# INTRODUCING THE 1966 ALFRED KORZYBSKI MEMORIAL LECTURER

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It is a very great pleasure to be called upon to say a few words about Alvin Weinberg. I have known him now for almost 25 years, but such is his modesty and inclination toward self-effacement that I know very little about him through himself. He was born in the windy city of Chicago in 1915, went to school there, both lower ones and the University, married there, and had his first job there. He is a physicist and had, among others, the great Carl Eckart as his teacher. He was just about 22 when he published his first paper, in collaboration with Eckart, on a subject of theoretical physics, then in the foreground of interest. He taught physics for a year, then became interested in biophysics. For a few years he was Research Assistant at Rashevsky's Institute at the University of Chicago and published about ten papers centered around the subject of nerve conduction. Nevertheless, when the war broke out and physicists were urgently needed for the uranium project at the University of Chicago, it was natural to call on Dr. Weinberg for help, and he readily followed the call.

This was an important turn in Dr. Weinberg's life. He had an opportunity to work in virgin territory, and his abilities and gifts unfolded rapidly. It was at this time that I met him. We were both members of the theoretical team in charge of establishing a theory of the nuclear chain reaction as well as designing a large reactor, capable of producing large amounts of the nuclear fuel and explosive, plutonium. Alvin was in charge of the theory of the chain reaction, and his development of that theory survived the intervening more than 20 years. They are in use today. Let me mention only one additional fact — he designed the Oak Ridge graphite reactor, the one that first furnished appreciable amounts of plutonium; he designed it single-handedly and in about two weeks.



Now, I want to bring out another contribution to the theoretical team in Chicago: he was the one who acted as an intermediary whenever friction between us, theoreticians, and another group developed. Everyone recognized his fairness, his willingness to meet the other fellow half-way, and he also could put across his — and his teammates' — point of view with greater clarity than the rest of us could see it.

The rest of Alvin's life is an open book to most of you. He moved to Oak Ridge in 1945, became Research Director and then Director of the Laboratory in short order. His broad early experience in several sciences enables him to assimilate and appraise the work of physicists, chemists, biologists, and also, and perhaps most particularly, nuclear engineers. However, his chief present function, and his first claim to fame, is as a statesman of science and as a philosopher of science. This latter he is not in the usual sense of interpreting scientific theories in terms of their broader implications. Rather, he is concerned with the role that science and learning play in our society, in the role that they should and perhaps will play. His contributions to these questions, nay, his opening up of the discussion on these questions, dwarfs his earlier accomplishments. These, nevertheless, have earned him the Lawrence Award, the Atoms for Peace Award, several honorary doctor's degrees, and, as I just heard, the noblest recognition which the University of Chicago can bestow on an alumnus.

There are many reasons for my valuing Alvin Weinberg dearly as a friend, and I won't acquaint you with these. Only one of his properties do I wish to bring out — his humble willingness to do the job that has to be done, his willingness, even eagerness, to accommodate the needs of the day. He changed from physicist to biophysicist, from biophysicist to reactor theorist and reactor engineer, from reactor engineer to appraiser and supporter of a broad spectrum of scientific endeavors. From this, he changed to a philosopher of scientific endeavor, and we shall hear him tonight in this capacity. The title of his address is 'Will Technology Replace Social Engineering?'.

# Alfred Korzybski Memorial Lecture 1966

## WILL TECHNOLOGY REPLACE SOCIAL ENGINEERING?*

Alvin M. Weinberg
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One of the most important lessons we have learned from our experience during and after the war has been that large-scale, organized research can solve the most difficult technological problems. Nuclear reactors, nuclear bombs, space radar, possibly desalination, are miraculous new technologies that have been created by concerted efforts sponsored by our Federal Government. Before launching a systematic attack on these problems we had to identify them as being worth solving and as being solvable. Each of these developments aimed at answering a technological question, i. e., a question that could be posed in strictly technological, as opposed to social, terms. The answer to each question was found entirely within the natural sciences and technology. For example, after nuclear fission had been discovered, rather by accident in 1938, it occurred to many physicists that nuclear energy could be relased on a large scale. The Manhattan Project was mobilized to exploit the discovery of fission; the project and its daughters, spawned by the Atomic Energy Commission, were prototypes of the technologically oriented, large-scale government project.

