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SCIENCE AND VALUES

The philosophy which has seemed appropriate to science has varied from time to time. To Newton and most of his English contemporaries science seemed to afford proof of the existence of God as the Almighty Lawgiver: He had decreed the law of gravitation and whatever other natural laws had been discovered by Englishmen. In spite of Copernicus, Man was still the *moral* centre of the universe, and God's purposes were mainly concerned with the human race. The more radical among the French *philosophes*, being politically in conflict with the Church, took a different view. They did not admit that laws imply a lawgiver; on the other hand, they thought that physical laws could explain human behaviour. This led them to materialism and denial of free will. In their view, the universe has no purpose and man is an insignificant episode. The vastness of the universe impressed them and inspired in them a new form of humility to replace that which atheism had made obsolete. This point of view is well expressed in a little poem by Leopardi and expresses, more nearly than any other known to me, my own feeling about the universe and human passions:

THE INFINITE[1]

Dear to me always was this lonely hill
And this hedge that excludes so large a part
Of the ultimate horizon from my view.
But as I sit and gaze, my thought conceives
Interminable vastnesses of space
Beyond it, and unearthly silences,
And profoundest calm; whereat my heart almost

> Becomes dismayed. And as I hear the wind
> Blustering through these branches, I find myself
> Comparing with this sound that infinite silence;
> And then I call to mind eternity,
> And the ages that are dead, and this that now
> Is living, and the noise of it. And so
> In this immensity my thought sinks drowned:
> And sweet it seems to shipwreck in this sea.

But this has become an old-fashioned way of feeling. Science used to be valued as a means of getting to *know* the world; now, owing to the triumph of technique, it is conceived as showing how to *change* the world. The new point of view, which is adopted in practice throughout America and Russia, and in theory by many modern philosophers, was first proclaimed by Marx in 1845, in his *Theses on Feuerbach*. He says:

> The question whether objective truth belongs to human thinking is not a question of theory, but a practical question. The truth, i.e. the reality and power, of thought must be demonstrated in practice. The contest as to the reality or non-reality of a thought which is isolated from practice, is a purely scholastic question. . . . Philosophers have only *interpreted* the world in various ways, but the real task is to alter it.

From the point of view of technical philosophy, this theory has been best developed by John Dewey, who is universally acknowledged as America's most eminent philosopher.

This philosophy has two aspects, one theoretical and the other ethical. On the theoretical side, it analyses away the concept 'truth', for which it substitutes 'utility'. It used to be thought that, if you believed Caesar crossed the Rubicon, you believed truly, because Caesar did cross the Rubicon. Not so, say the philosophers we are considering: to say that your belief is 'true' is another way of saying that you will find it more profitable than the opposite belief. I might object that there have been cases of historical beliefs which, after being generally accepted for a long time, have in the end been admitted to be mistaken. In the case of such beliefs, every examinee would find the accepted falsehood of his time more profitable than the as yet unacknowledged truth. But this kind of objection is swept aside by the contention that a belief may be 'true' at one time and 'false' at another. In 1920 it was 'true' that Trotsky had a great part in the Russian Revolution; in 1930 it was 'false'. The results of this view have been admirably worked out in George Orwell's '1984'.

This philosophy derives its inspiration from science in several different ways. Take first its best aspect, as developed by Dewey. He points out that

scientific theories change from time to time, and that what recommends a theory is that it 'works'. When new phenomena are discovered, for which it no longer 'works', it is discarded. A theory—so Dewey concludes—is a tool like another; it enables us to manipulate raw material. Like any other tool, it is judged good or bad by its efficiency in this manipulation, and like any other tool, it is good at one time and bad at another. While it is good it may be called 'true', but this word must not be allowed its usual connotations. Dewey prefers the phrase 'warranted assertibility' to the word 'truth'.

The second source of the theory is technique. What do we want to know about electricity? Only how to make it work for us. To want to know more is to plunge into useless metaphysics. Science is to be admired because it gives us power over nature, and the power comes wholly from technique. Therefore an interpretation which reduces science to technique keeps all the useful part, and dismisses only a dead weight of medieval lumber. If technique is all that interests you, you are likely to find this argument very convincing.

