have said:

"Why should man die of old age? I consider the process of aging an abnormal process. I am sure we can find means for switching off the mechanism which makes cells age. Then man, his body cells eternally renewed as they aged, would become immortal."

However it is obvious, as with the recent tragic loss of Mrs. Roosevelt, that many people will die before scientists really discover how you can live forever by diet control. Discussions have brought to the fore a number of additional points.

One is the great concern for attempting to ensure one's wealth while being preserved in a dormant condition. — Those who are so fortunate as to have this problem. Some have thought, like many a tribesman before them, of taking some of their worldly goods with them in their permacrypt. — Perhaps a small bag of diamonds or a small store of gold. If men act in the future as they have acted in the past this would be extreme folly. The most massive and intricate pyramid didn't stop grave robbers if there were the scent of gold. The safest way by far is to make sure no person held in suspension has any article of temptation about

them, or if they do they should be held in dormancy in an especially marked hazardous area far from those who wish to best insure survival.

Second, if profit making establishments, or nonprofit special interest groups, attempt to sell or provide services pursuant to preserving the body, and if history teaches us anything, they probably will try to persuade their clients into many unnecessary, expensive, worthless, possibly harmful extravagances. The simplest, most inconspicuous mode of preservation will prove best for survival. Heads of state, prominent and vain persons, may become ensconced in elaborate, refrigerated crypts on public display, but at much greater risk to their ultimate survival.

Third, to be more specific concerning the concept of death, it is beginning to have an alteration in character, less finality, and a greater amenability to control and decay.

One can imagine the semantic and legal snarls people will have to cut through. The law, it is hoped, will catch up with science, considering the dormant preserved person dead not finally but temporarily. The death certificate for those who are being preserved should be altered to read "a certificate of suspension," followed at a later date by a "note of resuscitation." Our guide again, in all of this, is that the welfare of the individual should be consciously considered first and that of the state last.

Although the manuscript has been in very few hands thus far several have said they definitely wish to register. They also had a few additional questions.

Might not one wake up to an entirely foreign environment, perhaps a hostile one, threatened by atomic wars, and devoid of our loved ones? We might say that war, as the anthropologist informs us, is not the deathly attendant of all societies for all time. It seems so to us, and is an overwhelming threat at present, but some humans at least will probably make it through to form more peaceful societies in the future. That the environment will be entirely foreign is unlikely. If you decide on suspension, others, even of your own family will likely decide similarly. The state of affairs more probably will be one in which you have an abundance of friends and loved ones. Depending on the differences in time of death and times of resuscitation you may find your grandparents, parents, children, grandchildren, etc., about you, all of whom may be approximately the same age. There may occasionally be the anomaly of your child being older than you and your parents being younger than you and so forth. If resuscitation came within a century a person who has a grandchild now might wake to live and converse with that same person.

If we consider for a moment Diogenes, Euripides, or Aristophanes returning to our century after some 20-odd centuries in between, it can be

seen that the adjustments wouldn't be unsurmountable. The plumbing might be improved a bit, but they would note that man had his same old collective neuroses and psychoses. Their objects had changed but the fundamentals would be familiar. For all our trials and dangers they would probably immensely enjoy themselves, and we would enjoy them.

Another worry was whether or not the organization with which you registered your desire would be competent and reliable enough to carry through the task. Generally speaking it isn't too complicated if we don't make it so. It is true we all feel more comforted under the letterhead of a reputable and famous board of directors who may perhaps take the place of the gods of old, but the job remains the same. We can have considerable faith in our fellow men to carry out our intentions, for they will desire us to do the same for them, if we let them know our intentions, and if at first we lay aside the same funds that we would normally lay aside for a funeral (and in many cases much less) to the end of cooling and storage. Later civilization should guarantee the right to immortality as it will undoubtably guarantee the right to a yearly income, but in the meanwhile the responsibility lies with the individual person.

We may note that society is quite solicitous about burying people whether they like it or not. Technically there are no problems. In very cold climes many bodies lie frozen right now, though it is doubtful if it is for reasons of ultimate resuscitation. In the warmer climates the body must be taken to a cooling plant, cooled sufficiently, transported to the permafrost area, and interred noting the necessary data. There is little but a slight alteration in our customary arrangements. The danger is more in ourselves; that we will put up imaginary barriers, or allow institutions and governments to befuddle us with red-tape and unnecessary expenses. It is wise for the organization that takes care of this, providing whatever services it can, to eventually go under UN supervision.

