

Transcript of Discussion at Dinner after 2nd James Gregory Lecture (given by Denis Alexander), Feb 28, 2008

Dinner Attendees: Fiona Bond (Project advisor), Sarah Broadie (Moral Philosophy), Helen Chambers (Modern Languages), David Cole-Hamilton (Chemistry), Kevin Diller (Divinity), Stephen Evans (Business Improvements), Paul Gifford (French), Rachel Hart (Archivist), Trevor Hart (Divinity), John Howie (Mathematics), Ivan Khovacs (Divinity, Tom Meagher (Evolutionary Biology), Eric Priest (Mathematics), Meg Ramey (Divinity).

Eric Priest: In his lecture Denis started out by saying that science has made some religious beliefs redundant but not the core ones, and he gave us a definition of science that:

- excludes ultimate purpose and value,
- has testable hypotheses,
- seeks laws,
- values mathematics, and
- is objective and is repeatable.

In the main part he made four key points:

1. The claim that science is the only valid kind of knowledge is self-refuting;
2. Science cannot explain itself;
3. There are other forms of human knowledge, apart from scientific knowledge; and
4. Science cannot address the ultimate questions of life.

He ended up by saying, that it's God as creator with intention and purposes for the Universe that offers the most consistent explanation for existence.

So let me kick off the questions. John Polkinghorne described how he sees reality partly through the eye of science and partly through the eye of religion, being both a scientist and an ordained priest himself. So this binocular vision helps him see more clearly. To him the questions addressed by science and religion are different, but not completely different; they are related in some sense so the answers need to resonate with each other in some sense. And he feels very strongly that you need the insights of both science and religion to make sense of the universe. Do you agree with that statement or do you think (along with Michael Faraday) that science and religion are completely separate from each other?

Denis Alexander: I'm not sure Michael Faraday did actually believe that (*laughter*)

Eric Priest: Oh well, maybe that's another myth that is wrong.

Paul Gifford: To me the polarity between religion and science never quite comes alive, unless you add a *third* term, namely, *culture*, because both science and religion are embedded in human culture. We never can say we are dealing with either in a 'pure' form, *without* some cultural inflection or input at some level. Sensibility, ideas, views of the world which are current in a given time develop and evolve, also. We can even say that evolution occurs in culture as well as in biological nature. So although we are bringing into dialogue two terms that can be seen as polar, and discussed as such, we won't do a good job of accounting for their interrelation unless we see the invisible mediating third term – culture. This is may accompany us through some of

these reflections: perhaps to help mitigate or transcend some of the apparent clashes, but perhaps also to question certain otherwise facile and suspect reconciliations between the terms.

Denis Alexander: I absolutely agree, I think culture is hugely important. Both enterprises are very firmly embedded in culture and can't avoid being so. However, I am not so sympathetic about using the language of evolution outside biology because it's often used wrongly as a substitute or synonym for development. I personally, as a biologist, would like to see the word kept within biology, simply because it has a clearly understood meaning there and once it's let loose into other realms it can simply mean change. But the cat's out of the bag, isn't it, in terms of popular usage?

Paul Gifford: Hm, the French for 'cultural development' would be 'l'évolution culturelle'...And Bergson's famous work of philosophy *L'Evolution creatrice* is about a coming-to-be (or genesis) of things far beyond the bounds of biological nature. I understand why it's important to a *scientist* speaking in *English* to distinguish a disciplinary area and a form of evolution that works by the precise mechanism of natural selection; but French usage has something to tell us too. It has the advantage of showing the integration of this particular form of genesis within a larger picture ... I'm not sure that this way of speaking can be dismissed as a case of loose popular usage, really; it's also a matter of the way different languages offer suggestively different accounts of reality...

A lot of the discussion between science and religion, when it ignores culture and historical context, is going to be difficult to understand. A good way to understand the Dawkins phenomenon is to consider 9/11 and the role of religion and the 'moral right' in American society. It's very hard to understand the angst that the new atheists have against religion without understanding that whole cultural and political context. That spills over into the science/religion debate, not always in a very helpful way, but at least it gives it a high profile and encourages people to come to lectures. Ten years ago far fewer people would have come to lectures like this one, and so the topic itself is embedded in culture.

Trevor Hart: Can I ask you about objectivity? You made the point that at times science aspires to objectivity but that it is also embedded in a tradition of practice, expectations, assumption, belief, and commitment of scientists by their training or discipleship under a teacher. So I wondered whether you find one way of differencing the ethos of natural sciences and that of humanities and ultimately religious faith would not be so much in terms of these two boxes of objective moral essence and subjective moral essence, but rather as part of a continuum of all levels on the one hand and an engagement with or aspiration of engagement with reality which is universal, which claims some intent which is more than simply personal which says: "this is not true just for me, but I think I am in touch with something real". On the other hand there is a set of fiduciary commitments, whether they are of a religious, professional or intellectual sort, and they exist at different levels, so that in science you have more of the objective fiduciary commitment than in humanities. With more of the validity, fiduciary, and a claim to something real, you don't simply have projection of the subconscious on the continuum.

