

# The Growth of Thought in Society<sup>1</sup>

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A MOVEMENT denying the justification of pure science was started in England in 1931 by a group of Soviet delegates, including Bucharin and Hessen,<sup>2</sup> at an International Congress of the History of Science, held in that year in London. It has been carried on since with considerable success by a number of able writers, mostly Marxists, under the leadership of L. Hogben, J. D. Bernal, and J. G. Crowther. As a result the idea of pure science is considered to-day as obsolete and reactionary by most of the scientists who take an active interest in the position of science in society. Though such scientists form a comparatively small minority, they have now brought considerable influence to bear on important organisations and publications dealing with scientific policy.

The doctrine of this school can be summed up in three points. (1) Pure science, as distinct from scientific technology, has no real existence. All science, pure or applied, arises in response to the specific practical needs of contemporary society. The ideals of a disinterested search for truth and of the cultivation of science for its own sake are unsocial and futile.<sup>3</sup> (2) Modern science in the last 300 years pursued this wrong tendency, which must now be replaced by a social control of science in the interests of the community.<sup>4</sup> It follows that resistance of scientists to social control of research and their claim for freedom of research is unreasonable. (3) Instead of urging such claims, scientists ought to join in the struggle for the establishment of the right kind of political power, which may be expected to advance science in the right direction.<sup>5</sup>

<sup>1</sup> The following reflections are occasioned by J. G. Crowther, *Social Relations of Science* (Macmillan & Co.), 1941, xxxii + 665 pp., 16s. net. (Henceforth referred to as *S.R.S.*)

<sup>2</sup> See *Science at the Crossroads* (Kniha), 1931. Hessen's article on Newton is considered by Professor Bernal "as the starting point for England of a new evaluation of the history of science" (*Social Functions of Science*, 1939, p. 406).

<sup>3</sup> These ideas were first made popular by Professor L. Hogben, himself not a Marxist, in *Science for the Citizen* (1938), from which a characteristic quotation is discussed below (pp. 452-3). This book had an enormous success. Another statement, even more effective among scientists, was that by J. D. Bernal in *The Social Functions of Science*; in his chapter on Pure Science (pp. 95-98) he ridicules the ideal of Pure Science as mere snobbism. J. G. Crowther in *S.R.S.*, p. 522, calls the disinterested pursuit of truth "a little cold, mean and selfish" compared with problems of practical use.

<sup>4</sup> *S.R.S.*, p. 352, condemns "three centuries piling up discoveries in regions of research artificially isolated from the general body of knowledge of social affairs."

<sup>5</sup> J. D. Bernal, *Social Functions of Science*, p. 404, says scientists should support Popular Front. Crowther, *S.R.S.*, p. 332, urges scientists to struggle for the rise to power of a "progressive class" and get the change over quickly.

This last point is now elaborated by Mr. Crowther, with obvious reference to the Communist Revolution, as it occurred in the past in Russia—and is expected by him to happen also everywhere else. We are told that in establishing the rule of—what Mr. Crowther calls—“progressive governing class”, the most ruthless methods are justified. The main point is to get the necessary change over quickly. The methods of the Spanish Inquisition are recommended.<sup>1</sup> Their past application by the Soviet authorities is excused as “imperfections due to the limitations of mankind”. Scientists who fell victim to such persecution are charged—without any evidence—of having brought it on themselves “by short-sighted opposition”.<sup>2</sup>

These maxims concerning the position of science are identical in principle with those of Fascist Totalitarianism, as described for example by Rauschnig in *Hitler Speaks*. A reference to this text by Mr. Crowther<sup>3</sup> supports this identification. Needless to say, in Hitler's eyes, the “progressive governing class” is the “ruling race” of Nazi Germans.

The purpose of this essay is to analyse the part played in society by the ideal of Science and by the ideals of other aspects of truth. We shall trace the principles of organisation which are appropriate for the service of these ideals, and through which the intellectual and moral order of society is established and developed further. We shall show that these organisations must be free, and that they must conflict with the claims of a Totalitarian State. Finally we shall demonstrate that the abandonment of the ideals of truth logically entails the replacement of these ideals by fanaticism coupled with cynicism—and that the establishment of a totalitarian rule of unscrupulous fanatics must follow.

#### PERSONAL INTEREST IN SCIENCE

The totalitarian doctrine asserts that scientists who cultivate science for its own sake are neglecting their duty to the community. They are reproached with seeking their private amusement heedless of the financial cost and irrespective of the consequences to society. Such unsocial practice—it is urged—ought to be suppressed, and science should instead be conducted as a public service. Scientific progress should be planned and directed by the authority representing the interests of society—that is by the State.

This argument assumes the totalitarian view of the structure of society. It implies that the social order is upheld by the commands of the State; all apparently independent manifestation under the

<sup>1</sup> “Inquisition is beneficial to science when it protects a rising class” (p. 333). “The danger or value of an Inquisition depends on whether it is used on behalf of a reactionary or a progressive governing class” (p. 331).

<sup>2</sup> *S.R.S.*, p. 557.

<sup>3</sup> *S.R.S.*, p. xxix: “Hitler's view is extremely dangerous because in relation to the present situation it contains more truth than the conventional idealistic view.”

State being either mere pretence or else representing some private residue to which the State has made no claim. Totalitarians assert that this is the actual state of affairs, basically, in the democracies; and that the totalitarian state, built on these lines, represents the only honest and logical position for the State power. In their view, therefore, an independent personal action can never claim to perform a social function; it can only be a private amusement, which, if it affects the public, will—more often than not—result in a public nuisance.

In order to prepare the critique of this doctrine—which will form the larger part of my subject here—I shall first briefly define the position of private freedom, about the nature of which the totalitarian and the liberal view of society do not differ in principle; though they do regard its value in a different light.

Private freedom may be represented as the converse of personal servitude. When it is completely absent, men are reduced to the state of slaves or villeins. Medieval authorities on the Common Law define this freedom as the condition in which a man's obligations are defined, and not to be varied at a master's pleasure.<sup>1</sup> The most decisive step towards a free status consisted in the fixing of feudal dues by custom, law and written copy. As a final stage in his emancipation the peasant acquired the right to discharge his obligations in cash, not in labour or produce. This commutation enabled him to dispose freely of his own time and to engage only in such work as was most congenial and profitable. The desire for greater freedom in this personal sense continues to enter as a factor into many modern relationships, as in the case of domestic servants, who prefer factory employment, which is more strenuous and less well paid, for the greater personal freedom which it accords.

The desire for personal freedom is the desire to be left alone; it does not define its purpose, because that would limit the freedom which is wanted. The demand is entirely irresponsible, and is put forward as a personal right of the individual. Liberals recognise and encourage the right to personal freedom, because they connect it with wider classes of human and social liberty. The totalitarian view admits the existence of no form of liberty other than that of private freedom, and sees therefore no reason to encourage its claims. It may tolerate personal freedom, but only so far as this does in no way affect the collective interests of the community. And above all, it insists, and must insist—as shown below—on identifying irresponsible private freedom with liberty in general, and arguing that hence social responsibility can only be achieved by the opposite of liberty: which is subordination to the orders of the State.

<sup>1</sup> Thus Bracton says: "For that is an absolute villeinage from which an uncertain and indeterminate service is rendered, where it cannot be known in the evening what service is to be rendered in the morning, that is where a person is bound to do whatever is enjoined to him."

A more general view of liberty, extending far beyond the claims of private freedom, will be most readily gained after a brief analysis of the two kinds of order which are known to occur both in nature and in society: one resulting from the exercise of authority *over* a group, the other from the enjoyment of freedom by the individuals *in* a group.

#### TWO KINDS OF ORDER

Wherever we see an arrangement of things, or of men, in good order, we instinctively assume that someone has intentionally placed them in this way. A well kept garden must have been laid out; a machine, working properly, must have been constructed; a company on parade must have been drilled and placed under command; that is the obvious way for order to emerge. This method of establishing order consists in limiting the freedom of things and men to stay or move about at their pleasure, by assigning to each a specific position in a pre-arranged plan.

