

MODERN SCIENCE AND CIVILIZATION

*The Sir Henry Simpson Newland Oration, given at Hobart on 5 March, 1958,
to the tenth session of the Australasian Medical Congress*

I will not need to tell you that I feel proud of the invitation to deliver an address which honours the great work done by Sir Henry Simpson Newland in Australian medicine. In common with all of you, though I confess without your qualifications for judgment, I have long admired Sir Henry Newland, one of those rare spirits with the secret of combining high professional skill with a broad and noble conception of public duty and of social service; as a surgeon, familiar with the need for precision; as a defender of the medical profession, clearly aware of the importance of preferring facts and solid reason to mere rhetoric. The very thought of his work places upon me a clear obligation to speak to you with such exactness as I can command, and with what I can achieve of that mental balance which has characterized him so conspicuously.

This will not be a political speech in the narrow sense. It will provide no headlines about disarmament, or 'Summit' talks, or the problems of diplomacy. These matters are of commanding importance, but they are not my theme tonight. What I want to do is to consider the place of modern science (including military science) in civilization. This will involve me, and those of you who are patient, in some examination of civilization itself, and what it means, and whether it is really advancing.

This is a formidable task to attempt in something less than an hour. But it is occasionally worth while to contemplate immense problems and seek to penetrate them a little. 'A man's reach should exceed his grasp, or what's a heaven for?'

We are living, as always, in a period in which emotions and prejudices can easily overthrow reason. The enormous developments of applied science have been publicly related to military provision to such a degree that we are in danger of losing the true conception of education and training and of preferring short-range policies to those long views which alone can help mankind along its eternal march.

The twentieth century has been the great century of scientific discovery and application. The basic researches into pure science have been and are little advertised. They are to an overwhelming extent the product of quiet labour by brilliant men not working against the clock but working against what must appear frequently to be the intractable problems of matter and of force.

More recently, applied science has come into its own. And because applied science produces what we commonly call 'practical results', the applied scientist, the technologist, has become widely publicized and there is a temptation to regard his craft as the one matter worthy of the attention of the scientific mind. This process has been brought to a head by modern developments in the field of warlike preparation. We have fed full on a diet of news about nuclear bombs, thermonuclear bombs, and now satellites, the space vehicles, the Sputniks.

There is a good deal of successful propaganda, heavily though perhaps unconsciously encouraged in our own countries, to the effect that the Soviet Union has outmatched the world in science, and that we must do something about it very quickly if we are not to be

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overwhelmed and destroyed. All thinking people have given much thought to this matter. That is why I am taking the opportunity of speaking to you about it tonight. Let me at once say two things.

One is that it is a mistake to be even faintly terrified because the Soviet Union has in one aspect or in some aspects of technology got ahead of the rest of the world. It would, in fact, have been a strange thing if it had not done so. Great talent is not the monopoly of any one country.

There is no doubt that the Soviet Union is training a greater proportion of its population in applied science than is any other country. A report made in September last by the Australian Academy of Science shows that, per million of population, the USSR is graduating twice as many applied scientists as the USA. These are striking facts. But their significance is to be qualified in two ways.

First, the Soviet Union can conscript young men and women into science at will. If this means a distortion of the pattern of education and leads to a neglect of humane studies, no great concern will be felt by an administration which is purely materialist in philosophy, which rests upon absolute power, which discourages liberal thought or speech, and which practises in relation to other countries an aggressive imperialism of the most unscrupulous kind. We may properly admire its technological achievements. We may properly seek to emulate them. But we are not to show ourselves willing to pay for them in the Soviet coin.

Second, there is much reason to believe that Soviet technological manpower is excessively concentrated upon military production. This may well produce spectacular results which impress all of us and terrify some of us. But if it means that domestic advancement suffers and better bombs are preferred to better bread, the price paid by the Russian rulers for power may prove too high. Russians at home are men and women, after all, with their own hopes and needs and ambitions.

We would therefore do well to preserve our sense of balance and to recall those many aspects of science in which the free world has been and is clearly ahead of the Soviet Union.

My second observation is that there are two aspects of the 'Sputnik' exercise. If it is designed to widen the boundaries of scientific knowledge by gathering and recording information from sources outside the world's atmosphere, then it is something that we should welcome and the results of which should be made available to all nations and to all mankind. After all, I have not (except metaphorically) travelled in space myself, but I can imagine that if I did I would realize more clearly than ever that the world is small place and that its inhabitants must live together if they are to live at all.

