BRITISH MEDICAL JOURNAL

LONDON SATURDAY DECEMBER 10 1949

CAN A SCIENTIFIC SOCIETY BE STABLE?*

BY

BERTRAND RUSSELL, O.M., F.R.S.

I will begin with some explanation of the question with which I am concerned. I call a society "scientific" in the degree to which scientific knowledge, and technique based upon that knowledge, affects its daily life, its economics, and its political organization. This, of course, is a matter of degree. Science in its early stages had few social effects except upon the small number of learned men who took an interest in it, but in recent times it has been transforming ordinary life with ever-increasing velocity.

I am using the word "stable" as it is used in physics. A top is "stable" so long as it rotates with more than a certain speed; then it becomes unstable and the top falls over. An atom which is not radioactive is "stable" until a nuclear physicist gets hold of it. A star is "stable" for millions of years, and then one day it explodes. It is in this sense that I wish to ask whether the kind of society that we are creating is "stable."

I want to emphasize that the question I am asking is purely factual. I am not considering whether it is better to be stable or to be unstable; that is a question of values, and lies outside the scope of scientific discussion. I am asking whether, in fact, it is probable or improbable that society will persist in being scientific. If it does, it must almost inevitably grow progressively more and more scientific, since new knowledge will accumulate. If it does not, there may be either a gradual decay, like the cooling of the sun by radiation, or a violent transformation, like those that cause novae to appear in the heavens. The former would show itself in exhaustion, the latter in revolution or unsuccessful war.

The problem is extremely speculative, as appears when we consider the time scale. Astronomers tell us that in all likelihood the earth will remain habitable for very many millions of years. Man has existed for about a million years. Therefore if all goes well his future should be immeasurably longer than his past.

Science, as pure knowledge, began about 2,500 years ago, but as a force affecting daily life it began much later—with gunpowder and the mariner's compass. It did not begin to be a really powerful cause of social change until the industrial revolution, 150 years ago. To predict on the basis of such a very brief experience is evidently hazardous. All that can be done is to pick out certain aspects of the question with a view to causing awareness of dangers and possibilities.

Broadly speaking, we are in the middle of a race between human skill as to means and human folly as to ends. Given sufficient folly as to ends, every increase in the skill required to achieve them is to the bad. The human race has survived hitherto owing to ignorance and incompetence; but, given knowledge and competence combined with folly, there can be no certainty of survival. Knowledge is power, but it is power for evil just as much as for good. It follows that, unless men increase in wisdom as much as in knowledge, increase of knowledge will be increase of sorrow.

Causes of Instability

Possible causes of instability may be grouped under three heads: physical, biological, and psychological. I will begin with the physical causes.

PHYSICAL

Both industry and agriculture, to a continually increasing degree, are carried on in ways that waste the world's capital of natural resources. In agriculture this has always been the case since man first tilled the soil, except in places like the Nile Valley, where there were very exceptional conditions. While population was sparse, people merely moved on when their former fields became unsatisfactory. Then it was found that corpses could be used as fertilizers, and human sacrifice became common. This had the double advantage of increasing the yield and diminishing the number of mouths to be fed; nevertheless the method came to be frowned upon, and its place was taken by war. Wars, however, were not sufficiently destructive of human life to prevent the survivors from suffering, and the exhaustion of the soil has continued at a constantly increasing rate right down to our own day. At last the creation of the Dust Bowl in the United States compelled attention to the problem. It is now known what must be done if the world's supply of food is not to diminish catastrophically. But whether what is necessary will be done is a very doubtful question. The demand for food is so insistent, and the immediate profit so great, that only a strong and intelligent government can enforce the required measures; and in many parts of the world governments are not both strong and intelligent. I am for the present ignoring the population problem, which I shall consider presently.

Raw materials, in the long run, present just as grave a problem as agriculture. Cornwall produced tin from Phoenician times until very lately; now the tin of Cornwall is exhausted. Light-heartedly, the world contents itself with observing that there is tin in Malaya, forgetting that that too will be used up presently. Sooner or later all easily accessible tin will have been used up, and the same is true of most raw materials. The most pressing, at the moment, is oil. Without oil a nation cannot, with our

*The Lloyd Roberts Lecture given at the Royal Society of Medicine, London, on November 29, 1949.

present techniques, prosper industrially or defend itself in war. The supply is being rapidly depleted, and will be used up even more swiftly in the wars that are to be expected for possession of such supplies as will remain. Of course I shall be told that atomic energy will replace oil as a source of power. But what will happen when all the available uranium and thorium have done their work of killing men and fishes?