But there does exist another, less conspicuous, type of order which is based on the opposite principle. The water in a jug settles down, filling the hollow of the vessel perfectly, in even density, up to the level of a horizontal plane forming its free surface. A perfect arrangement, such as no human artifice could reproduce, if the process of gravitation and cohesion, to which it is due, refused to function for a moment. Yet any number of such containers of varied and complex shapes, joined to a system of communicating vessels, could be filled in the same perfect and uniform way up to a common horizontal plane—merely by letting a liquid come to rest in them.

In this type of order no constraint is applied specifically to the individual particles; the forces from outside, like the resistance of the vessels and the forces of gravitation, take effect in an entirely indiscriminate fashion. The particles are thus free to obey the internal forces acting between them, and the resultant order represents the equilibrium between all the internal and external forces.

If the latter are absent or negligible, and the internal forces operate alone, the resulting equilibria present even more striking regularities. Fluids, gases and liquids take on spherical shapes; and at lower temperatures substances solidify into crystals, in which the atoms are arrayed at faultlessly even intervals in the three dimensions of space.

The molecules of half a dozen different substances dissolved together in a glass of hot water will deposit on cooling within a few minutes, each building up separate crystals of its own. Many millions of molecules of each substance will be sorted out from the others and neatly stacked up in its separate regularly spaced piles. The achievement may be compared in its magnitude with the sorting out, and careful arrangement into separate regular stacks, of the differently coloured marbles of a layer covering the whole planet. Such a task

would keep the whole of humanity busy for years ; yet a similar one is accomplished at no cost in a few seconds by the internal forces acting between a group of particles.

It is clear that the intervention of any human ordering agency which attempted to take over the task of the internal forces would be entirely ineffective. By directing the particles to wait their turn, to be picked out and arranged individually, the authorities would merely petrify a chaotic situation which they would never succeed in disentangling by methods based on the exercise of specific discrimination between individual particles. We may conclude that when very large numbers are to be arranged carefully, this can be achieved only by the spontaneous mutual adjustment of the units ; not by specific assignment of the several units to positions in a pre-arranged plan.

There is, of course, in general, no reason to expect such mutual interactions (internal forces) to be present between the units as will lead to the formation of a desirable orderly arrangement between them. Crystallising forces might be altogether absent, as in the case of the differently coloured marbles mentioned before which have no tendency to segregate spontaneously, as would different kinds of molecules. Or again the new order may be undesirable, as in the case of a chemical reaction yielding products that are not wanted, when performed in an unfavourable medium. We shall see later, when we apply these considerations to social problems, that the result of spontaneous ordering can be influenced by regulating or modifying the nature of mutual interactions between the units, which in this case consists of men or small organised bodies of men. At the moment we want only to confirm from this discussion that whatever such modifications may amount to, they will never turn a process of "crystallisation" into one of ordering according to specific plan ; and that, hence, in case the careful adjustment of a very large number of units is wanted, we have to accept one or another spontaneously arising order, and our choice will be greatly limited thereby, as compared with the number of desirable patterns our imagination can conceive.

This does not imply that spontaneously attained order cannot be of the highest degree of complexity. According to W. Koehler, the perception of *Gestalt* is due to the mutual interaction of the elements in the sensory field.<sup>1</sup> The evolution of the embryo from the fertilised cell may also be regarded as arising from the continuous tendency of its particles, interacting with the nurturing medium, to come to an internal equilibrium. The particles in the field of one "organiser" seem to be in complete mutual interaction, ready to take up in the developing whole any part which may fall to them through the interplay of the internal forces of the system. The entire evolution of species is commonly thought to have resulted from a continued process

<sup>1</sup> W. Koehler, *Gestalt Psychology*, New York, 1929.

of internal equilibration in living matter, under varying outside circumstances.

Such examples, however, should not prejudice us in favour of order by mutual adjustment, and against specifically planned order. Where smaller members are concerned, the latter is likely to show a greatly superior performance; and, of course, all machinery and mechanical technique of man demonstrate this superiority when numbers are small enough. The two alternative and opposite methods of achieving order—by limiting the freedom of the particles, or by giving full scope to their interactions—have their respective uses, and, owing to their extremely different operational principles, should rarely come into competition with each other. They will, however, usually be found combined to some extent in the way mutually exclusive elements combine: namely, one filling up the gaps left over by the other, and vice versa. Ordinary examples of this relationship are obvious enough: we will discuss it further when applying it to society.

#### CORPORATE ORDER

The main difficulty in handling men according to a pre-arranged plan lies in the fact that the outcome of human endeavour is mostly uncertain and is often worth while only to the extent to which it is uncertain. Sometimes this is obvious enough. Everyone understands that in a war the plans for the further conduct of the campaign cannot be completed twelve months ahead and presented at the beginning of each fiscal year with all the main battles clearly set out and a reasonable estimate of the costs included. And—though some passionate planners may speak as if they did not realise that this also largely applies to the conduct of research and production even in normal times—it is usually accepted that no activity in which new problems of any importance have to be solved can be planned in advance according to a time-table.

This will be the more true the more thoroughgoing is the proposed planning: that is, the more complete is the co-ordination of the individual actions according to the plan, and the less is left to the discretion of the individuals who are to carry it out. A closely co-ordinated body of men, applying themselves to a difficult task, will require re-direction almost every day in order to meet new problems as and when they arise. For this there must be a person in charge with responsibility to re-plan and re-organise continuously the joint activities of the men. They must form a corporation under the authority of a chief executive.

The chief, unable to give orders directly to more than 5-6 subordinates, will devolve his powers to successive tiers of subordinate officials below him. These broaden out at each stage, down to the lowest tier, which contain the officials in charge of the working men and women actually handling the job. The directions of the chief descend to these through a pyramid of authority, which is also an

organ for reporting upwards the events occurring below in the line of workers.

In a closely co-ordinated corporation each person's work is determined by the directions received from above, and all his communications regarding his work are in the form of reports to his superior. An official's direct contacts are essentially limited to the one man above him and to the 5-6 immediate subordinates below him. Any direct official contacts he may make beyond that would necessarily be at the expense of effective organisation. Since they would inevitably short-circuit some of the lines of authority on which that organisation relies, they would cut off either a superior or a subordinate, as the case may be, from some of his proper responsibilities.

The actions of a perfectly co-ordinated corporate body are essentially those of the one man at the top, who is the only one in the corporation acting independently. All others must obey first, and act only within the limits of, the changing directives issued daily by their superiors. The chief alone is allowed to deal with the wider perspectives and longer range problems of the corporation, he alone can evolve a strategy or policy and exercise powers of judgment of a high order. The lower ranks have only fragmentary tasks allotted to them, which they must solve within a scope limited by another man's decisions. They can show skill of various degrees, but, being tied down to a mere detail in another man's scheme, they can exercise no creative faculty of their own.

The immense strength of this method consists in welding the efforts of many men to one joint whole, which reflects the ideas of the chief and his advisers. The organisation elaborates these ideas into a wealth of details and co-ordinates the men at the bottom of the pyramid to carry them out. Each of these participates in a specific function of his own. It is by virtue of the superior efficiency of a far-reaching division of labour that the corporation forms a whole; greatly exceeding in effectiveness that of the aggregate of its participants, when operating as single individuals.

Some of the limitations of the corporate method can be derived from this analysis. A corporation charged with a number of tasks which are by nature separate will tend to split up into smaller operational units. Severe troubles will result if the separate tasks in question must use some resources in common.

But the type of administrative difficulty which is most illuminating for our subject is that which occurs when the authorities undertake to commandeer very large numbers of people and very diverse materials for special purposes at a variety of places. The results of such attempts—which are unavoidable in wartime—are large-scale maladjustments, which are manifested in the forms of indefinitely accumulating stocks in one place, of machinery without workers in another, and of men waiting to be given jobs almost everywhere. The difficulty arises here from the fact that the task inherently requires

a larger number of adjustments than a corporate organisation can carry out or control. The sorting out of men belonging to many hundred different professional grades and of materials of many thousand different qualities, and the re-grouping of men and materials into various productive units, cannot be carried out by a type of organisation in which each individual man and piece of property is assigned to a small sub-section, communicating only by an official channel of impassable length with any other small sub-section. The efforts to adjust the numerous lateral contacts involved in the re-grouping of conscripted men and materials will choke the official channels, and result in symptoms of paralysis below. Or else, if a large amount of cross linking is allowed at the base, the result will be the collapse of authority at the top and the spread of irresponsible activity throughout. Cross-links will often be established by impatient subordinates, tired of waiting for the official procedure to connect them with others. Thus arises all the futility, impotence and demoralisation with which corporations become impregnated, when they are put to tasks that are too complex for them.