No doubt before we are much older more and more satellites will be shot up into space, and recordings will occur. Indeed, I have for some time understood that this is one of the designed activities of the International Geophysical Year. Scientifically speaking, I would be no more disposed to regard it as a tragedy that Russia should send up the first scientific satellite than if some Russian expedition had been the first to reach the South Pole or scale the slopes of Everest. But the real fear that besets us is that the satellite should be developed into a military weapon, so that distant targets may be clearly seen and accurately attacked. One cannot but be reasonably suspect that one of the principal propaganda purposes of these recent

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exercises is not only to induce admiration for Russian applied science but also to strike fear into hearts and induce minds to yield to the spread of Communist doctrines and practice. If I am right in this, then the statesmen of the free world have two tasks.

One is the task of themselves maintaining such a power of destruction in war as will deter aggression. It is hard for me to understand those who would seek to abolish nuclear and thermonuclear weapons as the first step to disarmament and peace. In common with most democratic leaders, I am convinced that, uneasy though the peace may be which the existence of these weapons protects, their disappearance tomorrow would dreadfully increase the dangers of war. With her marked superiority in other forces and arms, the Soviet Union could overrun Europe almost at will, sweep into Africa, and become the terror of the world. Unless disarmament affects *all* forces and *all* weapons, it can be a snare and a delusion.

The other task of democratic statesmen is to continue their efforts to persuade the Communist powers that, if the power of destruction on the great scale has become mutual and overwhelming, it is high time that the immense possibilities of applied science should be increasingly diverted to the peaceful service of ordinary men and women.

These are important considerations. But my real purpose tonight is to invite you to consider how far these remarkable events are calculated to distort our own standards of civilization. In other words, I want so far as I can to recall everybody to an attitude of balanced judgement. For the truth is that in my own lifetime, scientists have wrought miracles, some of which operate entirely in the direction of preserving and enlarging human life and some of which, as they are now regarded, are designed to create a new and horrible capacity for the destruction of human life. Scientists are not alone to blame for this. They have tackled their problems and pursued their search for scientific truth. If other men, speaking on behalf of their nations of people care to use these great discoveries for evil, that, say the scientists, is not the responsibility of the research worker. This is, I think, not entirely true. 'Hath not the potter power over the clay, of the same lump to make one vessel unto honour, and another unto dishonour?' Scientists are not a race apart. They are citizens, bound to a social consciousness and social duties. They cannot, any more than non-scientists, stand aloof from the great moral issues. If it be true, and it certainly is, that the liberty of the modern scientist to pursue his chosen study is part of that great structure of self-governing and self discipline freedom which the institutions of the democratic world have painfully but persistently developed, the scientist has a special interest and a share of duty to maintain the structure. Liberty is under challenge. Even in some of its historic homes in Europe it has been beaten with blood into the ground. We are all bound to face these facts. As Bacon said, 'It is a strange desire to seek power and to lose liberty.' This does not mean that our scientists are to be afraid to toil and to discover and to make known. But it does mean, as a very able man wrote to me recently, that 'as science breeds power to alter the shape of continents and the destiny of myriads of human beings, it must engender within its ranks a sense of responsibility comparable to its sense of scientific discipline.' Putting this in my own way, science may well fashion the amoral instrument, but scientists, speaking and acting with superior special knowledge, must use all their influence to see that the instrument is used to serve the ends of individual freedom and public virtue. The scientist is not to forget that natural philosophy cannot make its best contribution to life unless it is accompanied by a moral and mental philosophy which will give it balance.

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The formulation and expression of a social consciousness; the recognition in this consciousness of the paramount need for the preservation of the spirit and institutions of freedom; these are among the greatest duties we all owe to civilization. If every specialist were to contract out of these duties and leave them to others, the result would be calamitous.

I am prepared to assert that the dreadful rise of Hitler was in no small measure due to the fact that Germans highly trained to think in special disciplines had been too much and too long content to leave matters outside those disciplines to the unguided decision of the incompetent or the unscrupulous.

Charles Morgan had a passage in his remarkable book *Liberties of the Mind*, which I adapt to my present theme.

It is necessarily hard for any man to know when he is surrendering a part of the liberties of his mind. He can recognize constraint upon his actions or upon that expression of opinion which is itself an action, but there is for him no self-criticism more difficult than the recognizing that within the house of his mind, in which he believes himself to move freely, certain rooms are locked *of which he has surrendered the keys*.