The indisputable fact is that industry—and agriculture in so far as it uses artificial fertilizers—depends upon irreplaceable materials and sources of energy. No doubt science will discover new sources as the need arises, but this will involve a gradual decrease in the yield of a given amount of land and labour, and in any case is an essentially temporary expedient. The world has been living on capital, and so long as it remains industrial it must continue to do so. This is one inescapable though perhaps rather distant source of instability in a scientific society.

BIOLOGICAL

I come now to the biological aspects of our question. If we estimate the biological success of a species by its numbers it must be admitted that Man has been most remarkably successful. In his early days Man must have been a very rare species. His two great advantages—the capacity of using his hands to manipulate tools, and the power of transmitting experience and invention by means of language—are slowly cumulative: at first there were few tools and there was little knowledge to transmit; moreover, no one knows at what stage language developed. However that may be, there were three great advances by means of which the human population of the globe was increased. The first was the taming of the animals that became domestic; the second was the adoption of agriculture; and the third was the industrial revolution. By means of these three advances men have become enormously more numerous than any species of large wild mammal. Sheep and cattle owe their large numbers to human care; as competitors with man large mammals have no chance, as appears from the virtual extinction of the buffalo.

In addressing a medical audience, it is with trepidation that I advance my next thesis, which is this. Medicine cannot, except over a short period, increase the population of the world. No doubt if medicine in the fourteenth century had known how to combat the Black Death the population of Europe in the latter half of the fourteenth century would have been larger than it was. But the deficiency was soon made up to its Malthusian level by natural increase. In China, European and American medical missions do much to diminish the infant death rate; the consequence is that more children die painfully of famine at the age of five or six. The benefit to mankind is very questionable. Except where the birth-rate is low the population in the long run depends upon the food supply and upon nothing else. In the Western world the fall in the birth rate has for the time being falsified Malthus's doctrine. But until lately this doctrine was true throughout the world, and it is still true in the densely populated countries of the East.

What has science done to increase population? In the first place, by machinery, fertilizers, and improved breeds it has increased the yield per acre and the yield per man-hour of labour. This is a direct effect. But there is another which is perhaps more important, at least for the moment. By improvement in means of transport it has become possible for one region to produce an excess of food while another produces an excess of industrial products or raw materials. This makes it possible—as for instance in our own country—for a region to contain a larger population than its own food resources could support. Assuming free mobility of persons and goods, it is only necessary that the whole world should produce enough food for the population of the whole world, provided the regions of deficient food production have something to offer which the regions of surplus food production are willing to accept in exchange for food. But this condition is apt to fail in bad times. In Russia, after the first world war, the peasants had just about the amount of food they wanted for themselves, and would not willingly part with any of it for the purchase of urban products. At that time, and again during the famine in the early '30s, the urban population was kept alive only by the energetic use of armed force. In the famine, as a result of government action, millions of peasants died of starvation; if the government had been neutral the town-dwellers would have died.

Such considerations point to a conclusion which, it seems to me, is too often ignored. Industry, except in so far as it ministers directly to the needs of agriculture, is a luxury: in bad times its products will be unsaleable, and only force directed against food-producers can keep industrial workers alive, and that only if very many food-producers are left to die. If bad times become common, it must be inferred that industry will dwindle and that the industrialization characteristic of the last 150 years will be rudely checked.

But bad times, you may say, are exceptional, and can be dealt with by exceptional methods. This has been more or less true during the honeymoon period of industrialism, but it will not remain true unless the increase of population can be enormously diminished. At present the population of the world is increasing at about 58,000 per diem, or about 20 millions per annum. War, so far, has had no very great effect on this increase, which continued throughout each of the world wars. Until the last quarter of the nineteenth century this increase was more rapid in advanced countries than in backward ones, but now it is almost wholly confined to very poor countries. Of these, China and India are numerically the most important, while Russia is the most important in world politics. But I want, for the present, to confine myself, so far as I can, to biological considerations, leaving world politics on one side.

