Body and Soul

Panel Discussion

St Paul's Cathedral

Tuesday 28 October 2008

Transcript

Panellists:

Keith Ward, Emeritus Regius Professor of Divinity, Oxford University

Neva Haites, Professor of Medical Genetics, University of Aberdeen

John Polkinghorne, former Professor of Mathematical Physics, Cambridge University

Denis Noble, Emeritus Professor of Cardiovascular Physiology, Oxford University

Chair:

Claire Foster, Lay Canon, St. Paul's Cathedral

Claire Foster

Good evening everybody, and welcome to St. Paul's Cathedral. It's great to see so many of you on such a cold, and now wet, night. I'm Claire Foster; I am a Lay Canon at St. Pauls, and a senior advisor to St. Paul's Institute. I'll introduce our distinguished panellists in a moment, but for those of you who are wondering I'm sorry to say that Robert Winston has been called abroad on urgent government business and sends his apologies that he cannot be here. However, we are delighted to welcome Professor Denis Noble, the renowned biologist, to the panel – a noble replacement, if I may say so. For those of you who have not been to one of our debates before let me explain the format. In a moment, I am going to ask each of our speakers an opening question and they will

speak for a few moments and then we will move into a panel discussion. Then, for the last part of the evening, we will take questions from the floor. If you have a question, please write it on the back of your leaflet and hold it right up to be collected. There are people watching to see questions being held up and we will be collecting questions until about 7.20pm so please do write them down before then. Also, please try and keep them brief because if they are long they may not get asked. We will end promptly at 8.00pm, but before you leave please do visit the bookstall at the back; and please also give generously to the retiring collection for our education department. You will have been given a Gift Aid envelope on the way in, please fill it in and put your donation in it.

There is other information about this evening, and the whole programme, in your white leaflets; including how you can hear a recording of it on Premier Radio this weekend, and also get a transcript if you like from our website. If you'd like to find out more about this series, please fill in the form in the leaflet and hand it in during the retiring collection or when you submit a question. We can also keep you informed about future events as well by this means. If you could fill in the feedback form too we would be very grateful, we really do read them all very careful and use your suggestions to improve future events. I'd like also to take this opportunity to thank the Templeton Foundation for their generous sponsorship of this programme.

It gives me great pleasure now to introduce our panel.

Starting at my far right, Keith Ward is Emeritus Regius Professor of Divinity at Oxford University; Professor of Divinity at Gresham College, London; and a priest in the Church of England. He is a prolific author, and his books include *The Big Questions in Science and Religion*; *Why There Almost Certainly is a God*; and *In Defence of the Soul*.

Neva Haites is a Professor of Medical Genetics at the University of Aberdeen and an honorary consultant clinical geneticist at Aberdeen Royal Infirmary. Among numerous national and international roles on medical and scientific bodies, she serves on the Clinical Genetics Committee of the Royal College of Physicians. Neva also councils those with a genetic disposition to cancer.

John Polkinghorne was Professor of Mathematical Physics at Cambridge University, and played a significant role in the discovery of the quark. He left to train as a priest in the Church of England, and after some years in parish ministry he now combines ministry and academia. His many books include; *Quarks, Chaos, and Christianity*; and *The Faith of a Physicist.*

Denis Noble is Emeritus Professor of Cardiovascular Physiology at the University o f Oxford, and a world renowned biologist. His latest book, *The Music of Life: Biology Beyond the Genome*, asks

what life actually is and draws on his experience of researching the heartbeat; as well as on evolutionary biology, medicine, philosophy, linguistics, and Chinese culture.

Would you please welcome our panel.

(*Applause*)

So, Professor Noble, Denis. We often think about human beings as body, mind, and soul; is that what a human being is? Is that how you think of yourself?

Denis Noble

The answer is a resounding yes, but I hasten to add that the body, the mind, the soul/self/spirit – whatever you want to call it – are not objects in the same sense as each other. I have two reasons for saying that. One comes from my experience as a biologist. You know, the body you can touch it; you can feel it; you can even weigh it; but you certainly can't do that with the mind or the soul. That has led some scientists, some of my colleagues including very distinguished scientists like Francis Crick the Nobel Prize winner, to question whether we should indeed be referring to the mind or the soul. "You," he says, in one of his books, "your joys and your sorrows, your sense of your self, your free will, are nothing more than the activity of billions of nerve cells and associated molecules" – which I would call the 'Reductionist Creed'. My experience as a biologist runs totally counter to that particular view. It is that the more you study the biological systems, the more you see the higher levels of organisation as being processes rather than objects. I would therefore suggest that the way to think of the mind or the soul is indeed as a process rather than an object.

But I also come at this from a personal viewpoint too. When I meditate, I might look at a candle flame, I might think of the sound of a bell and focus on that initially – and, of course, in that process of meditating you slowly remove all the activities of the mind, the thinking and intentions and so on, and I find – and I'm sure I'm not alone in this – that the further I go down that process of that kind of meditation, the more I find that there is absolutely nothing at the centre. This, of course, is the Buddhist concept of no self. But this does not mean that self does not exist, and it certainly doesn't mean that the mind doesn't exist; it exists in a totally different sense. So, I would say yes they exist but they are processes whereas the body is a thing.

Clair Foster

Thank you very much indeed. Neva Haites, how important are our genes in determining who we are?

Neva Haites

Thanks very much Claire. I'm going to try to interpret Claire's question by trying to look at some of the evidence around what makes us human and what makes each of us different from the person next to us; that is unless you are an identical twin here tonight. With the sequencing of the human genome, that is the DN, the inheritance material or the recipes of life that are found in our cells, we are beginning to be able to look at the differences between a human and animal genomes. From that evidence of the differences, we are beginning to be able to understand a little bit about how we have diverged from some of the animals. So, if we think of chimps we know that we diverged approximately six million years ago and that we are approximately 98% identical to the chimp genome in terms of the human genome. In comparison, the Rhesus monkey which we diverged from about twenty five million years ago we're only 93% identical – but that is still probably a surprising amount of identity.

Our human genome is about three billion chemicals long, or base pairs as we call them; and that is the recipe that gives us about twenty-five, to twenty, thousand different protein types that are produced from recipes. When we look at the proteins that are different between a human and a chimp, we see that in fact on average there is only two of the sub-units of a protein – an amino acid – that are different between a chimp and a human; and if we look at a third of the proteins, a third of them are actually identical so it's very interesting this type of comparative genetics. But let's focus down and think about individuals. What's the difference between individuals, regardless of their background or their ethnic origin? In fact, we are 99.9% identical – 0.1% difference. That 0.1% is made up however, of five million of those chemicals; those base pairs. So, again, we can start to look at those differences and see what that does to make us individuals.