This is the reason why, as already mentioned in the previous chapter, the scope of all specific ordering is limited to a comparatively small number of elements. Men cannot arrange large numbers in complex patterns: complex in the sense that each element is related specifically to many others; and this deficiency of man is not greatly offset by a devolution of his powers through tiers of subordinates to an entire corporation of officials. We have observed before that no authority can take over a task of ordering, achieved by mutual adjustment of large numbers. We may add now that if order is ever attained by the latter principle among men in society, the attempt to replace it by corporate order must lead to precisely that administrative chaos which we described in the last paragraph.

#### DYNAMIC ORDER IN SOCIETY

The term "dynamic order" is used by W. Koehler for an ordered arrangement resulting by spontaneous mutual adjustment of the elements, and I shall henceforth apply this expression here.

The best known example of dynamic order in society is that of economic life based on a competitive system of individual producers and consumers. For reasons which will become clear later, we prefer to limit ourselves in this chapter to the consideration of the order of production only, and to replace the consumers by mere demand curves, assumed to be prevailing in the market. Similarly the owners of resources, including workers, may be replaced by supply curves of resources, including labour. Producers may be single individuals or heads of corporations.

Producers are constantly on the look-out for an opening to utilise at a greater profit the resources which they now control, and to gain the control of resources, at present managed by other producers, by



finding more profitable applications for them. Each individual decision of a producer results in a change of his demands on the market of resources and of his offers to the consumers. These demands and offers are made in public, and affect the price structure of resources and consumers' goods, thereby leading to numerous adjustments of arrangements made by other producers. Such are the "internal forces" through which individual producers interact. Each interaction tends to a new mutual adjustment in the sense of a somewhat increased satisfaction to the consumer, as expressed by his own preference; and the series of continuously repeated mutual interactions tends to produce a distribution of resources in which each element of resource is used by producers to the greatest satisfaction of the consumers, as expressed by their demand curves. The result may be called a dynamic order of production, because it is an arrangement of great complexity and usefulness, achieved by a series of direct lateral adjustments between individual producers making independent decisions.

The most varied types of dynamic order are found in the intellectual and moral heritage of man. Of these we will take first the example of Law, and of Common Law in particular. Consider a judge sitting in court and deciding a difficult case. While pondering his decision he refers consciously to dozens of precedents and unconsciously to many more. Numberless other judges have sat before him and decided according to statute, precedent, equity and convenience, as he will have to decide now himself; his mind, while he analyses the various aspects of the present case, is in constant contact with theirs. And beyond the purely legal references, he senses the entire contemporary trend of opinions, the social medium as a whole. Not until he has established all these bearings of his case, and responded to them in the light of his own professional conscience, will his decision acquire the force of conviction.

The moment this point is reached and the decision publicly announced, the tide of influences starts running backwards. The addition, which the new decision makes to the Law, has arisen as an interpretation of the Law as it stood before; hence it represents a new aspect of the previously existing system, and makes it appear—to a greater or lesser extent—in a different light than before. Public opinion also has received a new response and a new stimulus. All judges yet to come have received new directions for their future decisions.

Thus it seems clear that the complex system of Case Law arises by a process of direct adjustments between succeeding judges. Each new decision is made with reference to all those made up to that date, and causes all earlier decisions to become—in effect—somewhat modified. This is precisely analogous to the relationship between the consecutive decisions of individual producers acting in the same market.

The next example of dynamic order will be our main subject, Science. Every scientist in search of discovery is faced with the scientific results and opinions of all other scientists up to that date, both living and dead, which are summed up in text books or—for more recent work—in current publications and public discussions. The scientist differs from the judge in that he is not given his case to decide, but has to select his own problem for investigation. Early in life he specialises on certain branches of science which fit his own personal gifts and his own strongest inclinations. Then he looks out for an opportunity to apply his particular knowledge and gifts; and finally he selects a special problem by the pursuit of which he expects to achieve the most important results. In the setting of his problem and in the way he seeks its solution, he is applying the traditional methods of science and the particular procedure of his own branch: with such possible modifications as he may desire to attempt. His judgment, through which his results are expressed, is based on accepted scientific standards of reliability and precision: again, possibly, with some personal variation of his own. Discovery in the end will be largely based on thousands of previous discoveries; and though the new addition will always modify the previously prevailing ideas to some extent, and sometimes may cause revolutionary changes in outlook, the essential unity of science will be maintained. Scientific discoveries are published without delay, since each scientist desires to get the credit for his own achievements. Discoverers will often defend their claims emphatically against criticism and seek to assure their acceptance by the scientific public.

Science is thus seen to be growing by the characteristic process producing dynamic order. New scientific claims are made in due consideration of all previously established ones; and the results thus obtained continuously modify the previously achieved positions of science.

In the way a scientist, intent on a problem, consults the results and opinions of scientists who worked before him, he resembles a judge referring to precedent. But in the way in which he looks out for a problem to which to apply his special gifts to the best advantage, and later, when discovery is achieved, puts his claims before his colleagues and tries to gain their acceptance for them, he acts rather like the business man, first seeking the most profitable application of his resources and then soliciting the consumers' approval for his goods. We see here a variation in the nature of the methods of adjustment ("internal forces") that are operating in the formation of the dynamic order. Between different judges the adjustments are of a purely consultative character; between business men they are largely competitive; while between scientists they show combinations of both types.

Science and Law are two extreme types of dynamic order in the mental sphere; the first being mainly cognitive, the latter mainly

normative in its character. There exist many other systems in the intellectual and moral sphere, and among them all kinds of blends of these two characteristics. The social legacies of language, writing, literature and of the various arts, pictorial and musical; of practical crafts, including medicine, agriculture, manufacture and the technique of communications; of sets of conventional units and measures, and of customs of intercourse; of religious, social and political thought; all these are systems of dynamic order which were developed by the method of direct individual adjustment, described for Science and Law. In each field there is being handed on from generation to generation a public mental heritage accessible to all; and new potential contributors are making contacts, of a more or less consultative or competitive character, with the elements which others have established in the same field before. Then, when they suggest their own additions or reforms, they return to the public and claim publicly that these be accepted by society—to become in their turn a part of the common heritage.

#### PUBLIC LIBERTY

The maintenance and growth of dynamic order in society entails a kind of liberty that goes far beyond the claims of personal freedom. Individuals, participating in the building up of a dynamic order, all act independently. They are not fulfilling another's instructions, elaborating details of another person's scheme, as is the subordinate official's duty. On the contrary, any specific desire of any other person, regarding the course of their future action, would be rejected by such an individual as improper, and injurious to his own function. Presented with the entire scope of a situation calling for initiative and judgment of a higher order, he must be given freedom to act according to his own conviction.

This freedom is in many ways the opposite of private freedom. It is not meant for the satisfaction of the desire to be left alone, or to do as you please. A judge may enjoy discharging his office, but that is not the purpose of granting him independence. The scientist's passion for research gives him immense satisfaction, but that is a poor reason for giving him the security of academic freedom. Nor should any business man in the modern world believe that his property rights over capital are given him for his pleasure. The freedom with which we are concerned here is not for the sake of the individual at all, but for the benefit of the community in which dynamic systems of order are to be maintained. It is freedom with a responsible purpose; a privilege combined with duties, as exacting as any that are shouldered by man. It may well be called, therefore, Public Liberty—as opposed to Private Freedom.

The Totalitarian State, which claims that it completely represents all the collective interests of the community, must reject the rival claims of individuals to act independently for the benefit of society.

