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Thought in Society

by Michael Polanyi

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My first three lectures dealt with our power of tacit knowing. They showed that tacit knowing achieves comprehension by indwelling, and that all knowledge consists, or is rooted, in such acts of comprehension. The fourth lecture showed how the structure of tacit knowing is duplicated in the structure of comprehensive entities. Dy studying the way tacit knowing comprehends human performances, I saw that what is comprehended has the same structure as the act that comprehends it. The relation of a comprehensive entity to its particulars was then generally recognised as the relation between two levels of reality, the higher one controlling the marginal conditions left indeterminate by the principles governing the lower one. Such levels could be stacked on top of each other to form a hierarchy, and this opened up the panorama of a stratified universe of living beings. Stratification offered a framework for defining emergence as the action which produces a higher level, first from the inanimate to the living and then from each biotic level to the one above it. Emergence would operate in this way both in the development of an individual and in the evolution of living things.

Tacit knowing was thus generalised to include emergence, and became the universal agency of fundamental innovations, an agency which, with rise of man, takes on the form of originality in man. So in the end we were confronted again with the mind of man, making ever new sense of the world by dwelling in its particulars with a view to their comprehension.

We now enter a new range of subjects. We shall ask, whether

intellectual powers grounded in tacit knowing and affiliated to evolutionary emergence, can exercise the kind of responsible judgment which we must claim if we are to attribute a moral sense to man. Could, in fact, my critique of detachment, as an ideal of science, open the way towards a theory reestablishing the theoretical grounds of moral choice?

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The story has often been told how scientific rationalism has impaired moral beliefs, first by shattering their religious sanctions and then by questioning their logical grounds; but this can hardly explain the actual state of the modern mind.

It is true that the Enlightenment weakened ecclesiastic authority and that a modern mechanistic philosophy--going back to La Mettrie--has denied justification to moral values. But I do not think that the discredit which the ideal of detached scientific knowledge had cast on the grounds of moral convictions, would by itself have done much damage to them. The self destructive tendencies of the modern mind arose only when the new scientific scepticism was combined with a new, unprecedented moral fervour.

The social aspirations of modern man had their origins in Christianity, but they were actually evoked by an attack on Christianity. It was only when the philosophy of Enlightment had weakened the intellectual authority of the Christian churches, that Christian aspirations spilled over into the secular thoughts of men, and intensified men's moral demands on society. The breaking of ecclesiastical control may have proved morally damaging in the long run, but its primary effect was to arouse a new social conscience.

At first, scientific scepticism smoothly cooperated with the new passions for social betterment. Battling for freedom of thought against established authority, scepticism cleared the way for political freedom and humanitarian reforms. Scientific rationalism inspired social and moral changes that have improved almost every human relationship in western civilisation. Since the French Revolution, and up to our own days, this rationalism has been the chief guide towards intellectual, moral and social progress.

Where then is the fateful conflict between the moral scepticism of science and the unprecedented moral demands of modern man? Throughout the very period during which they were beneficiently combined, we can trace the undercurrent of their menacing contradiction. And since the turn of the last century, the mixture of moral scepticism and moral perfectionism has become explosive. All that is peculiar to our age, its self-doubt, its audacity and its doctrinaire bigotry, originates in this mixture of opposites. Twentieth century mentality is a hybrid of scepticism and perfectionism.

Such hybrids fall into two classes, one personal, the other political.

The personal hybrid is born, when scepticism, looking at the world in strict detachment, finds in it no grounds for authority or value--and declares man's choice unrestricted. Then, moral perfectionism enters the scene and directs moral scepticism against the existing society, denouncing its morality as shoddy, artificial, ideological, hypocritical, a mere mask of exploitation. Thus moral scepticism and moral perfectionism combine to discredit all explicit expressions of morality, and, having blocked the proper channels of

morality, they force moral passions to express themselves in anti-moralism.