The third attraction of pragmatism—which cannot be wholly separated from the second—is love of power. Most men's desires are of various kinds. There are the pleasures of sense; there are aesthetic pleasures and pleasures of contemplation; there are private affections; and there is power. In an individual, any one of these may acquire predominance over the others. If love of power dominates, you arrive at Marx's view that what is important is not to understand the world, but to change it. Traditional theories of knowledge were invented by men who loved contemplation—a monkish taste, according to modern devotees of mechanism. Mechanism augments human power to an enormous degree. It is therefore this aspect of science that attracts the lovers of power. And if power is all you want from science, the pragmatist theory gives you just what you want, without accretions that to you seem irrelevant. It gives you even more than you could have expected, for if you control the police it gives you the god-like power of *making truth*. You cannot make the sun cold, but you can confer pragmatic 'truth' on the proposition 'the sun is cold' if you can insure that everyone who denies it is liquidated. I doubt whether Zeus could do more.

This engineer's philosophy, as it may be called, is distinguished from common sense and from most other philosophies by its rejection of 'fact' as a fundamental concept in defining 'truth'. If you say, for example, 'the South Pole is cold', you say something which, according to traditional views, is 'true' in virtue of a 'fact', namely that the South Pole is cold. And this is a fact, not because people believe it, or because it pays to believe it; it just *is* a fact. Facts, when they are not about human beings and their doings, represent the limitations of human power. We find ourselves in a universe of a certain sort, and we find out what sort of a universe it is by observation, not by self-assertion. It is true that we can make changes on or near the surface

of the earth, but not elsewhere. Practical men have no wish to make changes elsewhere, and can therefore accept a philosophy which treats the surface of the earth as if it were the whole universe. But even on the surface of the earth our power is limited. To forget that we are hemmed in by facts which are for the most part independent of our desires is a form of insane megalomania. This kind of insanity has grown up as a result of the triumph of scientific technique. Its latest manifestation is Stalin's refusal to believe that heredity can have the temerity to ignore Soviet decrees, which is like Xerxes whipping the Hellespont to teach Poseidon a lesson.

'The pragmatic theory of truth [I wrote in 1907] is inherently connected with the appeal to force. If there is a non-human truth, which one man may know while another does not, there is a standard outside the disputants, to which, we may urge, the dispute ought to be submitted; hence a pacific and judicial settlement of disputes is at least theoretically possible. If, on the contrary, the only way of discovering which of the disputants is in the right is to wait and see which of them is successful, there is no longer any principle except force by which the issue can be decided. . . . In international matters, owing to the fact that the disputants are often strong enough to be independent of outside control, these considerations become more important. The hopes of international peace, like the achievement of internal peace, depend upon the creation of an effective force of public opinion formed upon an estimate of the rights and wrongs of disputes. Thus it would be misleading to say that the dispute is decided by force, without adding that force is dependent upon justice. But the possibility of such a public opinion depends upon the possibility of a standard of justice which is a cause, not an effect, of the wishes of the community; and such a standard of justice seems incompatible with the pragmatist philosophy. This philosophy, therefore, although it begins with liberty and toleration, develops, by inherent necessity, into the appeal to force and the arbitrament of the big battalions. By this development it becomes equally adapted to democracy at home and to imperialism abroad. Thus here again it is more delicately adjusted to the requirements of the time than any other philosophy which has hitherto been invented.

'To sum up: Pragmatism appeals to the temper of mind which finds on the surface of this planet the whole of its imaginative material; which feels confident of progress, and unaware of non-human limitations to human power; which loves battle, with all the attendant risks, because it has no real doubt that it will achieve victory; which desires religion, as it desires railways and electric light, as a comfort and a help in the affairs of this world, not as providing non-human objects to satisfy the hunger for perfection. But for those who feel that life on this planet would be a life in prison if it were not for the windows into a greater world beyond; for those to whom a belief in man's omnipotence seems arrogant; who desire rather the stoic freedom that

comes of mastery over the passions than the Napoleonic domination that sees the kingdoms of this world at its feet—in a word, to men who do not find man an adequate object of their worship, the pragmatist's world will seem narrow and petty, robbing life of all that gives it value, and making man himself smaller by depriving the universe which he contemplates of all its splendour.'

Let us now try to sum up what increases in human happiness science has rendered possible, and what ancient evils it is in danger of intensifying.

