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EDUCATION FOR AN ATOMIC AGE

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Since the end of the last war, much has been written and still more spoken about atomic bombs and atomic energy. Statements that we must prepare ourselves and our children to "live in an atomic age" have been legion. What does this phrase mean? In its narrow sense it means that already there have been, and in the future there will be more, changes in various familiar ways of living consequent upon the use of nuclear energy and we must adapt ourselves to these changes. Perhaps the most significant changes are first, the effect of atomic and hydrogen bombs on warfare and the balance of power; second, the changes in medical and industrial research and practice brought about by the large scale use of radio-isotopes; third, the development of a new source of power, atomic power as it is called; fourth, the economic and strategic importance of the uranium deposits which Australia possesses; fifth, the development of a new type of executive-legislative relationship in the Federal Government as represented, for example, by the Australian Atomic Energy Commission and a new type of peace-time government industrial relationship which will have to be brought into being to produce the developments in the field of atomic energy which are expected; sixth, in international relations the control of atomic energy is one, possibly the major, issue around which the East-West controversy in the United Nations has crystallised.

It may well be argued that there are parallels between each of these and earlier events which were not regarded as heralding the beginning of a new age. Each war has seen the use of new weapons, each generation has made its contribution to industrial and medical techniques. In seeking an example of why major powers cannot agree it is not unusual in international politics to focus on a specific situation. What is different about this? Well, that is a very big question, but briefly the answer lies in the fact that this new energy source is many orders of magnitude more potent than anything else which we have had at our disposal previously.

All the other ages have been identified by historians in retrospect.

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Our awareness of living in a new era means that we recognise atomic energy as a major change many times more significant than previous research discoveries, or political upheavals. Perhaps the release of nuclear energy, demonstrated to the unsuspecting layman in the form of the funeral pyre of Hiroshima, is the symbol of an era in which science has become so important in our lives that all decisions, including political ones, must be made with scientific considerations in mind. This is the broader meaning of the phrase "living in the atomic age".

Over the last hundred years, the Western world, especially Britain and the U.S.A., has been moving towards increased mechanisation and has been placing ever more and more value on technical progress. Wartime advances in technology, culminating in the atomic bomb, have forced on us the fact that technology now occupies a unique position in our lives. Even though we have approached this point gradually, starting with the Industrial Revolution, the fact is that we are not yet prepared to face it; we have not been educated for it academically or politically. This problem, that the layman does not possess enough information about new developments for him to be able to assess them and exercise his influence on the programmes as a democratic citizen, is a very important one and education in the future must correct the deficiency. Recognition of the problem has been confined mainly to the physical and medical scientists and many great names have been associated with movements to try to provide solutions. A forceful statement on the subject has come from General Omar Bradley. He is on record as saying, "We have too many men of science, too few men of God. We have grasped the mystery of the atom and rejected the sermon on the mount." "The world has achieved brilliance without wisdom, power without conscience. Ours is a world of nuclear giants and ethical infants. We know more about war than we do about peace, more about killing than we do about living."

It is clear that the fruits of researches in the physical and medical sciences cannot be suppressed. They must be used for constructive ends or they may well break loose in another world war which could destroy civilization and its magnificent achievements to date. We need a real peace if human society is to evolve towards a new age where hunger, poverty and preventable disease will be eliminated from the earth. An age in which people in every country will rise

to a far higher level of intellectual and cultural well being. An age in which iron curtains will disappear and people, though proud of their own country, will yet be able to travel freely as world citizens. This is the hope science sets before us. We need far less talk of war which inspires fear and panic and more talk of great age struggling to be born.

It is all too clear that as yet, insufficient attention has been given to the social and political implications of modern technology, especially the great advances in physical sciences and the medical sciences. It is clearly of the greatest importance that citizens of a democracy should understand the issues which confront them and education must rise to the task. First we should consider why is it so important to be informed on these matters, and then how we can set about doing the job.

Insistence on the desirability of informed public opinion on atomic energy matters follows from the basic belief that democracy functions best when the people understand the issues. It might be objected that even if the people do understand them they have no apparent direct influence on the decisions which are made. However unless they are fully informed how can they choose their representative in Parliament wisely? In the case of atomic energy these representatives themselves, in turn, depend largely upon such scientific information as is available to them. The policy makers must eventually answer to their constituents who can evaluate actions in Parliament only if they themselves appreciate the issues involved. This, admittedly, is a general responsibility of intelligent citizenship but nevertheless it should be emphasized again and again.

