

CONFERENCE INTERNATIONALE: SCIENCE, TECHNOLOGY, AND HUMAN VALUES

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“Nature and value of knowledge”:

John Polkinghorne, Presenter; Steven Weinberg, Respondent.

Let me start off by asking the question why do people do science? After all it's pretty exhausting, and frustrating, and the wastepaper baskets of theoretical physicists are crumpled pieces of paper at the end of the day. Why do they do it? Well, some philosophers of science will put on a practitioner's hat and tell you seeking instrumental success, and I don't for a minute believe that is the case.

Fundamental science is an entirely different measure, which is understandable; it is concerned with a search for knowledge for its own sake. You can see that very easily by thinking of the following parable, suppose somebody differed a large black box to the meteorological office with a set of instructions which said “put in today's weather through slot A, turn the handle, and out of slot B will come the weather in a fortnight's time.” Well they are broadminded people at the front office and lo and behold week after week, day after day, it turns out the machine works. In other words, despite chaotic (?) their instrumental purpose would thereby have been totally discharged. They only need to keep the machine and turn the handle, but do you think they'd all go home and quit business? Not at all. Within a very short time they would be tampering with the seals on the machine and taking it apart to find out how it had this amazing power to model the earth's season atmosphere in that sort of way. Science is motive by the thirst for understanding, but that thirst will not be quenched by science alone in my view. And the reason for that is that science achieves its very, very considerable success which I take absolutely seriously, it achieves it by the modesty of its ambition. It only asks a limited set of questions about the world, essentially questions of how things happen and only considers a limited

range of experience. Experimental science essentially considers experience which is in some way repeatable. Observational science of course, historical sciences like evolutionary biology and cosmology have a rather wider (?) in that sense, but their full experimental power do, in my view, depend heavily on the experimental sciences. Now there is a great many questions that we feel are meaningful to ask about the world, at least I feel are meaningful to ask about the world and necessary to ask about the world that are not of that character. Questions of meaning and purpose, questions of why, if you like. There is a great deal of experience, of which we have very direct experience, and which we take extremely seriously which is not of that repeatable character, all our personal experience is of that kind. Even if we play the same CD twice, we never hear the Beethoven quartet in the same way a second. There is unrepeatable experience and most of what is significant and worthwhile in human nature is concerned with those demands of experience and if I am really to pursue the search for understanding which my scientific instincts encourage me to do, I'll have to take the risk and count on the ambiguity of moving into those areas of personal experience and asking those questions of meaning and purpose as well as questions of process.

So I am totally opposed to all implausible reductionist accounts of human nature and of human knowledge. I don't wish to see human kind described under any impoverished rubric. Of course we are on some sort of genetic leash, but we are more than genetic survival machines. Of course, our brains are constructed out of incredibly complex networks of neurons, but we are more than computers made of meat. And therefore I myself wish to seek for as wide and comprehensive and therefore as profound an understanding of the world as possible and have as wide a construction of rational inquiry as is necessary for the pursuit of that aim. I mean for example music is very much more than vibrations in the air, but that in fact is all it is, from a scientific point of view. Just a painting, a Rembrandt self portrait is more than a collection of specks of paint of known chemical composition. The reality of beauty is I think actually a very important clue to the nature of reality. I don't think that beauty is a sort of emotional anti-phenomenal froth on the top of a prosaic reality. I think it's a very deep insight into the world in which we live. I've recently been reading for a second time George Steiman's Real Presences which is a very imaginative and sensitive exploration of what it means to live in a world in which there is the true experience of human creativity. His conclusion is that that is possible if the world is itself a creation.