Denis Alexander: I think you are right; there is a spectrum. Even within the sciences there is a great spectrum as well. Clearly the goal of absolute objectivity is unachievable. Within science there are certain disciplines that lend themselves to a more rigorous approach, perhaps a more tightly mathematically rigorous type of science. There are other types of sciences which are

fuzzier. I was talking about this earlier with some mathematicians. In biology we may look at a piece of film on which there is either a blob or there isn't or it's somewhat unclear so you wonder if it's significant or not. In other words, it's a craft, and you can only learn to interpret the fuzzy blob and its significance by experience. You may say that's not very objective; in one sense that's right – there is a lot of interpretation there: what do we class as artifacts to be ignored?

So I agree there is a whole spectrum, which goes all the way through the humanities and the sciences and you can't draw a line with the strictly objective on the right and the non-objective on the left. In some spheres the data will be more tightly objective than in others, though there again interpretations of the data can vary in their levels of objectivity. I don't know what Eric Priest would want to say about string theory where there aren't any data at all, but where there is plenty of very sophisticated maths.

Trevor Hart: We were talking earlier on about science and poetry. There are points at which science at its most heuristic is at its most creative and imaginative. It is not as if these are the ends of a spectrum

Eric Priest: To me being creative is right at the core of being a scientist since it's crucial for making new discoveries. You need imagination in order to make leaps out of the box and so advance in understanding. Also, there is a sense in which much of 20th century science is very different from 19th century science in being much less well defined and less deterministic. There is evolution and statistical effects, effects of uncertainty, chaos and turbulence. There is much more of a sense of mystery – for example, in the very nature of matter itself. You used to talk about billiard balls colliding. Now you talk about possibly eleven dimensions folded up within themselves. You talk about clouds of probability. It's so much more mysterious. It's beyond our easy understanding. So, the very nature of matter, the nature of time, and the nature of the origin of the universe, is much stranger than we could have possibly imagined a few years ago.

Stephen Evans: When you think of science, do you think of absolutes, do you think of whether it's either right or wrong?

Eric Priest: Well pure mathematics is certainly about absolutes, when you state a set of hypotheses and prove a theorem that is very definite. However, much of science has many more intangible, uncertain elements than many people realize.

Stephen Evans: How do you think you can dispel the myth that science is often not about absolutes, but more about probabilities?

Denis Alexander: The English National Curriculum in Science is changing next academic year, and I understand they are going to be bringing in more of the idea that science is about competing theories, and not just about gathering and presenting facts. It will be great to incorporate more of that understanding into the curriculum at the beginning.

Thomas Meagher: Something many people have trouble with is that scientific facts are transitional or ephemeral and depend on changing theories. At one point in your talk you had a slide of western science and underneath it Christian religion underpinning it or feeding it. My

impression is that a lot of the instruments that underlie the scientific approach, such as the method of logical inference, actually go much earlier than that. I think it's a limited view to claim that western science was spawned from Christian faith.

Denis Alexander: Yes, I think you are absolutely right, and what I was giving was a highly misleading *Readers' Digest* compression on one slide. Clearly, science emerged from a kind of complex stew of components. As Islam spread from the 6th century onwards it encountered the world of Greek philosophy and mathematics, and a huge corpus of these works were eventually translated into Arabic. Islamic science flourished from the 9th to 13th centuries as it absorbed, criticized and re-synthesised this great corpus. There were great advances, particularly in astronomy and mathematics, although the empiricism that we now associate with modern science did not receive so much attention. Then Islamic science declined in the 13th - 14th century at just the time when medieval Christian Europe was gaining access to the same corpus of Greek writers.

Beginning in the first half of the 12th century, translation of ancient classical works into Latin, first from Arabic, later from the original Greek, became a major scholarly activity, with Spain as the main geographical focus. The Italian Dominican friar, St. Thomas Aquinas, baptised Aristotle into mediaeval theology in the 13th century. Just as in Islam the encounter of Qu'ranic theology with Greek 'science' led to both synthesis and an incentive to new ideas, so a similar process happened in Europe, with what we now term 'modern science' both building on, but to some degree rejecting, the philosophy of 'the ancients'.

So the 17th-century mechanical philosophers, the "new philosophers" as they liked to call themselves, had an acute self-awareness of being in the midst of a revolution, but like many revolutionaries probably over-stated their newness in their opposition to the 'ancients'. So you have Francis Bacon coming up to Cambridge in the late 16th Cambridge and reacting against the dominance of Aristotle that he found at Trinity College, and Newton after him doing likewise in the same College in the 17th century. The mechanical philosophers pointed out that you cannot work out what ought to be the case in the natural world by a process of deduction from first principles. You have to 'torture nature' to find out by experiment what nature is in itself.

Besides all this, there is of course the very important components of patronage and sufficient political stability to engage in academic pursuits that are all part of the rich brew that contributed to the 'scientific revolution'. It's a very complex story and I wouldn't want to be simplistic about it in any way. However, it's quite clear that there were underpinning ideas and aspects of mediaeval theology that did sustain and nurture the emergence of science in various ways, and it was those that my single brief over-simplified slide were intended to highlight .