What is the inevitable result if the increase of population is not checked? There must be a very general lowering of the standard of life in what are now prosperous countries. With that lowering there must go a great diminution in the demand for industrial products. Detroit will have to give up making private cars, and confine itself to lorries. Such things as books, pianos, watches will become the rare luxuries of a few exceptionally powerful men—notably those who control the army and the police. In the end there will be a uniformity of misery, and the Malthusian law will reign unchecked. The world having been technically unified, population will increase when world harvests are good, and diminish by starvation whenever they are bad. Most of the present urban and industrial centres will have become derelict, and their inhabitants, if still alive, will have reverted to the peasant hardships of their mediaeval ancestors. The world will have achieved a new stability, but at the cost of everything that gives value to human life.

Are mere numbers so important that, for their sake, we should patiently permit such a state of affairs to come about? Surely not. What, then, can we do? Apart from certain deep-seated prejudices, the answer would be obvious. The nations which at present increase rapidly should be encouraged to adopt the methods by which, in the West, the increase of population has been checked

Educational propaganda, with government help, could achieve this result in a generation. There are, however, two powerful forces opposed to such a policy: one is religion, the other is nationalism. I think it is the duty of all who are capable of facing facts to realize, and to proclaim, that opposition to the spread of birth control, if successful, must inflict upon mankind the most appalling depth of misery and degradation, and that within another fifty years or so.

I do not pretend that birth control is the only way in which population can be kept from increasing. There are others, which, one must suppose, opponents of birth control would prefer. War, as I remarked a moment ago, has hitherto been disappointing in this respect, but perhaps bacteriological war may prove more effective. If a Black Death could be spread throughout the world once in every generation survivors could procreate freely without making the world too full. There would be nothing in this to offend the consciences of the devout or to restrain the ambitions of nationalists. The state of affairs might be somewhat unpleasant, but what of that? Really high-minded people are indifferent to happiness, especially other people's. However, I am wandering from the question of stability, to which I must return.

There are three ways of securing a society that shall be stable as regards population. The first is that of birth control, the second that of infanticide or really destructive wars, and the third that of general misery except for a powerful minority. All these methods have been practised: the first, for example, by the Australian aborigines; the second by the Aztecs, the Spartans, and the rulers of Plato's Republic; the third in the world as some Western internationalists hope to make it and in Soviet Russia. (It is not to be supposed that Indians and Chinese like starving, but they have to endure it because the armaments of the West are too strong for them.) Of these three, only birth control avoids extreme cruelty and unhappiness for the majority of human beings. Meanwhile, so long as there is not a single world government there will be competition for power among the different nations. And as increase of population brings the threat of famine national power will become more and more obviously the only way of avoiding starvation. There will therefore be blocs in which the hungry nations band together against those that are well fed. That is the explanation of the victory of communism in China.

These considerations prove that a scientific world society cannot be stable unless there is a world government.

It may be said, however, that this is a hasty conclusion. All that follows directly from what has been said is that, unless there is a world government which secures universal birth control, there must from time to time be great wars, in which the penalty of defeat is widespread death by starvation. That is exactly the present state of the world, and some may hold that there is no reason why it should not continue for centuries. I do not myself believe that this is possible. The two great wars that we have experienced have lowered the level of civilization in many parts of the world, and the next is pretty sure to achieve much more in this direction. Unless, at some stage, one power or group of powers emerges victorious and proceeds to establish a single government of the world with a monopoly of armed force, it is clear that the level of civilization must continually decline until scientific warfare becomes impossible—that is, until science is extinct. Reduced once more to bows and arrows, *Homo sapiens* might breathe again, and climb anew the dreary road to a similar futile culmination.

The need for a world government, if the population problem is to be solved in any humane manner, is completely evident on Darwinian principles. Given two groups, of which one has an increasing and the other a stationary population, the one with the increasing population will (other things being equal) in time become the stronger. After victory, it will cut down the food supply of the vanquished, of whom many will die.* Therefore there will be a continually renewed victory of those nations that, from a world point of view, are unduly prolific. This is merely the modern form of the old struggle for existence. And given scientific powers of destruction, a world which allows this struggle to continue cannot be stable.

PSYCHOLOGICAL

The psychological conditions of stability in a scientific society are to my mind quite as important as the physical and biological conditions, but they are much more difficult to discuss, because psychology is a less advanced science than either physics or biology. Nevertheless, let us make the attempt.

