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CHANCELLOR DUNNING TRUST LECTURES 1960

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Ladies and Gentlemen, Principal Mackintosh, thank you for your very warm welcome. It is a pleasure to be here and it is a great honour to be asked to be the Chancellor Dunning Trust Lecturer. The purpose of the Trust, as it says in our Programme, is to provide understanding and appreciation of the supreme importance of the dignity, freedom and responsibility of the individual person in human society. One cannot read these words without a certain sense of seriousness and perhaps some sense of anguish. Even in its most negative sense, freedom is to-day reserved for only a part of our fellow man. But it does not just say freedom for the individual purpose, it says freedom for the individual person in human society, freedom to choose, freedom to live, to act, to love, to know. Freedom in this sense is rooted in tradition. It depends on meaning, it depends on the existence of community. These Lectures will have something to do with the changes in the world, the new hopes and the varying problems which we face in preserving freedom in this positive sense. Over a quarter of a century ago, a French girl, Simone Weil, wrote of responsibility in comparison with all generations that had preceded this, "Ours is perhaps unique in the extent to which our responsibilities are imaginary and the extent to which our real responsibilities are few. This circumstance, once properly understood, conduces to us some serenity of spirit." This was a

desperate sentence and she died very shortly thereafter in testimony to how poor the self-serenity of spirit. What are our responsibilities as individual persons in human society? To prevent general war, to protect against tyranny, to help those who suffer from it, to improve their situation, to meet the problems of destitution with which a large part of mankind is struggling, to return good for evil in our personal lives and in our lives as a society, to be our brothers' keepers and to testify to the truth. Human dignity itself is inseparable from meaning. My Lectures will have to do with the effect of the revolution in the character, the quantity and the nature of knowledge brought about by the increasingly rapid and successful growth of the sciences taken very broadly on the tradition in which we live. They will have to do less with the very well known changes in the mechanics of our lives, as technology and economy. I am not expert in these. And rather good things have been written about them by contemporary economists. They will have more to do with the altered content, character, function and conception of knowledge itself. To-day I want to get into this subject and I need not define what I am going to talk about since you will know what it is within an hour. But in my second Lecture I will talk primarily of what we have learned about us as knowers, I will talk about the content and character of knowledge, such things as objectivity, and necessity, and what sort of things we learn and what sort of things we don't even try to learn. This has to do with the ordinary day-to-day content of that part of philosophy which deals with knowledge and epistemology. I hope when I am through that I will have deserved the comment which Whitehead made at Harvard

in the '30's, when he commented on a lecture that Bertrand Russell had given. Russell was talking about the new mechanics of the atom about which he didn't know very much. When he was through, Whitehead said, "I have to thank my friend, Bertrand Russell, for his brilliant lecture and not least for the extent to which he has left the vast darkness of his subject unobscured". I will take a crack at that to-morrow! And in the third Lecture on Thursday, I want to talk, here I will be really on very treacherous ground, in so far as one can talk adequately in secular terms, about the relation between knowledge and those other elements of culture that are needed to nourish man, that have to do with the normative parts of our lives, of our discourse with our judgments of what's worth committing ourselves to and what is good and what is worth aiming at and what is meaningful, all that which needs to nourish man if he is to live in dignity, freedom and responsibility in human society. When Columbus set sail on his first voyage, the evening of his first day out he opened the book which was completely blank and which would later be the log of his voyage of discovery, and on the first page, at the head of it, he wrote: "Jesus cum Maria sit nobis in via". This terror of the voyage was natural enough but it was also partly a foreshadowing that discovery changes the world in a way which one cannot go back on. In this middle of the 20th Century, many of us have the sense of a voyage into a very unknown future, the sense of a past tradition qualifying all our future but not exhausting it and not preparing us for it very well; the sense that in this immense, thunderous impact of discovery upon tradition, we have come to a new phase in human history. Actually, terror attaches to new knowledge and