I do not pretend that there is any way of arriving at the millennium. Whatever our social institutions, there will be death and illness (though in a diminishing quantity); there will be old age and insanity; there will be either danger or boredom. So long as the present family survives, there will be unrequited love and parents' tyranny and children's ingratitude; and if something new were substituted for the family, it would bring new evils, probably worse. Human life cannot be made a matter of unalloyed bliss, and to allow oneself excessive hopes is to court disappointment. Nevertheless what can be soberly hoped is very considerable. In what follows, I am not prophesying what *will* happen, but pointing out the best that *may* happen, and the further fact that this best will happen if it is widely desired.

There are two ancient evils that science, unwisely used, may intensify: they are tyranny and war. But I am concerned now rather with pleasant possibilities than with unpleasant ones.

Science can confer two kinds of benefits: it can diminish bad things, and it can increase good things. Let us begin with the former.

Science can abolish poverty and excessive hours of labour. In the earliest human communities, before agriculture, each human individual required two or more square miles to sustain life. Subsistence was precarious and death from starvation must have been frequent. At that stage, men had the same mixture of misery and carefree enjoyment as still makes up the lives of other animals.

Agriculture was a technical advance of the same kind of importance as attaches to modern machine industry. The way that agriculture was used is an awful warning to our age. It introduced slavery and serfdom, human sacrifice, absolute monarchy and large wars. Instead of raising the standard of life, except for a tiny governing minority, it merely increased the population. On the whole, it probably increased the sum of human misery. It is not impossible that industrialism may take the same course.

Fortunately, however, the growth of industrialism has coincided in the West with the growth of democracy. It is possible now, if the population of the world does not increase too fast, for one man's labour to produce much more than is needed to provide a bare subsistence for himself and his family. Given an intelligent democracy not misled by some dogmatic creed this

possibility will be used to raise the standard of life. It has been so used, to a limited extent, in Britain and America, and would have been so used more effectively but for war. Its use in raising the standard of life has depended mainly upon three things: democracy, trade unionism, and birth control. All three, of course, have incurred hostility from the rich. If these three things can be extended to the rest of the world as it becomes industrialized, and if the danger of great wars can be eliminated, poverty can be abolished throughout the whole world and excessive hours of labour will no longer be necessary anywhere. But without these three things, industrialism will create a régime like that in which the Pharaohs built the pyramids. In particular, if world population continues to increase at the present rate, the abolition of poverty and excessive work will be totally impossible.

Science has already conferred an immense boon on mankind by the growth of medicine. In the eighteenth century people expected most of their children to die before they were grown up. Improvement began at the beginning of the nineteenth century, chiefly owing to vaccination. It has continued ever since and is still continuing. In 1920 the infant mortality in England and Wales was 80 per thousand, in 1948 it was 34 per thousand. The general death rate in 1948 (10.8) was the lowest ever recorded up to that date. There is no obvious limit to the improvement of health that can be brought about by medicine. The sum of human suffering has also been much diminished by the discovery of anaesthetics.

The general diminution of lawlessness and crimes of violence would not have been possible without science. If you read eighteenth-century novels, you get a strange impression of London: unlighted streets, footpads and highwaymen, nothing that we should count as a police force, but, in a futile attempt to compensate for all this, an abominably savage and ferocious criminal law. Street lighting, telephones, finger-printing, and the psychology of crime and punishment are scientific advances which have made it possible for the police to reduce crime below anything that the most Utopian philosopher of the 'Age of Reason' would have imagined possible.

Coming now to positive goods, there is, to begin with, an immense increase of education which has been rendered possible by the increased productivity of labour. As regards general education, this is most marked in America, where even university education is free. If I took a taxi in New York, I would often find that the driver was a Ph.D., who would start arguing about philosophy at imminent risk to himself and me. But in England as well as in America the improvement at the highest level is equally remarkable. Read, for instance, Gibbon's account of Oxford.

With this goes an increase of opportunity. It is much easier than it used to be for an able young man without what are called 'natural' advantages (i.e. inherited wealth) to rise to a position in which he can make the best use of his

talents. In this respect there is still much to be done, but there is every reason to expect that in England and in America it will be done. The waste of talent in former times must have been appalling; I shudder to think how many 'mute inglorious Miltons' there must have been. Our modern Miltons, alas, remain for the most part inglorious, though not mute. But ours is not a poetic age.