Hence the Totalitarian contention that liberty can mean only a private freedom to act unsocially, or at least irresponsibly, is a necessary corollary of the conception of the State as a corporate order specifically planning and directing in the common interest the entire collective activities of the community. Such a conception implies the rejection of all dynamic systems of order in society, and makes their suppression an essential condition for the existence of the State.

The Liberal view of the State can be represented, on the contrary, by analysing the changes which would have to be made in a corporate authority in order to transform it into a dynamic order. The change-over could be effected by a strengthening of the direct lateral adjustments between the subordinates, up to the point where all the specific features of their actions are determined—not vertically from above—but laterally by direct contacts below. Once all *specific* initiative has been handed over to the individuals at the bottom of the pyramid, the authority above can have left to it only functions of an *indiscriminate* character. The former executive authority is then transformed into a *supervisory* authority, presiding over the free individual initiatives below. Its functions are now: to protect these initiatives, to provide opportunities for their exercise, and to enforce the rules which govern the interaction of the individuals under its care. The services which such a State, acting as supervisor to the growth of dynamic order, renders to the community are the exact opposite of those which a State built as a corporate authority can render; it fosters the dynamic order which the imposition of corporate authority would necessarily destroy, and abandons thereby the possibility of carrying out specific tasks by centrally directed co-ordination of its citizen, which is the purpose proper to a State constructed as a corporate authority.

The functions of modern Democratic States in peace time correspond to that of the Liberal view of the State. These States act mainly as supervisory authorities, presiding over autonomous dynamic systems which they foster within their realm. The specific demands (in matters of health, education, defence, etc.) which they make on their private citizens are, in peace time, few and not far reaching, compared with the effects which the dynamic systems of society, competitive enterprise, the law, science, art, religion, etc., exercise on the citizens' life. In fact, corporate institutions, effectively co-ordinating their subordinates to specific tasks, are in (peace time) Liberal society, small, compared with the field of dynamic order, and the operations of these are determined by their participation, as wholes, in wider systems of dynamic co-ordination. Corporations with specific operative aims are mainly industrial enterprises, co-ordinated between themselves by the dynamic order of competitive production. The few other instances include such minor corporations as teams of research workers, dependent on senior scientists—which are mutually co-ordinated by the dynamic system of science.

The existing Totalitarian States do not achieve the extreme opposite of the Liberal idea, which would be a corporation in which all the functions of every citizen are assigned to him as specific tasks by a superior State official. In all large corporate organisations there are a certain number of cross links below, which, while they necessarily reduce the precision of instructions transmitted from the centre, introduce a certain amount of dynamic order instead. Though Totalitarian States claim to be responsible for all the collective interests of their citizens, they actually achieve only a paramount framework of corporate power, which leaves a varying amount of unabsorbed dynamic order functioning in the interior of the corporate organisation.

The struggle—conducted often at the cost of disastrous consequences—for the final subjection of this residue, persisting with particular tenacity in the economic field, is a constant preoccupation of Totalitarian Governments. The fluctuations in this struggle mark off the four main periods in the history of the U.S.S.R. : War Communism (1917–1920), N.E.P. (1921–1927), First Five Year Plan (1928–1932), and the subsequent period up to 1941.

I have pointed out in this chapter that responsible public liberty sets a limit to irresponsible private freedom ; but we must not think of the two as enemies. On the contrary, they merge into one another and mutually stimulate each other. Liberalism recognises that privacy is the ground on which—amidst many purely personal matters—there germinate new ideas, which will eventually benefit the community. Irresponsible privacy, solitary habits, non-conformity and eccentricity are protected by Liberal society, because it sees in these the breeding ground of independent men : much needed for the public good.

#### THE CONSUMERS' ORDER

We have yet to supplement our picture of the competitive economic system of which only one half, that of the producers, has been discussed hitherto. The other half, formed by the consumers, is the dynamic system of distribution. Each consumer interacts with every other one who is buying in the same market, by influencing, through his purchases, the prices at which the others can buy. This tends to produce a dynamic order in which each consumer is receiving—so far as the prevailing distribution of income permits—maximum satisfaction from the available goods and services. Such satisfaction is of a private nature. Millions of people sitting at breakfast on one morning are not combined to any common action, but are merely being satisfied severally, as an aggregate.

Aggregate individual satisfactions belong to the sphere of private freedom, and lie outside the main subject of this essay—the conflict between totalitarianism and public freedom, of which the freedom of science is an instance. I will, therefore, not pursue here any further the dynamic order of consumers.

## MACHINERY OF DYNAMIC ORDER

The people engaged in the various dynamic systems of society, other than economic, are organised on more or less official lines in circles of special interest and professional bodies. Artistic, literary, musical, sporting, medical, technical, scientific, political, religious, legal, etc., circles cultivate one particular section of the social heritage and supervise its development. Their main functions are: to preserve and disseminate in approved form the past achievements and accepted principles of their special field; to stimulate new individual contributions and to judge their value: discussing, and either rejecting or accepting new additions to the body of the heritage under their care. The "influentials" in these circles act as referees for the publication of papers and books, for the exhibition of pictures, the production of plays and musical compositions, as advisers for endowments and appointments, as authoritative critics of work already made public; they can powerfully help or hinder the novice; they rule the internal life of the community of specialists of which they possess the confidence.

They rule according to law; assessing values according to the standards accepted and publicly acknowledged as the basis of all activity in their own field. Without such traditional standards no creative work and no dynamic order is possible. Mental creation means an act of thought, or of art, or of practical craftsmanship, that can be proved valid by some pre-existing standards. While every new creative effort changes somewhat the framework to which it is assimilated, every such modification is based on the continued persistence of some wider criteria of validity, in the light of which the minor change is being approved. Take science. New discoveries are frequently upsetting the scientific outlook of the day and modifying scientific standards, yet these discoveries are accepted by science—though sometimes after a lengthy period of discussion—in accordance with a wider scientific outlook and a wider aspect of scientific standards, which they are found to satisfy. It is the same in every art, in law and in all the other fields mentioned above. Each is governed by a permanent fundamental idea that cannot be expressed precisely, yet which comes into play every time the standards of the day are challenged. There have been many attempts to define these ideas: to formulate Scientific Truth, the Law of Nature, or the Canons of Beauty. But these attempts can lead to no definite result. Scientific Truth is an ideal: the ideal underlying the practice of science. It cannot be finally de-limited so long as science lives and continues to grow, opening up ever new unexpected realms of discovery. The same is true of the Law of Nature, which represents the ideals of Reason and Equity as practically manifested in the development of the various legal systems; so long as this development goes on, its underlying principle cannot be finally assessed. In Art again the only evidence of the ideal of perfection pursued is afforded

by permanent artistic practice, as represented by the enduring masterpieces of all ages.

Ideals are adequately expressed only by the traditional practice which is conducted under their guidance. Their guardianship is the most important function of the autonomous circles of men cultivating the various dynamic systems: of science, law, art, etc.

Totalitarianism, hostile to all dynamic systems, attacks their standards and ideals. In the totalitarian view those who pursue ideals are neglecting their duty to society, for the sake of unsubstantial values of purely formal significance. The Marxist denial—quoted at the beginning under Point 1—of the justification of pure science, is a case in point. We will come back to it later in detail.

Another aspect of the same conflict arises from the democratic nature of the dynamic systems. Their growth takes place through the life and action of the community of specialists in charge. It is a democratic life conducted publicly, under the voluntarily accepted laws of this circle. We have seen how every new addition to the social heritage is suggested in public, discussed and codified, or rejected in public under the guidance of the "influentials" acting as elected officers. At the same time the specialist circles keep up popular contacts all around them. They appeal to a wider range of lay connoisseurs or specially interested members of the general public, and through these they recommend themselves to the common man throughout the entire community. Thus they establish the standing of their particular pursuits in the life of society as a whole. The inner circle of creative men becomes entrusted by the whole of society with the cultivation of certain ideals, in which the rest of the people take part at various stages of interest. We have here a system of indirect representation, at each stage of which people less experienced and interested in a particular field confide in others, more intimately concerned with it.

