Our main problem in the successful application of automation is one of imagination—and, I suppose I might say, of courage as well. We must make tremendous efforts to ensure that our economic and political thinking is contemporary with our opportunities and that we are not crippling ourselves with an out-of-date pattern of education.

The real problems of education are going to centre on the need to develop people capable of living the fullest possible lives in an age of plenty. We shall have to produce men and women who are able to understand the significance of the past, who are in the stream of current ideas and who can make use of them, and who have the quality of imagination that is capable of foreseeing and welcoming the future. This may sound something of a tall order and it may reasonably be asked how one can ever devise an educational system which would achieve all these ends. I am not an educational specialist and, even if I were, it would be absurd to offer a cut-and-dried recipe or formula. All I feel able to do is to suggest certain lines of thought which might be usefully pursued.

In the coming age of automation, I suggest we shall find it impossible to consider anybody as adequately educated if he or she does not understand at least some science. Neither shall we be able to regard as an educated man a technician or a scientist, however distinguished, who has failed to develop a substantial interest in the humanities and the arts, or who shows no evidence of being aware of the significance of society and his part in it. We ought, in other words, to be making a determined effort to produce better balanced people.

As an essential first step towards this, I believe that we must aim at a full-time educational system up to the age of eighteen. As with many of the better comprehensive schools already, it may well seem best to organize our schools not in the traditional classes or forms but in subject streams, so that at any given hour of the day a complex of specialized classes is being held in specific subjects. The pupils in these classes would be drawn from various form levels, to use the old terminology, so that in every subject they would be with boys or girls of their own mental capability, irrespective of the forms from which they are drawn. This obviously would produce a series of specialized groups. It could be that a boy particularly good at, say, history, might be in a very advanced group for that subject and in a low group for chemistry, or vice-versa, but there should only rarely be a situation in which he would be allowed to abandon either the one or the other completely. Half way through the school, it could be that some adjustment would have to be made in the number of hours which each pupil was expected to devote to a given subject, but I would be strongly opposed to the minima being too low or decided too early.
It might possibly be found desirable, as a way of providing a more adequate number of hours in which to educate pupils of particular promise, to develop what we might perhaps call ‘day boarding-schools’. Boys and girls could go to them at breakfast-time and stay until the evening. During this much lengthened school-day it should be easier to instil in them the type of attitudes which are necessary if we are going to develop the social conscience and sense of social responsibility which an age of plenty is going to demand. It would also give time for some handicraft, some art or music, and for visits to theatres and concerts and exhibitions. It is essential, in my opinion, that all children, especially in their teens, should be exposed to artistic and musical and other cultural influences as widely and as frequently as possible. This is not a luxury, to be reserved for a fortunate élite: it is an absolute necessity.

**No specialization until the age of eighteen**

I am opposed to any introduction of specialization until at least the age of eighteen. The development of talents should take place by a process of gravitation. Pupils who have particular gifts would move up in the structural pattern of the school, while those who lack them would remain at a lower level in these subjects; but they would move up in the particular areas in which they are talented.

I believe that some at least of our existing public schools could provide very well for the needs of the age of automation, if they were suitably modified. In spite of their negative aspects in the last century and in the early part of this, they produced many men with the qualities of leadership, self-confidence, and integrity which helped to create a standard of administration, morality, and determination that played such a great role in the powerful and much envied position of Britain up to the outbreak of the first world war. But they were geared to a different age. We may now be seeing a new public-school pattern emerging, possibly on the lines of Gordonstoun, one that stresses values more appropriate to the age of plenty which I would say is likely from the ‘seventies onward.

One of the elements in the Gordonstoun system, for instance, is that of learning to serve the local community in which you live and then expanding your interest to the nation at large. We are so accustomed to thinking in terms of poverty and of the allocation of resources within an atmosphere of scarcity, that to suggest this kind of education on a wide scale will immediately produce the comment, ‘this is all very well if you can afford it’. But I believe we shall be able to afford it, because the successful exploitation of automation technology is going to be the greatest wealth-creating power yet seen on earth. There will undoubtedly be argument about whether we should allocate most of our new wealth to the development of the 25 per cent, most intelligent members of the population, or whether we should aim at raising the standards of the remaining 75 per cent. My own feeling is that both are well within our reach, and there is no reason to make a sacrifice of one for the advantage of the other. The two vitally important things to aim at are a genuine breadth of education and a sense of social and human responsibility. We must keep these as our top priorities.