This situation was described already in Diderot's Neveu de Rameau two centuries ago. (It was recently staged with popular success in Paris.) Soon after this we find the Marquis de Sade, claiming moral justification for unbridled lust and cruelty. (He has been recognised by French existentialists as their precursor.) A century ago Dostojevski first described murder as an experiment in moral scepticism; and half a century has passed since Andre Gide showed that perversion and gratuitous crime could be seen as marks of moral authenticity. Today we have a whole literature, in which a somber and fantastic obscenity is presented as a token of ultimate honesty.

This has been a powerful movement pervading our whole culture. "Man must be his own beginning: the author of all his values". This teaching of Sartre was already anticipated by the manifestoes of abstract art at the beginning of our century. They made the same demands for absolute authenticity through total self determination.

The fusion of scepticism and perfectionism which produce such radical individualism, can also issue in political teachings totally suppressing the individual. Marxist perfectionism, which demands the absolute humanisation of society, denounces in the same breath any appeal to moral ideas as futile and dishonest. It injects its moral demands instead into a theory postulating a mechanical course of history, which, serving as a scientific disguise of its utopian promises demands unconditional support for its consummation. We are commanded to fight for a utopia, by the voice of science, which pro-

tects us from our scepticism, by scorning all utopias. We are incited to absolute revolutionary self determination by an assurance that its outcome is strictly predictable. The historical role of Marxism Leninism, and its power, lies in thus uniting the two contradictory forces of the modern mind into a single political doctrine. Its fusion of total scepticism and total perfectionism has secured the loyalty of millions to the insane tyranny of Stalin, and this disaster was intrinsic to the modern mind. It engulfed some of the ablest and most generous among us.

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It may appear extravagant to hope that these self-destructive forces of the modern mind could be harmonized by reconsidering the way we know things. If I yet believe, that a basic reconsideration of knowledge may be effective today, it is because, for some time past, a revulsion has been noticeable against the ideas which brought us to our present state. Both inside and outside the Soviet Empire, men are getting weary of ideas derived from the fusion of scientific scepticism and moral perfectionism. Suspicion is growing that something is fundamentally wrong here. This revisionist movement can be assisted by basing our thoughts on truer grounds.

I have prepared for this effort in certain respects. Everything I have said implied my repudiation of the grounds on which the absolute intellectual and moral self-determination of man was proclaimed by the great philosophic movement which supplied ideas of the French Revolution. To acknowledge tacit thought as an indispensable element of all knowing and as the ultimate mental power by which all explicit knowledge is endowed with meaning, is to deny the

possibility that each succeeding generation, let alone each member of it, should critically test all the teachings in which we are brought up. Statements explicitly derived from identifiable premises can be critically tested by examing their premises, and the process of inference which led to them. But, if we know a great deal that we cannot tell, and if even that which we know and can tell is accepted by us as true only in view of its bearing on a reality beyond it, a reality which can yet manifest itself in the future in an indeterminate range of unsuspected ways; if indeed we recognize a great discovery, a great idea, or else a great personality, as most real, owing to the wider range of their yet unknown future manifestations; then the idea of knowledge based on wholly identifiable grounds collapses, and we must conclude that the transmission of knowledge from one generation to the other must be predominantly tacit.

I have spoken of the effort that a person receiving a message must make, in order to understand it. Higher learning and the arts and skills can be taught only to pupils eager to make a great effort to understand their teachers and imitate their skill. A tacit knowledge is a dwelling in our awareness of particulars in terms of an entity they jointly constitute. In order to share this indwelling, the pupil must presume that a teaching which appears meaningless to start with, has in fact a meaning which can be discovered by hitting on the same kind of indwelling as the teacher is practicing.

Think of the amazing deployment of the infant mind. It is stirred on by a veritable blaze of confidence, surmising the hidden meaning of speech and other adult behaviour. And this holds for all

subsequent stages of learning. Interiorisation can proceed only by accepting the particulars bearing on the ideas which they convey without attending to these particulars. We may never be able to identify any of the premises of a culture in which we are growing up, any more than we will be able to tell what principles we are tacitly applying in using our senses and our body. At each step we accept, and must accept, unidentifiable grounds, trusting that the practice based on them is sound and the ideas conveyed by them true. A scepticism which would avoid this would spell total imbecility. St. Augustine has observed this, when--basing himself on Scripture--he said: "unless ye believe, ye shall not understand."