I subscribe then to the concept that the wisdom of any government increases in direct ratio with the breadth, depth, and intensity of the public understanding and public discussion that surrounds it. Democracy is not government by plebiscites. The role of the people does not stop at the ballot box. The health and vitality of a democratic society depends on the participation at all times in its decision-making of citizens who are concerned and who keep themselves informed.

Behind this premise there is another one, the argument in favour of the



democratic process does not conclude with proof that republics are inherently wiser and stronger than dictatorships. This is incidental to the attainment, or the approximation, of the principal objective for which men organize democratic governments. That objective is to secure for each citizen the opportunity to realize the promise to the full of his endowment as a man. The better-informed man is thus not merely a better-informed voter; he is above all a better-informed man. In the 18th century tradition, the perfectibility of man represents an end in itself.

Two other important reasons for stressing public information in this field have been indicated by Miss Lilian Kay following a study carried out at New York University. The first has to do with relationship between individual mental health and the problems of living in this atomic age. At the best, life in a modern complex civilization is a tense business. One reason many people find it so is that rapid changes make it hard to find emotional plateaux although peaks and chasms are abundant. One need only examine the daily newspapers to confirm this. Atomic energy, whether it be judged by itself or as a symbol of scientific advance, has been presented in extreme emotional terms.

For example, some time ago an American Senator made the statement that the explosion of a test tube full of material would kill every living thing within 1,000 miles. There is no way for the layman to know that this statement is a gross exaggeration of the position. On the other side of the account every once in a while the newspapers carry stories of cancer patients who are cured by radio-iodine and "owe their lives to atomic bomb research". The fact is both the destructive and constructive applications of modern scientific advances get over-emphasized and distorted. The best way for the individual to save himself from unrealistic despair to equally unrealistic elation in the face of such advances is for him to comprehend to the best of his ability what these advances mean.

This leads to a second reason for stressing the value of an informed public opinion, namely the ability of the individual to plan for the future. We are not now thinking of the extreme emotional reactions to either the threat or the promise of scientific advances but rather issues such as industrial and civil planning and vocational information for High School, College and University

students. Will the development of nuclear energy change job possibilities, if so, how? Will it add opportunities or will it just re-distribute manpower? At what levels of specialisation will these changes occur? Where should new types of training be introduced and should there be an all-round re-orientation of our educational system in the light of modern technical advances? All of these questions, and probably more, will have to be answered by or for young people who are now planning their careers and indeed their lives. In a similar way in the field of civic planning it will be increasingly important to consider the positive aspects of nuclear energy as exemplified by the use of nuclear fuels in power plants. On the other hand, civil defence considerations based on an objective appraisal of the possible occurrence and consequences of attack cannot be ignored. Morale has been defined as "a term which comes into prominence during crises when the conditions to which it refers are painfully absent or conspicuously present". At present it seems that the term may only come into use during crises but it must be developed between these times. Community or national morale can be no better than that of the individuals of the group concerned. Such considerations lead to the view that we should definitely plan to improve the average citizen's knowledge and understanding of technological matters by all possible means.

These are the reasons then why it is necessary for us to keep pace, in the educational field, with the rapid changes which are occurring in modern technology. In particular the development of atomic energy has provided a source of power which, if not properly controlled could have catastrophic consequences. However, it is not unreasonable to believe that, with an enlightened public opinion on the matter, development of atomic weapons need no more lead to the ruin of our civilization than did the development of chemical high explosives. Instead of predicting a gloomy end for our way of life let us recognise that the problem of atomic energy cannot be tackled in a vacuum, it must be related to man in his total environment. If we can achieve a better understanding of man's basic problems of society, culture, religion and government we can hope, with appropriate efforts, to inform him on important issues and develop a sane point of view. Though at the present time we seem to stumble in an abyss of ignorance we must not be daunted. The one hope for survival is to seek rational solutions

to our problems and not be stunned into inertia or muddle-headedness. The course of action must be in terms of the basic knowledge of man's reaction to other people's natures and cultures; his knowledge, or lack of knowledge, of fundamental scientific concepts and their impact on society.

The pessimist will tell you that such a programme is Utopian and cannot possibly have significant effect before the catastrophe is upon us. I do not believe this for a minute and even if I did I would not regard it as a valid reason why we should not make a start in the right direction.