Though these federally-sponsored developments stretched our science to the utmost, in two important senses they have been relatively simple. First, to mobilize around a well-defined technological goal only a few people had to be convinced. President Kennedy decided almost single-handedly that we should send a man to the moon, and this was enough to start the space program in a straight-forward and efficient way. Second, because technological goals are relatively easy to define, it is fairly easy to say whether a technologically-orientedproject has succeeded. The H-bomb either goes off or it doesn't go off; the Saturn V either reaches orbit or it blows up on the launching pad; the nuclear airplane either takes off or it doesn't (though it cost about one billion dollars to demonstrate that the nuclear aircraft was too difficult to be worth pursuing).



Our federal government is now beginning to mobilize around problems that are seemingly largely social rather than technological in content. This change is suggested in President Johnson's 1965 State of the Union Address, in his blueprints for the Great Society, as well as in the many reports now emanating from the White House or the National Academy of Sciences that deal typically with social problems. We have had reports on world population and birth control sponsored by the National Academy, reports on restoring the quality of our environment, concern about education, about urban renewal, about urban transportation, about race relations, and about poverty. President Johnson has dedicated the power of a scientifically oriented federal apparatus to find solutions for these complex social problems.

Social problems are much more complex than are technological problems. It is much harder to identify a social problem than a technological problem: how do we know when our cities need renewing, or when our population is too big, or when our modes of transportation have broken down? The problems are, in a way, harder to identify just because their solutions are never clear cut: how do we know when our cities are renewed enough, or our air clean enough, or our transportation convenient enough? By contrast the availability of a crisp and beautiful technological solution often helps focus on the problem to which the new technology is the solution. I doubt that we would have been nearly as concerned with an eventual shortage of energy as we now are if we had not had a neat solution — nuclear energy — available to eliminate the shortage.

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*Fifteenth Annual Alfred Korzybski Memorial Lecture presented before the Institute of General Semantics, Harvard Club of New York, 29 April 1966.

But I believe there is an even more basic sense in which these social problems are much more difficult than are technological problems. A social problem, almost by definition, exists because many people behave, individually, in a socially unacceptable way. To solve a social problem one must induce social change — one must persuade many people to behave differently than they have behaved in the past. One must persuade people, many people, to have fewer babies, or to attend school more regularly, or to refrain from disliking Negroes. By contrast, resolution of a technological problem involves many fewer individual decisions. Once President Roosevelt decided to go after atomic energy, it was by comparison a relatively simple task to mobilize the Manhattan Project. True, each scientist and engineer had to decide whether to work on the bomb or not to work on it, but this was a relatively simple decision and once made did not have to be remade every time the engineer did a new experiment.

The resolution of social problems by the traditional methods — by motivating people to behave more rationally — is a heartbreaking, frustrating business. People don't behave rationally; it is a long, hard business to persuade individuals to forego immediate personal gain or pleasure (as seen by the individual) in favor of longer term social gain whose ultimate usefulness seems quite remote to the individual. All this is well known and, in a sense, merely defines the task of the social engineer. The aim of social engineering as I use the term is to identify the social problems that bedevil society, and then to invent the social devices — usually legal, but also moral and educational and organizational — that will change each person's motivation and redirect his activities along ways that are more acceptable to the society. Each feat of social engineering basically seeks to make people behave better, to act more rationally — in short, to improve human nature.

The technologist is appalled by the difficulties faced by the social engineer; to engineer even a small social change by inducing individuals to behave differently is always hard even when the change is rather neutral or even beneficial in effect. For example, some rice eaters in India are reported to prefer starvation to eating wheat which we send to them. How much harder it is to change motivations where the individual is insecure and feels threatened if he acts differently, as illustrated by the poor white's reluctance to accept the Negro as an equal, or where the socially desirable goal can be reached only if some members of the community are willing to make a personal sacrifice in the interest of the larger good, as when a tenement owner rebuilds the plumbing system and landscapes at his own expense, in the interest of improving the neighborhood. By contrast, technological engineering is simple: the rocket, the reactor, and the desalination plants are devices that are expensive to develop, to be sure, but their feasibility is relatively easy to assess, and their success relatively easy to achieve once one understands the scientific principles that underlie them. It is therefore tempting to raise the following question: In view of the simplicity of technological, and the complexity of social, engineering, to what extent can social problems be circumvented by reducing them to technological problems? Can we identify Quick Technological Fixes for profound and almost infinitely complicated social problems, 'fixes' that are within the grasp of modern technology, and which would either eliminate the original social problem, or would so alter the problem as to make its resolution more feasible? It is in this sense that I ask, 'Can technology replace social engineering?'