It appears then that traditionalism, which requires us to believe before we know, and in order that we may know, is based on a deeper insight into the nature of knowledge, than is a scientific rationalism, which would permit us to believe only explicit statements based on specific data and derived by a formal inference which we have previously tested.

But I am not re-asserting traditionalism here for the purpose of supporting dogmatism. I admit that my re-affirmation of traditionalism might have a bearing on religious teaching, but I want to set this aside here. For I believe that modern man's critical lucidity must be reconciled with his unlimited moral demands, first of all, on secular grounds. We should hope to derive religious enlightenment and perhaps a religious renewal from such a reconciliation, rather than try to invoke the authority of revealed religion for achieving this reconciliation.

Neither am I going back on the impetus of the French Revolution.

I accept its dynamism, and share both its intellectual and its social aspirations. But I believe that the self-determination of man, proclaimed by the Enlightenment, can be saved from destroying itself only by recognising its own limits in an authoritative traditional framework which upholds it. Tom Paine could proclaim the right of each generation to determine anew its political institutions, for the range of this demand was in fact very limited. He unquestioningly accepted the traditional continuity of culture as the framework of self-determination. Today, the ideas of Tom Paine can be saved from self-destruction only by a conscious re-affirmation of cultural continuity. Tom Paine's intentions can be upheld only by the kind of traditionalism professed by Paine's opponent, Edmund Burke.

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I shall define this traditionalism by analysing the peculiar way in which the pursuit of scientific discovery is organised.

Science is systematic; but, as a whole, it is not ordered explicitly, like the systematic chart of the animal kingdom. Admittedly, science is divided into branches, and the branches are subdivided into narrower subjects. But the advancement of any one part of science depends directly on the progress of many other parts, possibly any other part. So the system of science forms a complex network. Any major discovery may weave new strands into this network, and may even reorganise it altogether. When Max von Laue discovered the diffraction of X-rays by crystals in 1912, crystallography was a dull subject, to be mugged up without a thought; fifty years later, it had become the center of an intellectual empire with provinces in every part of science.

Milton has compared truth with a shattered statue, the scattered fragments of which have to be collected and fitted together. But when you put together the fragments of a statue, you can see gaps where parts are missing and can see roughly the shape these missing parts must have in order to fit into a particular gap. Not so in science. To the average student, the system of science is always complete. Its gaps are visible only to exceptional minds who can sense the hidden possibilities to which present scientific knowledge offers clues. The heuristic vision of their subject and of its relations to other parts of science guides them to their problems and sets them on the path to discovery.

This brings us to the curious relation of an individual scientist to the system of science. No single scientist knows more than a tiny part of science and his view of this fragment is highly personal. How can we yet confidently speak of science as a systematic body of knowledge, and can we rely on it that science has the same scientific character throughout this body?

The answer to this lies in a principle that, to my knowledge, has never yet been stated, even though it is commonly practised in various fields. I would call it the Principle of Overlapping Neighborhoods. Every mature scientist knows an important part of science at first hand and can testify to its rich connections with other parts of science. This is as much as he can actually see of the system of science. But there are other scientists, cultivating adjoining fields, who see a similar fragment of science, parts of which overlap with the area well known to the first scientist. Consequently, when the first scientist finds that the judgments of his

neighbours about these overlapping areas is sound, he can take their word for it that science has systematic relations also in other directions beyond the overlapping areas and that the entire domains of his neighbours have the same scientific character as his own. Such reliance is of course mutual, and extends further from the first scientist's neighbours in turn to their neighbours, and so on indefinitely. Thus the whole of science, of which no one can know at first hand more than a tiny fragment, is covered by a network of overlapping neighbourhoods. Through this network every scientist participates in watching over the systematic coherence and scientific character of all science.

