SCIENCE AND SOCIETY

A. E. H. Bleksley

Since the last Congress our Association has lost by death a number of members. Of these I would wish to refer briefly to one, namely Mr James Gray, President of the Association in 1940-41 and Honorary General Treasurer for more than thirty years. Mr Gray was a man whose interests were not bounded by the horizons of his scientific and professional life. He possessed a high sense of social responsibility, serving for many years as a member of the Johannesburg City Council, of which city he became Mayor in 1946-47, and for a number of years as member of the Transvaal Provincial Council. His work on the history of the discovery of the Witwatersrand gold fields brought him to the realisation that many of the older inhabitants had not shared in the general prosperity resulting from the discovery of gold, and stimulated him, together with Mrs Gray, to devote much energy to the establishment of the Randjieslaagte Memorial Home for the aged, which will always stand as a memorial to James Gray.

The Annual Congress of our Association has now taken place in Lourenço Marques on four occasions, as an inspection of our banners gracing this beautiful Hall will indicate. It was in 1913, for the 11th Congress, that the Association met, for the first time outside of the borders of South Africa, in this friendly and hospitable city, under the Presidency of Dr Alexander Roberts, distinguished educationist and astronomer. The records of the meeting show that about 40 members attended the Congress, and that a total of 34 papers were read.

It is not only our Association which has grown since those days. The President of Section C told his audience that the town then had a population of 5,324 Europeans and 8,029 Natives and Asians. Scientific work in Lourenço Marques was already well established, however. Papers were read to the various sections by Portuguese scientists on the climate of Lourenço Marques, the determination of the latitude and longitude of the Campos Rodriguez Observatory, the sugar industry of Mozambique, the sanitary state of stock in the Lourenço Marques district, and the railways and harbours of the town and their relation to the Union. Among the papers read by South African members was one delivered to Section D by Rev. W. A. Norton, who is also attending the present Congress. May I express to him, on behalf of us all, a very hearty welcome.

The records of the meeting also show that the hospitality which we have come to associate so closely with Lourenço Marques was...
no new thing even then. In the report on the Congress we read of the members being entertained at a musical evening, at a military ball, and at a reception by the Governor General. Excursions, too, had their attraction; these included a circuit of the town and a visit to Polana Beach by special train, a visit to the Campos Rodriguez Observatory, and a trip on the Bay by steamship to attend a regatta which was followed in the evening by a fireworks display.

The next visit of our Association to Lourenço Marques came in 1922, when the President was the distinguished geologist, Dr A. W. Rogers, who had been the recipient of the South African Medal here in 1913. The attendance figures had risen to about 60 members, and the number of papers to 45, of which 9 were by Portuguese scientists.

After a long gap, the third Lourenço Marques Congress took place in 1948, an occasion which many of our members present here tonight recall with great pleasure. Our President of that year was Dr S. H. Skaife. The attendance again rose, to a figure of about 100, although there were only 36 papers delivered to the various sections.

And now, ten years later, we find ourselves once again in Lourenço Marques, in far greater numbers than ever before, mainly, may I say, because by this time every member of our Association knows that a Lourenço Marques Congress is in many ways a special occasion. I would like to take this opportunity of mentioning to His Excellency the Governor-General the pleasure with which the Council and members of our Association received, and the alacrity with which they accepted, the invitation once more to visit this lovely and friendly city.

Looking through the records of the earlier Congresses in Lourenço Marques, one is particularly struck by the fact that although the subjects of the scientific papers read before the various sections have changed through the years, although the main streams of scientific activity no longer flow along the channels of 1913, the broad function of our Association has remained unaltered. Our Annual Congresses have, in fact, since the beginning, served a dual purpose: they have provided both a meeting-place for the scientific workers of our widespread community and an opportunity for an annual stocktaking of the progress of science, with some indication of its significance, not only for the scientist, but also for the general public. In this latter respect, our Association has always seen itself as called upon to serve as a link between the scientist and the public of Southern Africa. And it is to the problem which thereby arises, the problem of the mutual relationship of Science and Society, that I wish tonight to direct your attention.