I should like to see entry to a university or to a technical college made subject to an acceptable standard in both the arts and the sciences. With few exceptions—it would be stupid, for instance, not to provide special conditions for people of unusual
talents—there should be no acceptance of would-be scientists and engineers who have no knowledge of the humanities, or of people wishing to follow an arts course who are ignorant of the sciences. Those who enter technical schools, with a non-professional career in mind, should be entitled to a training which should be sufficiently basic, broad, and flexible to enable them to change skills successfully several times in the course of their lives.

Broadly trained, adaptable people
The need to produce broadly trained, adaptable people will become increasingly important at all levels, but special attention, perhaps, should be given to the education of our future leaders in government, industry, and commerce. The traditional scientific disciplines are in the process of breaking down into many smaller sub-disciplines. Biology, for instance, has become no more than a broad general term for a whole complex of biological studies and sub-studies. Exactly the same is true of physics and of chemistry. Specialization has become fragmentation, to the point where to describe a man as a biologist is hardly any more meaningful than to describe someone as a writer.

The most serious difficulty about this sub-division is that each of these sub-disciplines has so developed in depth that even the people in an adjacent discipline are frequently not in a position to understand its implications. When a scientist says a particular development is not in his own field, he may mean, in fact, that it is unintelligible to him. This, in itself, perhaps is nothing much to worry about, but when we consider that a large number of scientific disciplines are shaping the world, and that none of them is intelligible to the layman, we may well feel that we are in a potentially dangerous situation.

The by now popular idea of the ‘Two Cultures’, the scientific and the humanist, is useful and even stimulating in its way but it can also lead to pessimism, because it can imply: ‘Here are two civilized people who cannot understand each other, who cannot even talk the same language’. This Tower of Babel is increasingly disastrous, not only because of the difficulty the humanist and the scientist have in understanding each other, but because in science itself each branch is more and more broken down and each fragment becomes bigger and deeper and larger. If scientists themselves cannot talk intelligently to each other because they find it difficult to understand each other’s technical language, how can you expect mutual understanding between the scientist and the humanist?

Scientists ‘On tap but not on top’
This sad fact is becoming increasingly true in government, in the Civil Service, in business, in the trade unions, and among other people whose influence and views determine the course of society. Hitherto, the political and social effect of the various scientific disciplines has been limited. It could be dealt with by a man who was well educated in the humanities and who utilized the knowledge of the scientist but retained complete control over him. This is now difficult and in the future it will be almost impossible. During the last war Winston Churchill said he wanted scientists ‘on tap but not on top’. He was probably right, provided that the non-scientist was able to understand the language of the scientist and was capable of interpreting it and,
from that point onwards, to make intelligent decisions, because, after all, the reason
for having the scientist on tap was to enable intelligent decisions to be made at a
dangerous and difficult time. These dangerous and difficult times will occur much
more frequently in the future, and this during a period when the complexity of science
and technology are growing in an unprecedented fashion. In these circumstances a
wrong decision could have far-reaching and dangerous consequences.

It is urgent, even now, that this risk should be looked at objectively. The educational
authorities, with the full support of the government, should institute a course of
training which would be specifically aimed at creating a new breed of administrator.
The type of administrator I have in mind must not be a scientist or technologist
Indeed, this would be dangerous. It is essential that the government of the nation —of
any nation—should be in the hands of broadly educated people trained to appreciate
and evaluate new developments.

Educationally, the task is a formidable one. We have at one and the same time to
breed the type of administrator with an interest not only in the humanities—in
philosophy, literature, economics, politics, in history or in the classics, but with some
understanding of science, its history and philosophy, and of the direction in which
science is moving. At first glance this may seem to be an attempted reconciliation of
the ‘Two Cultures’. I believe that such a reconciliation is indeed possible. If the
government were to decide, for instance, that the top levels of the Civil Service would
be open only to graduates who had successfully followed a particular university
course combining the humanities with some of the sciences, then we would
undoubtedly be well on the way towards getting the type of administrator I am
convinced we desperately need.