## THE MAJOR TECHNOLOGICAL FIXES OF THE PAST

To explain better what I have in mind, I shall describe how two of the profoundest social problems of mankind — poverty and war — have in a sense been solved by the Technological Fix, rather than by the methods of social engineering. Let me begin with poverty.

The traditional Marxian view of poverty viewed our economic ills as being primarily a question of maldistribution of goods. As I once heard Norman Thomas put it, 'Capitalism could never pay to the worker enough to enable him to buy back the goods which he produced'. The Marxist recipe for elimination of poverty therefore was to eliminate profit, in the erroneous belief that it was the loss of this relatively small increment from the worker's paycheck that kept him poverty-stricken. The Marxist dogma is typical of the approach of the social engineer: one tries to convince or coerce many people, in this case the capitalists, to forego their short-term profits in what is presumed to be the long-term interest of the society as a whole. I need not dwell on the fantastic cost of this kind of social engineering, a cost which we are still paying more than 50 years after the Russian Revolution.

The Marxian view seems archaic in this age of mass production and automation not only to us, but apparently to many Eastern Bloc economists. For the brilliant advances in the technology of energy, of mass production, and of automation have created the affluent society. As John Galbraith says, 'Since for nearly all time nearly all people have lived under the threat of economic privation, men of all temperament and views have stressed the controlling and permanent influence of economic need on social attitudes'.* But technology has basically changed this, at least in the Western affluent society. Technology has expanded our productive capacity so greatly that even though our distribution is still inefficient, and unfair by Marxian precepts, there is more than enough to go around. Technology has provided a 'fix' — greatly expanded production of goods — which enables our capitalist society to achieve the aims of the Marxist social engineer without going through the social revolution Marx viewed as being inevitable. Though the fix in this case can hardly be considered to have been quick (it has taken one hundred years) it is an example of how technology has converted the seemingly intractable social problem of widespread poverty into a relatively tractable one.

My second example is war. The traditional Christian position views war as primarily a moral issue: if men become good, and model themselves after the Prince of Peace, they will live in peace. This doctrine is so deeply ingrained in the spirit of all civilized men that I suppose it is blasphemy to point out that it has never worked very well. For the social engineering approach to elimination of war requires a vast and unworkable change in countless individuals' moral attitudes: men must be persuaded to remove war as an instrument of national policy even though they may find personal advantage or release in the waging of war.

Though it is too early to say, and I realize it is terribly presumptuous to claim, I believe that Edward Teller may have supplied the nearest thing to a Quick Technological Fix to the problem of war. The hydrogen bomb makes large-scale war a far riskier proposition than it has ever been — riskier in the crass sense that the man who orders the button to be pushed, is with perhaps a 50% probability, signing his own death warrant, if not the death warrant of many members of his own family. The hydrogen bomb greatly increases the provocation that would lead to large-scale war — and not because men's motivations have been changed, not because men have become more tolerant and understanding, but rather because the appeal to the primitive instinct of self-preservation has been intensified far beyond anything we could have imagined before the H-bomb was invented. To point out these things today, with the U. S. involved in a shooting war, must sound hollow and unconvincing; yet the desperate and partial peace we have now is much better than a full-fledged exchange of thermonuclear weapons. One can't deny that the Soviet leaders now recognize the force of H-bombs, and that this has surely contributed to the less militant attitude of the U.S.S.R. And one can only hope (and I recognize this to be only a hope) that the Chinese leadership, as it acquires familiarity with H-bombs, will also become less militant. If I were to be asked who has given the world a more effective means of achieving peace, our great religious leaders who urge men to love their neighbors and thus avoid fights, or our weapons technologists who simply present men with no rational alternative to peace, I would vote for the weapons technologist. That the peace we get is at best metastable and terribly fragile I cannot deny; yet, as I shall explain, I think technology can help stabilize our imperfect and precarious peace.

## THE TECHNOLOGICAL FIXES OF THE FUTURE

Are there other Technological Fixes on the horizon, other technologies that can reduce immensely complicated social questions to a matter of standard 'engineering'? Are there new technologies that offer society ways of circumventing social problems and at the same time do not require individuals to renounce short-term advantage for long-term gain? Several examples come to mind almost immediately.