Can I just mention one interesting and counterintuitive aspect of this story? Peter Harrison (who has the new chair of Science and Theology at Oxford) has just published a fascinating book about the Fall (*The Fall of Man and the Foundations of Science*, CUP 2007). Basically his thesis is that the idea of the Fall was very dominant in the theology of the 15th – 16th centuries, and was one of the driving forces in the emergence of the empirical method and experimental science. And the reason was that Adam knew everything -- he was a kind of superman. He named the animals, had immense natural knowledge, and when he fell, that great repository of knowledge was lost,

but not for ever. It could be found again by hard work and by “torturing” nature, using accurate observations and experimental approaches. You find this idea in Bacon and many other thinkers and natural philosophers of the period, that by hard work and experimentation you can rediscover how nature actually works. The restoration of all that Adam lost is really up to us to get on with – Harrison presents convincing historical data that this was a key motivation to explore and understand the natural world in the early modern period. That to me is an interesting example of how theology can motivate practical actions in a way that might seem quite counterintuitive from our perspective.

Eric Priest: Certainly the huge advance during the Islamic period should be appreciated much more. I was at a lecture the other day where the speaker asked the audience, who are the 10 greatest scientists? He continued, “Most of you will name ten Western European scientists, but for me three Arab scientists should be part of the list.”

Sarah Broadie: Well, that’s a good point, but I wonder if I might ask a different question. What you argued in the lecture essentially was that religion and science are not asking the same questions. Therefore the answers they give cannot be in conflict and science has not made religion redundant. This seems to me to be a happy message as far as it goes, but there’s another difficulty. Eric Priest reminded us of the list of criteria and characteristics of science. Whether or not it’s a complete list, it seems a good one to start.

Now, I think I’m correct in saying that the other activities you mentioned, such as artistic, aesthetic and religious activity, don’t have well defined objectives. Maybe within a great religion, such as the Christian religion, there is a list of objectives. But when you look at it alongside other world religions it is not at all easy to say it has a single set of objectives which it fulfills. I don’t mean that as a mark against it, but just that it seems to be the case. So where do we draw the boundaries of so called aesthetic or artistic activity? And does it matter if we can’t?

Another point: science has frightened or intimidated other disciplines from looking at the universe because at some point it tries to state specific objectives such that it knows if it’s reached them, and it knows if it hasn’t and also sheds some light on why it hasn’t. Notoriously there is no such framework in the context of aesthetic experience, or in the general context of religious experience, which tells people when they are getting it right and when they are getting it wrong. The hope for a framework which tells you when you’re getting it right or wrong is somehow the wrong approach in those areas. What I am suggesting is that it is the lot of the other disciplines to somehow feel less respectable in comparison with science, if they measure themselves against the general criteria that science avails itself of. It’s not that they are trying to ask the same questions and give less good answers, but when they ask their own questions they feel they fumble. This might not have mattered before human beings developed this wonderful edifice of science. But now it’s there and we feel inferior.

Denis Alexander: I think there is a tradition of trying to say history is science and sociology is science, in other word to build the ‘science word’ into other disciplines, which is a pity. I have been brought up as a western scientist where the word science has a certain specified meaning in the English language (which is rather different in German, French, and indeed most other languages). There are many valid forms of human knowledge and they don’t become any more

or less valid by tagging the word ‘science’ on at the front. Rather, it can denigrate those disciplines. They should have their own integrity and their own way of working. Reading a poem can often tell you a greater truth than a scientific description. It can be a far truer and a fuller view in my experience because it can fill in something that a scientific description misses out.

Scientists have been sometimes arrogant and overweening in their ambitions. For example, E.O. Wilson’s book *Consilience* aims at the ultimate integration of all forms of human knowledge, but it turns out that Wilson really means that all forms of knowledge will finally be subsumed into science, which I find neither likely nor helpful.

Eric Priest: I agree. I don’t think humanities should feel inferior in the slightest. Science makes its advances by being very specific about its assumptions. It’s only within those very specific assumptions that it is able to make progress. If you ask, however, what is important to you as a human being, science will come pretty far down the list actually and the humanities will often come much higher, so that is why your subjects are so important.

Sarah Broadie: Yes, I think they are important too. However, I do think there is a long tradition, latent positivism, where philosophers who are fairly well informed about the hard sciences ask what can the other ones show? What are your standards and how do you justify those standards? I sympathize with your reaction, Eric, but I don’t think we have completely articulated an effective response to that.

Eric Priest: Some branches of the humanities in collaboration with science can certainly make more advances by collaborating with science. Using sophisticated scientific methods to analyze texts or paintings or musical instruments, for example, can be a great help, so it’s important to do that when you can.

Trevor Hart: It’s not at all obvious to what extent the “social sciences” are scientific or not. I don’t know if this what Sarah is alluding to or not, but there is the assumption sometimes in theological circles that one should allow oneself to be ruled by the expectations and methods and canons of judgment of a virtually a scientific way of measuring things. Rather than allowing yourself to be guided by the sort of thing you are knowing, you are guided by the boxes provided to you by the so-called scientific method, which actually is not very scientific. You don’t allow your way of knowing to be driven by the object.

Eric Priest: But you are also often talking about an earlier version of science that is very deterministic, definite and rational. Many aspects of modern science has gone way beyond that. You know, we are talking about chaos theory, about probabilities, about unbelievable aspects about the nature of reality which are much more mysterious, much more intangible. We are trying to develop new techniques to deal with these new ideas.