It seems to me that in these matters we have, momentarily as I hope, been tempted to meet our potential enemy on his own ground. He says in effect, 'Why do you people in the Western World worry about your outmoded systems of free government and enterprise. Why, we under our system have become the greatest scientific people in the world!' Similarly, by implication and by moving signs in the sky, he is saying to the numerous new nations, particularly of Asia, the uncommitted nations, the nations entering into self-government and anxious to establish guiding posts for the future, 'Why should you be misled into following the worn-out democratic ideas? What you need is science. We are the people who can give it to you. It is our system of government which can produce it most effectively.' And so Sputniks are projected into space, and hundreds of millions of people gaze at them travelling across the sky and are tempted to bow down and worship them.

Yet what are the facts, put into the scales, brought to the balance? The facts are that in the field of research for the benefit of mankind, the free peoples have in our own time a record beside which the record of the enslaved nations of Communism pale into insignificance. It is, I believe, high time that we began to explain to the new nations of the world the significance of these matters.

I am not a scientist and therefore I cannot speak as one. I will, therefore, confine myself to those matters which are widely known among normally educated people.

Recently a friend of mine offered, in my presence, the view that many hundreds of millions of people will be more susceptible to the terror that flies by night, to the demonstration of power and the threat contained in Sputnik, than to those matters which, so far from threatening their lives, promise to extend and enrich them. For all I know he may, in the short run, be right. But the fate of mankind will be sealed if we take only short views. If we are to advance civilisation, we must take long views and must make it clear to all other people that the long view is the one which will, in the end, bring to them and their descendants happiness and peace.

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Civilization connotes balance. Effort will soon exhaust itself without relaxation. Grave matters are best judged in an atmosphere of occasional hilarity. In England, during the grim early months of 1941, nothing gave such assurance of ultimate victory as the rich and defiant humour of those who lived and worked in the middle of destruction. It is this instinctive sense of balance which saves civilized nations from crazy fanaticism; which makes their occasional hatreds so short-lived; which induces them to 'live and let live'; which is, even in the moment of conflict, the only sure hope of ultimate peace and understanding.

Balance of this kind is constantly threatened by sudden reactions, natural or 'whipped-up', to unexpected and spectacular achievement elsewhere. The Sputniks represent a great success for the Soviet Union in a field to which they have directed a great deal of skill and effort. It would be foolish to underestimate that skill and effort. But it would be even more foolish to treat it as a proof of our inferiority in the world of science or the much more important world of civilization.

What are our reactions to the Sputniks to be?

The quick answer is, 'We must produce more and better scientists. This is, beyond doubt, true. But scientists for what? That is the crucial question. God forbid that we should concentrate our efforts upon applying science to purposes of terror or destruction to the exclusion of science for the development of resources and the betterment of mankind.

I recently discussed this matter with a very distinguished research scientist of the Australian National University, Professor Ennor, who, like myself, is concerned at the recent threats to our sense of perspective. I asked him whether I was, as a layman, right or wrong in thinking that, in the overall consideration of the achievement of modern science, the Western World could claim a preponderance of constructive and useful achievement, and that, despite the inevitable demands of defence, we should not let down our efforts in the constructive field. Speaking with great scientific authority, he said that I was right. He has put himself, very generously, to the trouble of giving me some outstanding illustrations to support this view.

Even in the world of atomic physics the great basic discoveries have occurred in Great Britain and the United States. But the advances in medical research have almost eclipsed those in physics. We have already come to regard many of them as commonplace. Yet they have meant that in this century the expectation of life has been increased, in Western countries, by probably fifteen years. Professor Ennor has given me examples in the field of biochemistry.

Insulin, which has revolutionized the lives of millions of diabetics, arose from initial work by two German scientists. The first active preparation was made by Canadians. It was isolated in a pure state by an American.

The discovery and application of the various vitamins covers a history in which scientists in Great Britain, the United States, Switzerland, Holland, and Denmark occupy pride of place. The sulphur drugs and antibiotics, those new and valiant friends of man, take us back to a German scientist as recently as twenty-two years ago, and to British scientists a few years later. Modern chemotherapy thus began. In 1941 came the isolation of penicillin at Oxford – a remarkable achievement with which an Australian name, that of Howard Florey, will always be honourably associated.

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We think today of nuclear research too exclusively in terms of fissionable material for bombs. But the use of radioactive isotopes in biochemistry derives from a Swedish scientist only thirty-four years ago, and has been marked by astonishing development in the United States and in Great Britain.

These few examples serve to remind us that, in the great story of scientific achievement, democracy need not make a regulated bow in the direction of Communism.