Now, one of the ways we can do this is to look at some of the things we know are very different about certain individuals. For example, some of the conditions that we see as illness or as being quite different in terms of structure and function. So, if we think of a colleague with Down Syndrome, we know that that individual – in general – is born with one extra recipe book or chromosome. Chromosome 21, where they have three copies instead of two; and because they have

this extra set of recipes producing an extra set of protein products, we know that causes some very typical effects to them in the way they live their lives and their disease risks. Perhaps of more relevance, in terms of individual differences, is what I've come across as a clinical geneticist; whereas the first family I ever dealt with as a senior clinical geneticist was a family with four generations of history of ovarian and breast cancer. I became very fond of that family and I know them very well, I visited them often at births and at weddings. What was interesting was that although about half of the women had suffered from ovarian cancer or breast cancer, each of them took the same message from me in a very individual way. What they shared was a misprint in the gene called BRCA1, but what they presented to me was an individual point of view, as well as obviously a holistic whole body set of criteria that were different one from the other. That family taught me a great deal about the difference between genetics and the total individual.

But, we are now starting to being to look at what makes an individual different; and if we think of something very simple, our sense of smell, we know there are lots of genes that code for things that effect our sense of smell. We looked at 26 of them, scientists did; they looked at 190 people and they sequenced those 26 genes. They found that there were unique combinations of misprints in those genes that were unique to 178 of the people. Now, those misprints were subtle ones. They didn't cause major predispositions or illness, they just changed the way people interpreted smell and their sensitivity to certain smells. Now that's an example of where subtle changes can define individuality. We see similar subtle changes in taste, and in vision, and in all of the different aspects in the way we relate with our environment which are related to very subtle differences in our genome which are incorporated into those five million that are different from one individual to the next.

Claire Foster

Thank you very much indeed, fascinating. John Polkinghorne; how might genetics inform theology?

John Polkinghorne

I think that every significant scientific discovery informs theology by helping it to understand a bit more about the potential with which creation has been endowed, and the processes by which that

potential becomes an actuality. I think that genetics helps theology by pointing in the direction of a very important concept, which is the concept of information. I think that we are just beginning in science to be able to study complex systems, only moderately complex systems, in their totalities; not taking them to pieces, studying the exchange of energy between constituents, but taking them as a whole. When we do that, we find that these systems have an amazing power spontaneously to organise very complicated patterns of behaviour; and the way to describe those patterns is in something like a concept of information rather than simply in terms of energy. Now, DNA represents a static form of information. It's the given, if you like, blueprint for the body; but it doesn't determine, by any means, the whole embodied being. We have a hundred-thousand-million neurons in our brains which have a hundred-trillion connections between them at the very least. That amazing complexity could not be coded for by thirty thousand genes. So, a lot of the structure that is us – a lot of the pattern that's us – is produced through experience; it's produced epigenetically, as people say.

I think that these sorts of considerations help us, a little bit, to think about the problem of what is the real me; what is the human soul. When I am talking about the soul, I'm talking about really what is the carrier of my identity – what is the real me. I mean, here am I - an elderly, bald academic – what makes me the same as the school boy with a shock of black hair in the school photograph of many years ago? It's tempting of course to say material continuity, but that's an illusion because we know that the matter that makes up our bodies – the atoms that make up our bodies – are changing all the time through wear-and-tear, eating and drinking; I am atomomically distinct from that school-boy. What makes me the same I think, which is a carrier of continuity, is not the matter but the almost infinitely complex information bearing pattern in which that matter is organised at any particular time. Now, of course, I am waving my hands when I say that – I haven't the slightest idea how to describe accurately that fantastically complicated pattern – but that I think is the real me; that I think is the soul. It's a dynamic thing; my soul is formed as my memories accumulate; as my character is formed. It's also not wholly contained within my skin. I think part of the pattern that is me is the pattern of relationships that I have with other people round about me; so it's an immensely complicated thing to think about, but that is what I think the soul is. Incidentally, that's a real revival – in a sort of modern dress – of really quite an ancient idea. Both Aristotle and, following Aristotle, Thomas Aquinas thought of the soul as the form of the body and I think what I am saying has a cousinary relationship to that.

Now, if that's right, of course the pattern that is me will decay with my death; so it has no natural immortality. It's not a detachable spiritual component. I'm not an apprentice angel, I am an

embodied being. But I think it's a perfectly coherent belief, that I entertain, that the faithful God will not allow the pattern that is me to be lost. It will be held in divine memory – that isn't quite me continuing a full human life, I have to be embodied for that, but the Christian hope of course is that God will re-embody that pattern as me in some great final act of resurrection. So that's a long way from DNA but these things hold together it seems to me and I think these are fruitful, and to me helpful, analogies.

Claire Foster

Thank you very much indeed. Keith Ward, finally; the Judeo-Christian understanding of human beings is that we are made in the 'Image of God' – what does that mean to you?

Keith Ward

Well, I suppose since I've been a professor of theology I ought to start with the Bible; and start with Genesis. A lot of people think that the Christian or the Jewish view of the soul is that it is quite a separate bit, a substance which is separate from the body - quite different from it - and might even be better off without it. So I'd just like to say that is not the Biblical view at all, and I think a lot of the modern discoveries in biology about DNA actually help to make more profound our understanding of the human person as a physical being of a certain complexity and a very distinctive nature. So, the first thing I would say is that there is no word for 'soul' anywhere in the Bible. But, of course, you might find the word 'soul' in some translations but there is no actual word for it. The nearest thing in the Hebrew, in Genesis, is the word *nefesh* (*nephesh*) and that does indeed mean 'principle of life' but it's important to notice that *all* living things – all animals, even vegetables, potatoes and tomatoes – have souls. They all have living principles. So having a soul, for the Bible, isn't what makes human beings special. Indeed, as Claire mentioned, it's the notion of being created in the 'Image of God' that makes human beings special – so what is it to be created in the 'Image of God'?

First of all, again, what it's not. It is not being physically like God in any way at all; nothing physical is like God. But, many people have thought it means we have some mental characteristics like God's - we might be free, we're able to understand, we're able to think – and those characteristics may be a bit like God. Now that might be true and important, but it's not what most

scholars now would think being made in the 'Image of God' really points to. The general opinion now, amongst Old Testament Biblical scholars, is that being made in the 'Image of God' is having the role of God – under God, of course – with respect to creation. Just as God creates and cares for creation, human beings are distinctive among all the animals on the Earth because we are able, we have the capacity, to understand creation and to care for it too. We are responsible for how it goes. So, being made in the 'Image of God' is having capacities which make it possible for us to care for, or unfortunately to destroy, the Earth. It's having those capacities which make human beings special.