the unmooring, the unpreparedness that we have to deal with it. One finds this in the oldest legends, in the story of Adam, in the legend "Prometheus". But one finds it also in another place, less obvious, I think, not in discoveries which are discoveries of practice, like fire and atomic bombs, but even in discoveries which have to do only with our understanding of what the world is like and to some extent, therefore, of where we fit into it. Many of my colleagues attest this, just those who have had the greatest ideas. Planck once said, "I can tell whether I've had a good idea by how much I tremble," and Bohr once said to me, "When I'm up to something, the thought of suicide is always very close." This question of what discovery does to tradition and in turn tradition for discovery, touches on the ancient and inexhaustible theme of struggle, balance and lack of balance between what is familiar and essentially timeless in human life and the always manifest sense of change. Tradition is no less than what makes it possible for us to deal with sentient and thinking and acting beings with our experiences, to cope with ourselves, to limit and to some extent ennoble our joys, to understand what happens to us, to talk to one another, to relate one thing to another, to find the themes which organize and unite experience and give it meaning, to see the relevance of one thing to another. It is what makes us human and what makes us civil. I had in mind an ideal image of the part of human life which, if it is not inherently all inclusive, has the quality of being public, not governmental but universal, which speaks in terms intelligible to all, of things accessible to all, of meanings relevant to all. It is typically

and decisively a common heritage, that which men do not have to explain to each other, that which in happier days they did explain to their children, that which they can rely on as being present each in the others head and heart. It has as such an assimilating quality, points to the likenesses of things, points to the connection of things, and of course it has, by this, a highly over-simplified quality since things, in fact, really are not very much alike, defines the great human themes which run through all our experience which we can come back to and recognize and talk about. This communication, largely verbal, also, in important ways takes place without words. In very primitive societies, at least as the archaeologists have explained it to us, one even finds instances in which the purpose of tradition is to prevent any essential novelty, to assimilate one life to another and one generation to another, and one season cycle to another so that everything has a place, so that everything is manageable and familiar. It has to-day in the Western world a very different function. In the sense in which I shall be using the word, the sense which is relevant to this world of ours, tradition is also the matrix and the mother which makes discovery in its important sense possible. It is the organ of interpretation, of enrichment and of understanding that in the arts and in sciences and in what is left of our common life, gives meaning to new discovery. It is, of course, the special mark, the "cachet spécifique" of the Western world, of the modern European tradition that it has catalysed, and this for reasons that I think are not really understood, an immense outpour, an immense growth of discovery unlike anything that man has ever known, unprecedented use of the past for

the future, unprecedented enrichment of the power to find new things by virtue of the fact that we could better control the old, unprecedented certainly in volume, in weight, and wealth and scope and unprecedented even in quality, even if one thinks of the highest days of the great cultures of the past. Of course this discovering this use of it, is in important ways not like the discovery of North America but there is much more of the element of invention and creation than in the discovery of America. If one thinks of what goes on to-day, the discovery of America seems almost a little misleading because in that sense America was really there, it had no element of the artifact, it had no element of the art. It is largely to this subject that I will want to turn in my next Lecture. But even to-day if you think of some of the things which enrich our present world, atonality in music, or the structure and function of the genetic material which gives to all living things the qualities of life, continuity and reproducibility, mutability and stability or such notions as those which erupt from the more recondite parts of physical science into the public press, like parity, which has played a large part in some modest, recent discoveries in physics. These are not things which are just lying around to be found. It has required a tradition and a culture and a background even to come to these things, even to define them, even to know the means by which one can get at them. It depends on where we are, who we are, how we talk. Invention, creation are very great. I am not labouring this point because I want to argue either side of an ontological question, as to whether what one finds out in new knowledge, what one discovers, is something that is there or something that

