

## A SCIENTIST GOADS THE ECONOMISTS

THIS talk grew out of a discussion on the world of the 1980's. The discussion was in the United States, where the situation is this: Americans are fairly confident that they will somehow manage to stagger through to the year 1980, but they are not too confident of how things will go on from there. Then when I came to prepare my speech today it occurred to me that from a British point of view the 1980's are really too far ahead. We can be reasonably sure of reaching the year 1970, but how things will go on from there is quite unsure. By 1980, there may well be no Britain as we know it today. So I have decided to set things closer to the present day than was my first intention.

Another difference between here and America is that over there an argument is always treated on its merits, more or less irrespective of who puts it forward. Here we are so riddled with class-structure prejudices that people are always asking whether such-and-such a person has 'any right' to speak about what he happens to be speaking about. Has the scientist a right to speak about the humanities, and vice versa? This kind of nonsense. Any person has a right to speak about anything. The only question is whether other people are willing to listen. Today, I have the advantage that short of a stampede to the exits you *have* to listen.

Today I thought I would try to tell you a little bit about how a scientist may think about the humanities, and I will illustrate my general arguments either by topical examples or by things that may happen in the not too distant future.

First, let me deal with a hoary old piece of humbug. Science is based on experiment, it is said. You can't experiment with people. Therefore science has no relevance to people. Q.E.D.

You can't experiment with stars. Nevertheless we know a good deal about stars. Here you have the method of the *counter-example*. Whenever you are faced by someone who knows more about a subject than you do, and when you have reason to suspect that you are being given a lot of rubbish, look hard for a counter-example. This is the best way to prick an expert's bubble. Of course, you are not likely to get away with it if the expert is arguing honestly, but you will find that many experts use their expertise largely to feed hokum to non-experts.

You can't experiment with people, so the argument goes. But there *have* been a vast number of experiments carried out with people. The compendium of those experiments is known as *history*. There is indeed a close parallel between the behaviour of physical systems and of people. It is a mistake to imagine that individual particles behave in deterministic fashion. Under identical circumstances individuals often behave differently, both particles and people. But in quantity, both particles and people show behaviour that is highly reproducible. The only difficulty in making use of the compendium of historical experiments is to make sure that the external boundary conditions of a current situation resemble those of a historical experiment sufficiently closely. Take the present war in Vietnam, for instance. Here you have a very major power suppressing a small one, more or less in the face of the tacit disapproval of the rest of the world—a situation very similar to the Boer War. You have the small country fighting with considerable skill in both cases, a small country with a division in each case—Boers and English, North and South Vietnamese—and you have the major power becoming more and more strident and hysterical. So long as the boundary conditions do not change in Vietnam I would argue that the end will be the same as it was in the Boer War. The boundary conditions would be changed if the Russians were to proceed in the manner of President Kennedy at the time of the Cuba crisis—if the Russians were to announce a 'withdraw or else'

policy. Then the situation would be different and the historical experiment would become inapplicable.

Again, the way President Johnson has become the prisoner of his own generals is the same phenomenon as the way Lloyd George became a prisoner of his generals during the Flanders battles of the first world war. Against his better judgement, Lloyd George allowed himself to be forced to send more and more men to the slaughter. Because of this Lloyd George was 'dropped' by the British people. After the war he became a pathetic inconsequential figure. I would predict that this is the fate awaiting President Johnson. The American public will follow him now, but later on they will not forgive him.

When a scientist moves into the humanities he has one big advantage and one big disadvantage. I will take the advantage first. I have referred to history as a compendium of social experiments, which are immediately applicable to a current situation provided the external conditions are essentially the same. But what are the external conditions and how can one be sure that they are essentially the same? The external conditions are technological, and the scientist is in the best position to make a judgement on whether these are essentially the same as they were in some past historical example, or not. If you think about Vietnam again for a moment, there is a curious technological analogy between the style of that war and the Boer War. The terrain favours the smaller side, and the weapons used by the larger side are not sufficiently powerful to overcome the nature of the terrain. Of course, there could be a moment when technological similarity would cease, as for instance if the Americans were to resort to nuclear weapons. My point is that a scientist would make a better judgement on where similarity exists and where it does not exist than can a non-scientist. It is indeed because such otherwise clever men as Mr McNamara have made wrong judgements on this very point that the United States is in its present mess.