Paul Gifford: What we’re ditching is the positivism of the 19th-20th century. That became the fundamental discourse in the wake of the European Enlightenment. The physico-mathematical model came to be the model of all knowledge.; and predictability was projected as extended to the whole of reality. That was a discourse of mastery; a *dream* of mastery, to be precise – and the twentieth century has woken us up from that dream.

Reverting to the idea that Adam knew everything, the 17th century idea, it is interesting to ask, where does that come from? It's perhaps neo-platonic; maybe it dates back to the Renaissance. The idea that the mind in us is a fragment of the Divine Mind is neo-platonic which rediscovered Greek thought forms. It's hugely present in Renaissance figures such as Marsilio Ficino, for instance. And it generates various forms of esoterism. The act of knowledge is a sort of intuition; then there is a 'fall' from intuition into a laborious procedure of coded steps. One can see how that scheme might be superimposed on the Biblical account in the act of interpreting it.

Denis Alexander: The most primary source is Augustine, as expounded in particular during the Reformation by Luther and Calvin, but there was some influence in some thinkers from neo-platonic sources as you suggest.

On the more general question under discussion, different scientists today come from different directions in the science/religion debate depending on what kind of science they are doing. On the one hand you have what Eric Priest was talking about in quantum indeterminacy, and on the other hand you have Cambridge full of labs which are about as mechanistic as you can get. A big branch of biology is going through a very mechanistic phase, where you illustrate your cellular pathways with little Lego kits. So scientists coming out of that background will have a different discussion from the people coming out of, say, quantum mechanics or cosmology. The way the physicists and cosmologists talk about science/religion is often very different from a biologist.

Eric Priest: So do you think much of biology is fairly simplistic [*laughter*] and will it develop in a more sophisticated way in future?

Denis Alexander: Actually I think much of recent biology has been quite descriptive in its way. The sequencing of the human genome, for example, supplies us with a huge library of valuable information, but it's mainly a data-gathering exercise. Bioinformatics exposes fascinating connections between genomes in evolutionary history. Now it's systems biology that is receiving much attention: how do we put all this information together to generate overarching explanatory principles? Who knows, maybe biology might even start generating more 'laws of biology'. It doesn't have many at present.

Thomas Meaghar: In fact in 19th-century biology Darwin and others believed there was a defined series of natural laws and it was only a matter of time before they would be all discovered. The fundamental change that has happened in the 20th century is that the relationship between observer and the observed system has changed. A series of natural laws exist independently of the observer; whereas for the kinds of phenomena you are talking about in quantum mechanics, where there is an interaction with the system being observed, the natural laws associated with the observed system aren't as isolated from the observer as they used to be. It doesn't necessarily have anything to do with religion, but it is a major change in the philosophy of science. Even in your building block culture there is a new relationship between the observer and system.

Denis Alexander: I was thinking a little more of the contrast between the counterintuitive kind of thinking that characterises quantum theory, and the molecular mechanisms of how a cell works.

In biology you can generate the kind of descriptions that can be translated into concepts familiar to us in our daily language, whereas quantum mechanics is just weird, it has no obvious correlates in our daily experience. So there are different kinds of discourse. But I agree that this is to do with the philosophy and understanding of science, and has no particular religious connotations.

Kevin Diller: Is it fair to say that the distinction we are talking about really has to do with to what degree is the object we're talking about under the control and manipulation of the observer? And to the degree that the object slips away from control because we are studying something that happened millions of years ago or something so tiny we don't have the instrumentation or we are talking about something wholly other, that that creates the continuum that we are talking about here?

Denis Alexander: Yes, I think it's partly the scale or the level of discourse. For example, the justification of religious belief has many similarities with the justification of Darwinian belief. Darwinism provides an over-encompassing theory that makes sense of a huge amount of data, and very disparate data, for all kinds of disciplines. For me, it's at this level of generalization that the similarities between scientific and religious ways of thinking look most convincing. We have big overarching theories in cosmology and in evolution and these big theories of science encompass lots of different kinds of data, rendering the data coherent, and so and are very impervious to counter-evidence. Certainly evolution is a hugely successful theory that is doing a great job, with only a few pieces that don't fit very well, and we'll get to those one day and the puzzles will be resolved. That's scientific optimism showing through. But that's not that dissimilar to theology, where there is a powerful explanatory model, yet likewise some things don't fit and currently remain puzzling. The theologian might want to say that their explanatory framework is so good at doing its job that when these bits of data stick out as being problematic then "we can afford to wait a little while."

Paul Gifford: Would you accept that you are a scientist engaged in modern version of natural theology i.e. an argument concluding from the world to God, and looking for a meta-narrative that integrates the data you have from science? It strikes me that the difficulty of such an enterprise in a Christian context might be that the argument you are making is really one for *theism*, rather than for *Christianity*. You argue that a theistic hypothesis makes best sense of the existence of a physical world with biological evolution within it. But it strikes me that the enterprise of modern science, where the observer is part of and is dynamically linked to the thing observed, introduces a rather different game, another form of interplay between 'religion' and 'science'. That model is more directly akin to a specifically Christian view of things, where the central Actor, the Originator of the world-script, the Dramatist in Person enters into the equation and transforms it from the inside; and in a way that invites human participation in the completing of a 'new creation'. Science itself, embedded in a culture that changes, has thrown up this more specific and very suggestive new model.