Allied with this concern for the proper preservation is the concern whether or not the brain, a phenomenally intricate mechanism, will be harmed in any way. The question is whether or not it will survive in proper functioning order? As mentioned earlier there have been studies in freezing cells which indicate that all of the free radicals, all of the relationships within the cells, are in the same relationships upon rewarming. This would seem to indicate reason for optimism. Likewise the majority of mice and rats that were frozen recuperated with no ill effects which included observing how they responded mentally. Besides this there undoubtably will be considerable further experimentation to make reasonably sure the human will survive mentally competent before he is resuscitated.

1962 brought a critical increase in war tension for at least a brief period of time between the two megalithic powers U.S. and U.S.S.R. The lesson would seem to be that we have weathered the brink once more but there is no reasonable guarantee that the holocaust will not eventually erupt as long as nation-states refuse to give their military sovereignty to the United Nations.

For the more certain preservation of your life presently, and your body eventually, it would appear best to remove yourself to the safer parts of the globe if you live in the northern hemispheric holocaust areas. These areas at present appear to be the Eurasian heartland, North America, and the friction points in between. Because of fallout, no place in the northern hemisphere is as safe as its southern counterpart. If the megaliths are moving toward a considerable destruction of each other the safer places to live and die (if you must, and then be frozen) appear to be Australia, New Zealand, South America, and possibly southern Africa. The fallout charts indicate it would be much safer there not to mention the more grisly effects of attempting to live in the radioactive ruins of two or three charred northern civilizations.

December 1962 brought additional questions, and suggestions, and greater acceptance in the channels of communication.

One of the interesting answers which has come out in reply to the question: "Your preservation plan has great plausibility, but suppose for some reason which you can't envisage at the present that it doesn't work?" is that it still remains worthwhile to preserve the body for scientific use which will help others.

A recent, rather fanciful suggestion is that in certain circumstances some individuals may wish to wear a minute radio transmitter which would continuously send body condition data to a central exchange or a mentamachine. In case of extreme danger or death rescue operations could begin without delay. Coupled with this under certain circumstances might be the installation of freezing devices. A device may conceivably be developed which will freeze by releasing fluids within the system, or by external or/and internal thermocouples.

The New York *Times* lends increasing respectability to two hypotheses: that age can be controlled and that man may learn the techniques of regeneration. Lawrence Galton in his interviews with leading Columbia University scientists reports,

"There are those who believe that, through analysis of DNA in cells, it may become possible to determine whether an individual is susceptible to cancer and other diseases; that scientists may well find

that the aging process involves changes in the genetic code with passage of time and that such changes may possibly be prevented.”

Galton reports further:

“Dr. Hayashi sees another breakthrough in the offing. A human being begins as a single cell. At maturity, there are billions of cells — well differentiated. What mechanisms control the differentiation process — so that an arm is always an arm, for example? `The controlling mechanisms will be elucidated. And there is a possibility that regeneration could be achieved.’ “

Further, Dr. Sebrell supports his fellow scientist by saying,

“There is a fair chance, too, that we will understand the mechanisms by which organs develop. If so, we may very well be able to grow a new arm. When an organ develops, it grows to a certain size and stops. What stops the growth? Can it be started again? Cut the tail off a salamander, and it regrows the tail. If nature has made this possible for the salamander, there is a mechanism that man can learn.”

The *Washington Post* recently reported,

“surgeons and scientists are fashioning a stunning new breakthrough over death by borrowing and transplanting healthy organs ... `There is no question but that this problem is going to be solved,’ declares Dr. David M. Hume of the Medical College of Virginia in Richmond. ... In recent medical history, 13 kidneys have thus been borrowed from the newly dead, and at least 82 have been donated by living persons, from twins to relatives to virtual strangers.”

Both X-rays and drugs have been used to retard the antibody-forming mechanisms which have hindered complex organ transplants thus far.

The last evaluation of the thesis and the book in general, for 1962, was through a discussion by about 20 persons on Dec. 23rd. As the same questions were asked of these individuals as are listed in the “Request For Your Opinion” that pattern will be followed in summarizing the points of the discussion, salient and otherwise, — with a healthy injection of the author's bias.

1. There seemed to be a consensus that the subject was immortality and the prolongation of life.
2. The problem was seen as (1) how to achieve immortality, or (2)

how to convince the public that immortality is possible, or (3) what to do for people, here and now, who desire a reasonable chance at immortality in this interim period before successful methods of aging control have been achieved.

3. The question “What is the thesis?” was answered as follows:

(1) Death is not inevitable.

(2) Immortality is a real possibility.

(3) Immortality is possible, during the interim period, via freezing and properly storing the body.