is improvised or invented. It is a rather empty question. Of course, they are there or they could not be discovered. And I am even enough of a Platonist to say that they are there more than most of the manifestations by which they are discovered. But their discovery depends on elaborate developments in our tradition, the human tradition, without which they would have gone unseen. Their discovery reminds us that our world is full of things not yet discovered, a circumstance which caused joy to Jefferson and should cause joy to us, and the future is enormously rich in what we will learn about ourselves and about the world we live in. Discovery is neither wholly necessary nor wholly free, and this subtle, beautiful situation has been enormously illuminated and enormously lit-up and made intelligible and acceptable just by many of the developments in science itself. I think that I should even at this point add a little to the candour and clarity of what I am saying by reminding you that I also am the product of accident and special circumstance. I think the stories that I am going to talk about are of concern to all of us. But the way I come to it reflects the fact that I have been a physicist in this Century, I have lived through one of the great revolutions in our understanding of nature, the discovery of the laws of atomic mechanics. It gives me certain *parti pris*. I don't want to labour at this time what the *parti pris* is. We have, as I will explain to-morrow, a code name for it which we owe to Niels Bohr, which is a view of the complementary nature of human experience and human knowledge. This stems from the fact that in order to get straight how to talk about phenomena on an atomic scale, one had to recognize for the first time something just as radical and

odd as Einstein's discoveries about judgments of simultaneity. One had to recognize that on the atomic scale you cannot reduce indefinitely the gentleness with which you study a physical system. You have in learning about it to make a connection between it and the large scale objects which give you some account of the state of affairs, the pointers and meters and electrodes, and so on. And because of this, this not infinitely fine grain nature of observation, not all of the idealized experiments that we are used to in large scale physics or chemistry are in fact possible. They are indeed all possible, but they are not all possible so that they are all relevant to a given situation. The doing of one makes invalid any information that you may have thought you got by doing another, and the other way around. So that you have a choice of studying the system, a free choice, but this choice does not include knowing everything. This is, of course, what makes atomic mechanics a statistical rather than a thoroughly determinist theory (description). It is what introduces into it a very new notion of the objectivity of human knowledge and it indicates in a way which is quite rigorous that there is a place for many approaches in the study of a system none of which can completely exhaust the subject. If one needs to have more than one approach and to carry it out in order to exhaust the possibilities but, that in doing one, one has lost the value of another, you are doing something new and cannot apply what you have found in one experiment to a situation in which you set up another. Each is a new chapter. One sees in this a very strong and useful analogy to the role of tradition in various cultures in providing complementary bases for the organization of human



experience. Think of simple cultures like those of the village Indians in south-western United States. Think of the to-day very tense, tangled, complex culture of Japan, with ancient and modern interlocked in a quite brittle way. We can't hope to achieve what one of these cultures does and what the other does simultaneously. In each something of the other is lost and one is therefore prepared to find that the place and style and role of culture and tradition of our history, of our role as observers, does affect the nature of our discoveries, the nature of how we organize the world and yet not by this discovery, not by this finding, to be misled to any view which would deprecate the objectivity in the philosophical, fancy word, validity, in the word of the political scientist, legitimacy, of the discoveries that are made. This is perhaps hopeful in coping with the problem of the impact of discovery on tradition. I want to talk about some of the consequences of this impact, some of the consequences of the growth of science. I have physics in mind because I can't help it. But I am thinking of the very great growth in the historical and human sciences and not just science in terms of astronomy and dead matter, science as it used to be talked about a hundred or a hundred and fifty years ago, because I regard our situation as grave, interesting, radically novel, something which men have not had to face before in our whole history. It is putting difficult choices to us, it's doing so to-day and will increasingly and we can and should be judged and I think, if our civilization survives at all, we will be judged, by how we respond to this, how we respond here in our countries in North America, and by what use that response is to our colleagues in Europe who

are beginning to grapple with the same difficulties and by what good our example may be to the rest of the world for whom we wish that they will soon be in a predicament as difficult as that in which we find ourselves. I think it important that we know what has struck us and have our eyes open in facing it. Science rests on, and it intersects with, alters and affects almost all of man's ethical life and because of this, the change in the world which this great growth has brought about, both material and intellectual, is a very, very great one, an unfathomably great one. On the intellectual side, I want to talk primarily of three traits: one is the growth itself, one is the question of the structure of our knowledge, and one is the related question, the openness of knowledge, its potential infiniteness and therefore its inevitable limitation and partialness. This is, of course, not the first time that there has been a great change in the intellectual scene. In the 16th Century, not over one hundred years, not much over, had elapsed since the closed, God-ordered world with the earth in the centre, with fixed boundaries which characterized the early Renaissance, suddenly came apart into an open universe, open and infinite, with the earth moving slightly eccentrically, about a star. And all of the deep organizing ideas of men were changed about essence and final cause in nature and the knowledge of nature. Even as late as John Donne, he wrote:

"'Tis all in pieces, all coherence gone;

All just supply, and all relation."