If one looks at the whole vast orchestral score of evolutionary change (and not at one time-limited, discipline-limited line of that score), you see that 'religion' and Christianity are not necessarily the same thing. You certainly see a bigger problem here in understanding what we mean by 'religion'; and about the relation of 'religion' to evolving 'culture'

The theorist I follow at the moment in these matters is Rene Girard [recently quoted by the Archbishop of Canterbury] would say that ‘religion’ is pretty much natural human creation born – in ways Girard brilliantly explores – out of social need, particularly the need to manage the immense and crucial problem of human acquisitiveness, rivalry and violence.. Christianity, when it enters into the equation established first of all by archaic religion, is then seen as a *subversion from within*. Something that completely writes the script: not least, to observe one crucial example, the meaning and practice of ‘sacrifice’ ...

Ivan Khovacs: I found your point interesting that there may be too neat a correlation being sought between what science is and how that might explain God in the end, over and against the view that there is a more complex and subtle relationship between the knower and the known. Is this a new natural theology?

Denis Alexander: There are at least 20 different definitions of natural theology, which is part of the problem; it’s such a huge discourse. I would not want to derive my theology from my science. I don’t think my belief in God depends on my science.

Rather theology provides an umbrella under which all other branches of knowledge may be located. Science is one of those branches of knowledge which is subsumed within that world-view in which God is creator and revealer..The Christian faith centres on God’s revelation in the life, teachings, death and resurrection of Jesus. None of that can be derived from natural theology, by our study of the world and its properties, which is of course the goal of the scientific enterprise. Some people think of natural theology as a way of building up to our concept of God through the path of scientific discovery, but I find that quite problematic. Science can certainly highlight God’s existence, power and wisdom in creation, but as far as the character and purposes of God are concerned, I think we are dependent on revelation. We can then go on to ask the important question as to whether what we observe in the world is ‘consistent with’ this purported revelation of God’s purposes, and I think that’s what natural theology is partly about. I suppose I’m more of a top-down thinker myself: I would see Christian theology as giving a rationale and underpinning for all other branches of knowledge. I am happy with that sort of “natural theology.” It depends if one is starting with a top-down process or a bottom-up. One hopes that if you tunnel from both ends they meet in the middle. My tendency is to start from the top,, with theology as primary in the sense that it sustains and supports and rationalizes other branches of human knowledge. Is that a “meta-narrative”? Certainly. Scientists have no problem with meta-narratives. If Darwinian evolution isn’t a meta-narrative then I don’t know what is.

Eric Priest: In your lecture you argued by analogy, saying that one the one hand as a scientist you would find experimental results that are consistent with a theory, and then as a Christian you find that the world, the universe, is consistent with the existence of God. In other words, you have a kind of weak anthropic principle: rather than claiming to prove the existence of God or to be absolutely sure about God, you are saying your experiences are consistent with God’s existence.

Denis Alexander: Yes, that’s important, because getting back to biology, people like Steven J Gould used to say that if you replay the tape of life again, life would have come out looking very different, because the evolutionary process is stochastic, so that it’s very likely we might not have

been here. However, I take a different view: if anything, the data are now going in the other direction, so that if you replayed the tape of life it is very likely we *would* be here. A very constrained, organized set of events had to happen in order for us to be here. If we propose that there is a creator God who has intentions and purposes for the world in general, and for us in particular – then, if everything were *inconsistent* with that, it would be a very difficult position to hold to, wouldn't it? As it happens I think our greater understanding of the evolutionary process at all kinds of levels tends to exclude the idea that evolution is a chance or random process taken overall. Dawkins has also made this point many times. So it seems to me that the arrow of biological time, with the striking increase in organized complexity that we observe in the course of evolution, is indeed consistent with the idea of a God who has purposes for the world. So to that degree I am a natural theologian, if you like; in other words, if I couldn't say that at least to a reasonable extent what we observe in the world through our science is 'consistent with' the 'upper-level' grand narrative, then it would be hard to maintain it with intellectual integrity. So in practice there is an iterative process going on in which our confidence in the 'grand narrative' is increased along with our greater understanding of the universe.

The fact of emergence of mind through biology, through matter, on this planet is a remarkable, incredible phenomenon. We're so used to it, we take it for granted, but actually it's amazing, and to me it is very consistent with a God who has intentions and purposes for the world. It's not a proof, not a knock down argument, but it seems to be reasonably consistent.

David Cole-Hamilton: I think it's also possible to turn that argument completely on its head.

Denis Alexander: Go for it...

David Cole-Hamilton: I take a simplistic view. When Dawkins says the only reason for existence is to reproduce your DNA, that is clearly true in some parts of the animal kingdom, if not most of it. So a praying mantis will have its head bitten off so it can copulate. A she-wolf will be eaten by its cubs if it doesn't have any milk. Clearly there is a great urge to reproduce DNA throughout the animal kingdom, and they don't have religion, as far as we're aware. What is so special about humans? Well, eventually the human brain developed so that it had more time than is needed to hunt and reproduce. So it started speculating; it invented science; science is not something that was there, we had to invent it. You could equally say the same thing about religion: religion was invented because we had the time, we could speculate about what happened, saying "maybe God is there..." I don't think you have to say that, because what you see is consistent with God, it is any more believable than saying that we invented God because it fits in with what we see; it's a kind of a reversal.