That notion of capacity, of course, echoes what Professor Polkinghorne said about Thomas Aquinas. Aquinas is probably the greatest of all Christian philosophers, and he in fact did say the soul is the form of body. Now, there can be lots of discussion about what exactly that means but what it doesn't mean is that the soul is quite different and detached contingently to the body. It means the soul is the set of capacities that a human being, that a person, has. It is what makes some animal a person as opposed to not quite a person, and personal capacities – I suppose you could put it briefly – are those which have a unique point of view, a perspective, on a growing, developing, experience and a certain control over their future – however small – so that they make free choices which make their future their own. So persons are animals; persons are embodied and, I think, the expression 'process' is quite a good word for a capacity of a body. That might leave the question well what happens at death if we are such that our souls are principles which enable us to have certain capacities in the body; can they continue beyond the death of the body? Actually, I think that that is a possibility – that is to say the same process; the same pattern; the same set of memories; the same projects and ideals, the things we've made of our life can be re-embodied in a different form. I suppose that is what the key text in the New Testament says in 1 Corinthians, Chapter 15, that there will be a resurrection body as different from this physical body as the wheat is from the seed. It will be a different form, perhaps we wouldn't even call it material in that it meets the second law of thermodynamics and decays away, but it will be some form in which the soul – the capacities of a person; their memories; their projects; their ideals – can be embodied in a social reality. I think that is the Christian view; so what's distinctive about it is that we believe that our personalities, though they are fully physically based, can transcend this piece of matter – even this material universe – and be re-embodied in a grander world where the presence of God will be clearer and more intense.

That I think is, and ought to be, the traditional Jewish and I think Christian view of the soul. I think.

Claire Foster

Thank you. Can I remind the audience to please write your questions down, because there will come a time when it is too late. Write your questions down and hold them up really clearly, like that.

I just want to ask you Keith, really as a matter of clarification for me – and perhaps I missed something in what you said – you were talking about human beings in the 'Image of God' and you were speaking about the nature of a person and that which transcends the physical and goes on after death. Can you relate that description to the idea of the 'Image of God', or humans in the 'Image of God' more clearly for us?

Keith Ward

I think the idea of the 'Image of God' is related to our responsibility; for ourselves, for other people, and for the planet. So being made in the 'Image of God' is having a functional responsibility. It's not anything you can pin down to a particular substantial form.

Claire Foster

So 'Image of God' is a duty?

Keith Ward

It's a responsibility, it's a privilege. Certainly I think if you say what's different about human beings from other animals then what is most obviously different is that we can understand the mathematical structure of the universe, and we can build machines which have changed the universe. Our responsibility is in this universe. It is a great mistake, I think, to think of the soul as something which only exists after death or which has its most important part after death; it's got a responsibility and a privilege in this embodied world. I think that we are probably all agreed that that would be true, if there were a soul.

Claire Foster

John...

John Polkinghorne

I entirely agree that being in the 'Image of God' carries a responsibility for caring for God's creation, but I think it also probably offers an opportunity. I think that human beings have no doubt faint and fitful but nevertheless real and undeniable, power to be aware of the divine presence; to be aware of the divine Will. I think that is part of what is meant by the bestowal of the divine image upon us, so I want to see it as a sort of two way transaction, so to speak; that we have a responsibility, of course, for the creation of which we are a part; but we're aided in that responsibility by a relationship with the one who is the creator of that world.

Claire Foster

Neva...

Neva Haites

I guess I'd just like to add there that I think, regardless of our creed or religious beliefs, we all have that responsibility for the planet as a human being. It's good to have it attached to something that is firmly held by you, but I don't think that negates the responsibility of other people for our planet and for their inter-human relationships. So, I suppose in a context of a scientist I think about it more in terms of the way the brain and the body functions as a whole because even the concept of the spirit, the soul, and the mind, comes because we have a brain that can think. As John was telling us, the complexity of that brain allows us to consider these concepts as possibilities; but I think regardless of the way we interpret that intelligence that we have, we continue to have responsibilities that are far broader than just our domestic day-to-day ones.

Claire Foster

Thank you. Anything to add? No? Now, I'd like to put together something you said Denis about the soul and the mind being more process than entity, with John's account of the pattern created, as he put it, epigenetically. Do you think perhaps then, if you would answer first then John, that you are talking about the same thing?

Denis Noble

Well, process is after-all pattern in time. So the answer I think is clearly yes, and I'm sure John doesn't want to exclude time from the dimension in which we can look at the patterns or processes that we're talking about. The other thing to say on this is that processes obviously require the physical structure on which they are based – that's the sense in which, of course, the brain is totally necessary for us to have consciousness; to be a self in the first place. But, you know, there is a remarkable degree to which the causality – if I may put it that way – can go the other way.

Let me tell you one experiment that was done last year by a group of scientists in Canada. They were studying the stroking behaviour in rats as they groom their young. If there are no predators around, they do that; they stroke their young, they lick them. Motherly love, if you like, and certainly a form of expression of their kind of mentality their soul if you wish. Now, if you bring those colonies of rats up in a context in which there are predators they don't do that; they don't have the time to do so, they are defending the nest. That activity is inherited, the question is how. Is it just that they are copying, just as we might copy culturally what our parents did? The answer is no. The great surprise of this experiment is that it is done epigenetically; the stroking behaviour itself marks the right region of the brain, the hippocampus, which underlies the stroking behaviour itself – which is astonishing. So, there can be causality going the other way. I refer to this in my book as 'downward causation' and we are finding examples of this all over the place as the field of epigenetics grows and grows.

John Polkinghorne

Well, I certainly agree that processes – that's why I spoke of the soul as being a dynamically thing, something that grows and develops and so on; and I very much agree about that. I just want to make a comment about the relation of the brain to all this. Obviously, we need brains to be human

persons. If I hit you on the head with a hammer it will certainly not improve your human experiences. On the other hand, we should resist the temptation to thinking that our experience as persons – our consciousness for example – is simply a sort of froth, an epiphenomena as people like to say, of purely physical processes taking place within the brain. If you don't have the processes you won't have the experiences, but it seems to me that the relationship between them is more subtle than that. Neuroscience at the moment is making wonderful discoveries about how, for example, visual input is processed in the brain; and we should take all that seriously and gracefully. But there is currently an enormously un-bridged and yawning gap between that kind of talk, valuable though it is, and our simplest personal experiences of seeing red or feeling hungry. We just don't know how to make that bridge across. I don't rejoice in ignorance, but equally I don't think the way to deal with ignorance is to leave aside half of the experience.

Claire Foster

Thank you. Neva, do you want to say something about epigenetics? Perhaps defining the word for us first?

Neva Haites

I think I'll give you an example in humans that is parallel to the one Denis is mentioning, which is that we now know that the embryo brought up in the mother's womb is very much influenced by the mother's diet and other activities of the mother. We are able to actually identify chemical changes in parts of the DNA, which are these epigenetic changes where a chemical change can actually switch on a gene or switch off a gene – or modify the expression of a gene. So an epigenetic change is an added on effect on your inherited genetics which is caused by the body, but clearly that has an environmental influence. When you do studies, for example, of birth cohorts that have been under different circumstances - perhaps, as in China, been in famine as compared to in the West, being in excess of availability of food – we are now able to correlate outcomes in terms of mental health issues, and it's clear that some of the cohorts that were in the famine in China are in fact much more susceptible to certain forms of mental disorders including schizophrenia. It's almost for certain, and we are now defining the epigenetic changes and the genes that are changed by those influences based on those dietary effects. So, we're really starting now to begin to be able to correlate chemical and clinical effects based on environmental influences.