As an aside, by the way, I don't want to be handed any hokum about human values. It is a mistake to imagine that we

change our sense of values spontaneously, and that this in effect changes the human environment. You know the sort of thing—in the olden days people believed in slavery—now we don't—so things are changed. The point is that people went on believing in slavery until machines made slavery unnecessary. It is the technological environment that changes the ideas, not the other way round.

Now for the disadvantage. When one moves into any new field there is always the disadvantage of not knowing the facts. This forces you to rely on broad principles; and in much of what I am going to say today I shall be concerned with the kind of principles that have validity in all fields, principles that can be relied on I hope even in opposition to the popular view.

Of course you can't always find a powerful principle ready at hand to meet every situation. Sometimes it is necessary to scratch around and to come up with what is only reasonably informed common sense. The recent French kite-flying attempt to mount an attack on the dollar was a case in point. It seemed ridiculous to suppose that a nation with a GNP as low as France could attack in any way the currency of a nation with as large a GNP as the United States, unless the U.S. was in some quite extraordinary short-term financial embarrassment. But since American gold reserves could see the U.S. through any conceivable short-term crisis it seemed clear that the French attack must fail. Why was it not clear to the French, one wonders? Why did they make fools of themselves?

It is often hard to believe in the simplicity of arguments like this. There has to be more to it, one feels. The whole of the recent devaluation fracas had this kind of flavour about it, of simple problems being made difficult. Perhaps I should explain how I see the problem, in terms of what we call a scale change in physics. Here is a quick review.

Consider the economy, first in relation to a fixed technological environment. For stability, *average* consumption must

balance *average* production, averages being taken with respect to time. At any given moment an imbalance is permitted, provided, as I say, that over a moderate time interval the imbalance averages to zero. This concept of averaging is too difficult, however, for the average wage earner. Whenever the imbalance is on his side, production ahead, he wants his wages increasing. He won't wait for the imbalance to switch sign. When it does switch sign the last thing he will ask for is a reduction in wages. Consequently, money must shrink in value—the unit of money must shrink. This process occurs at all times in all countries. As we know, it is called inflation. Unfortunately, it doesn't affect all individuals equally, and it doesn't affect all countries at the same rate. Otherwise it would have little consequence. It happens more slowly with a hard economic control than it does in countries where the control is soft. The effect is that the soft country gets priced out of world markets.

In such circumstances the only cure for the soft country is a discontinuous change in the ratios of its monetary unit to those of other harder countries.

Notice that only ratios are involved—i.e. mathematical numbers. This is why the problem has the same logical structure as a scale change in physics—measuring in metres instead of yards for instance. Actually it is not easy to judge the best value for the discontinuous change, because this has to be done as a complicated average over all the goods which the country in question aims to sell to the rest of the world. This is why it would have been preferable to have avoided the problem in the first place. The problem is also complicated by the fact that technology changes continuously, and by different rates in different countries. These are genuine complications. Artificial complications are introduced by people becoming fuddled by the concept of an absolute monetary standard—the curious gold policy of the French for example. All that is needed is to choose one currency as a reference standard. There is nothing absolute about the centimetre or

the second. These are reference standards relative to which we measure length and time as *ratios*. To have three monetary reference standards—gold, the dollar, and the pound—is as absurd as it would be to have three primary meridians for the determination of longitudes on the Earth. Again obviously, I would say, the sensible thing is to choose the monetary unit of the country with the largest GNP—in the present world, the dollar. The use of sterling dates from the time when Britain had the largest GNP. This clinging to an imagined former glory—the sanctity of sterling—has a faded, pathetic quality about it, a pathetic quality that goes far towards explaining the deep trouble in which this country finds itself. There is no particular merit in being a big country, in having the largest GNP, as every American knows perfectly well. Merit lies in honesty, and logic is the greater part of honesty. Consider the quality of the logic displayed by some of the country's leaders at the time of devaluation.

As it happened I was lucky enough to switch on the TV news around 10 p.m. on the fateful day. As the set warmed up, I saw on the screen:

DEVALUATION                      14·3 per cent.

Remembering economists had estimated an imbalance of about 12 per cent., I thought to myself: 'Good, the Treasury boys have judged things pretty well'. Then the following events transpired. Following a brief announcement, we were taken to Downing Street. One of those chaps who spend the night holding a microphone and shivering violently outside No. 10 attempted to interview Mr George Woodcock of the TUC and Mr John Davis of the CBI, an organization that used to be known as the FBI until the name was overwhelmed by American associations.