The expansion of modern public life during the 19th century, which has continued rapidly during the past two decades through the advent of the wireless and film, had made this informal mode of self-government, by direct response of the public to the activities of various specialised strata, a most important element of democracy. It has recently become a factor in politics, where it seems to be side-tracking to some extent the electoral machine. In the United States in particular, the division between the Legislative and the Executive has invited the development of this type of direct public influence—exercised through the press and the results of private polls which sway in major issues the views of the professional politicians—the electoral machinery retaining of course its function as the ultimate sanction of public opinion.

The existence of this modern form of democracy, upheld by the circles of dynamic systems and the general public connected with them, makes it necessary for modern dictators to become totalitarian.

No absolute ruler can be satisfied to-day with dominion over political life alone. That realm in itself is shadowy and insecure—as shown for example by the regime of South American dictators. Dictatorship can become real to-day only by eradicating the whole autonomous cultural life with all its widespread popular roots. Not before the prestige of the guardians of intellectual and moral order is broken, their autonomous circles are dispersed, and the wider public is reduced thereby to a helpless mass, can the dictator address the people directly, without fear of control or criticism.

Followers of totalitarianism often try to reassure themselves, and others, by promising that the central planning of science, and of other cultural and economic activities, would not be oppressive, since it would be based on democratic elections with a wide franchise. However, a régime which undertakes to destroy cultural life—as well as a system of production based on independent individual initiatives—by converting its members into the officials of a corporate organisation, does not become less oppressive by the fact that its chief is due for re-election at frequent intervals. Tyrannical functions do not become democratic, even though each single measure were referred to a plebiscite. Actually, of course, there could be no meaning in elections under a totalitarian régime, which controls all the news reaching its citizens and is responsible for planning all their public intellectual activities. Democracy cannot rely on elections, but must be based on the proper division of the social order between the corporate and dynamic forms of organisation.

#### MOTIVATION IN STAGES

Social relations are impersonal. Writers have commented on this fact with regret in many particular instances, or complained in general terms about the soulless mechanism of society which effaces individuality and has no use for intimate mutual understanding. However, this is one of the prices that must be paid for the advantages of having a social machinery, which—like any other machinery—can operate only with material and with fuel that is more or less standardised, and can perform only such functions as are inherent in its construction.

The demands of the Law, its suppositions and interpretations must be definite and general. It must, therefore, assume a standard psychology, that of the Reasonable Man, who is expected to “take reasonable care”, “exercise reasonable foresight”, and is supposed “to intend the consequences of his actions”. The criterion of *animus* in criminal law is similarly limited to such crude psychological terms as “malice aforethought” and “accident”, or “justifiable self-defence”. The infinite variety of actually operative psychological factors are deliberately left out.<sup>1</sup>

<sup>1</sup> The multiplicity of formal concepts for the same personality within a legal and political system has been critically mentioned by P. Valéry, *La Politique de l'Esprit, Notre souverain bien*, Manchester University Press, 1941.



Nor can either employers or the public, for which a man works, take much interest in the personal traits and motives of those who serve them. They must standardise their requirements and contacts, to what is essential from their own point of view. Thus is formed the official aspect of the employee and of the independent individual in a public capacity ; it is defined by standard obligations and standard incentives or purposes, which are held to be proper for that occasion. The variety of individual motives, which prompt the desire to enter on these obligations, as well as on the attached incentives and entailed purposes, are again disregarded. They are respected as a person's private affairs, but have to be kept out of his official connections.

Another disparity inherent in the mechanical nature of social organisations is the divergence between the standard motive of the individual and the purpose of the whole, in which he participates. A subordinate working for a corporation has to be careful and disciplined in his duties, but beyond that the interests of the corporation which he serves are not his concern. His attention is properly due to the detail entrusted to him and to the exact intentions of his superior ; his legitimate incentive is to gain promotion by pleasing his superior. The corporation must be so organised and directed that an employee will advance its interests best by following this line of action. The position of the individual partaking in a dynamic system is similar. The problem before him comprises his entire responsibility. To the solution of his own problem, to the fulfilment of his own special task, he owes his entire devotion. The rules by which he has to be guided in doing so and by which he has to gain public approval for his achievements, must be such as to safeguard the advancement of the dynamic order, whenever individual actions are taken in compliance with them.

The official character of the employee or public official, as distinct from his private person, and the limitations set upon his intentions by discipline, are usually known well enough. But the official character of the person acting independently, of the public individual partaking in a dynamic system, is not commonly recognised as clearly.

Economic science has analysed the situation with respect to a system of competitive production. The standard incentives of the individual producer have been defined, and his normal obligations considered, as distinct from his private motives inducing him to pursue those incentives and to accept those obligations. It is also clear that he has no responsibility for the advancement of national or planetary prosperity in general, which is the purpose of the system, taken as a whole, in which he participates. He may try to reform business life, both as a pioneer at his own works or as a voter or writer, etc. He may give all his earnings to charities or to the Communist Party ; but he cannot carry on in business unless he keeps—while at his job—to the pursuit of profits for his firm.

The double distinction between private motives and standard motives, and between these and general purpose, is evident in judicial procedure. A man coming forth to give evidence may be prompted by a variety of motives; a barrister may take up a case for the love of money or to please his vanity, or for political reasons, or from compassion; a judge may be guided in his career by ambition, love of juridical scholarship, etc. But once counsel has been briefed, the judge has taken the chair, witness has been sworn in, each of them falls into the pattern of his official motives. To these they must restrict themselves: keeping out not only their private inclinations, but also any attempt to aim directly at the higher purpose in which they are participating. Witness must stick to facts and must not plead; counsel must argue his case and not assume a judicial attitude; the judge must apply the law, even though he should desire to amend it.

In science the irrelevance, for the result achieved, of the private motives leading to the pursuit of research, is neatly illustrated by comparing the persons who in different places make the same discovery at the same time. The principle of Conservation of Energy was discovered independently by a half crazy South German doctor (J. R. Mayer), a reputable beer brewer in Manchester (Joule) and a young Prussian Junker (H. von Helmholtz). The three living co-discoverers of Quantum mechanics (an Austrian, a Prussian and an Englishman) make, personally, an equally ill-assorted triplet. When men, so different, do the same thing at the same time, they are not following their private motives, but standard incentives, which their private inclinations have led them to accept.

The standard motive of a scientist at his work is to make discoveries that are important in science—as important as possible. He also desires to see these discoveries accepted by science and credited to himself. Unless he has a special gift and passion for discovery, this standard motive will not appeal to him, nor would it be of any use if it did. But unless he accepts this motive he will not become a scientist—whatever his intellectual powers and passions may be.

Scientists at work are specialists, unconcerned with the advancement of science as a whole. When they want to promote science as a whole, they must leave their work and attend committees, or make speeches and write memoranda. This is necessary, and is usually undertaken by senior “influentials” who have given up active research. It is significant that the main difficulty in the advancement of science as a whole by the defence of its ideals—to-day—lies in the fact that most scientists will not take any interest in the cause of science, for fear of disturbing their work.

#### IDEALS IN SOCIETY

We have outlined the machinery of the dynamic systems which constitute the intellectual and moral order of society, and have

analysed the motives at work in them. We have pointed out the connections of such systems, through successive levels of indirect representation, with the general public. These are instrumental in conveying not only the response and moral support of society, but also in providing financial resources, as well as recruits to the various groups of active specialists. These public relations are carefully cultivated by the inner circles and bodies of each system, headed by its "influentials". Each pursuit rivals with the others in attempts to gain the right sort of general publicity and to exercise its influences on education. They are also rivals for public funds, which they need for the endowment of the teaching, the practice and the exploration of their various fields. Society divides its attention, its funds and its recruits between them; it gives them support and accepts their guidance.

Society will be prompted by a variety of different motives when it contemplates giving support to any dynamic system of the intellectual or moral spheres. But once it has decided to lend its support to such a system, its intentions can be seen to be all transformed into an allegiance to the ideals by which the system itself is guided.