Claire Foster

Well that's very interesting; it just indicates that these patterns and processes are subject to change even at a genetic level. Keith, do you want to add anything?

Keith Ward

Well, I'll just add one thing because I didn't speak about God before and I was rightly told off for that; and, of course, God would be for most of us a consciousness with knowledge, and with intention, and yet God is not a physical being in any sense. So I think, for a religious believer, one has to have a concept of a being which is not at all physical but has consciousness, knowledge, and intention. So, in a sense, the destiny of a soul – for the person who believes that God is the ultimate reality – is to be united to God and to be aware of God. While it's entirely true that finite consciousness of human beings depends on the brain, I think as Denis said it doesn't wholly depend. Consciousness can also have effects on the physical brain and, obviously, on the environment. So perhaps when we talk of spirit in the Christian way of talking – body, soul, and spirit; or body, mind, and spirit – we're thinking of that part of the human being which relates to a wholly unembodied consciousness which lies at the root of reality. I think from a religious view that's a very important part of soul, that it does relate to something beyond the material even though the soul is very dependent on its own material embodiment.

Claire Foster

Thank you. I'd like to go back now to a point that a few of you have raised about the personal experience, or the individual experience, which is really, one might say, utterly unique; and try and put that together with the idea that individuality might ultimately be explained by genetics. I suppose what I want to ask is whether there is something about the scientific method that can't reach that interior, individual, personal, unrepeatable experience that we all have? I wonder who would like to pick that up first? John...then Denis.

John Polkinghorne

I think science is amazingly successful, but because it concentrates on a particular kind of experience – essentially reality encountered as an *it*, if you like, as an object – and in that domain, because it is reduced to the common denominator of objective experience, you can do the same thing over and over again. That gives science its great secret weapon, which is the weapon of experiment. I'm a theoretical physicist, but my subject has been driven largely by experimental discoveries. Now, there are whole swathes of human experience between ourselves, our encounters with beauty, our intuitions of ethical imperative, that aren't subject to repetition in that sort of way. We never hear the same piece of music, the same way, twice even if we place the same disc again. Science, I think, is unable – just by its own self-restriction – to deal with unrepeatable experience; which is most of the experience which makes life valuable and worth living.

Denis Noble

I would just put the point in a slightly different way, but I think I agree with you John. Science is not history, and to the extent that we as persons – the mind that we are, the soul that we are – is dependent upon our own individual histories and our history of interactions with everybody else; here again I think we come to the interaction side of all of this. It's exceedingly difficult to see how science can deal with that – but then, that's why we have other disciplines that *do* deal with that, and they're called the 'social sciences' I suppose; a form of science in the sense of knowledge, but the question I think you are going for is science in the sense of the standard Anglo-Saxon method of doing empirical discovery. It's extremely difficult to see how a process which relies on being able to repeat, repeat, repeat to determine that you really have found the truth about a matter physically and empirically can deal with relationships and interactions which are, essentially, history dependant. That's the problem.

Claire Foster

Thank you, yes. Neva, it is quite remarkable really that there is such a small percentage of genetic difference and yet we are so unutterably different from each other, and our experience of life is so different.

Neva Haites

I would say this, I am a scientist and I guess our ability to answer some of the questions is because we haven't yet been able to establish exactly the question we are trying to ask or the tools we need to answer the questions. When you were talking about emotions and feelings, I was thinking about the way we all feel about our children – our own child – that little feeling inside of you when you think of your own child; and as much as you love other children it's different, it's slightly different. There was a psychology experiment I was thinking of that was performed using magnetic resonance imaging; a way of imaging the brain and looking at how it's functioning. It told people who were being scanned that *this* basket contains your goods that you got at the supermarket, and *this* one contains somebody else's. They said to them, I'm taking away an apple out of the red basket – which is your basket, and the person's brain expressed in the MRI a certain activity pattern. They then took an orange out of the green basket, which was your neighbour's basket, and a completely different part of the brain showed activity – demonstrating that there are ways by which our brain does actually influence the way we are interpreting quite subtle differences about what we regard as *ours* and we regard as somebody else's. I know that's not a perfect analogy, but it is a little indication of the types of work we are now able to do with these powerful imaging techniques in looking at how the brain quite subtly differentiates between feelings that we are having.

Claire Foster

So, John, do you think is it just a matter of there being different science – or better science – that can somehow reach to these experiences which make life valuable at a personal level, or is it not a matter for science at all? Are you challenged by Neva?

John Polkinghorne

I still remain rather unrepentant, saying that science has purchased its great success by the modesty of its ambition. What we have been told about are very interesting results, and they correspond to the undoubted fact that we are embodied beings. For example, people also found that when Buddhist monks or Carmelite nuns meditate particular parts of the brain light up. That's very interesting, but it doesn't tell us anything about what that experience is in terms of value and authenticity. When I think about physics, there are bits of my brain that light up but that doesn't tell

me anything about the nature of physical understanding. So, of course we are embodied and of course it's good to know how these things happen; but there is more to aesthetic delight, for example, than the shift in the balance of neuro-transmitters. I think.

Claire Foster

Perhaps it doesn't want to be asked too many questions, or analysed too greatly. Do you want to come back Neva, or Keith – anything?

Keith Ward

Well I think that C.P. Snow, many years ago, talked about the two cultures; the culture of science and the culture, not even of the social sciences, but of the humanities. I think there is still a hint of that here, and I would think that science does deal with what is quantifiable – what you can measure, what everybody can observe – and what you can repeat; and I don't think that an understanding of what it is to be a human being, to have the unique experiences that you have and to work out the meaning and part of your own life for yourself, I don't think those are scientific activities. It's rather like analysing a piece of music in terms of the wavelengths of sound that it consists of. It's interesting to see that it consists of those wavelengths, but you're not really learning how to appreciate Beethoven by doing that. So, the interiority of a person is of immense significance. Your morality, your moral attitude's, your point of view, how you relate to other people; I don't believe there will ever be a scientific answer to questions about 'what ought I to do?' – it's a different sort of question. So science is invaluable for finding out the limits of what you *could* do, but then you've got to go on to questions of your own personal experience; and the place to find that is in novels rather than in textbooks.

Claire Foster

I'm going to push this just one step further and then we will move on. Supposing though a geneticist was able to say 'well, you might think you've made a moral decision and you might think that you've developed an appreciation of music but, actually, all of that can be explained by your genes – by your DNA – we haven't discovered that yet but we will eventually'. Keith?

Keith Ward

You're asking me? Oh, sorry.

Claire Foster

Denis has got an answer first if you want to think about it.

Keith Ward

Alright.