The common citizen of one of the Western nations is today aware, as never before in history, of the profound significance of science for himself and in his own life. For this the advent of the atomic bomb, more than any other single development of modern science, is responsible. He has been convinced, no doubt correctly, that in the various nuclear weapons man possesses the power to destroy himself. He knows on the other hand that in the peaceful applications of nuclear power man possesses the key to world-wide industrial development and prosperity. He is thrilled by the launching of a space satellite, and by the newspaper reports, which he perhaps only vaguely understands, of the first steps towards fusion power in the form of Zeta. He has come to take for granted the fantastic developments in the field of medicine which have lengthened his probable lifespan by almost fifty per cent beyond that which his grandfather enjoyed. He has access to the material resources provided by the labours of the engineer and which have given him a standard of living beyond the wildest dreams of his forefathers. His entire civilisation is in fact the product of applied science. And yet, wrapped about with the achievements of science as he is, he remains woefully ignorant of the spirit and the methods of science, particularly of the fundamental importance of the work of scientists in those fields usually called "pure" as opposed to "applied".

Now this kind of ignorance is regrettablly of the greatest possible importance, not merely to science, but to civilisation itself, and for a very obvious reason. The newest gifts of science are ambivalent; with their
promise they hold out a threat. The labours of the nuclear physicists and engineers promise boundless power; but at the same time they have given man the hydrogen bomb. Sputnik means the beginning of the space age; it also means that the Intercontinental Ballistic Missile is no longer a vague possibility but a menacing reality. Automation not only signifies the possibility of more consumer goods at a lower price; it also carries with it the threat of economic crisis. The success in the fight against disease means an increased lifespan for all those fortunate enough to have access to the new medical techniques, but at the same time it is bringing about a fantastic rate of increase in the population of the world, with the dark Malthusian cloud once more looming above the horizon. As Lord Boyd-Orr has put it: we are all anxious to increase the store of man’s knowledge, but the knowledge we have already is so great that the difficulty is not to get new knowledge, but to get the wisdom and the goodwill to apply the knowledge we have.

In other words, science has placed man in the position of having to choose one of two paths, the one leading to an ever brighter future, the other to the destruction of the world as we know it. And this choice is one which confronts, not the scientist in particular, but mankind as a whole. Yet how can mankind choose correctly, if his choice is to be made from the depths of a profound ignorance? How can the politicians of the world choose, when most politicians know little about science, and most scientists prefer to have nothing to do with politics? This is our problem, not only as scientists, but as citizens. Prince Philip, in the closing words of his Presidential Address to the British Association in 1951 phrased the issue more aptly than I could hope to do:

It is clearly our duty as citizens to see that science is used for the benefit of mankind. For what use is science if man does not survive?

In practical terms, it seems to me that this problem can be reduced to the simple form: how can we get science and society on speaking terms? And again it seems to me that the primary responsibility for this rests on the scientist. It is he who knows the significance of what he is doing, and it is he who should set about ensuring that his fellow citizens are adequately informed, as to both the methods and results of science, and the significance which these developments hold for society in general.

The scientist must therefore be prepared to play his part in the process of educating the great public, and happily it is becoming clear that increasing numbers of scientists are shouldering this burden of improving the public relations of science. This has not always been so, although there have always been those, even among the greatest figures in the history of science, who have not regarded the lay public as an audience below their dignity. To mention only one of the examples which come to mind in this connection: the theory of evolution, whose birth exactly one hundred years ago we will celebrate tomorrow, has had from its beginning a number of highly gifted popularisers and expositors, including Darwin himself. It is not always realised, even by biologists, that The Origin of Species went through six editions within twelve years, and that it was in general the intelligent layman who bought and read the book in such large numbers.

The fact is that now, certainly no less than in Darwin’s day, the public is aware of its need to know more about science, so that it is not necessary for the scientist in our time to look for an audience. The audience already waits, but in many cases the scientist still delays.

When, however, I suggest that education of the public is one of the most important problems of our time, I hope I will not be interpreted as suggesting that science should take the place of those elements of education which are commonly called “cultural”. No one will deny the continued importance of language and literature, of history, art, music — in general of those elements which make up what is still often called liberal education. What I am suggesting is that liberal education must be relevant to the time and the circumstances, since its purpose is to enable its recipients to comprehend the great issues, not only of the past, but also of our own time, the forces which are shaping our
destiny. And since the developments of science are among the most powerful of those forces, science is as much a part of modern culture as literature or art or music. Hence I am suggesting that in the present age no man dare call himself cultured unless he also possesses a broad knowledge of the principles of science. Without such knowledge no man, however well educated in other respects, is intellectually adapted to the times in which we live.