But my theme goes beyond this. Such facts as those I have mentioned effectively disprove any suggestion that the Russians possess some superior scientific genius. It concedes that in one highly specialized department the Russians may, temporarily at least, have outstripped us. As this is not the simple result of superior scientific intelligence, it must be due to the capacity of the Soviet Union to select and train scientists and technologists, and to order scientific labour into appointed tasks. In the result, government determines both the programme of research and the activities of the research workers. If it decides that, in a bid for the world domination of materialistic Communism, it will subordinate other scientific activity to the production of instruments of terror, so that terror may succeed where guile has failed, it has no free electors or enlightened citizens to restrain it. Its scientists may persuade themselves that they enjoy freedom in their own field. But it is a freedom hemmed in by slavery.

Once we recognize these facts, we will see that, in some current clamour on our side, there is a danger that we may be urged to adopt the Russian method in order to achieve the Russian result. Let us constantly remember that scientific defence provision is, for us, solely a means of preserving democratic freedom and civilized individual rights. It would be the ultimate tragedy to abandon the purpose of defence in order to prepare as the potential enemy prepares. In actual war, we put many particular freedoms in pawn so as to preserve the great freedom. But such a process should not long survive when war has been won. *A fortiori*, it should not become an established feature of what may well be a prolonged period of uneasy peace. If provision for military scientific research and development comes to be regarded not as a free national effort but as something requiring the abandonment of freedom and the acceptance of authoritarian control, we shall have abandoned the case against Communism in the very course of making ourselves ready to maintain it.

But I would like to carry this examination further. Nobody will deny that, with the rising pressures of growing populations, with the urgent need to discover and unlock new resources, the place of the scientist in modern society must be one of growing importance. My own Government has, by the far-reaching and costly university decision which I recently had the pleasure of announcing to Parliament, recognized this. Without more and more scientists and more and more scientific research, the material future of our people cannot be assured and enlarged.

But the housing and feeding and clothing and curing of mankind, though vital and imperative, are not an end in themselves. They are the means to a great end; when 'body gets its sop, and holds its noise, and leaves soul free a little'.

It is, indeed, this confusing of means with ends that has bedevilled the twentieth century. It is grimly significant that the century which has seen the greatest scientific achievements of recorded history has been, more than perhaps any other, disfigured, not only by wars of a

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stupendous range and intensity and destruction, but by widespread attacks upon the religion of love by organized hatreds and cruelties of the most barbarous kind. Humane studies have faltered, not only before active opposition, but in the face of impatience and indifference. Values have become debased or obscured. There is a widespread clash of selfish interest. The foolish slogan of 'something for nothing', which leaves Lloyd George's famous 'nine pence for four pence' far behind, has a false currency. And the grim law of Gresham has seen the false currency driving out the good. The second World War was thought likely to usher in a new era of internationalism. It has, in fact, led to a new wave of acute nationalism, frequently marred by racial bitterness, and accompanied by a new Communist imperialism all the more sinister because it professes to be the foe of imperialism.

Hitler is defeated and dead, but his harsh theories of racial superiority have left many converts. Mussolini is overthrown and dead, but his irredentist fancies are flourishing elsewhere.

It is not sufficient to say that there are brighter colours in the picture; that more people than ever before desire peace and are working for it; that the scientists have created the means for increased human health and happiness; that immense social progress has been made. These things are splendidly true, and I have said a great deal about them. But they will not ultimately dominate and redeem the history of this century unless we positively strive to get rid of those basic errors which have produced or permitted the evils which I have attempted to describe.

As an instrument, science can achieve either good or ill. That will depend upon the minds and spirits of those who use the instrument. Our natural and acquired capacity for extravagance, skilfully played upon by the sensationalists of the fleeting day, can too easily lead us to believe that the need for more scientists is such that all other higher studies should be subordinate; that the study of physical nature is the only thing that greatly matters; that if knowledge comes, wisdom will not linger. Believing as I do that science and wisdom have no necessary connection, and that scientific study and achievement are not ends but means, I am driven to the conclusion that what the scientists do or will do will put into our hands discoveries which can be the means of destruction or of a new and complicated form of technological slavery, but which, wisely used, can be the means of human salvation. The answer will depend upon our character, our broad intelligence, and our wise and understanding judgment.

I invite you to remember with pride that it was in the free world that the two great institutions of liberty, parliamentary self-government and the Rule of honestly administered Law, were fashioned. They have made a mark on this century compared to which a Sputnik is unimportant. It is too frequently forgotten, and sometimes by countries which should remember it, that, if Great Britain has not as yet fired a satellite into space, she has, by a creative modern policy, converted colonies into independent nations, founded upon parliamentary sovereignty and enriched by the rule of law, while the Soviet Union has been busy converting independent nations into colonies under the rule not of law, but of the tank and the bomb. The enslavement of Poland and East Germany and Czechoslovakia and Hungary stands in stark contradiction to the enfranchisement of India, Pakistan, Burma, Ceylon, Ghana, Malaya, the West Indies.