3a. Some said flatly that the thesis was substantiated, others were of a more skeptical turn of mind depending on the amount of immediate proof they demanded.

Not to imply what people in general would feel, but simply to report what 20 individuals interested in reading and discussing ideas thought of the thesis, about 11 were convinced, about 4 were unconvinced, and 5 were of an indeterminate opinion. One thought the freezing and resuscitation of the hamsters was sufficient proof of its eventual achievement for humans. Another was incensed by the comparison. Most agreed that prolongation of life will continue. One felt there must be some absolute limit to life.

3b. The question whether anything invalidates the thesis was commented on as follows: No positive scientific validation now exists, in the sense that no man has been frozen for any reasonable length of time and resuscitated. Some will only believe it possible when this has been achieved. Others said specifically that nothing invalidates the thesis. Others worked the middle ground, that if brain deterioration is too great, — presumably beyond one half hour before freezing, the individual would have a slim chance of recovery. Probably the most practical suggestion to come from the discussions was this insistence on the importance of virtually immediate freezing. An unusual delay between death and freezing, if not irremediable, might mean a wait of hundreds of extra years before enough was learned about reconstituting the original pattern, — and, a prohibitive resurrection bill.

Several felt that for social and psychological reasons freezing for purposes of resuscitation would never be allowed. Governments with their arrogant insistence on a willingness to war, for a marginal difference in ideology, when compared with the value of life, would find themselves in conflict with the desire for physical immortality. Another person felt

that men would lose their sanity trying to adjust to future civilizations and all of the changes immortality would involve.

3c. Though the basic arguments may be there, most felt the need for: better arrangement of the material, additional explanation of certain terms, and a more conservative estimate of the length of time for the suggested achievements. Quite a number of participants counseled that it would be much better to project the end of the interim period and the first successful resuscitations of the solidly frozen to “sometime in the 21st or 22nd century.” The criticism is well-taken. Analogy supporting this is da Vinci's practical suggestions for flying and the over 400 year interim period before it was achieved. (We can imagine that ancient men reasoned: — if birds can fly, why can't men?) The analogy continues to instruct us that we may seldom expect any process, be it flying or immortality, to spring with full blown perfection from the head of man. The airplane first flew for a few seconds. In a few years it was flying for hours. If we wished we could design one that could remain aloft indefinitely, by repairing and refueling in flight. Some satellites have made even that outmoded. Animal and human freezings and reanimations are likely to follow a similar pattern in time.

Lastly, more scientific data could be utilized for substantiation, such as the new information on the genetic code, its possibilities for regeneration, as in aged persons who reportedly occasionally grow a third set of teeth, and the recent transplanting of carefully washed animal bones in humans.

3d. Among the many suggestions was the proposal that hibernation should be more carefully studied and used as a transition to preservation by freezing and aging control. Another, offered that institutions might consider what could be done to help overcome the death instinct which is possibly quite strong in humanity. Unanimous agreement was reserved for the plan to freeze now and pay later.

3e. Questions were raised whether fact was always distinguished from opinion: Is a person really a message? Can a machine think and comprehend? Are children really smarter than their parents? That a person is a message seems outrageous, but this appears to be what Wiener suggests. He, as well as, Grey Walter, Ashby, and D. A. Bell in *Intelligent Machines*, suggests that machines do think. The meaning of comprehend as used, meant that the machine (meaning in this case the mentamachine) could encompass, gather in a wide range of wave data, far wider than the human can, incorporate it, and often know how to act because of the par-

ticular nature of that data.

Children are more intelligent in the sense that *Homo sapiens* are supposed to be more intelligent than ancient *Australopithecines*.

The idea that man was never meant to work caused considerable consternation. If some feel that he was, we wish them godspeed in the speedy pursuance of their conviction. We only hope they will understand their need for others of a Diogenean persuasion to stand aside and meditatively appreciate their “necessary” labors.

3f. The thesis could be tested, gradually, in time, by continuing research on freezing and resuscitating larger and more complex animals for longer periods of time. Volunteers, from the condemned, from certain types of terminal illnesses, and possibly from other sources, could be used if it were reasonably established that nothing would be lost to the individual in question and much might be gained for him and for others.

One person, in agreement with the text, added that if any person decided there was nothing to lose, considering the circumstances, any other alternative being an endless oblivion, then he should arrange to have his body frozen and stored.

3g. Some felt that the long disquisition on the machines and the more imaginative literature could have been trimmed. Perhaps they are right. But would we have the feeling we had written a book?