We agree then that an informed public opinion on the issues of the technological age is an essential part of education. In order to be able to think, plan and vote with respect to these issues it is essential to have an appropriate frame of reference. Nowadays when a hard pressed businessman is planning a trip around the world he no longer thinks in terms of going by ship; he thinks in terms of fast aeroplanes. In the same way, ideas which provided the standard for judging social situations forty years ago, indeed even ten years ago, are no longer adequate for making judgment on some of these new problems. A new point of view is needed which, while incorporating the basic democratic values, gives guidance in evaluating these new problems. For adults the three most important means of establishing an appropriate frame of reference are probably the press, the radio and books. Information released on technological matters, whether in the fields of atomic energy, jet engines or antibiotic drugs is judged by editors for its news value in competition with other news. In most cases, because of pressure on space and time the press and the radio news bulletins are not able to provide the necessary background for the item to be put into a proper context. There are, of course, exceptions to this. Both here and overseas some of the more serious newspapers give considerable space to providing the necessary background information. Here in Australia the A.B.C. has made real progress in the field. Through its programme, "News Review" it is able to provide considerable background information on topical matters by inviting people, skilled in the appropriate field, to give short talks. The "Science Survey" series enables more detailed discussions to be presented from time to time and radio discussions enable a large number of topics to be aired

and are of great value especially when they are given by a wide variety of speakers with broad interests. However, it must be admitted that such serious programmes do not reach the large bulk of the population. They suffer from the same difficulty which besets books on this type of issue. Namely, there is a tendency for the general public to take the attitude that "this is for Einstein, not me" and buy a detective story or switch to a programme which doesn't need so much mental effort.

There are other means for providing the information such as films, television, exhibits, lectures, discussions and so on. Excellent documentary films have been made in the U.S.A., England and Canada and the B.B.C. has had considerable success with documentary type programmes both on television and radio. The Atomic Scientist's Association in England hit upon the excellent idea of equipping two railway coaches as an exhibit and moving it from town to town at weekly intervals. The exhibit was manned by local scientific staff at each stop and the public were encouraged to visit it and to ask questions. In the course of a year the exhibit visited the main population centres and created much interest. These techniques of providing information, are applicable mainly to the adult population. We must not forget, however, that in the long run the only certain method to achieve results is to integrate new material into the classwork of children at school; and it must be continued at the University level too. Just as it is most important for science students to get a liberal education by providing opportunities in our Universities for them to mix with historians, geographers, political scientists as well as enjoy some art, drama and music, so it is essential that a liberal education for arts students must also include some understanding of the scientific disciplines.

Anton J. Carlson, the dean of American physiologists once declared that 20th century man somehow manages to survive in his man-made landscape just as ignorant of science and as haunted by superstition as Peking man in his unspoiled, primeval landscape of 100,000 years ago.

With due respect for the warmth of Carlson's feelings, I do not think we need to take as dim a view as he did. The truth is that dryads, leprechauns,



and trolls have long since fled a culture that prizes central heating, television sets, internal combustion engines, deep freezers, and all the other devices that ease and complicate our existence. The inanimate gadgets, animated only by the mechanics' tools, have generated a powerful antidote to the pathetic fallacy of animism that once populated the universe, with the creatures of man's fear and imagination. Almost everybody now has acquiesced in the Copernican revolution and the displacement of the earth and ourselves from the centre of the universe. There is general recognition of the idea that the cosmos is a vast impersonal system, ordered by the laws of mechanics. The germ theory of disease brings the people to their doctors, not to their knees. In Western law there is increasing acceptance of the idea of the criminal as a victim of psychological and sociological handicaps, an object for treatment not for vengeance. In the relationships of man to man, our fellow citizens are agreed that all men are members of the human race, and they expect that we will eventually learn to act like members of the same human family.

It is extremely doubtful that we could have found such wide acceptance of the rational and scientific view among the members of any previous generation. If we go back just a little way in history, we find the world of reason confined to much narrower quarters by superstitious fear and old wives' tales. Without doubt, future historians will conclude that it was during our lifetime, in the popularisation of the rational outlook upon the world among citizens and in all occupations and professions, that science had its greatest impact upon the life of mankind.

The ground still held in men's hearts by fear and superstition is thus narrowed. But on many of the most important questions of life, it seems to remain the decisive ground. Ironically, science itself seems to have fallen heir to much of what remains of the frightened awe formerly accorded to the outer darkness. There is reason enough to be troubled about public ignorance of the scientific and technical considerations that bear so heavily on the social and political issues of the day. But we have cause for more serious concern in the real misunderstanding which prevails in our culture about the nature of science as a human enterprise.