Denis Noble

Yes, this is one of the difficult questions isn't it? I actually don't see the genome as a programme for life, that's one of the metaphors that I take in my book in order to disentangle it and say that I think that has lead us to precisely that kind of question. I think it's the wrong kind of question. Because, what is clearly emerging in modern biology is that there is extensive interaction between the genome as a kind of organ of the body and the rest of both the body, and the environment. So, I would say that that's really to put the question in the wrong sense. In my book, I give an example of an action that I did while I was writing the book. The action was that as somebody asked a question whilst I was writing away I just pointed, I didn't say anything. Then I imagine a physiologist – I am a physiologist, so I can easily imagine this – working out all the neural connections that are involved in doing that. He writes his paper up, and he says 'I've analysed the neurophysiological basis of the action of pointing'; then a philosopher comes up to him and says, 'hey wait a minute, you haven't analysed an action at all and I'll prove it to you. What I will do is the following experiment; I will use you as the subject and I will put electrodes on your brain to stimulate the nerve cells in exactly the way you describe. Now tell me what happens?' Now, of course, we know there are ethical problems with doing that experiment but this is a 'thought' experiment so we don't have to worry about the ethics. What happens? The poor man does that (*points*) and he says 'I didn't do it. You made me do it.' Now, the reason is very simple. The reason that I did that was that somebody asked me where the lead was to take the dog out for a

walk, and without knowing that – without knowing those interactions with other people – you don't analyse the phenomenon! If you analyse it totally inside here the phenomenon doesn't exist.

Claire Foster

John...

John Polkinghorne

Just to make a quick comment. When I hear these claims of the unlimited explanatory powers of science I remember a particularly celebrated pioneer of quantum theory, Wolfgang Pauli, who had a very sharp tongue. He used to wag his finger at people and say 'no credits for the future'; in other words, don't claim that next year we are going to explain everything – get ahead and explain it.

Claire Foster

Neva, I slightly feel I should let you reply.

Neva Haites

I feel we sound as if we are further apart than we probably are. We are talking about extremely complex issues. I'll just remind ourselves of another experiment which was carried out in the 60s and 70s, and it was looking at twins in Minnesota who had actually been reared apart. I think they had just over 70 sets of twins, and about 35 of them were identical and the rest were non-identical twins. They looked at those twins – now they had been reared in very different environments, the identical twins – and they looked to see what influence where they were reared had and their monozygosity – their identicalness – had on their tendency to be religious. They found that there was much greater agreement in identical twins about their tendency to either be, or not be, religious as compared to the non-identical twins; which suggested that it wasn't environment that was influencing that so much as the fact that they actually shared their genome. Now that's not the total story and anecdotally, I was telling Claire, I have two friends who have identical siblings. One is a Jewish family background and the other is a Church of Scotland family background. One of the

Jewish family backgrounds brother is a rabbi and the other is an atheist; they're identical twins. The same for the Church of Scotland, one is deeply committed and the other is an atheist. In other words, these experiments don't necessarily prove anything. The study in the 1960s was strongly suggestive that there was an influence, but clearly, as I've given in just two little case histories, there are other things which influenced your beliefs and the way you perceived the world and the unknown; and conceptualise it for yourself based on incidents that have occurred personally close to you, and based on how your education has led you, I think, in different directions. So, I think we are not as far apart as it may sound.

Claire Foster

Thank you. Keith, any final thought on this?

Keith Ward

I'll just make this comment. There are colleagues of mine in Oxford, though I can't recall their names at the moment who have said that religious beliefs are caused by some disturbance, or virus, in the brain of some sort. (*Laughter*) Of course, it's also true that atheist beliefs are caused by whatever goes on in the brain. The point is this, whatever you say goes on in the brain that research is not going to answer the question which of those views is *true*. Is there a God, or isn't there? Nothing that you do to the brain will tell you which is true, but it's a real question. So, there is at least one question which science can never answer – in principle – of any part of our life; which of your beliefs is true. Science will tell you what causes the belief, perhaps or give you a part cause, a necessary cause, but it will not answer the question is it true and I think that's a simple question that science can never answer. Though some scientists assume that their own beliefs are true, strangely enough. (*Laughter*)

Claire Foster

Thank you very much.

Denis Noble

(*Laughing)* I must be the only person in this room who doesn't know who he is talking about. (*Laughter*)

Claire Foster

Well I'm certainly not going to say. Okay, one more thing – there are some excellent questions here – there is just one more thing I want to touch on. Touch being the salient word here. We've talked about the soul as being non-physical, but what do we understand by the suggestions that souls might 'touch'? Or be touched?

Denis Noble

Should I have a go at that? I didn't fully answer your first question, you see Claire, because I think you wanted me also to say something about body, mind, and soul. I think that question enables us to at least start to draw distinction between mind and soul. Because, if you ask the question can you touch a soul, I said earlier on you can't – obviously, in the sense that you can touch a body, you can't; you can't touch a mind either. But metaphorically, we do speak like this. If I speak of the 'dark night of the soul' you all know that I am referring to somebody who is grieving or is in some other kind of very severe distress; and we do not mean the 'dark night of the mind'. That would make one think of somebody puzzling over something, a difficult scientific problem or maybe a puzzle in the newspaper. It doesn't carry the same weight. So, I would say you can touch; but you are using the word 'touch' there metaphorically. But that's not to denigrate it; most of our language after-all is metaphorical.

Claire Foster

Thank you. John?

John Polkinghorne

I just want to say that I think there is much more relationality around in the world than, sometimes, we are able to recognise. Even in physics, even in my old branch of physics – particle physics, we know that the sub-atomic world cannot be treated atomistically because of quantum entanglement. So, I think there is a lot of relationality around. I'm not saying therefore souls can touch, that would be an absurd argument. But I think at every level of human experience it is likely that there is more connection than we are aware of, and particularly more than we are aware of in our highly individualistic age where we tend to think of ourselves as isolated beings.

Keith Ward

I think that in prayer, religious believers do aim at – or hope for – an experience of the soul touching God and that it wouldn't be surprising that in touching God you touched those souls who were also touching God. In that sense, there might be a deep significance in the expression the 'communion of saints'; of communion of that part of the personality which, arising from the physical, transcends it without ever leaving it entirely but transfigures it into something of spiritual depth. Then you might say that a person has a 'deep soul' if you are speaking about the fact that they can appreciate things that are beyond easy description, and a touching of souls perhaps is an ideal concept for prayer.

Claire Foster

Anything Neva?

Neva Haites

This is a very serious discussion and I'm not trying to trivialise it, but I'm trying to compare what you are describing with other situations – such as the girl and the boy, their eyes meet across the room and they both feel something that is very special, they come together and their relationship begins. I think we are, as human beings, able to have fairly special feelings that appear to transcend distance etc. Many of you will have had the experience where you go to ring your child and the phone rings and it is your child on the phone ringing you. Again, you have that feeling that

somehow you have connected just prior to that happening. So, while respecting what you are saying, I think that probably there are comparative, but less deeply meaningful, examples of where we can touch each other in a very significant way.