It is by trusting the operations of this network, and only by trusting it, that we can say that a systematic body of science exists. And when we say that science is a public domain of knowledge, we mean that, in view of this network, any particular scientific statement may be deemed to be accredited at second hand by all other scientists; and that we might conceivably find one prepared to demonstrate its truth to our satisfaction. Though it must be admitted, that such demonstration would hardly convince us, but for the fact, that we would trust the scientist, because he is trusted by his fellows. The network of mutual surveillance which secures the existence of a systematic body of knowledge to the satisfaction of its participants, imposes its acceptance on laymen, by virtue of the confidence granted by laymen to the body of scientists as a whole. If, for any reason, a serious break should develop, either in the internal network of science, or between it and the general public, the existence of science as a systematic body of

public knowledge would be called in question.

The situation is not without risks, for science is not a body of fixed knowledge, but an expanding enterprise. To secure the continued coherence of science, and its authority over laymen--on which science must rely for its public support--the network must control a steady flow of accretions coming from new discoveries. Here we see an exercise of authority, based on tradition, coming fully into view.

I have mentioned in my first lecture how scientific opinion determines whether a contribution submitted to a scientific journal is sufficiently plausible to be taken seriously. The teachings of science convey at all times certain basic convictions about the nature of things and about the method, which in consequence, is likely to yield results of scientific value. These beliefs and the art of scientific enquiry based on them, are not codified. In the main, they are tacitly implied in the traditional pursuit of scientific enquiry. They have undergone great changes in the course of the past four hundred years. Yet scientific opinion exercises at all times a powerful pressure to enforce these premises of scientific enquiry. Contributions which run counter to them are usually refused publication and, if published, are ignored. Such selection is indispensable, if journals are not to be rendered useless by carrying floods of nonsense. Yet the practice is notoriously dangerous, as important work has sometimes been refused attention. It has also led to occasional crises of confidence between scientific opinion and the lay public, as in the Velikowski case, and it has happened--though rarely--that in such a conflict, science was wrong and lay

opinion was right. My own quarrel with scientific opinion is largely about its official philosophy, though I have shown that there are considerable areas of some sciences the very substance of which has been warped by taking this false philosophy as its guide. Even so, I am only concerned with the false and meaningless image of the universe which these distortions of science present. I believe that lay judgment has well tested grounds on which to oppose scientific opinion in such matters.

But the fact that a statement is accepted to be true, does not yet qualify it to form part of science. There are many true statements which, though very important, are not part of science. A true statement is deemed to form a substantial part of science in the light of its scientific value. This value is composed of three coefficients: 1) its accuracy, 2) its importance for the system of science, 3) the ordinary, non-scientific interest of its subject matter. The same scientific value may be compounded of these three variables in different proportions. For example, though inanimate matter, which is the subject of physics, is not very interesting in itself, physics makes up for this by the accuracy of its measurements and the beauty of its theories. On the other hand, the discoveries of biology, though often not quantifiable and hence devoid of any mathematical beauty, richly compensate for such deficiency by the great human interest of living beings, which are its subject matter.

The proper assessment of scientific value is indispensable to the conduct of scientific life. It determines, whether a paper is worth publishing, and before that, it necessarily enters into assessing whether a problem is worth pursuing. What is more, the distribu-

tion of funds between different lines of enquiry, indeed, between different branches of science, will essentially depend on the comparative scientific value of the result to be expected in these alternative directions. Indeed the very opportunity for conducting research as an independent scientist, will depend on an assessment of the scientific value of the work that a candidate for such a position may be expected to produce. Not only do comparative judgments of scientific value determine thus the shape of science, but they determine beyond that the very composition of the network of scientists, whose collective opinion will make these judgments of value. Not only is science what it is, owing to such judgments, but scientists are what they are, by virtue of their mutual assessment of each other's merits in the light of these values.

Not a move can be made in scientific life without involving a most delicate and complex assessment of scientific value. Any disagreement on these standards of value causes a serious strain in the fabric of scientific life and any profound disagreement would menace the very existence of science as a coherent system of knowledge.

Remember now that these evaluations are exercised by a multitude of scientists, each of whom is competent to assess only a tiny fragment of current scientific work. Consider that each scientist must originally have established himself by joining at some point the network of mutual appreciation extending far beyond his own horizon. Each such acceptance appears then as a submission in advance to a vast range of value-judgments exercised over all the domains of science, which the newly accepted citizen of science henceforth en-

dorses unseen. Thus the standards of scientific merit are seen to be transmitted from generation to generation by the affiliation of individuals at a great variety of widely disparate points, in the same way, as artistic, moral or legal traditions are transmitted. And we may conclude, that the appreciation of scientific value too is based on a tradition which succeeding generations accept and develop into their own scientific opinion.