The old rationalist psychology used to assume that if you showed a man quite clearly that a certain course of action would lead to disaster for himself he would probably avoid it. They also took for granted a will to live, except in a negligible minority. Chiefly as a result of psycho-analysis this Benthamite belief that most men pursue their own interest in a more or less reasonable way has not now the hold on informed opinion that it formerly had. But not very many people, among those concerned with politics, have applied modern psychology to the explanation of large-scale social phenomena. This is what I propose, with much diffidence, to attempt.

Consider, as the most important illustration, the present drift towards a third world war. You are arguing, let us say, with an ordinary cheerful non-political and legally sane person. You point out to him what can be done by atom bombs, what Russian occupation of Western Europe would mean in suffering and destruction of culture, what poverty and what regimentation would result even in the event of a fairly quick victory. All this he fully admits, but nevertheless you do not achieve the result for which you had hoped. You make his flesh creep, but he rather enjoys the sensation. You point out the disorganization to be expected, and he thinks: "Well, anyhow, I shan't have to go to the office every morning." You expatiate on the large number of civilian deaths that will take place, and while, in the top layer of his mind, he is duly horrified, there is a whisper in a deeper layer: "Perhaps I shall become a widower, and that might be not so bad." And so, to your disgust, he takes refuge in archaic heroism, and exclaims:

> "Blow wind! some wrack!
> At least we'll die with harness on our back,"

or whatever more prosaic equivalent he may prefer.

Psychologically, there are two opposite maladies which have become so common as to be dominant factors in politics. One is rage, the other listlessness. The typical example of the former was the mentality of the Nazis; of the latter, the mentality in France which weakened resistance to Germany before and during the war. In less acute forms these two maladies exist in other countries, and are,

*Some may think this statement unduly brutal. But if they will look up newspapers of three or four years ago they will find, side by side, indignant letters saying that British labour could not be efficient on a diet of 2,500 calories, and that it was preposterous to suppose that a German needed more than 1,200 calories.

I think, intimately bound up with the regimentation which is associated with industrialism. Rage causes nations to embark on enterprises that are practically certain to be injurious to themselves; listlessness causes other nations to be careless in warding off evils, and generally disinclined to undertake anything arduous. Both are the outcome of a deep malaise resulting from lack of harmony between disposition and mode of life.

One cause of this malaise is the rapidity of change in material conditions. Savages suddenly subjected to European restraints not infrequently die from inability to endure a life so different from what they have been accustomed to. When I was in Japan in 1921 I seemed to sense in the people with whom I talked, and in the faces of the people I met in the streets, a great nervous strain, of the sort likely to promote hysteria. I thought this came from the fact that deep-rooted unconscious expectations were adapted to old Japan, whereas the whole conscious life of town-dwellers was devoted to an effort to become as like Americans as possible. Such a maladjustment between the conscious and the unconscious was bound to produce discouragement or fury, according as the person concerned was less or more energetic. The same sort of thing happens wherever there is rapid industrialization; it must have happened with considerable intensity in Russia.

But even in a country like our own, where industrialism is old, changes occur with a rapidity which is psychologically difficult. Consider what has happened during my lifetime. When I was a child telephones were new and very rare. During my first visit to America I did not see a single motor-car. I was 39 when I first saw an aeroplane. Broadcasting and the cinema have made the life of the young profoundly different from what it was during my own youth. As for public life, when I first became politically conscious Gladstone and Disraeli still confronted each other amid Victorian solidities, the British Empire seemed eternal, a threat to British naval supremacy was unthinkable, the country was aristocratic and rich and growing richer, and Socialism was regarded as the fad of a few disgruntled and disreputable foreigners.

For an old man, with such a background, it is difficult to feel at home in a world of atomic bombs, communism, and American supremacy. Experience, formerly a help in the acquisition of political sagacity, is now a positive hindrance, because it was acquired in such different conditions. It is now scarcely possible for a man to acquire slowly the sort of wisdom which in former times caused "elders" to be respected, because the lessons of experience become out of date as fast as they are learnt. Science, while it has enormously accelerated outward change, has not yet found any way of hastening psychological change, especially where the unconscious and subconscious are concerned. Few men's unconscious feels at home except in conditions very similar to those which prevailed when they were children.