Denis Alexander: Do you think maths has an existence independent of humans' minds?

Eric Priest: In pure mathematics you are discovering fundamental truths rather than inventing them. You may have to invent the mathematical techniques, but with them you are able to discover truths which are independent of your existence.

Paul Gifford: All forms of worthwhile anti-religious thought have this thought—that religious ideas, systems, doctrines and beliefs are a *complement*, invented by the human imagination to meet basic human needs. All significant anti-religious thinkers have that thought in some form: Marx, Freud, Nietzsche, all of them.

It's the form you would expect theories of religion to take when they belong to the reflexive stage of human culture. The human mind doubles back on its own processes and starts to form hypotheses about the psycho-social partheno-genesis of 'religion': its birth as a pure product of the human psyche in evolutionary cultural time. But now you have an intensely problematic proposition that religion is generated by the human mind as a natural process—that the human mind, in a kind of virgin birth, produces all the structures of belief and value which we understand by religion. That is the true 'virgin birth' according to Freud! The human mind is the source of it, without another agency or intermediary; and that is then seen as a sufficient explanation of 'religion'.

I have quoted the French theorist Rene Girard. Girard), who suggests that there may be something in this thesis of the social production of 'religion'; but Girard also insists that we are not to establish any simple equivalence between 'religion' and 'Christianity'.

How does religion arise? It's originally co-extensive with culture as such. Why so? Well, Girard says the no. 1 problem in any human society (including our own currently globalising one) is the management of human violence. It is *culture*, not hard-wired genetic instinct, that controls the tendency to violence. Culture, originally, is a system of interdicts and taboos regarding objects of desire which are likely to produce rivalry and hence violence (later, interdict evolves into law). And the lynchpin of all archaic cultures, according to Girard, is ritual sacrifice: that is to say a solemn, staged re-enactment of the 'founding murder' by which the destructive tensions of the group were discharged onto a scapegoat victim - the lightning conductor, so to speak, which enables human groupings to live together and manage their conflicts ... That anthropology of the birth of culture leaves traces still in both Greek tragedy and in the Old Testament. So for instance in Genesis, we find a descent into chaos and anarchy which permanently threatens human society.

However, what you then see is a process of evolving religious awareness. In the story of Cain and Abel, it is the mark put on the forehead of Cain: God wants to stop the mechanism of feuding, of violence, of tit for tat – that descent into the crisis of mimetically-led violence. The Ten Commandments identify all the objects of acquisitive rivalry. God demands mercy, not sacrifice, etc. In the gospels, you see the completion of this pattern. In the crucifixion you see Jesus entering into this archaic mechanism of unanimous violence against a scapegoat victim, in order to subvert it from within, to illuminate it from within, with a counter-truth which finally nails – i.e. reveals it for what it is and destroys its baleful hold. That's Girard's – hugely suggestive -- theory, very rigorously worked out....

What the theory does show is where the violence of religion comes from: why people were burned in the streets of St Andrews, out of bigotry and zeal; and why violent fanaticism is retained by the memory of Western societies as a synonym of 'religion'. Let's remember that the Enlightenment followed on from the centuries of wars of religion... And now we think Islam

is violent; but really, what we're seeing is the evolutionary heritage, still present within us, of an archaic 'sacred' and 'sacralising' violence, ventriloquising through the logic of the 'all-merciful' God. Nobody, believer or unbeliever, stands outside the danger of this resurgent logic of violence and the sacred: we're all embedded in it by the very fact of being human.

So here's a very radical and impressive account of why culture must be accounted as the crucial third term which mediates between science on one hand and religion on the other.

Ivan Khovacs: I would like to follow that up by asking Denis, what difference it makes to him that he seems to be talking about religion from an entirely different perspective from what Paul has just presented, which I might categorize as a bottom-up approach to religion. In contrast you, Denis, are dealing with religion by a top-down approach which would indicate an understanding of "givenness", of what religion is, or of simply revelation as opposed to a sociological understanding of religion. How does that shape your conversation between science and religion?

Denis Alexander: As already mentioned, I take the core of Christian belief to centre around the life, teaching, death and resurrection of Jesus. That's the core – Christianity emerging out of the Old Testament would be the core of my faith. Then one sees how that was baptized into first the Greek world and then eventually came into Europe and helped to get science off the ground in the process. So it is a characteristic of the three Abrahamic faiths that we are responding to historical events. Of course there is the important process of interpretation in that response, but we are not sitting down and trying to generate a religious system by some kind of bottom-up approach. That is very different from those monistic world religions that are much less loosely tied to historical events. Buddhism would still be true for the Buddhist even if the Buddha never lived, but you cannot say the same about Jesus for Christians or Mohammed for Muslims.

Of course there are many other forms of academic enquiry that are perfectly valid for the investigation of any of these religious belief systems. We can study them culturally, as Paul was mentioning, or sociologically, historically, or whatever, but at the end of the day the Christian would want to say that he or she is responding to what God has done in history, not generating some religious belief system of their own.

As it happens Jesus was very critical of certain forms of religion, so I would always want to define what we are talking about when we speak of religion. I am a natural skeptic; I don't believe in most religious beliefs. The 1st-2nd century Christians were accused of being atheists because they didn't worship the Roman Emperor, neither do I, so I suppose I am an "atheist".