Now you might have expected valuable comment from Mr Woodcock. After all, wage earners in this country take up about 70 per cent. of the GNP, which is obviously the major share of the national cake. One would therefore suppose that

members of Mr Woodcock's unions had played a fair share in producing the imbalance of the economy which led to devaluation, and that Mr Woodcock might himself have felt some measure of responsibility. But no, Mr Woodcock had nothing to say. So determined was he to say nothing that when asked the extent of the devaluation he would still say nothing, although we already knew the extent to be 14·3 per cent.

Mr John Davis was just the opposite. He said a great deal and he would have done better to have said little. Speaking very purposively he told us the devaluation would be useless because every other major industrial country would simply follow suit. No other major industrial country followed suit. And why should they? After all we were only putting right an existing imbalance, which was a source of irritation and embarrassment to every other major industrial country. Imagine the U.S., with ten times our production, devaluing in response to a moderate adjustment in sterling. Imagine us asking \$2.40 for the pound and the Americans saying, 'No, no, we insist, we absolutely insist, on giving you \$2.80'.

Next let us take a look at the response of three politicians, Mr Heath, Mr Callaghan, and Mr Wilson. Mr Heath pronounced lugubriously on the situation, as one might speak at a funeral, or as one might speak if some really devastating event had taken place—a sudden shift in the velocity of light, for instance.

Mr Callaghan spoke quite recently, on the day of his resignation as Chancellor. Apart from denying everything that the interviewer, Robert McKenzie, said to him, Mr Callaghan's main point was that he had done his best to protect those people throughout the world who had continued to put their trust in sterling. This was his answer to why he had continued for the three years of his Chancellorship in a policy that had already been tried over the previous ten years, and which was known already to be a failure. The excuse seemed rather good and rather noble. Unlike Mr Davis and Mr Heath, I was at first inclined to accept Mr Callaghan. Then doubt crept in.

Was there really anybody who had continued to trust sterling in spite of the economic evidence? If there were such people, then the world is less rational than I take it to be.

Mr Wilson was like a drowning man snatching for an argument. Everything he reached out for broke away in his hand. I know nothing of politics. You here belong to a School at which politics is studied, so perhaps you can answer me: was this good politics? Or would it have been better for Mr Wilson to drop his studied grave manner and to have become mad, as he sometimes does when he answers hecklers? Wouldn't it have been better to have been blunt: 'You so-and-so's out there, cowering in front of your television sets, have been living shamelessly above your income. Look hard at me. Look hard at a man who has made some pretty bad mistakes over the past three years. The worst of my mistakes was to try to protect you lot from your own damned shiftlessness. But I'm through with all that now. There's going to be no more slacking at work today so you can earn overtime tomorrow. That's finished too. And don't think bitching and belly-aching and going on strike is going to help you. If you try that game again I'll bang your stupid silly heads together. Hate me as much as you like. Do your worst at every by-election. Do your worst at the next general election, but by God in the next three years—come hell or high water—I'm going to put this country on its feet again.'

I'm no politician, but this is the way I would have spoken, not to please the publicity office, but simply because it happens to be true. I have no faith in the still small voice of conscience, but I do believe that in all of us there is the still small voice of reason. It has to be so because nature very wisely makes us learn to see, to judge shapes and sizes—to have an instinctive appreciation of geometry—to develop the concept of number which is the basis of reason—before we learn to speak. So it comes about that all children start life fundamentally sane. This basic inner sanity presumably exists in all of us however much it becomes overlaid through the years

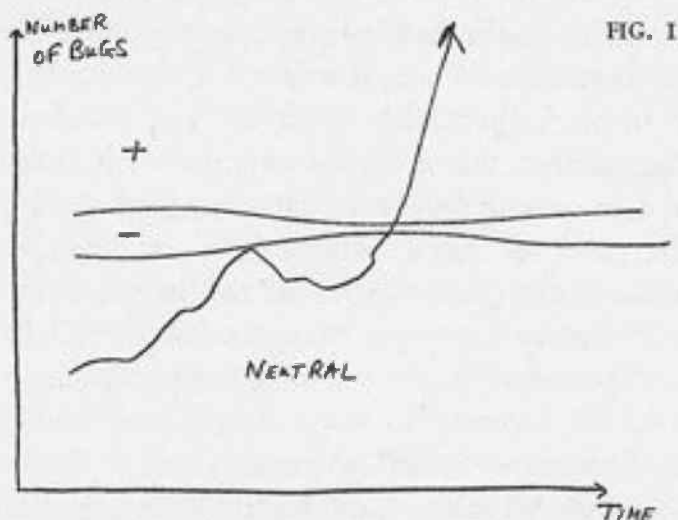


by the wordy rubbish that later becomes piled on top of us.