So I, and I (?) to the wider view. And in particular I would never support what

is a very popular dichotomy in the public mind, not in this sophisticated arena, but in the public mind of a division between a world of public fact which is the world of science and the world of real knowledge therefore, versus a world of (?) and opinion, which houses many other forms of human activity including religion, which of course we are decently respectful of. I respect you for your opinion and you respect me for mine. Maybe it's true for you. I'm not myself very interested in things that are just true for me, or even things that are just true for you. I am interested in things that are true, pure and simple. And it is the search for truth, which will never be fully fulfilled of course, that pushes one along. And I can't accept that dichotomy between public fact and private (?) for two reasons, the first is that first of all, that public world of fact of course if the philosophies of science really have succeeded in teaching us. They haven't had enormous success, but they have been able to point out to us that interesting facts are not unproblematic notions. There are no really interesting facts that are not already interpreted facts. Doubtless if I face the photographic plate before you we could all agree more or less on the pattern or the marks on that plate. That in itself would really be of no interest whatsoever. I remember when I was a very young chap as a postdoc at Cal Tech being shown by (?) and Gail Mann just such a photographic plate and you looked at it and it was the usual sort of mess that double chamber photographs always are but then there was some sort of interpretative overlay that they placed on top of it and the tracks were then identified, interpreted as being certain particles, and it was the first photograph of a (?), which was rather interesting to see. So there are no uninterpreted facts in the world. Similarly, I don't believe that aesthetic experience or ethical intuitions are simply cultural artifacts. Of course they are culturally conditioned, of course the effect of interpretation of the spectacles behind the eyes in the famous phrase of Russell Hanson. More important, the more we move from the impersonal into these personal domains of experience, but I don't think that that sort of knowledge is simply just a cultural artifact. Let me defend that, not only in relation to beauty but also in relation to ethical intuition. I know, of course, that there are tremendous cultural impacts of ethical discernment. But I actually believe I know as strongly as I know anything that torturing children is wrong. It seems to me about as solid a piece of knowledge as I possess, and I'm not going to have that explained away as just the way my society sees it. And I would also want to say that there is a well-documented, if perplexingly diverse role of human experience which is the subject of theological knowledge and with the experience of an encounter of some reality standing over against one. Reality who transcends us and who is therefore not the subject to experiment, we can't kick him around or put him

to the test anymore than we can each other if it comes to that point, but is the ground of I think, in fact our whole experience with reality and the uniting ground that ties together the facticity of the physical world and our ethical intuition, and also of course, moments of humanness or mystical experience, I've never had either of those in a strong way, but I do have a continuing faith and plentiful experience of worship. That's a reality that is just part of, for me, an adequate part of the world, and it would require for its discussion the appropriate language which as I argue in the second chapter of the handout is the oporum language of symbols. There are areas of human discourse where metaphor and symbol are functionally the way to proceed, where things that can be said need to be said, which can only be said poetically, just as there are things that can need to be said prosaically.

So my picture of the intellectual world, if you like, is that we are faced with a very broad spectrum of rational inquiry. I define rational inquiry as the search for motivated belief. I don't believe that religious belief, for example, arises from shutting ones eyes and gritting ones teeth and believing the impossible, I think it is rationally motivated. It is corrigible belief, in fact is considerably in need of correction, just as science has been proven to be corrigible belief. It is more difficult to correct it and more difficult to agree on the form of the corrections, but I don't think that in itself disposes of the nature of the activity. So I see a very broad spectrum and I suppose roughly speaking, science at one end, because it deals with an impersonal world that we are able to protest, that we are able to manipulate and interrogate in that very well and experimental way through human experiences, (?) of ethics, through to theology which is the retraction on our encounter of the reality of God. It seems to be that all those forms of rational inquiry have about them certain common features. Perhaps the most important common feature it seems to me they all have, including science, is that they require a certain self-sustaining secularity for the formation of their beliefs. I call that intellectual bootstrap, picking up a phrase from the history of particle physics.

I think that all forms of construction of broad schemes of understanding have that nature about them and they have a circular nature because they are involved in the two types of self-sustaining secularity. The first is the so-called **homenutic** circle. We have to believe and also understand, we have to understand in order to believe. We see that in science, where we need interpretive facts, that in itself requires belief. The deliverances of modern experimental high-energy physics, for example, come from registration and enormously elaborate arrays of counters and devices of that sort, and the

interpretation of those devices, the function of these devices is itself deeply imbedded in the intellectual scheme of the subject. So we need to accept part of the subject in order to understand what is going on, of course we also need to understand what is going on in order to feel reassured and continually reassessing and correcting the belief that we've fed in. so I think we can't escape from a sort of **homenutic** circle, (?) in order to understand, understanding in order to believe. I think all forms of human rational inquiry have that character and therefore all of them, to differing degrees involve accidental intellectual daring. Even mathematics really, because as we know, from the work of **Goertle** and other logicians, even mathematics can't prove the consistency of its own foundation. So not too many of us lie awake at night worrying about the consistency of arithmetic. But every worthwhile human activity involves an act of intellectual daring, for example, science is committed first of all to the intelligibility of the world, that's its basic belief, that the world is there for our understanding to an astonishing degree, and that in itself is an interesting subject I haven't time to pursue. And science involves acts of judgment of what is going on. In my view there is no adequate account of science that doesn't grasp the metal of induction, equally there is no specifiable algorithmic account of what induction is. We can make generalizations if it's just a fact of scientific history. We can make fruitful generalizations, but we can't reduce the scheme for doing that to a sort of rule book which tells us how many for instances we know before we (?). Science also involves the assessment of theories, judgments of things like naturalness and simplicity, which have proved to be fruitful, theoretic principles, long-term fruitful theories have been characterized by having these characteristics of naturalism and simplicity. But again I think those characteristics are not prescribable in some exhausted and algorithmic sense. That's why I myself find that of all the philosophers of science in this century, the one who is most persuasive in his account of the scientific method is in fact, Michael **Polangi**, usually interjected and despised by the professional philosophers of science, but of course the man actually was a distinguished practicing scientist and knew science from the inside, and I think that his account of science has a good deal of justice to it and takes into account the acts of commitment and intellectual daring. In fact, I believe that the success of science (?) should encourage his other cousins in rational inquiry, like theology to be similarly prepared to stick their necks out.