Claire Foster

I don't think that trivialises it at all. I think it's another demonstration of the same point. Well, there are some fantastic questions here. The first one on the list is; what happens to the soul in dementia? John?

John Polkinghorne

Well I'll jump in where angels fear to tread. It's, of course, a very distressing experience to see someone who is demented and you have the feeling that person somehow has gone. I think that the soul, so to speak, has been trapped internally and is not lost, but is unable to find forms of outward expression. That's the best I can do, but I certainly don't think that person has disappeared; though they may have disappeared from our view.

Claire Foster

Do you use the word soul and the word person interchangeably?

John Polkinghorne

Yes, I tend to because, as I said in my little opening remarks, I think of the soul as being the real me; and therefore the centre of my personhood.

Claire Foster

Keith...

Keith Ward

I would have thought it is very important to think that persons change a lot, and you respect them for what you have known them to be; and you respect them as they grow and as they fade. So, preserving that respect is deeply important whether you are religious or not because of the whole story of a life that is important, not just one stage. When somebody is asleep you may say they are not conscious, they are not doing anything, but you know that actually that is part of a richer life. If you do have a religious belief then, of course, you think that God will bring that soul into being at its fullest range of capacities. So that dementia is an incapacitation which will, in the presence of God, be overcome. But, either way, if you think of the person as a whole as related to the society in which they have grown and lived then it's important to continue those sorts of relationships, and to remember them as whole persons throughout a whole series of stages of life and not just the one stage they happen to be in.

Claire Foster

Including the relationality you were speaking about earlier, John. Anything Neva?

Neva Haites

No, I think Keith has captured that very well. I can appreciate what he is saying, and thinking of demented close family – as well as patients – that I've know, some of them retain that wonderful essence of the type of person they were and, although cognitively they are functioning very poorly, you can still see a compassionate, kind, person there as they were. Now others, unfortunately, can go another way and show a bad nature – a very aggressive nature – and I think for the observer it's much more difficult to conceive of that wonderful person that you knew before when that type of dementia occurs. I was just thinking as you were saying that, what do we think about the soul of a terrible person? Of a person who has caused anarchy, or a psychopath; where do we think of their soul? I can't answer that, but I was interested in thinking about – other than dementia – with other ways of behaviour how has the soul been modified?

Claire Foster

Well, there is a question here that follows on from that. Which is, is evil part of the body or part of the soul? Denis?

Denis Noble

I have a very quick answer. You cannot make an attribute like evil apply to the parts of my body. It's as simple as that.

Keith Ward

I agree, I think it's another interesting difference between the body alone and the embodied person. The body is something you can view dispassionately, almost mechanically really, you can do that. But, of course, if you are doing that you are not regarding it as the body of a person. So it's the personal aspect which makes the difference, and that's the aspect of what a person has done with their life and how they experience their life. Evil? I think it is possible for somebody to turn away from good, to turn away from love – sadly. But I think the Christian gospel is that it is never too late, and God always offers the possibility of turning back. I think that is 'Good News'.

Claire Foster

Do you want to add anything John? I'm just thinking about a body being shot through with all that the person is and whether they are distinguishable.

John Polkinghorne

If we take this dynamical view of the soul, then of course it can grow in a distorted way or in a fulfilling way. But, of course, I agree with Keith in that I don't think that the distortions and corruptions are beyond healing. But, it may be a painful process for that to happen**.** In fact, it *will* be.

Claire Foster

Neva?

Neva Haites

I find it a very difficult concept. If you think of a mental illness, say schizophrenia, which you can treat and you can return the person to a behaviour pattern that we consider more consistent with society, I'm not sure what we've done to the spirit in that body, to the soul, as such; whereas I know what we are doing to the brain. I suppose that there will come a day when we understand more about evil and the behaviour that is out with, what we consider to be, parameters that are normal within society. My perception is that there will come a time when we will be able to actually define that in quite clear terms and see it as either an environmental influence or an influence that has come from within that person which has generated a form of behaviour that is not acceptable.

Claire Foster

Thank you. There's a question here that I want to ask because it picks up on this internal/external aspect of our existences and experience, which is this: when the Bible is taken as a manual of Truth, doesn't that inhibit our own discover of the soul and self? Aren't we better guided by the 'inner self'? Keith?

Keith Ward

I don't quite understand that, what is the 'inner self'? Is that our own intuitions about what we are?

Claire Foster

Not an external manual telling you what you should believe about yourself I think.

Keith Ward

I don't think the Bible is that, anyway. The Bible is not a manual for anything, please don't believe that! The Bible is a way in which God may speak to someone who reads it in faith. But it doesn't give you information; if you wanted information then I'd look elsewhere.

Claire Foster

Including about your soul?

Keith ward

Well. The Bible you see, as I said, doesn't talk about the soul. It talks about responsibilities, it talks about moral obligations, it talks about justice. You know, 'let justice flourish and let it roll like a stream'. It talks about your obligations and I think this is where I have a slight hesitation about saying, 'oh well one day we will see that if people are evil it's because something in their brain is causing them to be'. In so far as that's true, and I think this is why Jesus said 'don't judge' – that you never know when something is being caused by something physical in the brain – but I'd want to really hang onto the idea that people, in the end, have responsibility; and that responsibility is again something science can't deal with. You can't answer the question 'are people free and responsible?' A scientist can never answer that. As a matter of fact, a philosopher can't either. But we still use that, we call people responsible. So I think it's very important to hang onto that element of responsibility, and I think the Bible helps you to acknowledge your responsibility and what it is that you ought to be doing for the good of the world; but it is not a manual which lays down specific rules which you have to follow in every circumstance. Just one, there's just one I might follow in every circumstance; which is love your neighbour as yourself. And love God perhaps too – yes, sorry. (*Laughter*)

Claire Foster

Thank you. Yes, John.

John Polkinghorne

I agree with that, I think it is a great mistake to see the Bible – or indeed any form of sacred literature – as a textbook. It's much more a laboratory manual, which are recorded the insights and spiritual experiences that will be illuminating to us.

Claire Foster

Neva...

Neva Haites

It's difficult when you are not imbibed with a study of a document such as this, and I'm well aware that there are other documents of equal status for other religions; and there are some consistent messages which come out from the Qur'an and the other good books. I see them, therefore, as more an evolutionary tendency in our understanding of our relationship with the world and with mankind. Almost good practice guidelines developing. For me, the Bible was written in its time. It was written by a group of men, there were very few women who were actually contributed in a major way. Therefore, I see it as a point in history rather, I think, than the firm basis which perhaps you are speaking about it – but my level of knowledge is not great enough.

Claire Foster

Thank you very much for that contribution. This is picking up on something that you've allowed to, Keith, on the soul and the spirit. There is a question here, how do you distinguish between the soul and the spirit? Is there a difference? Perhaps you'd like to answer that and then others can pick it up?