But less of vituperation and more of the principles we were supposed to be dealing with. Everybody is familiar with the fact that an action taken now can affect the future, either shortly or more distantly—next month or next year. This process of acting on the world, which then reacts back on you is called *feedback*. Suppose you invest on the stock markets. If your investments are wise your fortune increases from year to year, and if you always plough back your gains into new investments the outcome after several years could be very considerable. This process is known as *positive feedback*. The opposite case in which you invest unwisely, buying shares high and selling them low, will soon reduce your fortune. This opposite case is known as *negative feedback*. Feedback which increases what you start with is positive, feedback which decreases what you start with is negative.

This simple concept has a host of important applications, both scientific and social. Because the abstract logic is always the same, independent of the application in question, we can always argue with confidence as soon as we spot a feedback phenomenon. The essential thing is to spot whether the feedback happens to be positive or negative. Whether it is desirable to have positive or negative feedback depends on what you are dealing with. For stock exchange investment positive feedback is the right thing. But if you are fighting a cold and it is the bugs inside you we are talking about, negative feedback is what you need.

Before I come to political and economic applications of feedback let us see how much light we can throw on diseases produced by bacteria and viruses. In the first figure we have a typical situation. The horizontal axis refers to time and the vertical axis to the number of bugs inside you. We have a lower neutral zone in which there is no particular feedback. There are so few bugs inside you that the body doesn't trouble itself about them. Then there is a protective negative feedback zone. If the number happens to rise into this zone then



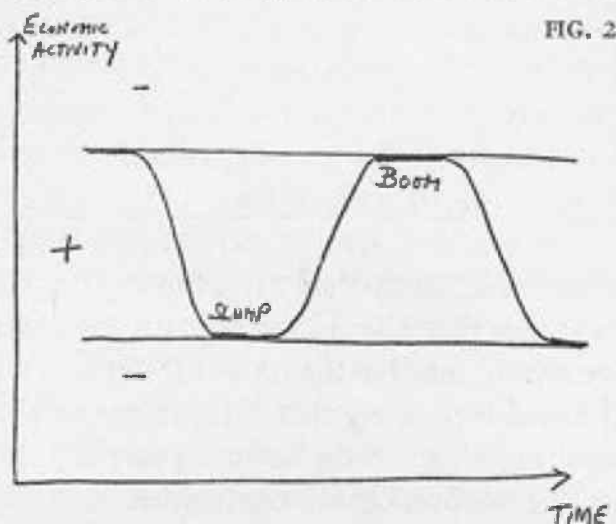
the bug population is forced back into the neutral zone. However, occasionally for environmental reasons the negative protective zone gets thin and the bug population manages to penetrate into the positive zone. Then off she goes, and you've had it. If its only a cold you burst out sneezing and so on.

When a disease hits you in this way one of three things happens: (1) The bug population goes on increasing and you die. (2) The body expands the negative zone upwards fast enough to catch up with the bug population. You have all experienced the phenomenon of an expanding negative zone. It is known as 'having a temperature'. Here is another popular misconception—that having a temperature is a bad thing. Just the opposite. Having a temperature is essential once the feedback becomes positive, unless (3) you can reduce the bug population back to the negative zone by using a drug.