The basis for developing an adequate public appreciation of science is, first and foremost, an educational system in which science receives the attention which is its due. This has been discussed too often of late for me to wish to say more about science teaching in school. Let us consider the rather more difficult matter of the education of those who have left their schooldays well behind them. How can we hope to provide the required scientific education for the adult?

Here I must address myself in the first place to those of my scientific colleagues who are directly concerned with one aspect of adult education, namely those who teach in Universities. Can we claim that in teaching our students we have exhausted every possibility? Or is it possible that the universities can contribute a great deal more to the education of the general public than they have done in the past? I believe that this is indeed the case; there are many universities which do not contribute directly to adult education outside of the limits of their duty towards their students, and which perhaps do not recognise, as they certainly have not accepted, the university's responsibility for adult education.

I am thinking, therefore, of the universities of our country as institutions possessing reserves of scholarship which they could place at the disposal of the public in this respect. I picture a university as the centre of the intellectual life, not merely of a few thousand students and a few hundred members of its staff, but of the entire community which it exists to serve. With Bruce Truscott I envisage a university with its doors flung open, its lights blazing and its great halls filled on well nigh every night of the week, a centre for a veritable revival of the spirit of learning. And although I would wish to see lectures and courses on science at the popular level as a highly important part of the programme, these would remain a part and not attempt to become the whole.

If there are those who object that the day for this kind of activity is past, that since the coming of broadcasting no one attends lectures, I must reply that the facts prove such an objection to be baseless. The radio has not emptied the concert hall; on the contrary, radio concerts have educated millions to an appreciation of good music, and developed in them a wish for more. Furthermore, in a city such as Johannesburg there are literally hundreds of clubs and societies whose major function it is to arrange for their members lectures on a wide range of topics. And thirdly there is the indisputable fact that there is a thrill about a crowded lecture hall and a good speaker just as there is about a crowded concert hall and a first-class artiste.

That there is a demand for such activities on the part of the university, and that there are universities which are meeting that demand, is clearly shown in the report of the Regional European Seminar on "The Universities and Adult Education" held in 1956, and which was attended by delegates from twelve European countries and from the United States and Canada. In this report it is pointed out that since the birth of the University Extension Movement in the 1870's, adult education services at the British universities have been extended so that, with only one exception, every university in England and Wales today possesses a department of adult education or extra-mural studies employing full-time administrative and teaching staffs. At the present time there are about 270 full-time members of university staffs in Britain who are entirely engaged in extra-mural activity. In addition the universities call upon nearly three thousand other part-time tutors, of whom rather more than one-third are members of the ordinary staff of a university, and who are paid extra for their extra-mural work, which they are in any case
not obliged to undertake.

These adult education departments spent in 1952 well over half a million pounds on their work, of which almost fifty per cent came from Ministry of Education grants, the rest from local education authorities, from funds controlled by the universities, and a small amount, roughly three per cent of the total, from student fees. In other words, and this is a most important point, the fees paid by students are so low as to present no obstacle to any would-be student, however impoverished.

Now the point of all this activity becomes clear when one observes the enrolment figures in these extra-mural courses. These show that recent university programmes contain about 900 tutorial classes with about 14,000 students, just over 1,200 one-year courses with 21,000 students, about 1,000 three-month courses for 15,000 students, and a considerable number of short courses, attended by a further 32,000 students. This gives a total of over 82,000 students in touch with some aspect of learning at university level in Great Britain — a figure to be compared with a total of 84,000 full-time students. In Britain, therefore, the universities teach one member of the extra-mural university public for every one full-time student on their rolls.

One should at this stage add that in very few cases is anything but a minute percentage of the total adult education effort directed towards increasing public understanding of science. The statistics which I have quoted, however, show beyond any doubt that it is indeed possible that the universities can play an important role in this connection, and one would wish to see the problem investigated by the university authorities in our own country, with a view to their becoming homes of culture both to those who already possess culture and to those who do not. Again with Bruce Truscot I would wish “the streets leading to Redbrick University to be crowded, night after night, with men and women, boys and girls of all classes and types, drawn to it as to a magnet, until it has forged a mighty tradition and is as much the centre of intellectual life in Drabtown as Saint Paul's or Westminster Abbey is the centre of religious life in London”.