But this is still only half the story of authority and traditional values in the shaping of science. For scientific opinion appreciates yet another value and prizes it greatly, and this value is opposed to those that I have spoken so far; it is the value of originality. Both the criteria of plausibility and of accepted scientific value enforce conformity, while the value attached to originality encourages dissent. This internal tension is essential in guiding and motivating scientific work. The professional standards of science must impose a framework of discipline and at the same time encourage rebellion against it. This is why science can pride itself both on its discipline and its revolutionary daring. The authority of scientific tradition enforces the teachings of science in general for the very purpose of fostering their subversion in the particular.

Scientific tradition derives this curious capacity for evoking opposition to itself and readily assimilating it from its belief in the presence of a hidden reality, of which the established teachings of science represent only one aspect: of a reality that is yet to be revealed more fully by future discoveries. It teaches its orthodoxy to the novice as a guide to make his own contact with reality

by which he shall gain independent grounds to oppose this orthodoxy.

Each independent discovery, born into the existing system of science, safeguards its coherence, even though by its originality, it may profoundly modify the system and even affect the nature of its harmonies. Every generation is responsible for re-interpreting the criteria of plausibility and the standards of scientific value and originality transmitted by the tradition of science. Such self-renewal of tradition is fateful, and yet unavoidable. To speak of science and of its continued future progress is to share the commitment of scientists and hope for their wisdom in serving it. Any attempt to replace this shared commitment by exhaustively specifying its grounds, must fail.

Scientific authority is not distributed evenly throughout the body of scientists; some distinguished members of the profession predominate over others of a more junior standing. But the authority of scientific opinion remains essentially mutual; it is established reciprocally between scientists, not above them. They exercise their authority over each other. Once the novice has reached the grade of a mature scientist, there is no longer any superior above him.

The Republic of Science realises the ideal of Rousseau, of a community in which each is an equal partner in the General Will. But seen in this light, the General Will is seen to differ from any other will in that it cannot alter its purpose. The community of scientists would instantly dissolve, if its task came to an end and the members of the community had to decide on doing something else. A subjective choice can be varied at will, but a commitment rooted

in tradition and bearing on reality, is dissolved by a change of direction. The difference is fundamental.

The Republic of Science, of which I described the constitution, is a Society of Explorers, bent on an indeterminate future, believed to be accessible and worth achieving. A similar constitution should be suited to explorations in the arts, in literature, in ways of life, in religion, in politics. All these can advance only by independent initiatives, mutually adjusted by taking note of each other. Such adjustments will include rivalries and conflicts, which, in society as a whole, are far more frequent than they are in science. Even so, all the independent initiatives must accept for their guidance a traditional authority, enforcing its own self-renewal by cultivating originality among its followers.

Elliot says that "often, the best, and indeed the most individual parts of a poet's work may be those in which the dead poets, his ancestors, assert their immortality most vigorously." And of the scope of ancestral ideas he wrote in Little Gidding:

> And what the dead had no speech for, when living,
> They can tell you, being dead: the communication
> Of the dead is tongued with fire beyond the language of the living.

We have seen that what Copernicus had no speech for when living, he could tell, being dead, to Kepler, Galileo and Newton.

We may safely assume then that the powers of anticipation, inherent in tradition, are alike in poetry and in science. Elizabeth Sewell has been demonstrating for some years past that poetry can actually anticipate scientific discovery.