Still, I think our situation represents a greater change in the view of the world than this rearrangement of ideas about the human habitat which characterized

the 15th, 16th and 17th Centuries. I think that it is a greater change and if it seems in some ways to make us a little closer to ideas of Greece and some ideas of Buddhist and Hindu culture, they are not very helpful, these analogies, in the present situation. Two of the features that I have mentioned, the third has a kind of novelty, at least in the European tradition, represent a sort of imbalance. There is imbalance between tradition in its meaningful sense, what is intimate and familiar and relatively old and established in human knowledge, things that people have lived with for a long time, the contours of which they know and meanings of which they know, their own experience and schooling, all of that on the one hand, and on the other, what is new and therefore known very superficially or known in intimacy only to very, very few people. The other kind of imbalance is a related one. It is the imbalance between what is known to us as a community, all of us, and what is common knowledge, what we can take for granted, and the rest, what is known by special groups, by specialized communities, people who are interested and dedicated and involved in increasing human knowledge and human understanding but not able to put it, though there is a lot of effort to trying, into the common knowledge of man, not able to make it something of which we and our neighbours can be sure that we have been through it together, not able to make of it something which, rich and beautiful and heavy with insight, is the very basis of our civilized life. The educational and cultural problem is vaster than it's ever been before. In some ways this is trivial. We're an enormous society. We deal with more people, we hope for more from a larger fraction and we hold on, I think, with a great fervour and dedication to the open and inclusive view, that knowledge to love, to live

to know, to act and to choose are not the special right of any a priori, selected, limited part of our people. We have ourselves a loose, unhierarchical character in our society, perhaps a little more in the United States than in Canada, but not much, but it's not an ordered society in the sense that we can look up hierarchies in a book - we can't - find out who is the best composer or the best comic or the best physicist. I don't think we want to and I think if somebody tried it, we'd laugh at it. But the other side of the story is really quite brutal. In the 16th Century, much more even in the 17th, people began to express some anxiety about the strait of the European tradition. They were learning a great deal that was new. This frightened them and they thought that perhaps the sum of human knowledge might double within a half a century. Of course, the sum of human knowledge is a funny phrase, it doesn't refer to the Gospel of St. Matthew or Oedipus. Those things don't double at any time. But if we are talking about propositional knowledge, statements that this is a fact or statements more typically that if you do so and so you will find that out or statements that if A then B which are characteristic of the sciences and characteristic of that part of what we know about the world which has grown so much, then it is very different. To-day, such knowledge doubles in approximately a decade. This means that a man of sixty is living in a world in which a very small fraction of what is known to man, not man as a community, but men as many communities, a very small fraction was known when he went to school. This can be measured, of course, otherwise one couldn't talk about it. It can't be measured with precision, it can't even be measured

with great elegance. Professor Price who has been at the Institute some years has measured it, for instance, by the number of people working at the acquisition of knowledge and it follows this rule and has for something like two centuries. You can measure it by the volume of publication. It's easy to say that not everything that is published is important but it is also easy to say that we are in a desperate state and we protect ourselves against the publication of things that we don't need to have published. There is too much that we need to fill the journals with trivia or with things that could be deduced from what we already know or things that are redundant. These don't, of course, measure the grandure of knowledge. They measure its bulk, its weight and they follow the same rule. The most vivid statement comes from Purcell at Harvard who said a year or so ago, "Over ninety percent of all scientists are living". It's supposed to be funny but it isn't! Of course, people do hear and read about new knowledge from friends, papers, from magazines, over the radio. It would be better if it were more directly routed in a living and commonly shared tradition, for most of the new knowledge is quite specialized in character, not all equally so. Most of it is something that you can understand with some honest and good understanding, if you know what's gone before, because in order to understand it, you need to know what people did to get the knowledge. It's instrumental in character. How it was acquired, defines its meaning. You need to know the terms, you need to know what the meaning is of the abstract ideas in terms of which it's formulated. It's not something that is likely. This differs from science to science and I will have words to say about that,