Science still appears as a kind of magic. In the popular view science is first of all our most securely established body of knowledge. It is a rich mine of hard facts that have a tougher consistency and more utility than revelation. How these facts originated and were put together, nobody inquires. The notion that they might go on growing in number is disturbing to a large number of people. They raise the question whether there shouldn't be a law or a moratorium or a breathing spell. Scientists are workers in this House of Magic. They are qualified by special gifts -- today, of course, they must also be security cleared -- for access to technical information. Their job is to make something useful out of the ready-to-hand facts. Science is thus primarily an important step in the immense technological process that makes the Western world so rich and strong. The suggestion that science has cultural as well as technological implications is downright suspect and heretical, if not worse.

I believe you will agree that this is a fair rendering of the image of science as it is held in the public eye and mirrored in our press. It is something more than a merely popular image. It presents its most alarming aspect as it is accepted among otherwise educated members of our society. It contributes to the anti-rational, anti-scientific mood which sometimes shows up in our culture. It promotes the almost complete estrangement of arts and letters from the sciences, which explains why our humanists largely miss the insights which science now offers into so many of their habitual concerns. I have to admit that sometimes it is found even among engineers and scientists, who are all too often ignorant in fields outside their own, and among them it tends to confirm a sterile insularity that shirks the cultural and social responsibilities of their profession.

I believe the day has come when a man without some knowledge and appreciation of science is but half educated. He is cut off from the main stream of intellectual and cultural advances more surely than if he knew nothing of literature, drama or the arts. I have met people who pretend to be proud of their lack of knowledge of science. I can only feel pity for them; they are divorced from the real world in which they live, among people whose technology

they despise. If they attain positions of authority they are apt to make decisions unrelated to reality with unfortunate results for others; a rigid knowledge of the past can obscure the vision of an expanding future.

We can easily see, in principle, that such misunderstanding of science in our society presents serious hazards to both science and society and we have to take steps and remove the difficulty. It is here that the universities come into their own. Speaking personally I find it exhilarating to have been able to share in the great experiment in education established here in Canberra - the National University. The underlying idea excites both the admiration and envy of our colleagues overseas and I am sure that when the history of the period comes to be written the foresightedness of the Governments which established and nurtured the university in its formative years will be remarked.

I have looked at universities both from the outside and inside - I spent 4 years working in the U.S. Government laboratory at Los Alamos during the war and a little over 3 years at AERE in England after the war - difficult times for the universities and times during which they were under continuous discussion and scrutiny. I am not alone in thinking that universities are about the most important institutions in the western world. I believe they have made contributions to western civilization - physical, intellectual and spiritual contributions - which are beyond the power of any man to compute or to comprehend. And I believe that the nature of the civilization that our grandchildren will inherit on this earth will depend in a critical, possibly in a decisive, degree on what our universities do, or fail to do, in coming years.

I believe in this decisive role of the university, not because I wish to minimise the role of our other educational, religious, and political institutions, but I believe that the way in which civilization changes over the centuries is largely determined by how men use their heads. The university, as I view it, is the spearhead of man's efforts to make better use of what is in his head. It is at the university that men's intellectual abilities are sharpened and are brought to focus on mankind's basic problems. At the university man's intellectual forces are mobilized for the attack on those

great unknowns which lie just beyond the frontiers of knowledge. It is the role and the task of the university to be eternally dissatisfied -- dissatisfied with man's inadequate knowledge; dissatisfied with the ways in which he uses his knowledge. Thus, the chief aim of a university must be, not merely to help individual men to learn more, but to help mankind to know more.

And that is about as succinct a way as I know of expressing the goal of a university; to help mankind to know more. In seeking this goal, the specific mechanism available to the university is called research. The purpose of university research then is to enlarge man's understanding of the world, his understanding of his fellow men and of himself.

You will note that I have used interchangeably the phrases "to know more" and "to understand more". I do this without apology -- and, in fact, with emphasis. To know and to understand are not quite synonymous. For though one normally cannot understand without knowing, we frequently know things we do not understand. Yet the goal of research must not merely be to acquire knowledge for its own sake, but to secure knowledge as a step toward understanding. A research project collects facts -- experimental data -- not solely to prepare tables of numbers, but as an aid to finding or perfecting a theory, an interpretation, an understanding of the phenomenon. Furthermore, in science we must be most exacting in judging how far understanding has been achieved. In science we require that understanding shall be quantitative, not merely qualitative, and that it lead to the ability to predict. We require that our theory explain all the related facts, not just some of them, that it describe accurately in advance all experiments which we perform. We also aim for theories which have simplicity, elegance, beauty. Reaching an understanding of things not only satisfies an intellectual desire, but an emotional or aesthetic one too.