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It was the problems of the modern mind, which have led me to

explore the traditional grounds of scientific discovery and to glance at similar grounds in other creative work throughout society. We can see now that the absolute intellectual, moral and political self-determination implied in the teachings of scientific rationalism, is absurd. And we can see that the doctrine, going back to Descartes and supported by great thinkers like Kant, J. S. Mill and Bertrand Russell, which teaches that radical doubt leaves behind unchallengeable truth, and that we must critically examine any affirmation or supposition transmitted to us, before accepting it, is equally untenable. Our mind comes into existence only by voraciously accepting innumerable unexamined premises, without which we would grow up as total idiots. It is not true that science flourishes by the practice of absolute scepticism. On the contrary, it is based on an elaborate tradition of plausibilities, intellectual values and assessments of originality, which scientists maintain within an organisation of mutual trust and mutual appraisal. Scientific originality arises within this matrix and has no meaning without it.

I see creative thought encouraged on similar lines throughout modern society. It is organised like scientific life by the mutual adjustment of independent initiatives guided by an authority reciprocally imposed on each other by its members. It is a Society of Explorers, teaching its dynamic tradition, which constantly renews itself by fostering originality. These creative innovations are personal--intensely personal--acts, but their intent is universal, for they are dictated by a compelling responsibility for advancing true thought and noble actions. Wherever men have rightly spoken

in the name of truth, saying, Here I stand and cannot do otherwise, we instantly recognise both the power of impersonal truth and the greatness of the mind upholding it. We readily identify both the personal and the universal pole of such a commitment.

Whether we date it to Luther or to Copernicus, or to the French Revolution, our heritage is this Society of Explorers, of which I have traced the constitution and defined the metaphysical foundations. The freedom and responsibility of modern man is guaranteed by this framework and circumscribed by it. Originality is always fragmentary. The degree of originality any particular scientist trusts himself to possess will decide the range of matters over which he will venture to improve on current teachings, and by the same decision he will accept unquestioningly an immensely greater range of teachings as the basis of his new departure. Such is the definition of his particular calling. And just as each scientist must choose a problem, which is neither too large for him to solve, nor too small to be worth his while--so a great reformer may call in question a large province of existing society, if he feels equal to the task of improving it, while others will take the responsibility for the betterment of a smaller area of society--perhaps an imperceptibly small one. The degree to which existing society is accepted as given will vary between greater men and lesser men, but what is accepted as given must always remain predominant.

It follows, that scepticism is an unreliable instrument for the enlargement of freedom; it exercises a liberating power only when incidental to creative originality. Perfectionism is destructive; the great movements of reform which have so deeply improved society

in the Western parts of the world since the French Revolution, were achieved by abandoning the perfectionism of that revolution. When, in our own twentieth century, radical scepticism was combined with revolutionary perfectionism, there ensued a period of unprecedented cultural destruction, of paranoiac mendacity and enslavement.

I must turn now to the personal form taken on by the hybridisation of moral scepticism and perfectionism, so widespread in our times. What shall we say of writers from Nietzsche to Sartre who tell us that man must be his own beginning, the author of his own values? To explore these doctrines in the imagination, has served as a theme for great literature and its extreme demands of originality have quickened our sensibility to the basic elements of art, be it in poetry, fiction or drama, painting or sculpture, or music. They have impelled philosophy to daring explorations of being and nothingness. But it is not surprising that any tendency to apply these doctrines in practice, has been disastrous. For they are, of course, absurd.

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But we must not leave unnoticed the determinist objections to the claims of personal responsibility. Philosophers since Kant have found it difficult to find a place for man's responsible decisions in the natural order of things. Can a conception of responsibility ultimately grounded in my own commitment to its metaphysical foundations, withstand the critique of universal causation?

I should reply that this critique has lost much of its severity for two reasons. The first is, that we can be sure that the principles governing inanimate nature do not determine the behavior of sentient living beings. Some unknown principle must enter, very

different from all that is noticeable in the inanimate domain of nature, to account for sentient and responsible human behaviour.

Secondly, even in the inanimate domain, we have come to acknowledge the occurrence of uncaused events. One radio-active atom may decompose today, the other in a thousand years, and physics insists on it that there is absolutely no reason for this difference. I shall not suggest (as some writers have) that responsible decisions operate uncaused by virtue of quantum mechanical indeterminacy. Chance events and the responsible choices of men have it in common that in both cases we feel that the outcome could have been other than that which has actually happened; but otherwise no two things could be more different. The outcome of a chance event is the most meaningless thing in the world; a responsible choice the most significant utterance of a rational being: it owes nothing to chance. I shall borrow from physics only the revolutionary possibility of assuming uncaused events to take place under those principles which might account for the characteristic behaviour of sentient, responsible beings.