Take science. The hopes attached to its progress are most varied. Man's desire to know and understand more, just for the sake of enlightenment, plays a part. But there is even in this part a divergence between a religious view which seeks, through science, the verification of God's wisdom, and an opposite outlook which supports science for the sake of discomfiting church and religion. In modern times the spreading of science to new countries usually begins with the endowment of medical research, which even in highly developed countries seems to appeal to the widest public. On the other hand, the progress of industrialisation leads to an accentuated support of the exact sciences by a small but influential circle. Both types of this class of supporters hope to gain useful knowledge from the progress of science: to be applied to the healing of disease and other technical problems. After the Peace of 1919 many new countries, like Czechoslovakia, Hungary, Turkey, gave support to science in order to promote national ambition, and some international scientific organisations were at that time vigorously subsidised in France for the purposes of French national supremacy. The Soviet Government, and for some time also the Fascist Government of Italy, were lavish in entertaining international scientific meetings on their soil with a view to strengthening their prestige abroad.

The fact that in our times all public funds allotted to science are given to local or national institutions, instead of being spent evenly over the planet, wherever people are prepared to pursue research (which would be their most economical use from the point of view of science), clearly shows that as yet no existing community is prepared to support science exclusively for its own sake, but only in so far as it is maintained within the limits of the community and contributes

to its life. Obviously public authorities acting in this fashion would rather produce a science which was entirely their own: which would either show that only the spirit of their own country could produce good science, or would be of such a kind that it would be of no use to anyone outside the country of its origin. Some Governments have tried it; revolutionary and warlike Governments particularly have tried it hard. During the past 25 years many violent events have helped these Governments to seclude their own scientists from others, and to press on them forcibly the claims of their own country and régime. Science during this time has progressed considerably. Yet when we look at a modern textbook of physics, chemistry, astronomy, mathematics, etc., there are no divisions according to the places from which the various contributions originate. The divisions are entirely systematic, following the logical structure of the subject; and each section and sub-section forms a mosaic of closely related pieces of evidence the authors of which are dispersed between various warring nations, New Civilisations, New Orders etc. There is not even a seam to show for the efforts of all the great powers which have laboured to tear up the unity of science.

Governments, whether peaceful, warlike, democratic or revolutionary, had to be satisfied to support international science because there is no other. They had to subsidise a great deal of science, which—so far as any rational human foresight goes—will never be of definite use to anyone, because that is the only way science grows. They had to give allegiance to the ideal of science for its own sake, because the alternative is to have no science at all. Much as a cow may be kept in order to yield its milk, its flesh, its hide, its dung, its bones, or may be maintained as a sacred animal; but in any case must be born from a cow, and left to live and grow up into a cow, in its own interest, as a cow—otherwise it will yield none of the expected benefits, either practical or sacred.

The confusing feature about autonomous systems in society is that here the cow of our picture is part of society itself, living for a purpose of its own in the midst of the community which supports it. Those inside and outside this part of society are the same kind of people, responding fundamentally to the same intellectual and moral stimuli. The immense popular success of an exhibition like that of the Palais de la Découverte in Paris (1937), which was devoted almost entirely to pure science; the universal fame which Albert Einstein gained in the 1920-ies through the discovery of a new scientific interpretation of space and time; the popularity of N. Bohr in Denmark and that of Rutherford in Britain; all sufficiently illustrate the wide recognition of science among the people. The ideals cultivated by special circles in society are acknowledged as real by the common man, even though his own aims in life lie in a different direction. Believing these ideals to be real and living, and their guidance essential to society, he approves of their continued cultivation, hoping thereby

to maintain a steady increase of human and material values in society.

This hope of progress through the pursuit of various forms and aspects of truth—artistic, scientific, religious, legal, etc.—by a number of autonomous circles, each devoted to one of them, is the essential idea of a Liberal Society, as contrasted to a Totalitarian State. It reveals the full scope of the ideal of freedom. The Liberal conception is that freedom is the only method by which we can continue to discover the regions of yet undisclosed truth into which we are advancing. Truth is so complex, and each particle of it hangs together directly with so many others, that it can be revealed only by a continuous series of independent individual initiatives. On the other hand, there are so many kinds of truth, corresponding to the wealth of different faculties possessed by man, and the variety of interlacing patterns that can be found in the world, that the explorers must split up into a number of detached parties, each following the guidance of a single ideal which leads to one aspect of truth out of many. Only thus can the growth of the whole vast web of better understanding be advanced, which in its entirety is far beyond human perception, but on which, nevertheless, Liberal Society confidently bases its future.

#### THE SOCIAL MILIEU

I have tried to make it clear earlier that while it is impossible to transfer the task of ordering, achieved by a dynamic system, to any single planning authority (and that nothing but chaos can be the result of such an attempt), a dynamic system can be modified to a certain extent by variations—in kind and intensity—of indiscriminately applied influences. These may operate either through a change of the “internal forces” by which the individual elements interact, or as general forces and limitations from outside. In a sense we have already seen that this applies to dynamic systems in society, when we observed that their standards must be guarded and the opportunities for their cultivation maintained and protected; that they must receive the support of society: in recruits, finance and confidence. It is also fairly obvious that the prosperity of these autonomous systems embedded in society, and living on it, must largely depend on that of the general surrounding milieu, and will often advance, or decay, with the rest of the community; further, that they will take notice of subjects arising in other parts of society, make use of new techniques developed there for other purposes, and generally experience humanity at large as the most interesting part of the surrounding world.

However, this will cause no fundamental change in the internal structure of the dynamic systems of society, nor alter the ideals which they are serving. In fact there are dynamic systems in society which largely depend for their growth on changes in social circumstances.

Thus the Common Law has been authoritatively defined as "a system which consists in applying to new combinations of circumstances those rules which we derive from legal principles and judicial precedent".<sup>1</sup> The persistence of legal structure throughout changing circumstances is well illustrated by the establishment of the Common Law—with variations in detail—in British India and other populous British native dependencies; and perhaps even more strikingly by the adoption of the *Code Napoléon* as a model for their new civil legislation, by numerous independent Asiatic, African and South American nations, which modernised themselves during the 19th century. Japan, Siam, Turkey, Egypt and the new Spanish and Portuguese States of South America all followed this line.

Naturally, this has also an application to science. New facts which turn up in society, be it by wars of conquest or by business expansion or the progress of technical inventions, may supply most interesting new data for scientific study and may suggest innovations in the experimental technique of science. Besides, scientists at work share the interests of other people to the extent that they find added attraction in an investigation if it deals with things of general human or practical importance. However, whatever new materials science feeds on, it will always continue to absorb them for its own purposes. There is no evidence that these purposes have undergone any important modification ever since the methods of modern science started operating about 300 years ago. Our scales of scientific values have not noticeably changed during this period; no parts of science have lost their validity on account of a change in scientific standards. What was accepted as true by scientists 300 years ago would still be accepted as true by us to-day on the evidence available at that time; and there is no reason to believe that the reverse would not hold. In the last 25 years, in particular, the planetary unity of science has been maintained (almost without a conscious effort), even though the greatest contrasts have developed in various countries and in spite of energetic attempts of certain Governments to disrupt that unity.

#### THE ATTACK ON SCIENTIFIC IDEALS

We return to the analysis of the movement of thought in Britain to which our opening paragraphs referred. The war on pure science waged by this movement has now been placed in a wider context. It arose under the influence of Marxist philosophy and, though many of its followers are sincere believers in freedom, its politically most active personalities profess the doctrines of the Communist International. Our previous analysis shows that only the position of the latter—not that of the former—is consistent with the rejection of the ideal of pure science. The arguments that are mainly used to sustain

<sup>1</sup> Lord Wensleydale, quoted by Professor J. H. Morgan in *Enc. Britannica*, 14th Edn. Art. Common Law.

this denial confuse science with other things that science is *not*: thus distorting the perception for what science *is* in reality. The various connections of science with society, the motives for which science is undertaken, the materials which feed it, as well as the effects—good and bad—which result from it, are dazzlingly illuminated, while the life of science itself is left in the dark. Since few people know science intimately, while many know its surroundings, it is not difficult to suppress by this method all general belief in the life of science.