To repeat, then, the goal of a university is to help man learn more and to help man understand more. Research in science, technology and other fields is essential to the fulfilment of the university's mission. However, it is also obvious that the research undertaken must be devoted solely to achieving that mission -- achieving understanding.

This is the reason why the research in a university - whether it be science or in engineering - must, above all else, stick to fundamentals. There is a danger, and it is a real one when money is scarce, that the universities be asked to do something useful to the community - test milk, analyse water, fuels, lubricants, design gadgets and so on. Lee Dubridge tells of an electrical engineering department where half of the staff is busily engaged in designing radar aerials - not because they are seeking to understand the radiation of E.M. waves but because an airforce contract for such gadgeteering was available. The excuse was that they could employ 3 more engineers and these men helped with the teaching. As Dubridge points out the University might just as well lease and operate a city store so that the people working in it can, on the side, teach economics, marketing, human relations and business English.

I don't want to give the impression that I am unaware of the difficulties of financing higher education. Indeed I spend more time than I care to think about in worrying out annual budgets, but the problem cannot be solved by financing things which are not higher education. A proper research programme in any field must never be abandoned, distorted or harmed by taking on irrelevant work for which funds happen to be available - and then pretending that this irrelevant work strengthens the programme which it has damaged and displaced. There is one most important exception to this. Universities have been called upon, and have patriotically and properly responded to help the national defence in time of emergency. The contributions which universities have collectively made in this area are beyond calculation.

But we should not be led into thinking that designing weapons of war is a normal and proper function of a university as a university. It is an emergency function rendered in part because special technical talents are available in the universities and in part because certain administrative problems are avoided and because, by and large, better people are attracted to university laboratories. We should not confuse the operation of special defence facilities or services requested by the government with the normal educational functions of the university. We must take on these extra services by all means whenever it is necessary, desirable or patriotic to do so. But in times of peace they must not destroy the major functions of a university, which in



the long-term may be more important for the national defence.

There is one aspect of university work which may need comment. Throughout this discussion I have used terms "research" and "education" almost interchangeably. I have spoken of research as a part of the function of higher education. I could equally well have spoken of education as a function of research. Nowadays we hear a great deal about the conflict between teaching and research. I have heard a lot of arguments about how many hours a teacher should devote to research and how much to teaching, but none of it convinces me that there is a real conflict. If the purpose of a university is to advance understanding, then it follows that both the understanding of the student and of the teacher should go hand in hand. How a man can really teach science without acquiring a consuming curiosity about the many things which are unknown is beyond my comprehension. And how one can get a glimpse of the unknown without an equally consuming desire to tell it to others who will carry it on is also a mystery. An enquiring mind must be the chief possession of university people and that is the only kind of mind that can explore the unknown or stimulate students. I think history has shown that with but few exceptions, research laboratories go dead when they are not stimulated by the continued intrusion of fresh young minds and equally teaching establishments go dead when not infused by the enquiring spirit of scholarship.

The universities have a big job of public relations before them. The population must understand that the main purpose of science is not to produce bombs, guns and radar, or even refrigerators, radios, television and atomic energy. Possibly we should come out boldly and unashamedly and tell the truth, that the aim of the scientist, and for that matter all research workers of whatever discipline, is to advance human understanding. We should admit that we believe in human understanding for its own sake. We believe humans differ from the beast largely in their ability and their urge to learn, to know, to comprehend. Men climb Mount Everest, explore the bottom of the sea, sail to the far corners of the earth, probe the atom, and crystal, and the stars, because they are born explorers; because men are always challenged by the unknown. We need to go even further and re-emphasise the value of the enquiring mind.

How few people there are who think of the university as primarily the meeting ground for enquiring minds. More people think of the professor as a person who earns an easy, and deservedly meagre living by reading dull lectures from dusty notes before drowsy students. Yet these same people send their sons and daughters to the university in the belief that from these same courses they will learn to make a handsome living, as well as learn to be good people, patriotic citizens and wise parents. It is the failure to understand the essential role of the university as a toughener of the mind, stimulator of curiosity, as the ringside of intellectual conflict which makes for much of the doubt about the need for the universities, of the value of learning which in turn finds reflection in poor financial support, and forces the universities to live a hand to mouth existence, never at any time seeing their future more than a year ahead.