Probably the most important new Technological Fix is the Intra-Uterine Device (IUD) for birth control. Many of the world's most desperate social problems stem eventually from the Malthusian imbalance between our means of subsistence and the growth of our population. In the not-too-distant future, say within one hundred years, it seems clear that control of world population will dominate all other concerns of mankind. Our own government in the past few years has recognized the significance of population control, an awareness first marked by a report in 1962, 'Control of World Population', issued by the National Academy of Sciences. Since then other reports have appeared, and in general birth control has all but become an element of our nation's foreign aid policy.

Before the IUD was invented, birth control was almost entirely a problem of individual motivation; to achieve reduction in births, individuals had to be motivated very strongly indeed. Even with the pill, the individual's motivation had to be sustained day in and day out; should it flag even a little, the strong motivation of the previous month might go for naught. But the IUD, being a one-shot method, greatly reduces the individual motivation required to induce a social change. To be sure, the mother must be sufficiently motivated to accept the IUD in the first place. But, as experience in India already seems to show, it is very much eas-

*Science, 145, p. 117, 10 July 1964.

ier to persuade the Indian mother to accept the IUD once than it is to persuade her to take a pill every day. And, as some economists have pointed out, there is real economic advantage to paying women in overpopulated countries like Indonesia or India a flat fee to accept the IUD. The Indian Government is contributing $5 \times 10^6$ IUD's per year, and it hopes thereby to reduce the birth rate from $20 \times 10^6$ per year to $13 \times 10^6$ per year. The IUD does not completely replace social engineering by technology; yet because it greatly reduces the degree of individual motivation required to achieve a social end, the IUD so reduces the social component of the problem as to make an impossibly difficult social problem soluble.

Let me turn now to problems which have from the beginning had both technical and social components — broadly those concerned with conservation of our resources: our environment, our water, and our raw materials for production of the means of subsistence. The social issue here arises because many people by their individual acts cause shortages and thus create economic, and ultimately social imbalance. For example, people use water wastefully, or they insist on moving to California because of its climate, and so we have water shortages. Or too many people drive cars in Los Angeles, with its curious meteorology, and so Los Angeles suffocates from smog.



The water resources problem is possibly the best example of a complicated problem with strong social and technological connotations. In one sense, there is plenty of water in the United States — the total run-off amounts to 1,100 billion gallons per day, compared to a consumptive use of only about 100 billion gallons per day. Yet, as last year's experience [1965] here in the East shows, local water shortages are a very real thing. Now to a shortage of this sort there are two possible responses. The response of the social scientist or social engineer is: Let us use the water we have more rationally — by reducing consumption, by overcoming people's irrational prejudices against re-using cleaned-up water, by discouraging additional migration into water-short, though otherwise pleasant, parts of the country. The response of the technologist is much simpler: let's get more water, by conveying it from a greater distance, by desalting, by making artificial rain — that is, by means of a Technological Fix.

Our management of water resources in the past has been based largely on the ancient Roman device, the aqueduct: every water shortage was to be relieved by stealing water from someone else who at the moment was too poor or too weak to prevent the steal. Southern California would steal from Northern California, New York City from upstate New York, the Southwestern states from the Columbia River states, continental United States from Alaska and Canada, the farmer who could afford a cloud-seeder from the farmer who could not afford a cloud-seeder. The social engineer insists that such short-sighted expedients have got us into serious trouble; we have no water resources policy, we waste water disgracefully, and, perhaps in denying the ethic of thriftiness in wasting water, we have generally undermined our moral fiber. The social engineer, therefore, views such technological shenanigans as being short-sighted, if not downright immoral.

The water technologist on the other hand views the social engineer's approach as impractical and possibly arrogant. To persuade people to use less water, to get along with expensive water, is difficult, time-consuming, and uncertain in the extreme. Moreover, say the technologists, what right does the water resources expert have to insist that people use water less wastefully? People like to use lots of water. Green lawns and clean cars and swimming pools are part of the good life, American style, 1966, and what right do we have to deny this luxury if there is some alternative to cutting down the water we use?