Finally, there is more diffused happiness than ever before, and if the fear of war were removed this improvement would be very much greater than it is.

Let us consider for a moment the kind of disposition that must be widely diffused if a good world is to be created and sustained.

I will begin with the intellectual temper that is required. There must be in many a desire to know the important facts, and in most an unwillingness to give assent to pleasant illusions. There are in the world at the present day two great opposing systems of dogma: Catholicism and Communism. If you believe either with such intensity that you are prepared to face martyrdom, you can live a happy life, and even enjoy a happy death if it comes quickly. You can inspire converts, you can create an army, you can stir up hatred of the opposite dogma and its adherents, and generally you can *seem* immensely effective. I am constantly asked: What can you, with your cold rationalism, offer to the seeker after salvation that is comparable to the cosy home-like comfort of a fenced-in dogmatic creed?

To this the answer is many-sided. In the first place, I do not say that I can offer as much happiness as is to be obtained by the abdication of reason. I do not say that I can offer as much happiness as is to be obtained from drink or drugs or amassing great wealth by swindling widows and orphans. It is not the happiness of the individual convert that concerns me; it is the happiness of mankind. If you genuinely desire the happiness of mankind, certain forms of ignoble personal happiness are not open to you. If your child is ill, and you are a conscientious parent, you accept medical diagnosis, however doubtful and discouraging; if you accept the cheerful opinion of a quack and your child consequently dies, you are not excused by the pleasantness of belief in the quack while it lasted. If people loved humanity as genuinely as they love their children, they would be as unwilling in politics as in the home to let themselves be deceived by comfortable fairy tales.

The next point is that all fanatical creeds do harm. This is obvious when they have to compete with other fanaticisms, since in that case they promote hatred and strife. But it is true even when only one fanatical creed is in the field. It cannot allow free inquiry, since this might shake its hold. It must oppose intellectual progress. If, as is usually the case, it involves a priesthood, it gives great power to a caste professionally devoted to maintenance of the intellectual status quo, and to a pretence of certainty where in fact there is no certainty.

Every fanatical creed essentially involves hatred. I knew once a fanatical

advocate of an international language, but he preferred Ido to Esperanto. Listening to his conversation, I was appalled by the depravity of the Esperantists, who, it seemed, had sunk to hitherto unimaginable depths of wickedness. Luckily my friend failed to convince any government, and so the Esperantists survived. But if he had been at the head of a state of two hundred million inhabitants, I shudder to think what would have happened to them.

Very often the element of hatred in a fanatical doctrine becomes predominant. People who tell you they love the proletariat often in fact only hate the rich. Some people who believe that you should love your neighbour as yourself think it right to hate those who do not do so. As these are the vast majority, no notable increase of loving kindness results from their creed.

Apart from such specific evils, the whole attitude of accepting a belief unquestioningly on a basis of authority is contrary to the scientific spirit, and, if widespread, scarcely compatible with the progress of science. Not only the Bible, but even the works of Marx and Engels, contain demonstrably false statements. The Bible says the hare chews the cud, and Engels said that the Austrians would win the war of 1866. These are only arguments against fundamentalists. But when a Sacred Book is retained while fundamentalism is rejected, the authority of The Book becomes vested in the priesthood. The meaning of 'dialectical materialism' changes every decade, and the penalty for a belated interpretation is death or the concentration camp.

The triumphs of science are due to the substitution of observation and inference for authority. Every attempt to revive authority in intellectual matters is a retrograde step. And it is part of the scientific attitude that the pronouncements of science do not claim to be certain, but only to be the most probable on present evidence. One of the greatest benefits that science confers upon those who understand its spirit is that it enables them to live without the delusive support of subjective certainty. That is why science cannot favour persecution.