too. In the early sciences, almost anyone can get a good idea of what's going on. In the late sciences, which have been at it for centuries, it's a very different story. It means that there's a certain danger, rather a grim one, that in trying to pick up without a good deal of skepticism and caution, a synopsis of modern genetics which is not a very old science, or modern cosmology which is not so old, just by reading about it, one may be misled by the fact that words sound familiar. A word like 'time', for instance, sounds very familiar and may suggest something that one has seen on a playing field in one's own life. Sometimes it's true but characteristically, and much more often, words have been used in the interests of simplicity and economy for something that has been refined and altered so that it's not very much like what we mean by an ordinary experience in ordinary life. The word 'relativity' and the word 'indeterminate' which one uses about atomic phenomena, well, they both sound rather familiar and they sound as though they were referring to rather constant states of mind of the human psyche but they don't mean anything like that. I think in the next half-century when we get deep into the real understanding of some of the intricacies and marvels of living things and their relation to us, there will be some kind of an answer to the question, "What is life"?, but we to-day as outsiders and anyway, it's very early in the game, we wouldn't recognize the kind of answer that would be given when it is given. It isn't the question we meant to ask. This means that our common life and specialized knowledge are in a rather unsymetric relation. Everything, of course, starts with our common life, our common experience, our common

discourse, what we do with our hands, how we talk about it, how we talk to each other. Then we begin to manipulate, intellectually, in the interests of understanding, and physically, very often in the interests of making something, or improving something, but also in the interests of understanding. These two get to be very close together and new things grow. I can't get away from the analogy of the fingers of the hand separate from the common matrix of our common life together but then are separate, or of the branches of a tree. I am talking about the fact that behind the different words and the difficult words, there is by now a difference in experience in life and in tradition which is very hard to bridge. Anyone who tries to tell about it, it's, as I say, not equally hard in all different branches of study, has some of the same problems as a man who has been off to war for five years and tries to explain what it's like to people who stayed home, or a man who has been in prison, but in addition there is the intellectual problem of often very difficult, abstract ideas and a great deal of learning that separates him from his audience. This knowledge is, of course, not without order. It is essentially all about order. (Never get the world orderly,) it isn't, but it's underlain and transfused by order and the purpose of knowing is to discover and create and unearth this order which relates things with one another, to reduce, of course, not to eliminate, the arbitrary in the world. But it's not orderly in the sense that there are a few general premises from which one can deduce everything else. It's not orderly in the sense that one can say, as I heard Bevin argue, just a year or so ago, "Of course I don't know all about this but I know the basic things, I know the fundamental things" because in a certain important sense

there aren't basic principles like that. The deep things in physics, the deep things in mathematics, these are not things that can be talked about, except in terms of a tradition which is by now very much separated from the common tradition. We have, of course, between the sciences, valuable and important contacts, enormous relevance of physics to biology, of chemistry to astrophysics, all through the world, enormous analogies between communication and heat engines which the mathematicians can refine and we have between us not only professional interests but friendship, patience, good-will and respect for each other but there is no, in spite of these relatednesses and in spite of the absence of contradiction, as far as I know, between the functioning of the most subtle parts of a living cell and the behaviour of atoms so far away that it's taken light two or three billion years to get here from where they are, no contradictions, no incoherences, no synopses. This is new and it's also a great change in our understanding of nature, and of our possible view of our place in it. But it doesn't mean that knowing a few laws like the famous, but I assure you, only very partial equations of Einstein that have been on so many magazine covers, you can deduce anything about life or that you can deduce anything really interesting about the structure of the cosmos or that you can deduce anything about atomic mechanics or that you can find out how chemicals behave. It's a lack of contradiction, of mutual potential relevance, but not by any means anything simple and orderly, in the sense that you learn a few things and then all of the rest of it you can work out for yourself on a piece of paper or hire somebody to work out. The receptacle