Such a course could begin at eighteen and it might take six years. An undergraduate
would be required to prove an adequate knowledge of mathematics and physics in
order to gain entry. He would read whichever of the humanities he pleased, but his
whole period at the university would be interlaced with courses in the philosophy and
history of science and with what is currently happening in the scientific world. It
would embrace one year spent on some project, say, in America, in Europe, or in
some under-developed countries to experience first hand how the rest of the world
lives and what it thinks and feels. This would be as a participant in a project and not
as an observer only.

These students would be drawn from all strata of society and they would ultimately
inevitably become highly privileged people, particularly if they were given preference
in selection for the top positions in the Civil Service, in politics, in commerce, in
industry, and in the trade unions. I would not trust the management of the nation’s
affairs to men who had no first-hand knowledge of what was happening in this
quickly changing world, and who did not understand even the language of technology.
But I do not want the world to be run by scientists and technologists, because science
and technology are of value only as servants to society. I want to see at the head of
affairs basically educated men, science-orientated humanists. They must understand
the values of mankind; they must have a view of history and a view of the future.
They should have a strong flavour of science about them, but not enough to turn them
into scientists.
It is not only in Britain that there should be men trained in this way. The Germans and the Russians, the French and the Chinese and the Americans are going to need a top-level education of this kind just as badly. I think that everywhere, in this interdependent world, the danger of not having these sort of people at the helm will be increasingly felt. If you have to make a decision, you will not be able to base it on getting the best expert advice, and then perhaps coming to an amateurish conclusion. First you will have to understand what technical advice to ask for. To get the right answers you must know the right questions. At the present time it is impossible to convey many scientific and technical ideas, so that they can be fully understood and appreciated in their proper weight and implication by people who have no real awareness of what is happening in the scientific and technical worlds.

Even if by some miracle the system I am proposing were instituted virtually here and now, it would take us something like ten years before the first of its products were available. In this highly critical next ten years we have somehow to make do with the leaders we have already got. It is interesting to wonder whether, in this respect anyway, we in this country are better off or worse off than other advanced nations. What assessment does one make of our existing stock of leaders, the men already formed and educated and established to cope with the early and critical stages of automation? I myself think that we are rather inadequately provided.

In America they have a number of advantages over us. The first is that many of their business leaders have by now been trained in business schools, perhaps even a little over-trained, but nevertheless they have been taught to think in a systematic and purposeful manner. Furthermore, the American Government, as we noticed in the days of the late President Kennedy, leans heavily on expert backroom advisers, first-class economists and scientists, men with a wide range of experience, because their technical universities are so closely linked with industry and commerce. Nearly all their professors of science and technology act for a substantial part of their time as industrial consultants. This is true to a much smaller extent in this country, and so we do not get the same live interplay between the universities and industry that they have. Even so, I believe the Americans, too, will find it necessary to make educational changes somewhat along the lines I have indicated. If their Government should ever come to depend entirely on the advice of scientists and technologists, it would get a non-human view of current problems and it would fall into the chief error of a quantitative society, that of being dominated only by logic and technical considerations. But we in Great Britain may find ourselves in exactly the opposite position. We may be too little moved by technical and logical considerations and, possibly, may not even evaluate them correctly. That could be equally dangerous.

I must not give the impression that I am obsessed with the problem of educating a governing class. Our rethinking about education must, of sheer necessity, to say nothing of social justice, cover the whole nation, from top to bottom. Much has been talked and written in recent years about the need to educate the masses for leisure. But you do not educate masses; you educate people; although it is undoubtedly a good thing to educate large numbers of people. And when we talk about the problems of leisure, a little caution may not be out of place. In spite of all the optimistic prophecies, we are not going to get this greatly increased leisure overnight. It may be many years before there is any really remarkable reduction in the amount of time spent at work. But come it will. In teaching people how to live full and balanced lives
we have to take account of the vast variety of temperament and character which exists among human beings. Not everyone is capable of understanding painting or sculpture or good music, not everyone can read poetry or understand the finest drama. But there must be vast numbers of people with great potentialities at all social levels who have never really become aware of the cultural riches that are open to them.