Sir John Latham has, on a number of occasions, enumerated the changes he believed to be necessary to the constitution. I should like to add education to these. Primary, secondary and tertiary education are all so vitally important to the future of the country that they should be the concern of the highest authority in the land, the Federal Government. Money spent on the education of our children and our young people is the best investment the nation can make at the present time. The shortage of scientists, engineers and technologists of all types is a matter of the greatest concern to thinking people, and if we are going to make our way in a world which has reached its present technological standard we must have more of them. Moreover, unless we are forever to be dependent upon fundamental discoveries which are made overseas, the men we have must be brought to their highest capabilities by provision of the right environment in which they can grow to maturity.

It is the universities which must fill the role. The objectives and activities of universities can be brought to a focus if we think of them primarily as centres of creative thought. It is a truism to say that all of the changes in civilisation, all of the changes in the way in which we live and think have come as a result of the creative thinking of individual men and women. It is for the universities to encourage and develop new ideas even though their practical value at the time is not evident. It is only through new ideas that



men make their dreams come true.

But now I must come off my hobby-horse of the university and back to the general problem of education. I hope I have said enough to show that, without doubt, education is facing a very difficult problem. Although most people would answer in the affirmative if asked whether they should have more information about atomic energy and other technological matters, there is in fact no evidence that they will actively seek out such information. Indeed, it would probably be easier to prove the opposite, and this is the situation we must face.

The 1954 weapon experiments at Bikini in the Marshall Islands which, according to the American Atomic Energy Commission resulted in the firing of a number of hydrogen bombs, caused a sensation in press and radio circles. It led to much comment and hypothesising, most of which was not founded on fact. However many thinking men, educators, leader writers and public figures in several countries have remarked that these developments caused far less excitement than the dropping of the two ordinary atomic bombs at Hiroshima and Nagasaki. Some claim this to be because people have become hardened to the idea. However, two other explanations are possible. One is that a bomb whatever its type, actually dropped on people is different from a hypothetical bomb, even if the performance of the latter weapon is expressed in terms of what it will do to people and homes. The second interpretation might be that information as to what the bomb will be like is difficult to comprehend without considerable background knowledge. To me it seems unlikely that people have grown harder than they were, or that they are too frightened by the idea of fission and the atomic bomb to become more frightened by this newer idea of the hydrogen weapons, which can be many times more powerful and devastating in operation. Dr Lilian Kay of New York University has carried out considerable research into the emotional response of individuals to the term "atomic energy". She found that fear is not the outstanding characteristic answer. This is a reassuring result in a period of international tension, yet we hear a great deal about how afraid people are of atomic energy. The source of this information is often an editorial writer or a commentator devoted to the idea that the best way to create interest is through fear. This approach is a dangerous one and is bad for morale. Good

morale can only be built up by a realistic approach to the problem and by providing sufficient information so that the individuals can have confidence in their understanding of the position. It is towards this end that we must work; we must strive in every way to prevent multiplication of feelings of insecurity, futility and lack of knowledge. Fear, confusion, and misinformation are inadequate reference points and make it difficult for the man in the street to interpret the news. We have to work towards methods of reporting news which will provide a cumulative store of knowledge against which the significance of new events can be interpreted without sacrificing the interests of the reader or making him feel that he must be a nuclear scientist to read a newspaper.

We, in the Western world, are facing the difficult task of selling democracy to our ex-enemies and perhaps more important to under-developed nations of the world. We must beware that absorption in this project does not blind us to the need for maintaining and developing democracy at home. Creation of a feeling of crisis is all too easy but in the long run cannot be an effective way of maintaining and strengthening the morale which we must have if we wish to continue to strive for peaceful solutions to the world's problems. It is frequently stated that the consequences of stockpiling arms is war but the consequence of stockpiling fear may well be demoralisation. It would be tragic indeed if the two accumulations reached a peak at the same time.

The physical scientist must continue his work in the interest of maintaining national security, increase our knowledge of physical matters and apply modern technology to raise the standard of living of the peoples of the world. The social scientist must stop uttering platitudes and strive to increase our understanding of the problems of motivation and communication. If the two types of skill can be married, as they surely can, then our new education can look forward to stockpiling the most important commodity of a democracy in this atomic age --- an informed and alert population.