The doctrine formulated at the opening of this essay as Point I of the Marxian view, that science cannot be distinguished from scientific technology,<sup>1</sup> is leading the way in the attack on scientific ideals. Yet the distinction, so commonly denied to-day, is fairly obvious. Technology is knowledge of the way to produce practical advantages by the use of material resources. There is a limit to the urgency of any particular practical advantage and a limit to the abundance of any practical resources. No process of technology can remain useful in face of a drastic reduction of the urgency of the "advantage" gained and/or of the abundance of the "resources" used up by its application. All processes of technology can thus be invalidated by the occurrence of such changes in the relative urgencies of needs and in the relative abundances of materials, which would cause the process—if applied—to produce things that are *less* valuable, from things that are *more* valuable. An invention producing practical *disadvantages* would scarcely retain that name.

Science, on the other hand, cannot be affected in its validity by variations of abundance of things or urgency of needs. Its interest may thereby be altered slightly, but not one particle of science will be invalidated; nothing will become untrue that was true before—nor the reverse.

Another way to discredit the self-purposive standing of science is to connect the private motives and circumstances of scientists with the nature of their contributions to science. This is a line much favoured by Mr. Crowther in the *Social Relations of Science*. He is greatly concerned with people's incomes. We learn that often people are too poor to be concerned with science, and that in other cases they are too rich to trouble about it. Plato, for example, was rich and despised science,<sup>2</sup> and ever since rich people tend to follow him.<sup>3</sup> Of course very often it is on the contrary great wealth that promotes scientific interest, just as the right sort of poverty may do it.<sup>4</sup>

<sup>1</sup> I prefer here the term "scientific technology" to that of "applied science", so as to exclude for the moment the problems offered by practical branches, like medicine, education, economics, where scientific principles are applied directly to man or human society.

<sup>2</sup> *S.R.S.*, pp. 66-67.

<sup>3</sup> *S.R.S.*, p. 125, Platonism the carrier of anti-scientific snobbery in Roman times; p. 279, it becomes the philosophy of the ruling bankers of the Renaissance; p. 578, it is the first sketch of the philosophy of modern Fascism.

<sup>4</sup> *S.R.S.*, p. 116, the Romans were too rich to advance science; p. 160, so were the Moslems; p. 592, the French people after 1918 were also too rich; p. 552, Russian Academy before the Soviet Revolution misguided by wealth. On the other hand (p. 208), great wealth was helpful to Roger Bacon's scientific work; and also (p. 358) to Guericke's: and (p. 369) to Boyle's,

Such considerations are misleading, unless taken in a sense in which they are obvious and irrelevant. Whether a person can and will become a scientist or not clearly depends to some extent on his income and private circumstances. But once he has become a scientist, his results do not depend on his personal circumstances. I have quoted some of the evidence on this point in the chapter on motivation, and could go on filling pages with similar cases. Only one shall be added here because it will particularly appeal to Marxists. The greatest advance in physics made in Russia during the past 25 years was the observation in 1928 of a new form of optical scattering by the Soviet physicist Landsberg. The same discovery was made a few weeks earlier by C. V. Raman, a native and inhabitant of British India, who, in view of his priority, received the Nobel prize for this piece of work. He had, however, to share some of the credit with the Viennese physicist—now an ardent Nazi—A. Smekal, who predicted the effect some years earlier. It is difficult to find three privately and socially more divergent people than Landsberg, Raman and Smekal, yet their work in science is essentially identical.

Science is again submerged with extraneous matters when the practical interest of society is emphasised to the point at which it appears that science itself is guided by that interest. The obvious fact that—with the exception of very few cases—none can tell at the time of a discovery what its future practical applications will be; and that these applications are known least of all to the discoverer, whose knowledge of technology is mostly slight, is overcome by a mystical construction, that social needs compel discoveries which scientists believe follow from the internal logic of scientific development; so that scientists are unconsciously following a practical purpose of which they themselves are unaware. Mr. Crowther explains for example, the direction taken by Clerk Maxwell when embarking (around 1855) on his studies of the theory of gases and of the electric field, as follows:

“Mercantilism had surrendered the initiative to industrialism, and navigation gave place to the steam engine and the telegraph. In parallel with this social movement, mathematical astronomy gave place to heat and electricity. . . . Maxwell's reform appeared to him mainly as a transfer of attention to those parts of science that seemed most promising of important discovery. He did not enquire why heat and electricity appeared to him more promising than astronomy. It was sufficient that he knew that they were so. History has entirely confirmed Maxwell's opinion, though he regarded it as self-evident. It is possible now to see that he was an intellectual instrument of a development determined by the main social forces of his time, while his choice of studies appeared

and—in general—the status of a gentleman of leisure was the economic condition for scientific excellence throughout the Middle Ages (p. 239) and in 16th and 17th Century England (p. 384). On the other hand, medieval Society was too poor for the advancement of science (p. 222), while the Roman slaves were just prosperous enough for its pursuit (p. 113).



to himself to be determined by the logic of their own development."<sup>1</sup>

Mr. Crowther's theory of Maxwell's position in the midst of the industrial interests surrounding him is up to a point analogous to the well-known type of demagogical construction: "The Jews desire Hitler's fall; Churchill fights Hitler; hence Churchill is the tool of the Jews." The difference is only that Mr. Crowther's construction contains one more element of magical reasoning. In his argument there is no question of the tool (Maxwell) being actually intent on promoting the interests in question; it is admitted that he was not aware of future practical applications of his work. Thus Maxwell becomes an *unconscious* tool of interests, to which he was admittedly indifferent, in the pursuit of future results, of which he was admittedly ignorant.

Such constructions gain strength in the eyes of their believers from the very fact of their absurdity. Absence of tangible reality is taken to prove the presence of a profound, hidden principle of "social determinism".

A common manifestation of the same fallacious intellectual instinct, which Mr. Crowther utilises in this argument, appears in the irresistible habit of the beginner—so often reproved in the schools—to "write history backwards". The novice keeps reconstructing the minds of people at an earlier period of time as if they could have known the events which followed in a later period. It requires a trained effort of the imagination to avoid infusing the minds of historical people with a fore-knowledge of their own future, which is forming an integral part of our present conception of them.

The writing of history backwards is a standard method for proving the magic powers of social needs in directing the discoveries of scientists. Professor Hogben applies it as follows to the case of Maxwell:

"... In Maxwell's treatise the Newtonian mathematics of the older universities was linked to the experimental measurements made by Faraday and Henry in extra-mural foundations, such as the Royal and Smithsonian Institutions. As with the form, so it was with the substance. From the beginnings of practical telegraphy the possibility of propagating electrical phenomena through space without the aid of conducting material in the ordinary sense continually prompted speculation and experiment. In the adventurous hopefulness of nineteenth century industrialism, telegraphy without wires was the philosopher's stone and the elixir of youth. Thus far, telegraphic communication was the most spectacular achievement of science. As such it received its full share of recognition in the Great Exhibition which coincided with the Atlantic Cable venture. Two years later—in 1853—Dering, an inventor whose electrical appliances received an honourable

<sup>1</sup> *S.R.S.*, p. 453.

place among the exhibits, referred to 'the craving there is at present for wireless telegraphs'. This was the year in which Maxwell became second wrangler."<sup>1</sup>

Fantastic exaggerations ("philosopher's stone," "elixir of youth,") referring to a problem which it would be more correct to describe as an obscure one at the time in question,<sup>2</sup> together with other colourful stage settings, thus endow the method of writing history backwards with irresistible power; in particular when the subject is one known to few, and the writings are addressed to the general public in combination with a political message which they convey.

To make the position, thus established, impregnable, it is only necessary to keep it sufficiently obscure. Strictly speaking *no definite statement whatever* has been made above by Professor Hogben about the reasons that led Maxwell to develop the theory of electromagnetic waves, which about half a century later contributed to the invention of wireless telegraphy. At least none that would go beyond the commonly held and rather irrelevant opinion, that the study of electricity in the 19th century gained added interest from its wide practical applications. Yet the force of indirect suggestion in Professor Hogben's quoted passage is so strong that he can use it to prove his attack—made on the page before—on the view generally accepted in previous literature, that Maxwell "laboured for knowledge alone" and was justified in doing so. This—we are told by Professor Hogben—is nothing but an "arrogant pretence" of scientists.