In this sense I can share in Dawkins' atheism to a very large degree, in that the God he doesn't believe in, I don't believe in either. I don't think God is a complex entity like a Boeing 747 with lots of components. I don't believe in the kind of God he describes. So it is important to carve out what we really mean about our faith, identifying the baggage which isn't very helpful. The huge problem we have at the moment in the modern world of many religions is to do that job in a faithful and coherent way without getting bogged down in minutiae. So as I say, my core beliefs are fairly few actually.

Trevor Hart: In the lecture you talked about “religion”– and you qualified that quite carefully by saying of course that you had to fall back on some abstraction of what many mainstream traditions hold in common. But is there something about the Christian faith, a Christian account of the world and God’s dealing with it, which is more consistent than other possible religious or metaphysical scenarios which you sketch out? Is there a God, and is there a God-coherent cosmos?

Denis Alexander: I was pre-recording a Radio 4 programme recently, “Beyond Belief” (later broadcast on March 17th, ed), dialoguing with Muslim scholars about the decline of Muslim Islamic science, and why did that happen? One of the theological points voiced by some Islamic scholars as to why this happened centres on the idea of Allah’s absolute decree controlling the movement of every particle, and the way this more radical stream of Islamic theology gained sway amongst Muslim thinkers. Once you have an over-emphasis in Allah’s controlling will, so the argument goes, then this *subverts* the idea of law, the idea of consistency, because Allah could do something different at different times if he so wills. If every single possible event is uniquely determined by Allah, including the motion of every atom, then it is actually rather hard to derive consistency in one sense. I don’t for a moment think myself that the decline of Islamic science can be ascribed to one particular theological point like this, though it may have been a contributing factor, but rather the decline was due to a complex mix of factors, including economic and political. But I mention the point because I have heard it raised by Islamic scholars when discussing the question as to why Islamic science didn’t make further progress, particularly in not developing a more empirical stance towards the sciences.

One of the things one sees highlighted in the writings of the early Christian natural philosophers is the *faithfulness* of God in the created order. This in turn is derived directly from the great creation passages of Job, the Psalms and Isaiah that highlight God’s intimate involvement in the created order. It’s not a Christological point, but the Biblical character of God lends itself to consistency and coherence, that God is going to do the same thing, time after time. As I was alluding to briefly in the lecture, I think it is generally accepted by historians of science that the very idea of scientific laws that we scientists find so familiar today was nurtured by the assumptions of Christian theology that were shared in common by the natural philosophers of the early modern period, such as Descartes, Boyle and Newton.

Trevor Hart: I just examined a very good PhD thesis arguing about primary and secondary causality, and the issue that God causes everything to happen, but it is through created causes? But one of the claims made in the thesis was the stress on this in early Reformed theology created the situation in which one could simply strip away the transcendent and remove God from the picture all together – as in “I have no further need for that hypothesis” – and leave in place the completely comprehensive secondary causality, which explains everything. So even though in the theology it was intended as a way of explaining how everything works in the world, because it was comprehensive and you didn’t have to say “God acts here, but not there”, if you remove God from the picture you end up with a completely secular man of science...

Denis Alexander: Yes Christianity has often been called its own grave-digger in that sense. We are not looking for God in particular little aspects of the created order, but rather in the whole story. Either the universe has a creator or it doesn’t, that’s the knife-edge. Of course that’s why

Christians don't believe in god-of-the-gaps types of argument where you try and locate your argument for 'god' in the bits of the world that science can't yet explain, a very unsatisfactory type of argument, and one that is being repeated by the Intelligent Design proponents, only in their case it's a kind of 'designer-of-the-gaps' argument.

Tom Meagher: With regard to animal religion, you should read *WatershipDown*, ...again. [laughter] But I always interpreted biblical scripture as an allegorical manifestation of human nature. This goes back to the first lecture in the series which asked, did the writers of the Bible believe it, or were they working toward another agenda at the time? The nature of culture can go a long way to provide a structure for religion and belief, but you can only go so far with that. You have science and you have religion, and at some point people want to try and string them together. I think the ultimate question is, can the existence of God be subjected to scientific proof, and I think the answer that has been assumed over and over again to be "No", so those pieces of string are never going to meet.

Eric Priest: A lot of what is important to us as humans can't be proved. I can't prove my wife loves me. Many key aspects of life have to do with experience rather than proof.

Denis Alexander: In biology we don't use the word proof, do we? In the biological sciences, there are many things for which we have good evidence. But the word proof belongs more to physicists and mathematicians.

Tom Meagher: Well it depends. In experimental biology you have hypotheses testing and test ideas on a balance of probability.

Paul Gifford: Paley's idea was that from nature and the indication of patterns of nature you can make conclusions in a rational process. But Darwin actually is the torpedo in the side of Paley, since he introduces the notion of evolution and puts back the factor of time. In Christ College dining room in Cambridge you have two portraits behind you; one is Paley and the other of Darwin. They went to the same college. Our own implications of time to truth are crucial. So regarding evolution, you have to decide if it is a process which is contingent and random, or inspired and called. That's the real question of natural theology.