of all this knowledge is, of course, not mankind in general and it isn't merely any one man either. It's a group of highly specialized, slightly fluctuating communities of interlocking experts, the professional people who care about these things. We know each other in these and we have one really remarkable characteristic which is the one sure mark of people who are interested in knowledge, who are in the honest sense of the word, scientists. This characteristic is that people are grateful to each other for their discoveries. I don't think that there is any lack of professional jealousy when they wish one had done that, when they wish one had gotten credit which one thinks one earned for doing something that somebody else got credit for. But these are minor and superficial and shut-offable things, and the gratitude isn't. If somebody can see something that you've been puzzling about and tells you about it or writes a paper about it, this is a very great thing. This intimacy, of course, is something we are very aware of, this cordiality and warmth. We notice it with great hope and I think it's very relevant to the political future of the world, but we notice it also with melancholy, partly because it doesn't in any real sense encompass the world, but even more when we think of holding the world together to-day in its dangerous and disparate state. The bonds don't seem strong enough for that, and for the times we live in. But these communities are a kind of modern version of the mediaeval guilds that represent a sort of cognitive syndicalism. To these two attributes - knowledge increases that it's hard to keep up with and to the fact that it's in specialized hands and not our common treasure - there is another feature to which I should

refer. It's not new but it's depth, pervasiveness, and I would say the light it sheds seems to me knowledge, understanding, perception, the simplest kinds of perception, seeing and hearing, involves the knower in a choice, an action, an exclusion. This is what I want to devote to-morrow's Lecture to, or one of the things to which I want to devote it. For us to see or to hear, for us to perceive, talk or communicate, we have to ignore. In order to understand anything we have to fail to perceive a great deal more that is there. Knowledge is always purchased at the expense of what might have been seen and was not. And in all these matters, the potential is vastly greater than what is really known. This means that it is a condition of knowledge that we know a relatively small part of what is knowable, it is a condition of knowledge that somehow or other we pick our clues which give us insight to what we find out about this world. We act in knowing. It is surely one of the great roles of the arts that they profoundly extend what and how people can see and perceive and almost give the power to the organs of sense and above all in their great manifestations, that they alter and extend what people can see, not as individuals alone, but even more as a community, in a common vision. These three things, rapid growth, fragmentation and the essentially unlimited character of the knowable characterize the cognitive pulse in which we live. This is a time when the specialized traditions flourish and the common one binding us all together is eroded. It is eroded very much by the fact that the terms in which problems come to us are not familiar. It is eroded by the changing face, the changing institutions and forms of our society, by the fact that

the explosion in knowledge is coupled to and accompanied by an explosion in technology and by rapid change in every aspect of how we live. I see with great misgivings the fact that faced, for instance, with the questions posed by the rapid development of super weapons, the resources of our traditional attitudes toward good and evil seem hardly available, seem hardly relevant, they seem hardly to bear on this problem which, nevertheless may involve the end or the survival of human kind and human civilization and which certainly is a central matter in our ethical life. I think that in the end we'll come down to where we ourselves stand and how we did in this situation. It may be hardest, for in this vast world, its unceasing change, its great novelty without any precedent, not easy to grasp, its great alterations and its great nostalgia for a time when things were simple and more familiar and easier to keep in place, there are yet present for us beautiful and ever growing perspectives of understanding and of order more than at any time in man's whole history. The great sciences offer themselves a moving way in which there is harmonization on one hand of change and novelty, and on the other of a great and overriding sense of harmony and order. We have, I think, in dealing with this world a double sort of duty, the duty on the one hand to be constant and firm and faithful to what we really love and what we really know and what is close to us, to our art, our knowledge, our community, our tradition in the sense in which tradition has been the story of man's glory. To all the other traditions, to all the rest of the world with its wonders that we don't know very well, we need a sense of hospitality and openness, the willingness to make room for the strange, for the things

that don't quite fit. This is a hard double duty. If it is made possible at all it is because it is mediated by things quite outside the cognitive order by friendship, by the regard and the love we bear one another which soften the harshnesses of isolation and bring us news, understanding, sympathy for what our fellows are doing to bind some common human tie between us. These two parts of our duty make a picture of common life and an ordered world quite different really from any that man has in the past been content to accept, not very easy and not very tranquil but with a hope of a common life touched and illuminated by community and by growing knowledge of the world and of men.

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