The remarkable fact that this new theory of science is always demonstrated by examples of a comparatively remote past, *in the midst of our century possessing unparalleled scientific achievements of its own*, can be understood from the above analysis. The practical applications of recent discoveries are not yet known, so that in their case history cannot yet be written backwards. What technical inventions were the discoveries of the Nobel Laureates Planck, Einstein, Perrin, Millikan, Michelson, Rutherford, Aston, Chadwick, Barkla, Heisenberg, Compton, Franck, G. Hertz, Rubens, Laue, Joliot, Fermi, Urey, Anderson, W. H. and W. L. Bragg, Schrödinger, Dirac, etc., unconsciously intended to produce? No one can tell—so the new theory of science must pass them over.

<sup>1</sup> *Science for the Citizen*, p. 737.

<sup>2</sup> The urgent need of wireless transmission arose, according to Professor Hogben, from a burning desire to save the cost of telegraphic cables. The actual state of affairs can be assessed as follows. Owing to various technical difficulties, wireless transmission has never superseded cable telegraphy. On the land the use of cable remains uncontested and the competition between wireless and cable for overseas telegraphy is yet undecided. This fact, far from moving all scientific speculations of our time, remains unmentioned even by the author of *Science for the Citizen*, who takes such particular interest in the problem.

The real importance of wireless transmission (apart from its more recent application to broadcasting) has obviously been in the field of navigation—the supposed loss of interest in which is thought (by Mr. Crowther) to have turned Maxwell's mind from astronomy to electric waves. Actually, to-day, this country depends for its very life on navigation; and this dependence arose precisely in the decades after the repeal of the Corn Laws: in Maxwell's time. Thus a flippant critic might suggest that the theory of social determinism has proved right after all—only that Maxwell's response was not to the decline, but rather to the sudden increase in the national significance of navigation.

One wonders how the great physicists in the list above would have fared if, before embarking on their investigations, they had had to get a certificate of its social usefulness from a scientific directorate, as contemplated by Marxist scientists and their friends. To what conflicts may not have led their "arrogant pretence" to be sole judges of their own preference!

#### THE TOTALITARIAN POSITION

However, this argument in a sense lacks reality. Points 1 and 2 of the Marxian position stated at the opening of this essay—the negation of pure science and the demand for the control of research by society—have not been put forward by their protagonists as isolated doctrines, nor can they be met on such grounds. The attack on science is a secondary battlefield in a war against all human ideals, and the attack on the freedom of science is only an incident in the totalitarian assault on all freedom in society. This attack is entailed in Point 3, demanding unconditional support of scientists for the rise and continued rule of the right kind of political power.

It is hardly possible to argue with this doctrine. It calls for unlimited violence in order to achieve the establishment of desired changes in the social structure and rejects all obligations to truth or humanity which might obstruct its own set purpose. But we may use the foregoing analysis to draw up a brief outline of the totalitarian position in its entirety: so as to reveal the full strength of its formidable logic and bring into view the decisive points at which its advance must be met.

Liberal society, by maintaining various systems of dynamic order, entrusts its fate largely to forces beyond its control. Its productive system grows in unpredictable directions; and by the cultivation of the ideals to which it gives allegiance, society lets itself be guided towards new stages of enlightenment, whose implications are largely unknown. The faith that society may confide itself to a variety of principles, which guide systems of co-operation by individual adjustment, is the faith of Liberalism, on which—as I have tried to show—the entire structure of the Liberal Society depends. From the opposite position one arrives, by following the same analysis backwards, to all the basic principles of the Totalitarian State.

Suppose society decides to abandon the pursuit of largely uncertain ends and to take its fate wholly into its own hands, directing its course entirely towards definite and specific immediate aims: then the structure of society must be changed accordingly. The application of the whole community to the achievement of a definite immediate aim—like winning the war, or dealing with flood, famine, epidemics, or any other emergency—must be entrusted to a State with powers to use every citizen for that definite aim, in accordance with a central scheme, or plan, formed at headquarters. No respect for law, or even humanity or truth, must interfere with the immediate good of

society which is thus defined and entrusted to the State. No individual has any justification to act independently under a State which alone knows the whole plans for the future welfare of the community. There may still remain residues of private life and private freedom; but all independent individual action for the public good, all public liberty as Liberals define it, must go. A State which is wholly responsible for the collective welfare and progress of its citizens must be dictatorial.

Powerful emotional forces are set into motion when general aspirations are replaced by specific aims. The wide hopes of men, withdrawn from where they dwelt in many dimly perceived expectations, are now focused entirely on the single concrete task set by the State. Such faith is narrowed down to the point of idolatry and intensified to the pitch of fanaticism. It produces a curious type of fanaticism, deriving its strength from the destruction of all ideals. A fanaticism, bitterly hostile to all ideals; combining fanatic passion—in an entirely novel way—with hard-headed, biting cynicism.

It is a vast undertaking to convert a social body, where the citizens are participating in the wide horizontal network of dynamic order, into a corporation in which every man is a subordinate depending vertically on the State. In Germany this process has gone on for years, and even to-day there seem to remain numerous circles retaining vestiges of their previous independent cohesion.

The transformation has been described by Rauschnig as the endless Revolution of Nihilism. Wherever citizens meet, or communicate with one another, to cultivate any aims that are not set to them by the State, the network of communications must be destroyed; and its destruction must be made secure by placing each individual directly under authority from above. All jointly upheld rules and standards, and the authority of eminent individual experts, must be ground to dust so that no shelter should be left standing, for use against the decrees from the centre. Any influence that the circles hitherto cultivating special ideals may possess over the general public, and all access they may have to the public ear, must be eliminated: so that the official voice alone shall be heard. Any motive that goes beyond the fulfilment of directions from above can be tolerated only as a residue of private life and must be branded as unsocial or disloyal if it should attempt to pursue aims of any wider significance. There must be left no more independent witnesses, or judges, or scientists, or preachers, or painters, musicians, playwrights, journalists, historians, economists, or even doctors, lawyers or clergymen; no independence of unions, professional associations, congregations or even sports clubs can be tolerated; the validity of all laws, of science, of the arts, of religion must be suspended and their substance declared subject to summary revision by the State.

This process of vertical integration under Party Rule is nothing but the sober logical consequence of the replacement of social ideals

by immediate specific social purposes. But the destruction to be undertaken in its execution is so vast, and the lingering feelings of respect for the intellectual and moral treasures hitherto cultivated, as well as for the men who would defend them, is still so strong that only disciples steeped in fanaticism will be able to suppress their own scruples and wield the weapon of terror with sufficient effect. The party members educated in unscrupulous fanaticism is an indispensable factor in the making and maintenance of the Totalitarian State.

The promotion of the totalitarian doctrine thus involves three phases which can be traced, for example, through Mr. Crowther's book.

*Firstly* the debasement of the most cherished ideals of our civilisation. Respect for Christian devotion may be debunked, for example, as follows: "The Franciscans . . . were the obverse of the new bourgeoisie. By pledging themselves to poverty they atoned for the bourgeoisie's lust for gain, and became its conscience. In return, the bourgeoisie kept and favoured them."<sup>1</sup> Thought and art even at its highest peaks can be exposed in a similar fashion. The Renaissance may be described as "in effect a manœuvre by the triumphant bankers and merchants to fortify their new ruling positions by cultural defences".<sup>2</sup>

*Secondly*, the transfer of devotion from ideals to specific aims. People must be made to feel that to pursue pure truth is "a little cold, mean and selfish" as compared with direct service to the community. Gradually all ideals are replaced by a single determination directed towards immediate social action.

*Thirdly*, the establishment and justification of the new ground entailed by this position. We are told: "On the one side there is private ownership, spiritual vulgarity and some independence; on the other side there is communal ownership, moral dignity and police supervision."<sup>3</sup> And thus eventually the mind will be opened to the final thesis, that the methods of the Spanish Inquisition are the rational instruments of human progress.

<sup>1</sup> S.R.S., p. 188.

<sup>2</sup> S.R.S., p. 248.

<sup>3</sup> S.R.S., p. xxvii.