Keith Ward

In the New Testament, Paul talks about 'body, soul, and spirit'. The word 'soul' is 'psuche', so you could just call that 'mind' – psychological capacities really. And then spirit is that part of the mind

which relates you to God specifically. So the spirit, and the word is 'breath', is the 'breath of God'; so at the heart of each human being there is actually the presence of God as a breathing, vivifying, life-giving principle. So, under three-form unity for the Bible; you've got the body, you've got the mental capacities of understanding and appreciating and acting freely, and then you've got the presence of God within; and that's the spirit really, I think.

Claire Foster

So do all sentient beings have spirit?

Keith Ward

Yes.

Claire Foster

Including animals?

Keith Ward

Yes. Every living thing has the breath of life, which is the spirit.

Claire Foster

Thank you. Denis?

Denis Noble

All I want to add to that is to say that different cultural traditions, and particularly different religious traditions, tend to divide up these entities in very different ways. Suffice it to say that if we were

talking in the context of an East Asian audience we would draw these lines somewhat differently. I don't find that surprising, and I don't think it is a problem either.

Claire Foster

How differently would we draw them if this was an East Asian audience?

Denis Noble

Well, I like the story that when the Buddhists went from India to China and they first started to convey to the Chinese this concept of the 'no self' – what I was referring to earlier on – what leads you to the view that the self is a process rather than a thing, the reaction of many Chinese was to say 'why do you need to convince us of this? We never thought there was such a question?' (*Laughing*) Now, the reason for that is that Taoism has exactly the same idea. So, even the question, like is it a matter of distinguishing body and other things like mind and spirit, is treated differently in other languages and in different cultures. All I'm pleading for is that we recognise that, there are other ways of looking at it; but I don't think that we should be bothered by that.

Claire Foster

Neva, or John? Anything to add?

John Polkinghorne

Can I just say that I've always found tripartite language very difficult to know how to understand and use; I mean, I tend to think that we are unitary beings with two complimentary aspects. One of which you can label, if you like, 'bodily'; the other you can label, 'mental/spiritual'. But further subdivision to that I, personally, don't feel is helpful – but that's a statement about me perhaps rather than about reality.

Claire Foster

Yes, again developing that a little there is a question here then. Could one argue that we are part of a larger process, a universal soul? Could this be God? Keith?

Keith Ward

I can only speak when I'm switched on. (*Laughter*) Well, I mean there are certainly religious views which would hold that we are all parts of God and that God is the Oversoul of which we are all parts. Indeed, there are elements of the Christian faith – and of Islam, but I won't go into that – which speak about Christians living *in* Christ. In so far as Christians say Christ is divine, then you are saying that human beings can be part of God. But I think that most Christians, like me, would want to say that in the end God could exist without us. Maybe I'd go so far to say that maybe God would be different if we didn't exist. For a Christian, maybe there wouldn't be a cross and a resurrection for example; so I think the world may make a difference to God.

Claire Foster

Denis, do you want to add anything?

Denis Noble

I'll pass on this one. (*Laughter*) I am actually, despite a lot of the things I've said this evening, I am a very non-metaphysical person.

Keith Ward

I'm a very metaphysical person and my wife keeps telling me to give it up. (*Laughter*)

Claire Foster

Does it make you hard to understand? Is this really happening or is it a metaphor? Did you want to add anything John?

John Polkinghorne

I would just say that, personally, I think it is very important to maintain a distinction between creator and creation. Not least because creation has an in built transience to it, that I think has the hope of a destiny beyond its death. But that can only, I think, rest in a creator who is both faithful and not subject to transience and decay.

Claire Foster

Neva...

Neva Haites

Again, just to comment, I think, about humans on this planet having a unified responsibility to each other and to the planetary system – the planet and its needs. I think it is becoming clearer and clearer and, whatever you call that unifying theory, I think it is something that is going to become essential to ensure that the eco-system in which we live, and that the variety of human ethnic backgrounds, is maintained to continue to have the kind of planet that we have become accustomed to with all of its diversity which gives it such wonderful variety. I would hope that, regardless of one's background and religious views, people would come to realise the importance of actually working together to achieve good health, good supplies, and good approached to the environment. However we call it, and however we define it, I think that is going to be something that, for our children and particularly our children's children, is of absolute importance.

Claire Foster

Thank you, thank you. Well there is a question here taking us to a different place altogether. How does the panel view the argument for Intelligent Design? John?

John Polkinghorne

Can I say unfavourably? I think that the Intelligent Design people have good intentions but they make two very bad mistakes. They make a scientific mistake in thinking they can demonstrate, for example, irreducible complexity – because they think you've got six pieces you need for this, you can only assemble it if those six pieces were immediately brought together. But evolution doesn't work that way, it's opportunistic – two bits for this, two bits for that, fuse it and so. I mean, there are people here who know much more about that than me, but that seems clear to me that they make a claim that if it were scientifically validated would be a remarkable discovery; but they haven't made it.

But, even more importantly, they make a bad theological mistake – because they are looking for gaps. Although they are very careful in their public language, for political reasons in the United States, of course they see God as the designers. But behind it lies a very bad theological mistake, that if nature did it all somehow or other God had nothing to do with it. But, if God is the creator and sustainer of nature, God acts as much through natural process as any other way. If you could show me, and of course you can't, but if you could show me that the whole story of life – from the first replicating molecule to you and me – was a perfectly natural process; that wouldn't mean that God hadn't done it, God's purpose wasn't behind it. So, I'm afraid I'm not too keen on ID as you perhaps would have gathered.

Claire Foster

Keith?

Keith Ward

What annoys me is that people in the press keep talking about Intelligent Design Creationism, and I think we have to be quite clear Intelligent Design is *not* Creationism. Creationism is the view that the world was created in six days, Intelligent Design people accept that evolution happened. But I agree with John about them, they haven't really convinced the community of biologists that there are things which need a designer to explain. But, I'd just like to say this one thing. Of course I don't think it's possible to say that every little bit of the world, every bit of the human body or animal body, is specifically designed by anybody – that's not possible. But it is possible, I think, to say that the whole process of creation and evolution is intelligently designed. So it's very important to make that distinction, to say that the process of evolution is, of course, intelligently designed but unfortunately the American movement called Intelligent Design has stopped us using the expression intelligent design because we don't want to say that God keeps interfering to make things happen that wouldn't, otherwise, happen.

John Polkinghorne

Can I make a stuttering interjection to say that I absolutely agree with Keith, and I deeply resent the hijacking of important words. We believe, Keith and I at least, believe in intelligent design in the sense that he has explained. I'm also a creationist. Not in the curious, North American, sense of the word, but because I believe the world to be God's creation. Useful words have been corrupted.

Claire Foster

Doesn't design, though, imply a designer? One can accept intelligence, but design? You would say designer wouldn't you?

Keith Ward

I expect God did design the universe (*Laughing*), I've got no problem with that. I tried using the expression 'Intelligent Creation', but that didn't work out. You just can't win this battle; people are determined to misunderstand it. You have to distinguish Creationism – six day, no evolution – Intelligent Design – evolution, but with God doing special things every now and again that nature

can't do – and Intelligent Creation, which is this whole universe and the way its set up shows immense ingenuity, at the very least, and I think, for me, that belief is highly reasonable and doesn't involve what is now called the Intelligent Design Hypothesis. Let science decide on that.