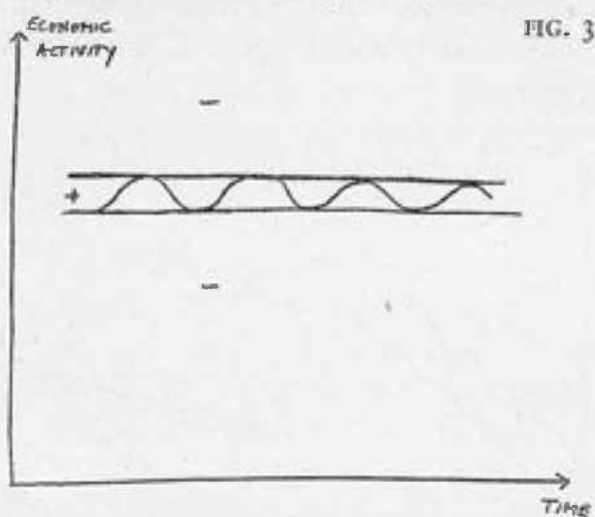
When the negative zone extends high you are said to be resistant. One way in which the bug population can penetrate the negative zone through to the positive zone is by picking up a dose from somebody else. This is less likely to happen when the negative zone is broad and high, because there is a limit to how many bugs you can acquire from someone else. Hence things like the common cold, to which we are all highly resistant, are rarely picked up from others, whereas diseases like smallpox, for which our division line between negative and

positive comes low, are readily passed from one person to another. So you see how it comes about that some diseases are infectious while others are not.

The economy as practised by the private sector has positive feedback, at any rate until the inflationary or deflationary swings become very large, when negative feedback sets in, as in the second figure. When government intervention is made,

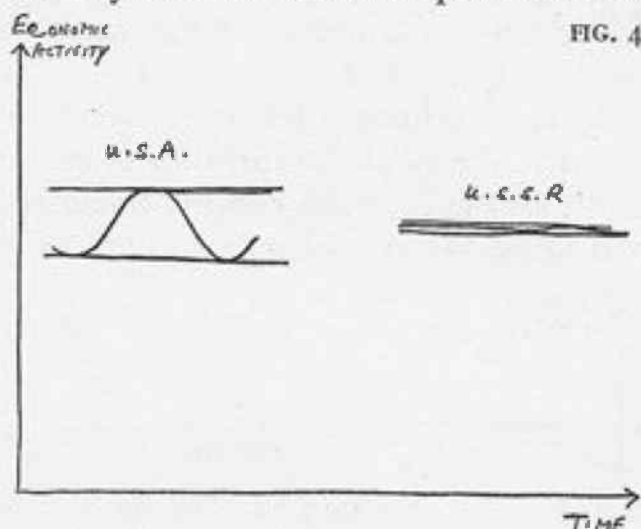


as it is in modern capitalist societies, the negative feedback lines are brought much closer together, as in the third figure.

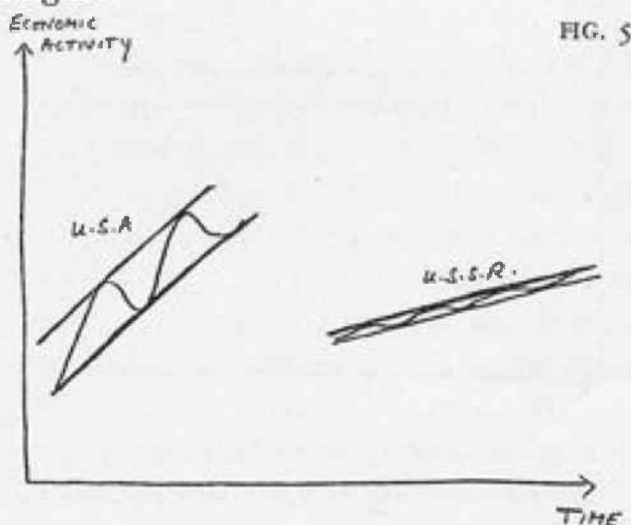


Increasing government control brings the negative lines still closer together. We have the situation shown in the fourth

figure. The irony is that while the capitalist and communist



scream at each other until they are blue in the face the only difference between them lies in the adjustment of the width of the guide lines. Even the term 'guide-lines' is American. Actually, the width of the guide lines is not trivial. So far I have said nothing about the absolute scale of activity. This depends on the technological environment. Since technological change mostly comes from the private sector and since the close guide-line system implies a squeezing out of the private sector, technological change tends to come quicker when the guide lines are fairly widely spaced. We have the situation of the fifth figure.



Perhaps the most important of my general principles was contained in our bug example, when I mentioned the possibility of reducing a population in the positive feedback zone back to the negative zone through the use of a drug or antibiotic. Not all bugs are alike. Some are more resistant to the drug than others. The resistant bugs tend to survive when the population is cut back. So although you are cured of your disease the cure has been achieved at the expense of concentrating the resistant bug. So long as you don't break out again with the disease this does not matter. But if you are subject to repeated outbreaks the ultimate effect may be so to concentrate the resistant bug that the drug in question becomes ineffective. What has happened here is that the bug has been *selected* by its environment—the environment being the drug, and you.