Here we have a sharp confrontation of the two ways of dealing with a complex social issue: the social engineering way which appeals to our 'better' instincts, the technologists' way which appeals to our sense of 'practicality'. Even though I am a technologist, I have strong sympathy for the social engineer. I think we must use our water as efficiently as possible, that we ought to improve people's attitudes toward the use of water, and that everything that can be done to rationalize our water policy would be welcome. Yet as a technologist, I believe I see ways of providing more water more cheaply than the social engineers seem to concede is possible, and I therefore object to his arrogation of superior moral virtue in his attitude toward this social problem.

I refer of course to the possibility of nuclear desalination. The social engineer dismisses the technologist's simple-minded idea of solving a water shortage by transporting more water primarily because in so doing the water user steals water from someone else — possibly foreclosing the possibility of ultimately utilizing land now only sparsely settled. But surely water drawn from the sea deprives no one of his share of water. The whole issue is then a technological one; can fresh water be drawn from the sea cheaply enough to have a major impact on our chronically water-short areas like Southern California, Arizona, and the Eastern Seaboard?

I believe the answer is yes, though much hard technical work remains to be done. We now pay about 20 to 25 cents per thousand gallons for water in municipalities such as Los Angeles. To distill one thousand gallons of fresh water from sea water containing 35,000 ppm of salts requires a minimum of 3 kwh of mechanical work; if we eventually get energy from very large reactors at, say, 1.5 mills /kwh, the absolute lower limit to the cost of extracting fresh water from the sea would be about one-half cent per thousand gallons. Thus between the one-half cent per thousand gallons theoretical lower limit and the 20-odd cents we can afford to pay, there is, say, 19 cents that can go for capital cost of stills, operating costs, conveyance costs, and additional energy cost (because in practice our distillation process uses energy rather inefficiently).

It was R. P. Hammond, now at ORNL, who first recognized that if the distillation process were carried out on large enough scale and if the source of energy were a nuclear reactor of enormous size, the capital costs could be reduced much below the then current estimates, and that 20 cents per one thousand gallons was by no means an irresponsible estimate. Hammond's views — that big means cheap, and big enough means cheap enough to desalt the sea economically — have been generally accepted. A large program to develop cheap methods of nuclear desalination has been undertaken by the United States, and I have little doubt that within the next ten to twenty years we shall see huge dual-purpose desalination plants springing up on many parched sea coasts of the world. The first will probably be a 150 million gallons per day, 1600 megawatts of electricity, dual-purpose plant for the MWD in Los Angeles; this will produce water at about 22 cents per one thousand gallons at the plant site and by-product power at 2.7 mills/kwh. This may well be followed by a plant in Israel of about the same capacity as the Jordan River project (about 150 mgd), and then perhaps by a much larger plant near Lower California to serve both Mexico and Arizona. And I believe, on the basis of research now in progress at ORNL and elsewhere, that water from the sea at a cost acceptable for agriculture — less than ten cents per one thousand gallons — is eventually in the cards. In short, at least for areas close to the sea coasts, technology can provide water without requiring a great and difficult-to-accomplish change in people's attitudes toward the utilization of water; a technological fix for an important part of the water resources problem is closer at hand than some of our social engineers are presently willing to concede.

The technological fix for water is based on the availability of extremely cheap energy from very large nuclear reactors. What other social consequences can one foresee flowing from really cheap energy eventually available to every country regardless of its endowment of conventional resources? Though we are only vaguely seeing the outlines of the possibilities, it does seem likely that from very cheap nuclear energy we shall get hydrogen by electrolysis of water, and thence the all-important ammonia fertilizer necessary to help feed the hungry of the world; we shall reduce metals without requiring coking coal; we shall even power automobiles with electricity, via fuel cells or storage batteries, thus reducing our world's dependence on crude oil. In short, the widespread availability of very cheap energy everywhere in the world ought to lead to an energy autarky in every country of the world; and thence to an autarky in the many staples of life that should flow from really cheap energy. As H. G. Wells put it in 1914, the world can be set free by the advent of cheap energy, provided this cheap energy is available to every one.