Rapidity of change, however, is only one of the causes of psychological discontent. Another, perhaps more potent, is the increasing subordination of individuals to organizations, which, so far, has seemed to be an unavoidable feature of a scientific society. In a factory containing expensive plant, and depending upon the closely co-ordinated labour of many people, individual impulses must be completely controlled except by the men constituting the management. There is no possibility, in working hours, of either adventure or idleness. And even outside working hours the opportunities are few for most people. Getting from home to work and from work to home takes time; at the end of the day there is neither time nor money for anything very exciting. And what is true of workers in a factory is true, in a greater or less degree, of most people in a well-organized modern community. Most people, when they are no longer quite young, find themselves in a groove—like the man in the limerick, "not a bus, not a bus, but a tram." Energetic people become rebellious, quiet people become apathetic. War, if it comes, offers an escape. I should like a Gallup poll on the question: "Are you more or less happy now than during the war?" This question should be addressed to both men and women. I think it would be found that a very considerable percentage are less happy now than then.

This state of affairs presents a psychological problem which is too little considered by statesmen. It is hopeless to construct schemes for preserving peace if most people would rather not preserve it. As they do not admit, and perhaps do not know, that they would prefer war, their unconscious will lead them to prefer specious schemes that are not likely to achieve their ostensible purpose.

The difficulty of the problem arises from the highly organic character of modern communities, which makes each dependent upon all to a far greater degree than in pre-industrial times. This makes it necessary to restrain impulse more than was formerly necessary. But restraint of impulse, beyond a point, is very dangerous: it causes destructiveness, cruelty, and anarchic rebellion. Therefore, if populations are not to rise up in a fury and destroy their own creations ways must be found of giving more scope for individuality than exists for most people in the modern world. A society is not stable unless it is on the whole satisfactory to the holders of power and the holders of power are not exposed to the risk of successful revolution. But it is also not stable if the holders of power embark upon rash adventures, such as those of the Kaiser and Hitler. These are the Scylla and Charybdis of the psychological problem, and to steer between them is not easy. Adventure, yes; but not adventure inspired by destructive passions.

Conclusions

Let us now bring together the conclusions which result from our inquiry into the various kinds of conditions that a scientific society must fulfil if it is to be stable.

First, as regards physical conditions. Soil and raw materials must not be used up so fast that scientific progress cannot continually make good the loss by means of new inventions and discoveries. Scientific progress is therefore a condition, not merely of social progress, but even of maintaining the degree of prosperity already achieved. Given a stationary technique, the raw materials that it requires will be used up in no very long time. If raw materials are not to be used up too fast, there must not be free competition for their acquisition and use but an international authority to ration them in such quantities as may from time to time seem compatible with continued industrial prosperity. And similar considerations apply to soil conservation.

Second, as regards population. If there is not to be a permanent and increasing shortage of food, agriculture must be conducted by methods which are not wasteful of soil, and increase of population must not outrun the increase in food production rendered possible by technical improvements. At present neither condition is fulfilled. The population of the world is increasing, and its capacity for food production is diminishing. Such a state of affairs obviously cannot continue very long without producing a cataclysm.

To deal with this problem it will be necessary to find ways of preventing an increase in world population. If

this is to be done otherwise than by wars, pestilences, and famines, it will demand a powerful international authority. This authority should deal out the world's food to the various nations in proportion to their population at the time of the establishment of the authority. If any nation subsequently increased its population it should not on that account receive any more food. The motive for not increasing population would therefore be very compelling. What method of preventing an increase might be preferred should be left to each state to decide.

But although this is the logical solution of the problem, it is obviously at present totally impracticable. It is quite hard enough to create a strong international authority, and it will become impossible if it is to have such unpopular duties. There are, in fact, two opposite difficulties. If at the present moment the world's food were rationed evenly the Western nations would suffer what to them would seem starvation. But, on the other hand, the poorer nations are those whose population increases fastest, and who would suffer most from an allocation which was to remain constant. Therefore, as things stand, all the world would oppose the logical solution.