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But if some of these great and revolutionary achievements seem to some of us to be so commonplace as to be outdone by Sputnik, let us be good and sound, practical, technological fellows together, and consent to be judged in the field of science, pure and applied. The great pure scientists, from Bacon to Newton to Rutherford, did their work in the atmosphere of intellectual liberation. If living today, they would have no headlines. Their great mental powers were wedded to almost inhuman patience. They had no clients clamouring for results. Today we are 'practical' men. We want results, and we want them quickly. This urgency of demand, since it cannot sensibly be applied to pure or basic scientific research without great harm, has tended to concentrate itself upon applied science, thus, paradoxically (as I hope), speeding up pure research by the simple and unconscious expedient of leaving it uninterrupted!

The results, in the free world, have been phenomenal. Whatever the potentialities of space missiles for destruction, they are as nothing compared with what has already been done for construction; for the combating of disease and the prolongation of life; for the development of natural resources; for the improvement of public health and sanitation; for the encouragement of literacy; for the fluid movement of people and of goods; for the raising of material standards of living. We have become so adept at demanding (and frequently obtaining) something new and better next year that we sometimes forget that the average man today in Australia (to take a near example) enjoys as a matter of commonplace right privileges and amenities which for his grandfather represented either the unknown or the vaguely hoped for.

Nothing that I say or have said tonight is to be regarded as a plea for complacency. The work to be done always exceeds the work already done. Vigour is essential. But all our efforts can be wasted if we lack a sense of direction and purpose. I, for one, am far more afraid of the impact of Sputnik upon our minds than I am of its threat to our physical existence. For the truth is that the nearer the world comes to saturation point in its brilliantly acquired capacity for mutual destruction, the more certain it becomes that another global war can be initiated only by insanity or by blundering accident. Protection against war therefore involves two elements.

The first element is complete readiness on the part of the free world, the non-aggressive world. It must, not from choice but from necessity, maintain such a degree of defensive and counter attacking power as will deter aggression. This involves grievous burdens, but they must be borne.

The second element is no less important. Indeed, it is vital. It is that our social policies, and particularly educational policies, should be so devised as to encourage sanity and responsibility and discourage blundering accident. Psychologically, the true answer to the threat of war is to be found in the improving nature of man himself. Whatever we are called to do in the field of new and better satellites and ballistic weapons, we must not forget that the true function of science is to enlarge the boundaries of human knowledge, and that of applied science to raise the standards of human living and happiness. Moreover, we cannot all be scientists; it would be a black day for the world if we were. We need more medical skills; more miracles from the laboratories of the biochemists; more labour-saving devices in homes; cheaper and more efficient methods of construction. But, these are not an end in themselves. The true end to be served is the enlargement of the human mind and spirit. We have tended to lose sight of this great truth. Our mechanical skill has tended to overthrow our sense of values. We find in television a substitute for reading, and in the wireless a substitute for

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thought. We drive in handsome and powerful motor-cars in long and melancholy procession on crowded highways at weekends, inhaling fumes and wondering vaguely how long the return journey will take. In those far-off ridiculous days when the higher education was classical and humane, when men stored up in their minds a love of knowledge of letters and philosophy and history, our fathers had not reached this strange state of worship for the machine and obedience to its demands.

If we look at the matter in this way, we see science in its proper perspective; not as the master, but as the servant. We are not to adapt the Shorter Catechism to read 'The chief end of man is to glorify science and enjoy it for ever.'

As we look forward, therefore, we are not to allow our education of new generations to be distorted. More scientists; more scholars; more scholarly scientists; more scientific scholars; more historians and philosophers and poets. For if science is truly to serve the cause of civilization it will be because the people to use the advances of science have grown to use them in a civilized way.

With your tolerant consent, I quote from my own recent speech on the Universities. 'Let us have more scientists, and more humanists. Let the scientists be touched and informed by the humanities. Let the humanists be touched and informed by science, so that they may not be lost in abstractions derived from outdated knowledge of circumstances.'

'All things work together for good,' it was once said in another context. Yet all good things can be and frequently are used badly. Not all the most brilliant successes in laboratories and factories and fields will make a nation great in the eye of history if it has failed to enthrone the human spirit and to set about it with knowledge, and justice, and patience and understanding.