From cheap nuclear energy should come at least a partially effective means of cleaning up our polluted air. As matters now stand, two of our most important air pollutants are motor vehicles and large-scale fossil-fuelled central power plants. It is estimated that the Kingston Steam Plant of TVA puts out about 400 tons of $SO_2$ each day. Nuclear power plants emit no such effluent, and they can be designed so as to release less radioactivity than comes from the radium contained in the coal burned in a coal-fired steam plant. Recently, the Florida Power and Light Company decided to install two 750 megawatt nuclear plants not only because they are cheaper than conventional plants but also because they are cleaner. Cheap nuclear energy also offers the possibility of eliminating smog from auto exhaust in a curiously unexpected way. The fuel-cell developed as a by-product of the space effort might become the source of energy for the electric automobile of the future. A few papers have already appeared in the open literature that suggest that an electric automobile having a 200 mile range and 100 horsepower is not so very far away. With electricity at 6 mills/kwh, such an electric car would be cheaper to operate than are ordinary gasoline-fuelled cars. Thus nuclear energy offers the promise of a neat technological fix to the complicated problem of air pollution — by offering means of transporting people and heating and lighting houses more economically and with much less pollution than we now are forced to tolerate.

## WILL TECHNOLOGY REPLACE SOCIAL ENGINEERING?

I hope these examples have demonstrated that many social problems can be circumvented or at least reduced to less formidable proportions by the application of the technological fix. The examples I have given do not strike me as being fanciful, nor are they at all exhaustive. I have not touched, for example, upon the extent to which really cheap computers and improved technology of communication can help improve elementary teaching without having first to improve our elementary teachers very much. Nor have I invoked some really fanciful technological fixes: like providing air conditioners and free electricity to run them to every Negro family in Watts on the assumption (suggested by Huntington) that race rioting is correlated with hot, humid weather; or the ultimate technological fix, Aldous Huxley's Soma Pills that eliminate human unhappiness without improving relations between people.

My examples illustrate both the strength and the weakness of the technological fix for social problems. The technological fix works by appealing to human nature as it is, with all its cupidity and crassness and indolence: by providing an electric automobile that is cheaper, as well as non-polluting, or by making warfare a losing proposition even for the individual who must decide whether or not to press the button. The technological fix accepts man's intrinsic shortcomings and capitalizes on them for socially useful ends. It is therefore eminently practical and in the short term relatively effective. One doesn't wait around trying to change people's minds: if people want more water, one gets them more water rather than requiring them to reduce their use of water; if people drive autos that cause smog, one provides cheaper autos that do not cause smog rather than forcing them to tax themselves for expensive gadgets that clean up the exhaust on their present cars.

But the technological solutions to social problems tend to be metastable, to replace one social problem with another. Perhaps the best example of this instability is the peace imposed upon us by the H-bomb. Evidently the Pax Hydrogenium is metastable in two senses: in the short term, because the aggressor still enjoys such an advantage; in the long term, because the discrepancy between have and have-not nations must eventually be resolved if we are to have permanent peace. Yet, for these particular shortcomings, technology has something to offer. To the imbalance between offense and defense, technology says let us devise passive defense which redresses the balance. A world with H-bombs and adequate civil defense is less likely to lapse into thermonuclear war than a world with H-bombs alone, since the danger of thermonuclear war mainly lies in the acts of irresponsible leaders. Anything that deters the irresponsible leader is a force for peace: a technologically-sound civil defense would therefore help stabilize the balance of terror. And, in spite of much public opinion to the contrary, a surprisingly feasible civil defense may well be a technological possibility.

To the discrepancy between have and have-nots, technology offers the nuclear energy revolution, with its possibility of autarky for have and have-nots alike. How this might work to stabilize our metastable thermonuclear peace is suggested by the possible political effect of the Israeli desalting plant: the Arab states I should think would be much less set upon destroying the Jordan River project if the Israelis had a desalination plant in reserve that would nullify the effect of such action. In this connection, I think have countries like ours can contribute very much. Our country will soon have to decide whether to spend $\$4 \times 10^9$ per year for space exploration after our lunar landing. Is it too outrageous to suggest that this money (which we are told must be spent to maintain our economy) be devoted to building huge nuclear desalting complexes in the arid ocean rims of the troubled world? If the plants are powered with breeder reactors, the out-of-pocket costs, once the plants are built, should be low enough to make large-scale agriculture feasible in these areas. I estimate that for $\$4 \times 10^9$ per year we could build enough desalting capacity to feed more than ten million new mouths per year (provided we used agricultural methods that husbanded water), and we would thereby help stabilize the metastable, bomb-imposed balance of terror.