What I do reject you will perceive, well Descartes is not having a very good day today for me. I not only reject dualism, I also reject the sort of foundationalism. I don't believe that there are clear and certain truths on the

basis on which we can erect a certain metaphysical edifice. I think that's just an illusion, a dangerous illusion. You know, William Temple, the great Archbishop of Canterbury, once said that the most disastrous moment in the whole of European history was that day that Descartes spent in the stove, whatever that meant. Well I think Temple may have slightly overemphasized that, but I think as great a man as Descartes was I think he (?) astray. So I don't believe in foundationalism, I think we have to make some sort of acts of commitment which are rationally motivated, but not rationally provable. Equally I don't believe in the strategy of skepticism, to question everything all the time would be immensely a fruitless activity, it would become completely paralyzing to science, it would be open to correction, but not actually skeptical. If you question everything all the time you will never get anywhere. There are strategies of rational inquiry which lie between the desire for certainty and the total rejection of anything that is not holy and unquestionably certain.

So that's the **homenutic** circle. And there is also, I think, an epistemic circle involved in places, that is to say how we know things depends upon the nature of the object we are seeking to know. And of course the measure of the object we are seeking to know is made available to us through our knowledge of it. I don't myself believe that there is an universal epistemology which is applicable to everything at all times in all circumstances. I believe that epistemology or just epistemology is framed in relation to the object of knowledge. I think that's a quite important point, there is really not much present in these chapters but I think it's to me has become an important point. In physics if we approach the quantum world in physics demanding the clear and localized certainties which are available to our knowledge of the Newtonian world we should fail to understand the quantum world altogether. The quantum world is there to be known, but it is known on its own terms. Our epistemology of it is to be modified by its own nature, exactly what that means of course is still a matter of debate, unresolved debate among people who think about the (?) of quantum mechanics. But back to this question of whether you can put things to the testing has to give way to trusting. I am persuaded by the sort of contrast that **Buber** emphasized so much, between the I-it literally and the I-thought relationship. So I think we have to take those things into account and I think these features of **homenutic** circles and epistemic circles are common to all forms of rational inquiry. Generally speaking they become more acute as we move into areas that are more personable and which we have less dominance, less power to interrogate and transcend the phenomenon of which we are interested. That's why as I say

somewhere science is easy in one sense, there are (?) the actual practice of science is easy and theology is hard. That is not because scientists are terribly (?) and theologians are terribly stupid, it's just that they have a more difficult task. Just as biology is more difficult (?) obviously for the same reason.

I've talked for a very long time and I think the discussion is probably more interesting than the disposition. Let me nail my colors to the mast. First of all I am an absolute and firm believer in the value of knowledge for its own sake and I want to defend that as strongly as I could. I think just the value in knowledge, actually in the end when one has to justify that I think, for me, I can't perceive ultimate justification of it that doesn't have a theological basis, just as I don't believe the defense of the value of creation that we were talking about before lunch is ultimately justifiable without some notion of creation behind it. It is worthwhile asking if you do believe that knowledge is valuable in itself is asking why you think that's so. I knew that for sure in the late 70's just before I left behind physics I was for a little while the chairman of the Nuclear Physics Board and Science Research Council, as it was then called in my country. So it was my job on behalf of the high energy physics community and the nuclear structure committee to ask the British taxpayer for a fairly modest sum, it was about 45 million pounds a year, in those days. Of course I had colleagues on the council who were asking for money for (?) science, for engineering, astronomy and other things like that. We all used to sit around at the appropriate time of the year and explain why our subjects needed more money than the other subjects, and were worth more money than the other subjects. Now, when I came to my turn I could of course employed prudential arguments, people working in high energy physics producing a pool of highly trained skillful and clever people. There are spin-offs from the very clever instrumentation involved in designing experiments and accelerators which breed sophisticated control systems that you can use elsewhere. But all that was true, but wasn't the (?) issue. In the end, the only justification for asking for 45 million pound was that it is a worthwhile object in itself to know something of the structure of matter out of which this amazingly diverse world is made. That was the only honest and in my view, totally sufficient explanation of why we wanted that modest sum of money.