3h. That analogies break at some point is true. It is also true that when they hold, they aid in much of the world's problem solving. Bacteria, hamsters, and humans have all the basic biological characteristics in common. But we do not mean that just because bacteria have been salted away for hundreds of millions of years and then reanimated via warmth and water, that the same could be done with a hamster or a human. Obviously they would just deteriorate. Nor do we mean that just because a hamster's temperature can be lowered below freezing, with half of the body contents frozen, and then reanimate him with a couple of lightbulbs that the same can be done with a human. The differences are such that scientists must develop unusually sophisticated techniques of resuscitation and reanimation before such a feat is possible. What is suggested is that the present short term freezing of hamsters and other animals points the way to a real probability for men. The differences are those of degree and may be overcome within a few centuries.

Some felt the text implied that genocide, or immortality, were inevitable, or some of both. The author's meaning was not so strict. Man in some sense appears to have some control over the outcome. At least

ours has been a repeated plea for the prolongation of individual life. It is meant that genocide is the logical outcome if man does thus and so. Immortality is the outcome if man institutes other cooler and more studious procedures. A mixture of the two is certainly possible. Mankind has a genius for doing everything.

3i. The objection is granted with alacrity that the writer has seldom defined his terms adequately. The conceptions and definitions are to be considered provisional. All of them are open to amendment and change. None are sacred. All are in a state of flux. As suggested before, death appears to be gaining a wider more flexible meaning. Death may often be a dormant condition in which the molecular life processes are held in stasis. It may also mean, depending on the case, oblivion and no return.

Most of the time when the word immortality was used in the text it meant a condition in which the individual would not normally die through aging, though he would be vulnerable to death through accidents or suicides of irremediable bodily discription and destruction. The provisional conception envisions at present the necessity of freezing if one dies before aging control or prolongation devices are operable. But if one were resuscitated this didn't mean one was immortal. It was hopefully thought that aging control and prolongation would be developed in the future, perhaps by the time reanimation was practical. Even if the chance of immortality lay before the individual his or her life expectancy might still be some function of the rate of serious accidents indicated above. It is conceivable that scientists might be able to safely store each person's pattern, if the individual desired it, to offset losses by accident.

6. This side of totally rewriting and reorganizing the book (which one man vetoed, because the way it is written now should set all of the non-conformists right on edge) the most pointed objection on the part of a few concerned the wills which should be either excised or removed to the end of the book.

(I wish to state explicitly that you only use the wills if you have no better alternative. I don't happen to know of a better one, but you may, and if you do you should logically avail yourself of it. My personal feeling, as explained, is that some agency should act as a repository of records concerning this and as an information exchange center. These functions 20th C. Books has volunteered until the U.N. might take over supervision. 20th C. Books cannot help with the freezing and transportation except with information on these and other allied needs. We are glad to provide these functions until a better arrangement is instituted, and apologize if we have been too enthusiastic for our own educational

program: however not so much that it has kept us from presenting it for your consideration.)

7. Among all the consequences suggested is the ingenious possibility that with aging control some of our youth will demand rapid aging to more quickly reach their optimum capabilities. May we escape some of the ravages, anguish, and delights of adolescence?

All of the probable consequences of immortality we can think of should be discussed in the hope that we may be able to avoid the possible ill effects, and more intelligently enjoy what we assume are the greater benefits. This will have to wait for the present.

Once more we take leave of what must have been a very patient reader. If the style has seemed unduly self-conscious and defensive, perhaps you will partially forgive this in the novice. If some of the comments have been undignified and facetious, it may come from believing too whole-heartedly that if you wish to say something in deadly earnest, use the comic vein, and often vice versa; that ideas have precedent over form, in the first instance at least; and that the good news of such a superficially outrageous subject needs the harlequin and the fool as its herald.

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This is a very general bibliography suggested by 20th Century Books. It is open-ended, and non-final, we should like to repeatedly stress. The concern is to locate, to read, and to discuss the most important, most influential, most significant books in each significant area of study in this century. They may come from any place on the planet. One doesn't care where they came from, who wrote them, or what they believed. The concern is whether or not they have had, or will have, an impact and prime influence in that field of knowledge or action; in short, the books that a person would have had to read in order to be well educated in the thought of this century.