Taking a long view, however, it is by no means impossible that the population problem will in time solve itself. Prosperous industrial countries have low birth rates; Western nations barely maintain their numbers. If the East were to become as prosperous and as industrial as the West, the increase of population might become sufficiently slow to present no insoluble problem. At present Russia, China, and India are the three great reservoirs of procreation and poverty. If those countries reached the level of diffused well-being now existing in America their surplus population might cease to be a menace to the world.

In general terms, we may say that so far as the population problem is concerned a scientific society could be stable if all the world were as prosperous as America is now. The difficulty, however, is to reach this economic paradise without a previous success in limiting population. It cannot be done as things are now without an appalling upheaval. Only government propaganda on a large scale could quickly change the biological habits of Asia. But Eastern governments would never consent to this except after defeat in war. And without such a change of biological habits Asia cannot become prosperous except by defeating the Western nations, exterminating a large part of their population, and opening the territories now occupied by them to Asiatic immigration. For the Western nations this is not an attractive prospect, but it is not impossible that it may happen. Irrational passions and convictions are so deeply involved in the problem that only an infinitesimal minority, even among highly educated people, are willing even to attempt to consider it rationally. That is the main reason for a gloomy prognosis.

Coming, finally, to the psychological conditions of stability, we find again that a high level of economic prosperity is essential. This would make it possible to give long holidays with full pay. In the days before currency restrictions dons and public schoolmasters used to make their lives endurable by risking death in the Alps. Given secure peace, a not excessive population, and a scientific technique of production, there is no reason why such pleasures should not be open to everybody. There will be need also of devolution, of a great extension of federal forms of government, and of keeping alive the kind of semi-independence that now exists in English universities. But I will not develop this theme, as I have dealt with it in my Reith lectures on "Authority and the Individual."

My conclusion is that a scientific society can be stable given certain conditions. The first of these is a single government of the whole world, possessing a monopoly of armed force and therefore able to enforce peace. The second condition is a general diffusion of prosperity, so that there is no occasion for envy of one part of the world by another. The third condition (which supposes the second fulfilled) is a low birth rate everywhere, so that the population of the world becomes stationary, or nearly so. The fourth condition is the provision for individual initiative both in work and play, and the greatest diffusion of power compatible with maintaining the necessary political and economic framework.

The world is a long way from realizing these conditions, and therefore we must expect vast upheavals and appalling suffering before stability is attained. But, while upheavals and suffering have hitherto been the lot of man, we can now see, however dimly and uncertainly, a possible future culmination in which poverty and war will have been overcome, and fear, where it survives, will have become pathological. The road, I fear, is long, but that is no reason for losing sight of the ultimate hope.

VISCERAL ACTINOMYCOSIS*

BY

V. ZACHARY COPE, B.A., M.D., M.S., F.R.C.S.

Consulting Surgeon, St. Mary's Hospital, and Bolingbroke Hospital

The subject I have chosen has never previously been discussed in any lecture in the series, yet for a reason which I shall give I think it would have been of special interest to Dr. Bradshaw. Dr. William Wood Bradshaw became a Fellow of this College in 1854. For many years he was in practice at Andover and Reading, and he was at one time vice-president of the Reading Pathological Society. He died in 1866, and his widow, Mrs. Sally Bradshaw, by a will dated September 6, 1875, left money to found a lectureship whereby the memory of her husband might be perpetually honoured. This will was proved on August 26, 1880.

Between these two dates something interesting had happened: actinomyces had been discovered and the disease "actinomycosis" named. The discovery was made by Bollinger in 1876, and the name was coined by his friend Harz. Now Dr. Bradshaw did not publish many clinical articles, but if you turn to the *Lancet* for 1846 you will find that he gave a remarkable account of a case of abdominal abscess. The description was of a slowly developing hard mass in the right iliac fossa culminating after two years in an abscess, which discharged pus. The patient improved under treatment by potassium iodide, but his condition relapsed and the right thigh became permanently flexed. The patient's general state deteriorated and there was a fatal issue. From the account given there can be little doubt that this was a case of actinomycosis, which, at the time when Dr. Bradshaw's article was published, was unknown. The first case to be noted in man was by Ponfick in 1879, so that by the time Mrs. Bradshaw's will had been proved actinomycosis had been added

*The Bradshaw Lecture delivered at the Royal College of Surgeons of England on November 10. This lecture is being published, with illustrations, in the *Annals of the Royal College of Surgeons of England*. It is published here by kind permission of the President of the College.