Yet I am afraid we shall not satisfy our social scientists or social engineers. Our technological fixes do not get to the heart of the problem; they are at best temporary expedients; they create new problems as they solve old ones. Finally, social engineering, like the Supreme Court decision on desegregation, must be invoked to solve social problems. And of course our social engineers are right. Technology will never replace social engineering, even though it may often help make it less futile. Technology has provided and will continue to provide to the social engineer broader options, to make intractable social problems less intractable, to, as H. G. Mesthene says, change the ground rules of the social games we play and thereby convert hopeless games into winning games. Technology will buy time, that most precious commodity that converts violent social revolution into acceptable social evolution.

And so I plead for understanding between the social engineers and the technologists. It is heartening that our country now recognizes and is mobilizing around the great social problems that corrupt and disfigure our human existence. It is appropriate that in so mobilizing we call primarily upon the viewpoints and expertise of the student of society and the social engineer, just as in mobilizing around the problems of the war and immediately after we called upon the student of science and the technologist. But let not the social engineer arrogate unto himself too much wisdom or claim too much. Even with all the help he can get from the technologist, his problems are all but insoluble. It is only by cooperation between the attitudes and viewpoints of social engineer and physical engineer that we can hope to achieve what is the aim of all technologists and social engineers: a better society, and thereby a better life, for all of us who are part of society.

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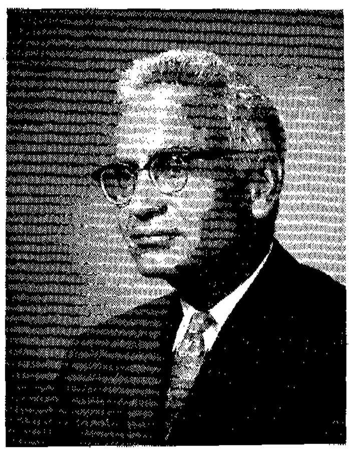
ALVIN M. WEINBERG, Director of Oak Ridge National Laboratory — the man, his life and his work were so illumined by Professor Wigner's delightful Introductory as to make any usual sort of biographic data malapropos for those fortunate ones who were with us on the evening of 29 April 1966. For the record the following from the announcement of the meeting is added:



'Dr. Weinberg has written extensively on some of the difficult problems of public policy posed by the growth of modern science. One of his recent articles appeared in the 6 August 1965 issue of Science, "But Is the Teacher Also a Citizen?" His writings also deal with the criteria for deciding which fields of science deserve the greatest amount of public support when public support is limited. His main criterion is one called "imbeddedness" — that is, a scientific discipline has the highest scientific merit when it bears most strongly on its neighboring scientific disciplines and illuminates them most brightly. He is the co-author, with E. P. Wigner, of The Physical Theory of Neutron Chain Reactors (University of Chicago Press, 1958).

'Dr. Weinberg served as a member of the Scientific Advisory Board to the Air Force, 1956-1959. In June 1959 he was elected President of the American Nuclear Society. The following year he was appointed to a three-year term on the President's Science Advisory Committee. He was asked by the President's Science Adviser in 1961 to chair the Panel on Science Information; in this connection he spent the summer of 1962 working at the White House preparing the panel report, "Science, Government, and Information." During these years he served on several other panels, including the one on Civilian Technology. For the past three years he has been a member of the National Academy of Sciences Committee on Science and Public Policy, which in 1965 issued the report on "Basic Research and National Goals".'

In relation to the Institute we first knew Alvin Weinberg while he was studying for his doctorate at the University of Chicago and participated in two of Alfred Korzybski's seminars (the Institute was then near the University) and wrote a paper on 'General Semantics and the Teaching of Physics', published in The Physics Teacher, April 1939. A quarter century later he became an Honorary Trustee, one of the 'new' group elected in our 25th anniversary year. The 'original' group consisted of some of the famous men in mathematics, psychiatry, anthropology, biology, medicine, law, etc., who were interested in Korzybski's work from long before to soon after the publication of Science and Sanity, and whom he asked to be Honorary Trustees in 1939. Few were still living in 1963 and it seemed appropriate in that year to elect a 'new group' and none more appropriate than Alvin Weinberg. In accepting election, he indicated that doing so was by way of acknowledging 'my intellectual debt to Korzybski'. This I treasure personally.

— M. Kendig
31 March 1968