SIGNIFICANT BOOKS OF THE 20TH CENTURY A very tentative list as of 1961

Astronomy	Hoyle	Frontiers of Astronomy	Mentor	1955	England
Anthropology	Frazer	The Golden Bough	Macmil.	1922	England
Autobiography	Nehru	Toward Freedom	Beacon	1937	India
Autobiography	Gandhi	Experiments With Truth	Beacon	1929	India
Biochemistry	Oparin	Origin of Life	Dover	1927	USSR
Biology	Sherrington	Man on His Nature	Anchor	1940	England
Chemistry	Curie	Radioactive Substances	Wisdom	1912	France
Chemistry	Pauling	The Nature of the Chemical Bond	Cornell	1939	USA
Cybernetics	Wiener	The Human Use of Human Beings	Anchor	1950	USA
Drama	Shaw	Androcles and the Lion	Penguin	1913	Britain
Economics	Keynes	The General Theory of Employment	Harcourt	1936	England
Education	Dewey	Experience and Nature	Beacon	1925	USA
Geopolitics	Mackinder	The Geographical Pivot of History	Murray	1904	England
History	Toynbee	A Study of History	Oxford	1955	England

History	Wells	Outline of History	Garden	1920	England
Literature	Joyce	Ulysses	Modern	1922	Ireland
Mathematics	Russell	Principles of Mathematics	Norton	1903	England
Philosophy	James	Pragmatism	Hafner	1907	USA
Philosophy	Sartre	Existentialism	Wisdom	1946	France
Poetry	Eliot	The Waste Land	Harvest	1922	USA
Pol. & Govt.	Lenin	Imperialism	Inter.	1917	USSR
Pol. & Govt.	Mao	Selected Works	Inter.	1945	China
Pol. & Govt.	Sun Yat-Sen	Three Peoples Principles	n.i.p.	1927	China
Pol. & Govt.	Hitler	Mein Kampf	Hougtn.	1927	Germany
Physics	Einstein	Relativity: The Special & General Theory	Crown	1916	Germany
Physiology	Pavlov	Conditioned Reflexes	Dover	1926	USSR
Psychology	Freud	Interpretation of Dreams	Mod. Lib.	1900	Austria
Religion-Philos.	Iqbal	The Reconstruction of Religious Thought in Islam	Ashraf	1934	Pakistan
Sociology	Weber	The Protestant Ethic & The Spirit of Capitalism	Scribners	1920	Germany

Since this is such a restrictive bibliography additional bibliographies may be obtained by writing to 20th C. Books. Additionally those who would like to form discussion groups based on significant literature of this century are welcome to aid and information. Write: 20th C. Books, 1500 Harvard NW, Washington, D.C.

REQUEST FOR YOUR OPINION

Perhaps you will excuse another reminder, in case it hasn't been clear in the text, that this book merely attempts to present a hypothesis for discussion. My wish is to explicitly disclaim any finality and admit total fallibility if I have been inadvertently dogmatic through enthusiasm. All mistakes are my own and I wish to embarrass no one in or out of 20th C. Books by circulating such a strange idea. I am, however, in the dilemma of not knowing whether or not there are any invalidating mistakes. I am dependent on you for criticism. If the thesis is invalid we can drop the whole thing. However, if the idea is viable we may be able to improve it, with your help, and locate a publisher who will circulate it more extensively.

The following questions are not meant to circumscribe your criticism. They are listed to stimulate your opinion and to reach for central points. Any honest criticism in any form is infinitely preferable to silence. Friends, especially, are likely to soften their criticism either face to face or in writing. Ultimately, however, it will be far more humane to the writer, and to possible future readers, if you will lay your opinions on the line. Speaking directly saves loads of time. It will be of considerable aid to us if you will note your criticisms below, tear out, and mail to 20th C. Books.

1. Subject: Does it have one? What is it?
2. Problem: Is there a problem? What is it?
3. Thesis: What is it?
 - a. Is it substantiated?
 - b. Does anything invalidate it?
 - c. How could the substantiation be improved?
 - d. What is missing?
 - e. Are there any factual inaccuracies?
 - f. Are any operations suggested for testing the thesis?
 - g. What is extraneous?
 - h. What kinds of arguments does the author use? Are any invalid? Are any analogies stretched too far?

- i. Does the writer define his terms? If they are inadequate what improvements would you suggest?
4. What are the basic assumptions of this work?
5. Do any value judgments get in the way of the main message?
6. Organization: Are the arguments and data in a proper order? Assume it will be rewritten. How would you go about it?
7. Consequences: What consequences do you see if the thesis happens to be valid?
8. How could the style be improved?
9. Taste: Is poor taste shown in criticism of other viewpoints?
10. Audience: Who do you think the audience is or should be? Has the audience been treated appropriately?
11. Viewpoint: Has the author been trapped in his own cultural, geographical, political environment? What should be his vantage point?
12. OTHER CRITICISM: What have we missed?