Claire Foster

Denis...

Denis Noble

Just a brief comment, it seems to me that intelligence is a very difficult thing to define. Just think of all the arguments over intelligence tests, just to indicate, there are very many different forms of intelligence. The chapter in my little book that deals with evolution ends with the statement that evolution was more blind than Beethoven was deaf. But that doesn't mean to say that I don't think there is a particular kind of intelligence there, there is an intelligence in the process by which the whole thing happened. I tell you, although I'm a scientist and I investigate these phenomena in accordance with the standard laws of science and empirical discovery, I'm still amazed and in awe of what it is that we see around us.

Claire Foster

We are drawing to the end of the evening, in that I'm going to ask the panel in a moment each of you to leave us with a thought. But, let's just throw in one last question. Priests are said to be given the 'cure of souls', what does this mean? We have two priests on the panel, Keith?

Keith Ward

What it actually means, in Elizabethan English, is the care of people. (*Laughter*)

John Polkinghorne

Exactly. I entirely agree, absolutely. (*Laughter*)

Claire Foster

Well, we've got time for one more question then! Could a highly developed machine ever have a soul? Neva, would you start?

Neva Haites

We've spoken about the fact that we think all living beings have a soul, and we've spoken about the soul in the Biblical sense as really being – in a way – the way the brain functions; and I know it's been spoken of in other ways. Depending upon the intelligence of this particular robot etc., I suppose it will have the ability to make some thoughts of its own as a computer. Will that be a soul? Well, in my terms it will be demonstration of a functioning system that allows independent actions and thoughts. Whether you would call that a soul I'm not absolutely sure, but I think it will be demonstration of extremely elegant use of engineering, science, physics, and what we call systems biology these days, to begin to create models to help us understand how individuals work. I guess the latest terminology in science is synthetic biology – trying to actually create, chemically and in engineering terms, things that help us to understand how the body works. I think these models will certainly do that, and their 'soulness'? I'm not sure about...

Claire Foster

John, what would you say to that?

John Polkinghorne

I don't really know what to say to that. A highly designed machine is not a very well defined concept. That's the best I can say, I mean behind it lies the sort of Promethean notion that we can somehow really construct tremendously complex things. Just think of the complexity of a single

living cell. It's immensely subtle and so on. I think it is beyond – it's very dangerous to say things about the future – but I think it's beyond immediately foreseeable human capacity to get anything as remarkable as that.

Claire Foster

Just explain 'Promethean'...

John Polkinghorne

Promethean means the exalting of human ability to perform tasks that, actually, are a divine prerogative. Sorry, that's a terribly formal definition...it means getting uppity. (*Laughter*)

Claire Foster

Because Prometheus nicked the fire, and then he got his liver eaten. Isn't that right?

John Polkinghorne

Prometheus stole the fire, yes.

Claire Foster

Denis...

Denis Noble

Yes, as a systems biologist who is trying to do what was describe earlier on and therefore perhaps to create these monsters – or find out how they could be created – I think we have a very important linguistic problem here. If highly intelligent machines could show grief, sorrow, joy, we would no longer call them machines. It's as simple as that.

Claire Foster

Alright. Keith...

Keith Ward

My computer keeps saying to me 'it's not my fault!' On the day that I believe it, it will have a soul. (*Laughter*)

Claire Foster

Good answer. So I would just like each of our panellists to finish with a final thought. Who would like to start?

John Polkinghorne

Well, I'm a jumper-in. We live in an immensely rich, many layered, complex world and we are ourselves very rich, many layered, people. My thought would be; resist producing a grand theory by a process of procrustes – that is to say chopping off the bits of experience that you don't fully understand. That's not the way to truth and understanding.

Claire Foster

Thank you. Thank you. Neva?

Neva Haites

I think human beings are an extremely elegant product of natural evolution. I think they are informed and derived on the basis of what they have inherited; what they have been exposed to in the womb and thereafter; where they are born; the environmental influences around them. I think the wonder of this is that we have created such diversity around the planet and I hope that, regardless of our beliefs, the way forward will be to respect that diversity and that individuality and

work together, regardless of our views, to understand it and learn how to make the life of individuals as fulfilling as possible.

Claire Foster

Keith...

Keith Ward

I'm very struck by the way in which people of rather different beliefs have agreed about quite a lot, and most of the basic things, about what is important in human life and the way that we ought to see human beings. In the end, I would think that, as a priest, believing in God – following a religious way – is seeking a way of fulfilling human being. Perhaps more than human being, but let's stick with that. Fulfilling human being is a matter of cultivating people's own awareness and grasp of their own unique individual lives and holding that they are important because of that uniqueness. Treasuring their freedom and doing everything that will maximise it scientifically and morally.

Claire Foster

Thank you. Denis...

Denis Noble

Well, I think we stand at a very interesting time in relation to biological science and the way in which it relates to the kinds of questions that we've debated this evening. If the twentieth century, particularly the second half of the twentieth century, was about how we break Humpty-Dumpty down into his billions of pieces; the genes, the proteins, and all the other components – which was a very necessary phase of reductionist biology which we had to go through; sequencing of the human genome, of course, was its apogee and was totally necessary – what we are now trying to do I think is to put it all back together again. That's going to be, first, very much more difficult. As John has emphasised, it is exceedingly complicated. So, it's going to take us much longer but it will lead to a very interesting change in perspective. Which is that, I think, that the science of the twenty first

century – so far as biology is concerned – dealing with integrative processes looking at how things are put together, rather than how to break them down into their component parts, will be one that will be more sympathetic to many of the questions that we've been discussing today. That, incidentally, would be my answer to the question 'has science in some sense been dehumanising?' Some scientists – and I'm a scientist myself when I say this – *have* been, and I think it's because they've taken too simplistic a view of the reductionist agenda. There is another side, and that's what we are now investigating. It's going to be a very exciting ride, stay with us.

Claire Foster

I just can't help saying this. I think this does reflect an increasing recognition of what women bring to the subject - I have to say - about the joining together of things rather than the taking apart of things. I'll just nip that in, having the prerogative as chair, as my last thought.

I have to say, there have been some absolute gems this evening and I do recommend that you look at the transcript on the website which will be there in a few days; and listen to Premier on Sunday to pick up what – or be reminded of some of the things – that we've heard tonight. I think our panellists have been quite superb in the wisdom that they have brought forth for you. Just to remind you about the retiring collection, and about the bookstall which is just over there on your way out. It's really fantastic of you all to come; it's great to see such a full cathedral to consider these sorts of issues. Thank you for your questions, I'm very sorry that we couldn't put all of them to the panel.

But, most of all, could I thank; Denis, John, Neva, and Keith for a fantastic evening.

(*Applause*)

END