Physicists will remember that for a quarter of a century, from the discovery of quanta by Planck in 1900, to the discovery of quantum mechanics in 1925, there were two kinds of physics, classical physics for large particles, and quantum physics for atoms. Some physicists, including Niels Bohr, tried to link the two domains by a transitional principle which would yield the two different systems of physics as the two solutions appropriate for large and small particles, respectively. When quantum mechanics was discovered, it offered just such a principle.

We are facing a similar situation and, with luck, may make as

good a guess at a future solution. At one end we have the domain of inanimate nature, at the other, the highest form of life represented by a creative act of the mind. The missing principle which will account for the emergence of man from the inanimate, must form a transition between the two domains.

Look first at inanimate nature. It is controlled by forces which draw matter towards stabler configurations. These forces may be held in check by friction, which can be released by various agents, some of them uncaused. The decomposition of a radioactive atom may be the uncaused cause of an explosion. To sum up: we see forces driving towards stabler potentialities, which, when locked by friction, can be released by uncaused events controlled only by probabilities.

Creative innovations are evoked likewise by an anticipation of their hidden potentiality. In the inanimate domain the accessibility of a stabler position produces a force, in the mind it produces a problem. This heuristic tension is released by choices, that are hazardous and appear uncaused. But such gropings are not random; they are not controlled by statistical probability but by a heuristic effort, seeking the truth.

The great difference is that the mind produces something new, a new comprehension controlled by a new level of existence which the inanimate does not do. We may surmise then that the quality of consciousness resides, that is absent in the inanimate.

In my last lecture I identified emergence, which creates new levels of existence, with comprehension by tacit knowing. Such organic innovations should now be regarded as due to the release of

potentialities by the gropings of uncaused events. I have spoken of the gradual intensification of the center in living things, accompanied by an increasing value of its actions and exposing it to ever more serious reproaches. This process, culminating in the greatness and misery of moral responsibility, would have its place here, at the very point where consciousness arises to grant us the capacity for facing responsibility.

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The over-all title I gave to these lectures was "Man in Thought." I wanted to speak of the logical interrelation between living and thinking in man and to extend this interrelation by tracing the joint ancestry of man and thought, all the way back to their inanimate antecedents. I have introduced a number of new principles, crowded on top of each other, for I could not resist the temptation of glancing at a set of ideas appearing on the horizon.

But I feel that, actually, all I have talked about presents a single, fairly simple vision. This part of the universe, in which man has arisen, seems to be filled with a field of potentialities which evoke action. The action thus evoked in inanimate matter is rather poor, perhaps quite meaningless. But inanimate matter, matter that is both lifeless and deathless, takes on a new meaning by originating living things. With them a hazard enters the hitherto unerring universe: the hazard of life and death. The field of new potential meanings opened up was so rich that this enterprise swept on towards an infinite range of higher meanings, unceasingly pouring them into existence, for the better part of a billion years. Almost from the start this evolutionary response to potential meaning had

its counterpart in the behaviour of the living things it brought forth. It seems that even protozoa have the faculty of learning; they respond to potential meaning. Rising stages of evolution produce more meaningful organisms, capable of ever more complex feats of understanding. In the last few thousand years we, men, have enormously increased the range of comprehension by equipping our tacit powers with an explicit cultural machinery of language and writing. Immersed in this cultural milieu we now respond to a vastly increased range of potential thought.

It is the image of humanity immersed in potential thought that I find revealing in its bearing on the problems of our day. It rids us of the absurdity of absolute self-determination, yet offers each of us the chance of creative originality, within the fragmentary area which circumscribes our calling. It provides us with the metaphysical grounds and the organising principle of a Society of Explorers and I believe that this represents the essence of a modern free society. I think that this image of it might offer to those who would wish to reaffirm the principles of such a society, an assurance that it is greater than its shortcoming may make it appear to be.