When you judge a policy by its results you have a selective mechanism. In making your judgement you are introducing what is often called a selective gate—or just a 'gate', for short. The advantage of using a gate is that you can try many more methods of attack on a problem. In most problems if you have to be sure that a method of attack is right before you begin then it is likely you will never solve your problem, certainly if there is any real difficulty in it. But provided you reject a line of attack as soon as you see it won't work you don't have to be so fussy in the things you try. This is the way of it in biological processes. Nature is very prolific in the trial of possibilities but very rigorous in the rejection of failures.

This is only plain commonsense, but it is astonishing how impossible it seems for human societies to follow such a straightforward plan. Mr Callaghan and Mr Wilson followed an economic policy that had already had a trial over a decade at least, and which was known to have failed.

Christianity has been operative for 1,500 years or more. After this long period of trial the world is still in a mess. Instead of concluding that christianity as a philosophy for running society simply doesn't work, christians demand more of

it. The psychology is exactly the same as that which led to Mr Wilson's economic package of July 1966. We know our policy is right. Admittedly it hasn't worked. Therefore we must have more of it. The fallacy lies of course in 'believing' at the beginning that a particular policy or philosophy is 'right'. This is an incorrect concept. You never should say that a policy is right. All you can properly assert is that it has satisfied the criterion of judgement which was set up in the beginning. So long as it continues to satisfy your 'gate' you continue. As soon as it fails to satisfy the criterion you chuck it out.

Very little in this country operates now on a selective basis. The whole private sector used to operate selectively—your company made a profit or you didn't survive, this was the selective gate. Selection still applies in some industries, but major branches of industry—the aircraft industry particularly—are now content to live like pensioners on government subsidies. Of course the aircraft industry deceives itself into believing it is producing planes for profit, but this is not so. A few planes are and will be sold, but not enough to cover costs let alone to make a profit. The chance of our having a thriving aircraft industry was already lost in the mid-1950's when the government of the day did not support the new technology of the small de Havilland company. If the *Comet* had been supported instead of outmoded planes that were in fact supported the story might have been different. The tragedy of a missed opportunity is there but this should not blind us to the fact that an opportunity is no longer here.

The aircraft industry is but one example of a welfare state within a welfare state. The armed services represent a still more expensive welfare state. The armed services nowadays serve little or no useful purpose. The country is not under military threat and if it were our present level of preparedness would be ludicrously inadequate. The present day level of military technology is such that we can no longer afford the expenditure that would be necessary to make us effective. So why spend £2,000 million p.a. on the armed services? To pro-

vide a welfare state for the military establishment. To keep Air Marshal so-and-so happy and Admiral so-and-so, and General so-and-so. Nobody likes to tell them that they can't go on having the things they've always had. The £2,000 million p.a. has to be spent in order to preserve their way of life.

Don't think I'm being unpatriotic, or that I minimize the chance of our becoming involved in war. The chance of our becoming involved in war is as great now as it ever was. In fact we are in a war right now, an economic war. We are engaged in a war with France which is just as real as the old-style wars ever were. The point is that by being befuddled by old-style concepts we are making a very poor show of this new-style war.

The aircraft industry and the armed services are not the only welfare states within a welfare state. The Trade Unions, the universities, the civil service, scores of government establishments. By a welfare state I do not mean visits to your doctor, I mean support without a determinate performance test. The only people who are subject to serious performance tests in our community are businessmen and ministers of the government. It is not by accident that these are the two sections of the community that are most reviled, businessmen by those of socialist persuasions, and politicians by all of us, myself included. It is no accident that those who are called on to satisfy no performance test revile those who are. Think of the BBC chaps who spend their time grilling the politicians. Where should our sympathies really lie?

You see now that I was quite serious in suggesting a few minutes ago that Mr Wilson should have belted into the public in his recent broadcast, instead of avoiding the real issue, instead of taking an apologetic line. The urgent need now is for the Prime Minister to stop treating the public as if it were behaving responsibly, when in fact the public is not behaving responsibly. The need is to give it to the people straight from the shoulder. Otherwise the war I spoke of a moment ago, the real war, will undoubtedly be lost.