The universities, together with other organisations concerned in adult education, could also share in another form of activity, namely that of encouraging many more people to participate personally in scientific work rather than merely to listen passively to reports of what other people are doing. There are far too many laymen — indeed far too many scientists — who look upon science as an esoteric business demanding for its practise years of specialised training superposed on unusual intellectual gifts. While it is true that there are intellectual gifts required of the scientist, these are a great deal less rare than many people believe. And as for specialised training, as every practising scientist is aware, there are vast fields where facts and principles of great scientific value may be discovered with no more complex tools and techniques than are readily available to any intelligent layman. The visual observation of variable stars and meteors, and the search for comets, for example, have always been the special domain of the astronomical amateur; to these can now be added observation of the artificial satellites, whose numbers must be expected to grow very considerably during the next year or two. Other fields of special interest to the amateur could be mentioned by any specialist; one need only remind this audience of the distinguished amateur contributions to South African science which have been recognised by the award of our own Certificate of Merit.

Work such as this makes small demands in the way of instrumentation; enthusiasm and intelligent observation are its major requirements. And apart from the direct contribution to the storehouse of scientific fact which the amateur can make, let us not forget that he often brings to science a freshness of viewpoint which is sometimes lacking in his more inhibited professional brethren, and which often more than compensates for any lack of specialised knowledge. After all it should be remembered that Darwin, Mendel, Herschel, Marconi, Franklin, and many others who have attained high rank in the list of scientific worthies were largely self-trained amateurs.

Science, therefore, would gain much from a wider participation of laymen in research,
but of perhaps even greater importance in the long run would be the gain to the laymen themselves. There can be no doubt, although scientists are on the whole not inclined to emphasise this, that active participation in the work of science can be an exhilarating experience. Science contains, in fact, an aesthetic element whose existence is generally unsuspected by the layman. One would wish that many more members of the general public could be given the opportunity of sharing in that experience, and in learning, from the inside, something of the spirit as well as of the methods of the scientist. Should not our own Association do more to open such doors, to enlist a host of new and enthusiastic colleagues outside of the professional ranks, to contribute to the exploration of the unknown, and at the same time to the great task of the scientific education of our fellows?

With the best will in the world, however, the universities, together with museums and scientific associations, can hope to reach only a very small part of the total population. For a major attack on our problem we must enlist the support of the two most important media of popular education of our time: the Press and the Radio. Both possess the right of entry to almost every home in the civilised world. Yet the space in newspapers and the time in radio programmes allotted to scientific matters appear to be out of relation to the importance of science in the modern world.

For this state of affairs the scientist himself must shoulder a large part of the blame. For various reasons, not least perhaps the fear of being frowned upon by their professional colleagues, and also in many cases the fear of being inadequately or even incorrectly reported, many scientists bluntly refuse to have anything to do with the Press. The reluctance of the scientist to explain the meaning of his work through the columns of the newspapers is now rapidly vanishing, but the problem of adequate science reporting in the popular Press is still largely with us.

The time is indeed now ripe, as many of the large newspapers overseas have already recognised, that every large newspaper should have on its staff someone capable of dealing knowledgeably and intelligently with scientific subjects, of equal standing in the journalistic profession with the special critics of music and drama, or the racing and sports editors or political specialists. The adequate reporting of scientific discoveries is no longer the comparatively easy task that it was a generation ago. The science writer today is a specialist journalist on whom considerable demands are made in respect of scientific knowledge and integrity. Perhaps it is time that a Science Writers Association be founded in South Africa on the lines of similar associations elsewhere, in order to ensure that good science reporting be encouraged.

It must be recognised, however, that from the point of view of the Press the main emphasis in science, as in everything else, must be human interest. If, therefore, in the newspaper reports of our Congresses we find that a paper on a humanly intriguing though scientifically not very important topic receives much newspaper publicity, while another in which these aspects are weighted in the inverse proportion occupies no more than an inch of space on a back page, we cannot as yet complain. If ninety per cent of the readers of a particular newspaper are more interested in cricket, clothes and crime than in Heisenberg's new Unified Field Theory, it is of cricket, clothes and crime that they will want to read.