Comment: They are asking for ten billion now.

Polkinghorne : Well things have gone up since my day. Anyway we are not so rich you can afford more than we can. The second thing I really do believe is I really do believe in the unity of knowledge. I do want myself, to seek, as I've

tried to indicate a unified understanding of the world in which I take absolutely seriously all aspects of what I believe to be basic human experience. Now obviously that phrase begs a lot of questions and I answer those questions in one way if all of you ask them in the same way. But I do want myself to seek an understanding which takes science seriously but takes on a form of rationally motivated human inquiry of equal seriousness and which seeks to integrate, but that's the really worthwhile grounding of my theory, it's commonly called metaphysics, of course. But obviously we won't achieve that completely, but that is the thing to aim for and again I believe that (?) object is ultimately theologically (?) because the ground of knowledge is also one. I say all of these things because I feel a very great need to defend these values in the present world. It is a world which is increasingly fragmented into specialisms as we all know and as we indeed all experience. We all know more and more about less and less. It is a world which in many ways is concerned with short-term aims. And again that is pretty understandable in many ways because there are so many pressing short-term aims which impinge upon us in a world where there is so much devaluation and injustice. But short-term aims don't exhaust all the things we should be aiming for. It's also a world I think, which in many ways, partly because of its specialization and because of its short-term aims is in danger of being carried away by simply technological imperatives. "If something can be done, let's get ahead and do it, come on chaps, it's very exciting." You know when you read the accounts of people who were at Los Alamos during the war, many of them have written their memoirs, and they all have a common theme, really, which was first of all what fun I was and it was I suppose the greatest concentration of scientific power in a single spot for a common purpose that has ever been assembled. And the problems were obviously very interesting. But for most of them, almost all of them as far as I can make out, it was only when they actually had seen the first test explosion they asked themselves what they'd been doing. Now I'm not arguing whether they should have made, well I'll tell you I think they should have made the atom bomb, I don't myself have doubt about it, but I think they should have asked themselves what they were up to. And we live in a world, because of its specialization, because of its pressing needs, we are apt to get rather carried away on technological imperatives, so I think actually anything that makes us reflective upon knowledge and upon value from the integration of the two is greatly to be encouraged.

Steven Weinberg: I don't agree with everything that John says but so let me start by emphasizing the areas in which I do agree. I agree very strongly with

what he has to say about science and that should not be taken for granted because there is much commentary on science these days that falls on either one of two extremes, either the extreme of naïve empiricism which seems to be the sin of scientists, and on the other hand a radical relativism which is fashionable among scientists. What John calls “critical realism” his attitude is I think just the right one. One that sees science as universe-assisted logic to quote him. That is something that proceeds in a methodical way but the method itself is one that has through long experience been suggested to us by our interaction with the universe.

I also, and this may surprise him a little more, applaud his emphasis on theology. As he does, I deplore the phrase that’s so common these days that “something is true for me” and if something else is true for you there is nothing to argue about we each have our own truth. I find that repulsive. In this sense I think theology is like science, if it is to mean anything at all, it is a search for an objective truth, something that is difficult to determine, but that is not just a matter of personal inclination. One so often hears today people, including people who are often in holy orders, say that theology is not the important religion, the important thing about religion is how it helps us to live our lives. You know, it’s a very curious statement to say that theology is not important, to say that love and grace and heaven and hell and sin are all not important. Clearly, what’s being said is that I don’t believe in any of those things, and therefore let us move on to something else so that I will not have to display my irreligion. Susan Sontag in an essay some years ago had a wonderful description of this, she called it “piety without content.” And as John said, after all why should anything be conceptually powerful and practically useful if it doesn’t have some relation to the way things are. In this sense, although I’m not sure I fully understood what Dean Thiemann said this morning. I think this represents a contradiction to what I took to be some of his remarks.