The desire for a fanatical creed is one of the great evils of our time. There have been other ages with the same disease: the late Roman Empire and the sixteenth century are the most obvious examples. When Rome began to decay, and when, in the third century, barbarian irruptions produced fear and impoverishment, men began to look for safety in another world. Plotinus found it in Plato's eternal world, the followers of Mithra in a solar Paradise, and the Christians in heaven. The Christians won, largely because their dogmatic certainty was the greatest. Having won, they started persecuting each other for small deviations, and hardly had leisure to notice the barbarian invaders except to observe that they were Arians—the ancient equivalent of Trotskyites. The religious fervour of that time was a product of fear and despair; so is the religious fervour—Christian or Communist—of our age. It is an irrational reaction to danger, tending to bring about what it fears. Dread

of the hydrogen bomb promotes fanaticism, and fanaticism is more likely than anything else to lead to actual use of the hydrogen bomb. Heavenly salvation perhaps, if the fanatics are right, but earthly salvation is not to be found along that road.

I will say a few words about the connection of love with intellectual honesty. There are several different attitudes that may be adopted towards the spectacle of intolerable suffering. If you are a sadist, you may find pleasure in it; if you are completely detached, you may ignore it; if you are a sentimentalist, you may persuade yourself that it is not as bad as it seems; but if you feel genuine compassion you will try to apprehend the evil truly in order to be able to cure it. The sentimentalist will say that you are coldly intellectual, and that, if you really minded the sufferings of others, you could not be so scientific about them. The sentimentalist will claim to have a tenderer heart than yours, and will show it by letting the suffering continue rather than suffer himself.

There is a tender-hearted lady in Gilbert and Sullivan who remarks:

I heard one day	A gentleman say
That criminals who	Are sawn in two
Do not much feel	The fatal steel
But come in twain	Without much pain.
If this be true	How lucky for you.

Similarly, the men who made the Munich surrender would pretend, (*a*) that the Nazis didn't go in for pogroms, (*b*) that Jews enjoy being massacred. And fellow-travellers maintain, (*a*) that there is no forced labour in Russia, (*b*) that there is nothing Russians find more delectable than being worked to death in an Arctic winter. Such men are not 'coldly intellectual'.

The most disquieting psychological feature of our time, and the one which affords the best argument for the necessity of some creed, however irrational, is the death wish. Everyone knows how some primitive communities, brought suddenly into contact with white men, become listless, and finally die from mere absence of the will to live. In Western Europe, the new conditions of danger which exist are having something of the same effect. Facing facts is painful, and the way out is not clear. Nostalgia takes the place of energy directed towards the future. There is a tendency to shrug the shoulders and say 'Oh well, if we are exterminated by hydrogen bombs, it will save a lot of trouble'. This is a tired and feeble reaction, like that of the late Romans to the barbarians. It can only be met by courage, hope, and a reasoned optimism. Let us see what basis there is for hope.

First: I have no doubt that, leaving on one side, for the moment, the danger of war, the average level of happiness, in Britain as well as in America, is

higher than in any previous community at any time. Moreover improvement continues whenever there is not war. We have therefore something important to conserve.

There are certain things that our age needs, and certain things that it should avoid. It needs compassion and a wish that mankind should be happy; it needs the desire for knowledge and the determination to eschew pleasant myths; it needs, above all, courageous hope and the impulse to creativeness. The things that it must avoid, and that have brought it to the brink of catastrophe, are cruelty, envy, greed, competitiveness, search for irrational subjective certainty, and what Freudians call the death wish.

The root of the matter is a very simple and old-fashioned thing, a thing so simple that I am almost ashamed to mention it, for fear of the derisive smile with which wise cynics will greet my words. The thing I mean—please forgive me for mentioning it—is love, Christian love, or compassion. If you feel this, you have a motive for existence, a guide in action, a reason for courage, an imperative necessity for intellectual honesty. If you feel this, you have all that anybody should need in the way of religion. Although you may not find happiness, you will never know the deep despair of those whose life is aimless and void of purpose; for there is always something that you can do to diminish the awful sum of human misery.

What I do want to stress is that the kind of lethargic despair which is now not uncommon, is irrational. Mankind is in the position of a man climbing a difficult and dangerous precipice, at the summit of which there is a plateau of delicious mountain meadows. With every step that he climbs, his fall, if he does fall, becomes more terrible; with every step his weariness increases and the ascent grows more difficult. At last there is only one more step to be taken, but the climber does not know this, because he cannot see beyond the jutting rocks at his head. His exhaustion is so complete that he wants nothing but rest. If he lets go he will find rest in death. Hope calls: 'One more effort—perhaps it will be the last effort needed.' Irony retorts: 'Silly fellow! Haven't you been listening to hope all this time, and see where it has landed you.' Optimism says: 'While there is life there is hope.' Pessimism growls: 'While there is life there is pain.' Does the exhausted climber make one more effort, or does he let himself sink into the abyss? In a few years those of us who are still alive will know the answer.