Yet human interest and science are not necessarily incompatible; and important new discoveries are not often overlooked, except when, as sometimes happens, they are embodied in a paper which is a masterpiece of verbal obscurity. After all, it is not really surprising that the public had to wait ten years or more before it heard of Einstein's theory of relativity. That monument of scientific reasoning required the combination of mathematical knowledge and skill in exposition of an Eddington to be made intelligible. There can be little doubt that the modern newspaper editor is eager to obtain news of scientific advances and interpretation of scientific trends, and in our own country it is still largely necessary for him to obtain that from the scientist himself. Only, therefore, if we are prepared to write and talk on a level intelligible to the layman can we
hope that our science will be well reported.

The same requirements are even more obvious in the case of the Radio. It is possible, as the C-Programme of the B.B.C. has shown, to obtain and to hold a large and responsive listening public for science talks at what is undeniably a high level of sophistication. Even with its sights set at a lower target, the Radio can contribute greatly to the popular understanding of science, but again only with the full co-operation of the scientists themselves. It would not seem unreasonable to suggest that a large radio organisation such as the S.A.B.C. should also have a Science Editor, a man of some scientific standing, who could keep in touch with the universities and the various scientific research organisations, and who would be responsible for adequate science reporting. The time devoted to science, in the form of talks, interviews, discussions and dramatic presentations, could, one feels, be considerably extended without exhausting listener interest or exceeding the limits suggested by the importance of the subject.

There remains one further suggestion, originally made in his Presidential Address six years ago by Dr Schonland, and which should not be forgotten, namely that consideration should be given by our Association to the possibility of forming a Parliamentary and Scientific Committee on the lines of the organisation founded at the beginning of the last war in Britain. This consists of members of Parliament and representatives of a large number of scientific and technological institutions, and its main activities are to ensure an exchange of information between members of Parliament and scientists, and to take action to right matters seen to be wrong in the light of such information. The importance of such an organisation is that it enables the scientist to influence the legislature in those matters on which his special knowledge is particularly relevant. Perhaps one might suggest this possibility to our very energetic Cape Centre for consideration in the near future.

So far I have discussed the responsibility of the scientist towards society. It should, however, be borne in mind that Science and Society constitute in a sense a symbiosis; they are, in fact, mutually dependent. While it is true that the advancement of Society today depends in an increasing measure on Science, it is equally true that the proper advancement of Science can only take place with full support from the community.

The implications of this fact are numerous, but I must limit myself to a consideration of one or two which I believe to be of particular importance. In the first place, it is generally agreed that if the industrial expansion of South Africa is to continue, a considerable increase in the number of available scientists, pure and applied, must take place. This is, of course, a situation not by any means confined to our own country, as a number of recent studies overseas have made clear.

In the report, published two years ago, on Scientific and Engineering Manpower in Great Britain, it is pointed out that in 1956 there were six qualified scientists and engineers in every thousand of the working population, and that the minimum output required to meet present demands of industry, government and education is about 10,000 per year. This demand, the report states, is barely being met. Within ten years, however, the demand will have doubled, and according to the report it will represent a remarkable educational achievement if the output can be raised in the same proportion.

To meet the demand in the United States, recent surveys have shown that the present output of scientists and engineers must be increased considerably. Even if it were possible to double the present output, it is stated, it would be five to ten years before an appreciable effect would be felt. By 1980, it has been estimated, only one-half of the total number of scientifically trained personnel required for the full development of industry will in fact be available, in spite of strenuous efforts to meet the shortfall.

The exact dimensions of the problem in South Africa have not yet been clearly delineated, although it is gratifying to learn that an official investigation of scientific and technical manpower requirements and reserves is at present being undertaken. In the absence for the time being of reliable data, we can however attempt to assess the position.
by comparison with Great Britain. If we assume that our conditions are comparable with those in Britain, we might argue that if the need there is for 10,000 new scientists and engineers yearly, we in South Africa with one-twentieth of the population should produce about 500 annually. This is approximately the present rate at which our universities are producing new graduates in these fields.