John also argues eloquently for theology placed within an area of human discourse where science also finds a home, quoting from his first chapter. I think he is a little ungracious about this because although he wants theology to be placed within that area of human discourse, he argues for example that the witchcraft of the **Azamb** tribe should not be placed in that area of human discourse. He says it lacks the qualities of comprehensiveness, simplicity and fertility of further development that he claims for theology and science. There is something unfriendly about that. The pictures of theology as someone who wants the membership criteria for a club to be set just at the level where

theology will be admitted as a member but then there will be no further members, like **Azamb** witchcraft. It's somewhat ironic also, because this is a club which theology used to preside over. In the end I think he fails to convince someone who was not already in his direction, that theology does deserve a place in that area of human discourse where science also finds a home. And the question is just the question he asks, not is it useful, not is it a powerful symbol, the question, and he is right about what the question is, does it bear some relation to the way things are ? Now his case is, according to John, an empirical one, it's based on religious experience, which is in its clearest form I suppose would be the experience of revelation. Well, I haven't had any revelation, I don't know whether John has. A few of us have been on the road to Damascus, I think for most of the people of the world we are riding piggyback on other people's reported revelations. And we have a right to ask whether we should take those reported revelations seriously. I suppose someone who has had his own religious revelation is immune to these arguments and I'm not speaking to that person. But I'm speaking to probably most of us, the common mass of humanity who has not had religious revelations and have to view this religious experience pretty much from outside.

Looking at it from outside, one sees a spectacle of thousands of years of theology failing to converge in any measurable degree to a common opinion about heaven or hell or grace or sin or any of the other great questions. Not only failing to converge but insofar as they can come to clear well-defined statements, quite disagreeing with each other, and this even though often they are supported by the secular arm, enforcing agreement, still there is no convergence. After all, I might be said to me, I have no direct experience of the mass of the electron; I have never measured the mass of the electron. It's true, I'm a theorist, I don't measure anything. I believe in what other people tell me about their empirical experiences about measuring the mass of the electron. Why should I believe them and still doubt the experiences of those who claim religious revelation ? Well it is largely that the sciences have converged. This is clearer in physics than in the other sciences. They have converged to a common view. You go to Japan or India, you hear the same physics. You certainly don't hear about the same revelations. Now John is not unaware of this argument and he counters it by saying that physics is easy and speaks of the modesty of ambition of physics and to a lesser extent to all of the sciences. And there is a sense in which he is right, it's not that physics, or science, let's talk about physics. It's not that physics is easy to do, it's true we don't have to clamber about in the canopy of a rain forest with Ed Wilson, we

have to go to Congress to get eight billion dollars from them. That's not easy. And I don't think it's fair to say that physics is intellectually easier or more difficult than that matter than any of the other sciences. There is a sense in which however he is right, that physics is easy. It is easier to tell success from failure in physics. It is easier to come to a common agreement about what is correct. This is why incidentally to the best of my knowledge there has never been a case of cheating in physics. That is a case of outright falsification of important data.

There are plenty of examples of stopping doing the experiment when you have the answer that you think you wanted to get. But things of the sort that have the answer that you think you wanted to get but things of the sort that have happened, that we read about in the biomedical sciences, in the pages of Science and Nature simply have not happened, in physics. And I don't think this is because of the moral superiority of physicists, but because it is so much easier to come to a common agreement about what is correct or not. But this is not because physics has simply attracted a generation after generation of lazy intellectuals, this is because physics has evolved to discover those questions that can be answered in a commonly agreed objective way. Originally when physics started, it wasn't called physics, it was called philosophy and it was all mixed up with ethics and theology. Over the centuries we have learned that some questions can in fact be addressed and lead to answers and others can not, and I would argue that theology has been shown by the lessons of history to be what is leftover in philosophy after you take out all the questions that can be answered.

Now John correctly, I think, points out that there is an element of an intellectual bootstrap in theology and also in science, but it is not possible, but it is not possible for a scientist to give a justification of science within science itself. I think this is absolutely true. In a sense David **Hume** that you can not defend the inductive method by using the inductive method. But it goes beyond that. It really science is a way of looking at things and it is evolving, we don't look way we look at things entirely in terms of what we've discovered because we wouldn't have discovered them if we weren't looking at things in that way. There is, as John says, an intellectual bootstrap, and one might also say well then what is wrong with an intellectual bootstrap in theology, suppose the rest of the world doesn't agree with you, well that's just too bad, just go ahead and see how far you get. I think in the end the question of what sort of intellectual bootstrap one wants to participate in has to be grounded in a moral judgment. I don't see any way of escaping in the end an expression of moral feeling about what kind of intellectual life one wants to live. And I think

here is where theology is so lacking. Theology it seems to me was not created by people like John Polkinghorne who have an interesting truth. It was created by people as Professor Sullivan said are overwhelmingly concerned with death, especially their own death and death of those they love, and beyond that with a sense of general helplessness and its significance of what John said is the desire not to be seen as just computers made out of meat. And therefore it seems to me, that theology indelibly bears the stamp of wishful thinking. Wishful thinking is too mild, it is an overwhelming urge not to be seen as just part of the universe in which human beings are not particularly significant and which there is no power watching out for us or caring...(recording cuts off – defecting tape)