It is vitally important during the next decade to increase the grants made by the government to the Arts Council and to other bodies with similar aims, and to increase them on a very big scale, not only in order to promote the arts as an activity, but to encourage the understanding of them simply by the process of enjoying them. The way to teach the young to enjoy the live theatre is to take them to it; the way to make them enjoy music is to take them to hear it, not only to teach them the piano; and the way to make them enjoy the fine arts is to take them to galleries and show them pictures and talk about them, so that those who have any kind of latent interest in these arts have them awakened and stimulated. I am sure that if this were done on a very big scale, a substantial proportion of our young people would respond to these cultural stimuli very strongly and there would be a great flowering of all forms of art, ranging from the cinema to ballet, the visual arts, sculpture and music. You cannot have these arts in a state of vigour and health without the participation of a large cultured public, and if you create this public by arousing the interests of young people in the arts, the satisfying of these intuitive desires would lead to a considerable development in the creative arts themselves. They only flourish when the market is there for them. It is the duty of government to see that the market is available and well provided with funds.

So far we have tended to underrate the interest and the latent intelligence of the mass of people. We are always being assured that the average man can only be interested in football and horse racing. If this is true today it is simply an indication of how wretchedly inadequate the present stimuli are. A passion for music and a passion for sport are not mutually exclusive. The playing of football, the adoration of players, the interest in racing—these are not bad things in themselves. But there is no reason why people should not enjoy football and at the same time be interested in cultural activities too. At the present time we are all inclined to consider only the extremes at each end of the interest spectrum and in this way to create unhelpful and unreal stereotypes.

One of the most interesting and remarkable things we are seeing at this present time is that side by side with increasing mechanization and automation there is an extraordinary display of interest and activity in, for instance, painting and sculpture. We find that with the steady reduction in working hours and household chores, men and women are engaging in many creative and artistic activities for which they never had time before. There is a far greater involvement in the arts than there has ever been previously.

One remembers that during the war—because people were confined to their homes—there was an enormous increase in listening to good music on the radio and it is encouraging to see that a large part of this new-found interest has lasted to this day. Cultural developments do not just flourish and die; they create cultural habits, and these tend to persist. There is an increase in sporting activity, too. As people become richer one finds a great increase in boating and in open-air sports of all kinds.
Another interesting phenomenon which is already discernible is that with the growth of mass-production, craftsmanship tends to become expensive. Machines do so much more work that, relatively, the cost of human labour increases enormously. So there is a growing tendency for people to make things at home, and to by-pass the professional by, for instance, decorating their houses themselves or making their own furniture. As people have more leisure and less need to go and sell their leisure for money, they tend to use it themselves and rediscover the joy of using their hands. I take the optimistic view that the increased leisure people are given as a result of automation will not be a burden to them. I cannot subscribe to the theory that human beings, particularly if they are properly developed and educated, are morons who cannot be trusted to spend half an hour by themselves unsupervised and undisciplined. Nevertheless, I am assuming that an avalanche of leisure cannot arrive overnight. A working week of fifteen hours may take fifty years to arrive, and in that fifty years we shall have an educational and attitude-forming breathing space. We have sufficient time to educate the young to understand themselves and their needs as human beings, but to achieve this we shall need to rid ourselves of our worship of specialization and examinations.

It may be felt that the people running industry, the people who are going to use automation, might usefully show themselves rather more aware of the cultural possibilities which automation is beginning to bring with it. But it is not the function of industry to be concerned much with culture, although it tends to take a more sympathetic view today than it did in the past. In my view, industry cannot take responsibility for the cultural side of its employees’ lives. It does not possess its employees, it merely employs them. It has no right to attempt to mould their minds. What it can much more properly do is to assume greater responsibility for the patronage of cultural and artistic activities, and there are signs that this is happening. This year, for instance, the Institute of Directors announced a scheme for supporting artists and artistic ventures, and a large number of firms responded immediately. This type of patronage is part of the activity of the company director as such, as the man in charge of his shareholders’ investment. The other sort of patronage—telling people how to spend their leisure—would be an activity as an employer, and that is something different.

The age of automation need not in the least be an age of uniformity. The whole purpose of leisure is to give people a chance of developing whatever talents and interests they have. We can never take upon ourselves the right to think that we know what is best for everybody, whether we are employers or members of government. But we can make sure that there is enough automation to give society the free time and the wealth through which to expose people to the opportunity of self-development. It is this exposure which is so important. I am sure that the increase of personal and national wealth now open to us will give many people unprecedented opportunities of developing and fulfilling themselves. Automation and education are two sides of the same penny.