But this estimate is based only on the white population of the Union. If we bear in mind the fact that now, and presumably for a long time to come, the technical skills for the country as a whole must be provided very largely by the white population, this figure becomes obviously too low. It should not be unreasonable to suggest that it should at least be doubled. This would mean that at present we are producing not more than one-half of the scientists and engineers who would be needed for the adequate development of our industry and adequate teaching in schools, universities and technical colleges. And since we must expect our future needs to be even greater, one might justifiably conclude that within the next ten years we should be producing annually about 2,000 trained scientists, pure and applied, or four times our present supply.

The obvious question that now arises is: can we hope to approach this figure? Or must the development of the country be retarded because of a critical shortage of technical manpower? Clearly it would be impossible under the circumstances to give a categorical answer; it does seem clear, however, that unless every conceivable step is taken to remedy the situation we will before long find ourselves in very serious difficulties. If we use all our available reserves of scientific talent, and in the most efficient way, we may just be able to meet the anticipated demand.

The first point here is that there exist in our population sufficient reserves of young people with the general intelligence needed for university study. Ten years from now, for example, in the Transvaal about 33,000 children will reach the age of 17. Statistics show that of these approximately one-sixth possess intelligence sufficiently high to enable them to take a university degree, and of this fraction one-fifth could be expected to do Science or Engineering. For the whole of the Union these figures would be rather more than doubled. Hence among the young men and women of University-entrance age ten years from now, it would be possible to find just about the two thousand potential science and engineering graduates which our estimate has suggested as the likely number required. Our reserves of intellectual material are therefore only just adequate.

Unfortunately, of course, not by any means all of these potential graduates will in fact graduate. Statistics collected by the Transvaal Education Department recently show that of 100 pupils in Standard I in Transvaal schools in 1945, only 14 reached Standard X in 1954. Approximately one-third of all pupils who enter Standard VIII proceed to Standard X, and among those who leave school at the end of their compulsory schooling there is an unfortunately large percentage of the most intelligent children. In the United States the proportion of matriculants is twice as great, and even there the wastage in the lower grades at high school is regarded as being unduly great. Clearly, therefore, the first task is to ensure that all children with the mental capacity to do so should at least complete the High School course. This would, in the Transvaal, at once double the number of matriculants from whom the future university students can be selected.

If we are to do this, however, the first requirement is the realisation that we are not concerned primarily with quantity. We are, in fact, going into the educational market to buy quality. We are here concerned with the supremely important problem of making the best use of that most valuable of our natural resources: the gifted child. It seems extraordinary that in the educational system of our time we should emphasise the need for special attention to the retarded child. For him we establish special schools, organise special classes, develop special educational programmes and techniques. It is, of course, correct that this should be done. But let us not regard it as the only function of general education to cater for the retarded and the intellectually mediocre. Surely the gifted child, of whom we are constantly reminding ourselves that he is the future leader,
also deserves our very special attention. In the words of Joseph Cohen of the University of Colorado, surely it is time for us to embark on an unceasing drive to discover, save, challenge, motivate, mature, and, if possible, bewitch, the promising, the gifted, the superior, wherever they are to be found.

And here I would refer to the importance of encouraging more girls to consider the possibility of higher education, and particularly of the future awaiting girls in the field of science. The use of the term manpower has perhaps tended to make us overlook the fact that half of our potential manpower is in fact female. It seems to be only in Russia that this fact has been recognised. One reads, for instance, that in the U.S.S.R. today fifty per cent of all professional workers, and even twenty per cent of all engineers, are women. The deployment of our gifted women constitutes a problem of particular importance.

Having discovered the suitably gifted pupils in our schools, the next step is to induce them to continue with their education, which will, one fears, not always prove an easy task, although the newly instituted policy of differentiated secondary education should prove a valuable stimulus in this direction. One faces here the apathy of parent and of child, the economic pressure which forces so many pupils, and particularly the girls, to leave school in order to obtain employment, and the growing shortage of adequately trained high school teachers. We must embark on a policy of persuasion, and of providing adequate financial assistance through bursaries and scholarships for students at university.

At the present time about three-quarters of all students in the universities of England and Wales receive financial aid of this kind. The total cost is about £7½ million pounds, the greater part of which is provided by central and local education authorities. In South Africa the situation appears to be very different. In the University of the Witwatersrand, for example, about 25 per cent of the students are in receipt of such assistance, rather less than one-half of the total sum being derived from central, provincial and local authorities, the balance from industry.