Dropping metaphor, the present situation is as follows: science offers the possibility of far greater well-being for the human race than has ever been known before. It offers this on certain conditions: abolition of war, even distribution of ultimate power, and limitation of the growth of population. All these are much nearer to being possible than they ever were before. In Western industrial countries, the growth of population is almost nil; the same causes will have the same effect in other countries as they become

modernized, unless dictators and missionaries interfere. The even distribution of ultimate power, economic as well as political, has been nearly achieved in Britain, and other democratic countries are rapidly moving towards it. The prevention of war? It may seem a paradox to say that we are nearer to achieving this than ever before, but I am persuaded that it is true. I will explain why I think so.

In the past, there were many sovereign States, any two of which might at any moment quarrel. Attempts on the lines of the League of Nations were bound to fail, because, when a dispute arose, the disputants were too proud to accept outside arbitration, and the neutrals were too lazy to enforce it. Now there are only two sovereign States: Russia (with satellites) and the United States (with satellites). If either becomes preponderant, either by victory in war or by an obvious military superiority, the preponderant Power can establish a single Authority over the whole world, and thus make future wars impossible. At first this Authority will, in certain regions, be based on force, but if the Western nations are in control, force will as soon as possible give way to consent. When that has been achieved, the most difficult of world problems will have been solved, and science can become wholly beneficent.

I do not think there is reason to fear that such a régime, once established, would be unstable. The chief causes of large-scale violence are: love of power, competition, hate, and fear. Love of power will have no national outlet when all serious military force is concentrated in the international army. Competition will be effectively regulated by law, and mitigated by governmental controls. Fear—in the acute form in which we know it—will disappear when war is no longer to be expected. There remains hate and malevolence. This has a deep hold on human nature. We all believe at once any gossip discreditable to our neighbours, however slender the evidence may be. After the first world war many people hated Germany so much that they could not believe in injury to themselves as a necessary result of extreme severity to the Germans. One sees in Congress a widespread reluctance to admit that self-preservation requires help to Western Europe. America wishes to sell without buying, but finds that this often involves giving rather than selling; the benefit to the recipients is felt by many to be almost unendurable. This wide diffusion of malevolence is one of the most unfortunate things in human nature, and it must be lessened if a world State is to be stable.

I am persuaded that it can be lessened, and very quickly. If peace becomes secure there will be a very rapid increase of material prosperity, and this tends more than anything else to provide a mood of kindly feeling. Consider the immense diminution of cruelty in Britain during the Victorian age; this was mainly due to rapidly increasing wealth in all classes. I think we may confidently expect a similar effect throughout the world owing to the increased wealth that will result from the elimination of war. A great deal,

also, is to be hoped from a change in propaganda. Nationalist propaganda, in any violent form, will have to be illegal, and children in schools will not be taught to hate and despise foreign nations. Active instruction in the evils of the old times and the advantages of the new system would do the rest. I am convinced that only a few psychopaths would wish to return to the daily dread of radio-active disintegration.

What stands in the way? Not physical or technical obstacles, but only the evil passions in human minds: suspicion, fear, lust for power, hatred, intolerance. I will not deny that these evil passions are more dominant in the East than in the West, but they certainly exist in the West as well. The human race could, here and now, begin a rapid approach to a vastly better world, given one single condition: the removal of mutual distrust between East and West. I do not know what can be done to fulfil this condition. Most of the suggestions that I have seen have struck me as silly. Meanwhile the only thing to do is to prevent an explosion somehow, and to hope that time may bring wisdom. The near future must either be much better or much worse than the past; which it is to be will be decided within the next few years.

(*The Impact of Science on Society*, London: Allen & Unwin, 1952;
New York: Columbia University Press, 1951 and
Simon & Schuster, 1953.)

NOTE

1 Translation by R. C. Trevelyan from *Translations from Leopardi*: Cambridge University Press, 1941.