Helen Chambers: I am interested in your talking about comprehensibility, and incomprehensibility, and indeed refreshed by the idea that incomprehensibility is quite alright in many areas. I didn't expect a scientist to take that that point of view. I wondered further to what extent you thought comprehensibility was important, because it seems to me that at a university people are always seeking comprehensibility, but a lot of the evidence of culture and the texts we read is otherwise. How can people best live with an acceptance of incomprehensibility, and to what extent can people do that, who are always reaching for comprehensibility?

Denis Alexander: It's a natural human propensity to look for patterns and explanations. I'm sure that derives strongly out of our evolutionary past as well. Animals are always looking around, to make sense of things. So we have a deep drive to look for patterns and comprehensibility. I think what's so fascinating about science (and Lewis Wolpert wrote a whole book on this) is its counterintuitive nature— you come up against facts that make no sense at all.

The old classic example on this was the corpuscular and wave understandings of light. You needed to hold together these two incompatible notions at the same time in order to make sense of the data. So this means that you also have to have huge faith in your data. Schroedinger's equation definitely works in every experimental system in which it has been tested. But quantum theory is quite counterintuitive. It doesn't fit with our everyday experience. So, the data have the final say and you have to believe in them even though you think the quantum world is really weird.

Eric Priest: But quantum theory is still an approximation to reality. There is still a deeper theory that we are seeking, that we haven't yet found. It does not give an absolute account of the nature of reality. In modern science there is often a sense of mystery and a sense of incomprehensibility.

Helen Chambers: It takes maturity to live with that.

Eric Priest: I think when you are exploring the nature of the universe, if you're proud then an understanding will slip through your fingers. Humility and accepting incomprehensibility is essential for a modern scientist.

Denis Alexander: To me as a biologist, when I talk to my cosmologist friends, they tell me that at one time (at the moment of the Big Bang) all the matter of the universe could have passed through the eye of a needle. To me that is unimaginably counterintuitive. You think of the vastness of the sky with its 10^{22} stars. If you had told that to your average person a hundred years ago, they would have said, "That's ridiculous; don't be stupid." So in a way are called to believe ridiculous things.

Tom Meagher: Actually part of the counter-intuitiveness of that thought is that with the compression of matter to that degree, the physical laws would be so different that theories we use now would be invalid.

David Cole-Hamilton: What you were saying, about organizing information and thinking about things by organizing ideas. Isn't that how you make up religion, to fill in a gap you don't have? And in fact, isn't it more consistent to say people have made it up? There are, what did you say, 23,000 different religions? Is the explanation of a so-called primitive tribe any less consistent than our modern ideas?

Denis Alexander: Not everything is a product of our minds. Mathematics is true whether you believe it or not, and I've never met a mathematician who hasn't thought that. Actually maths exists outside the human mind. So there is a general agreement that there are things that exist independent of whether we are here or not.

The fact that there are religions in every part of the world doesn't tell you anything about whether they're true or not. There are lots of things in every culture of the world. So then it's down to the really hard slog of looking at specific religious beliefs. They can't all be right; they may all be wrong; we can investigate which ones might be plausible. At least the major world religions

are seeking explanations of why there is a universe instead of no universe. If one is interested in that kind of intellectual inquiry then I think one would ipso facto be on a religious quest. But of course you can just throw up your hands, and say, “Well, the universe is a brute fact, it’s just here; we don’t know why it’s here”, and leave it at that. But as a matter of fact we all have to live our lives as if we already knew the answer to the question as to whether the universe has some kind of ultimate purpose or not. We are all existentially committed to world-views that lie well beyond the ability of science to adjudicate.

David Cole-Hamilton: You said your religion, which is based on Christ, is consistent with what you see around you. So if all these other people in the world with different religions also see consistency, they can’t all be right. I am speaking from a position of a believer, but I’m interested in how you come to that belief. I see it as an act of faith and don’t see how you can prove it.

Denis Alexander: I don’t think the word ‘proof’ is quite appropriate in this context, any more than it is in biology. However, we can talk about evidence, rational argument, plausibility, balance of probability, that kind of thing. One can compare different religions, but never enter into another religion properly without actually becoming a part of it. That makes it difficult. The cultural aspect of all this is clearly important. I have lived in Muslim cultures for many years (in Turkey and in West Beirut) and know that religion quite well. I have taken part in interfaith dialog with many Muslim friends and so I think one can enter into another faith to a certain degree. After all, you can learn other language, and begin to enter into another culture that way. You can have an inquiry that is both rationally based, and also culturally influenced. Of course the major world religions such as Christianity and Islam can be expressed culturally in a huge variety of different ways.

David Cole-Hamilton: You would have to say, from what you say about the Christian religion, that there are many things that are right and consistent, and therefore other religions are wrong to the extent they don’t adopt them.

Denis Alexander: It is true, comparing Islam and Christianity, that there are certain things that are clearly in common and others that are not. All Muslims and Christians accept that.

Eric Priest: That is probably quite a good point to finish, since we are looking forward to the next talk on Islam, where hopefully we shall be exploring these aspects in depth. It’s been a wonderful evening where we have brought together a wide variety of people who don’t normally discuss together in this way. In particular, Denis we want to thank you most warmly for a marvelous lecture and for so clearly articulating a wide range of topics for us. Thank you very much indeed. [*applause*]