Now it seems clear that unless the university studies of the worthwhile student whose financial circumstances are poor are adequately subvented, he will generally not reach the university at all. And since it is society which needs his trained services, it is society which should make it possible for him to be trained. This is not a question of providing an expensive education for the personal benefit of the fortunate recipient, but of being prepared to pay for something without which society as a whole must suffer. Central and provincial authorities, and industry as well, must be induced to recognise their responsibility in this regard.

Another problem, which is closely linked with that of finance, is that of improving teaching, and in particular the teaching of science, in our high schools. Basically the point is that teaching is the key profession; the other professions can only begin to train their recruits where the school teacher leaves off. And if our schools are understaffed, or staffed by inadequately trained men and women, we cannot hope to provide the experts on whom our future prosperity depends.

In science and mathematics the need is particularly urgent, not only in South Africa, but throughout the world with the possible exception of Soviet Russia if recent reports are correct. It has, for instance, been authoritatively stated that in the year 1954-55 the high schools of the United States needed 7,900 new teachers of science and mathematics; during that period a total of 3,800 completed their training, and of this number only 2,100 actually entered upon their teaching career at the beginning of the next academic year.

A recent departmental investigation has shown that fewer than one-half of all high school mathematics teachers in the Transvaal possess a degree with Mathematics as a major subject, while one out of every six has had no university instruction in the subject at all. In Physical Science the situation is little better; 13 per cent of all teachers of this subject in the Transvaal have had no training in science beyond their own high school courses, while a further fifteen per cent have had only one year of university training in Physics or Chemistry.
The situation appears indeed to be worsening. During the past five years the Johannesburg College of Education, the major source of English-speaking teachers in the Province, has turned out a total of only fifteen teachers with graduate qualifications in Physical Science. The upshot of all this is that high school classes are not only in general too large for efficient teaching, but also that they are in far too many cases conducted by teachers who are themselves only one jump ahead of the class, and incapable of stimulating the enthusiasm of the bright pupils or the interest of the dull. Large numbers of potential scientists and engineers are being lost to the community simply as the result of uninspiring teaching. And one of the reasons for this, perhaps the most important reason, is that the graduate in science or mathematics is today a person for whose services industry is prepared to pay salaries considerably greater than he would obtain in the teaching profession, and here I include even the universities in many cases. This seems to me to indicate not only that the question of teachers' salaries is basic to the whole problem, but also that if industry is not to find itself without technical personnel, it must do more to encourage financially the training of science graduates so that the supply of science teachers is also maintained.

When, finally, the student reaches the halls of learning, the responsibility falls once again on those of us whose privilege it is to teach. One would only hope that scientific instruction at our hands may be a power and an inspiration, that we may give, in the words of the Book of Wisdom:

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Certain knowledge of the things that are, namely to know how the world was made, and the operation of the elements:
The beginning, ending and midst of the times: the alteration of the turning of the sun, and the change of the seasons:
The circuits of the years and the positions of the stars:
The natures of living creatures, and the furies of wild beasts: the violence of winds and the reasonings of men: the diversities of plants, and the virtues of roots:
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And all such things as are either secret or manifest.

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YOUR EXCELLENCY, LADIES AND GENTLEMEN:

If I may summarise very briefly the theme of my remarks, it is this. Science and Society in our time are indissolubly linked. Without continued advance in the fields of pure and applied science, Western civilisation cannot be maintained. And without an adequate public awareness of the spirit of science and of what is needed to bring it to its fullest flowering, the future prospect for man is indeed dark. Upon us all, both as scientists and as citizens, falls the duty of public enlightenment, the responsibility of helping our fellows to see more clearly what lies ahead, and of choosing the way that leads to a more glorious future. In a literal sense science today is pointing the way to the stars; in a figurative sense this is surely also our duty as it is our pride.

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Nutrition Society of Great Britain

The Nutrition Society of Great Britain will hold a symposium on “Rumen Function” at the Royal Veterinary College, Royal College Street, London, N.W.1, on Saturday, March 7th, 1959.

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Fifth Alex L. Du Toit Memorial Lecture

Copies of the fifth Alex L. du Toit Memorial Lecture entitled “Observations relating to Quaternary Environments in East and Southern Africa”, by Dr H. B. S. Cooke, are now obtainable from the Geological Society of South Africa and members of this Association will be allowed to purchase copies at a nominal charge of 7/- per copy.