The current panacea is entry into Europe. In taking a

heterodox line over entry into Europe I feel much the same way that I do in taking a heterodox line in science, acutely conscious that I might be wrong. But I feel I must follow my instincts. In the first place I have an instinctive distrust of the people who are the strongest advocates of entry into Europe. Their arguments just do not smell right. They have the style of arguments produced in support of a policy—policy first, argument second, the pernicious cart-before-the-horse again. There must be many supporters of joining Europe among you. Perhaps you can decide which for you is the cart and which the horse.

In science we have some little experience of co-operative projects with Europe. The projects do not come here. Instead we always have a drain of money and man-power from this country into Europe. This is not due to any ill-will on the part of Europeans. It is just that Europeans do not want to come and reside in Britain and on any committee that has to decide the siting of a facility there is always a majority of Europeans. The only circumstance under which I could conceive of a major facility coming here would be if the Europeans should decide that it was necessary to let us have something in order that they could continue to get money out of us.

The trouble lies of course in geography. So far as Europe is concerned we are at the end of the line, out on the fringe. Europeans see Britain in much the same way that we see Anglesey. In the long run political influence would inevitably move away from us. There would be a drain into Europe beside which our present brain drain across the Atlantic would be a very minor phenomenon. At least I think so. Eventually I think the relation of London to the major continental cities would become like the present day relation of Manchester and Birmingham to London. Some of you probably come from Manchester and Birmingham and you will know what I mean. You will know that Manchester and Birmingham would immediately become more important and more confident cities if London were to cease to exist.



But my main objection is that I believe those who advocate joining Europe want to do so for exactly the wrong reason. They are attracted towards Europe because Europe has the aspects of a welfare state. By joining they seek to avoid the very steps that would in any case set our affairs to rights.

I know that many people are afraid of the spread of American technology into Europe. Mr Wilson has referred to it in the kind of phraseology that one might employ in regard to an invading army. But this is to get things just 180° wrong. Armies of occupation are objectional because they consume your productivity. A technological invasion improves your productivity, just the opposite.

In any case the fact that wages and salaries are only one-third here of what they are in the U.S. should give us a huge advantage. We should have no difficulty in competing with America, especially if we import their technology. There used to be a lot of talk about low wages in Japan. Now it is here where wages are low. It is we who should be doing the undercutting.

The trouble, as we all know, is that our productivity is very low. Everybody pretends this is some deep mystery, but there is no mystery at all. Productivity is low because of the absence of performance tests throughout our national life. This is the debility caused by the welfare state disease. Remember I am not speaking now about doctors and hospitals. I am speaking about the wholesale system of handouts to every conceivable section of the community, handouts that carry little in the way of performance requirements. Stated bluntly, American productivity per man is three times ours because Americans work three times more effectively. American life is geared in all its aspects to performance tests. This forces Americans to think seriously about what they are doing, to consider all possibilities seriously, to get jobs properly done, instead of living in a dream world.

It is absurd, I would claim, to talk of small trifling increases of productivity, of some 3 per cent. or 4 per cent. a year. If at

any stage this country cares to rid itself of the accumulated clap-trap of centuries, if it is willing to accept a cool, rational attack on every problem, if above all, it is willing to accept the harsh reality of the performance test in place of the comfortable euphoria of the welfare state, it can increase its productivity by 200 per cent. The Americans have proved this to be possible, so it is absolutely certain that it can be done. The economics of the situation are shown in my final figure.

Gain from introducing oxygen supply into national life	200% $\equiv$ £60,000 m.p.a.
Reduce by 15% to allow for technological royalties	9,000
Reduce by 15% for tariff barriers	9,000
Reduce by 20% for increased imports	12,000
	<hr/>
	30,000
Effective increase	£30,000 m.p.a. $\equiv$ 100%

Of course it will be said that changing our attitude to work is not enough. Where would the investment capital necessary for such a sudden expansion come from? Manifestly from cutting out the many futile enterprises on which we are at present engaged. The multitude of welfare states of which I have spoken need cutting, not by 5 or 10 per cent., but to the bone. If this were done there would be no shortage of investment capital. Britain today is like a garden choked with weeds. Without an utterly drastic cut-back the weeds will continue to grow, and they will continue to choke all enterprise. Unless the weeds are killed it is Britain herself who will be dead, quite quickly now. The days in which we could continue to live in slothful ease have gone.