

In our Time Programme 19  
*The Internet and Cyberspace*

**Melvyn Bragg** : Hello, it's quite difficult to live for the moment, never mind living forever. Anyway, in the 20th century, our notions of physical space have been revolutionised. Einstein said that space was not a separate entity. We've probed and explored the outer reaches of our physical space, with space flight, powerful telescopes, and theoretical physics. But in the last 20 years, with the birth of the internet, a virtual form of space has been introduced to us - cyberspace, where people can meet and communicate ideas.

You sit at home, punch the keys, and you can rove all over the world, the keyboard becomes a magic carpet. But does cyberspace introduce a new concept of space in our world, or does it really have its roots in Einsteinian physics or even in medieval theology?

To discuss this phenomenon of our time, I'm joined by the Rev Dr John Polkinghorn, a distinguished scientist, as well as being an ordained priest, a fellow of Queens College Cambridge, and Canon Theologian of Liverpool, he's spent his scientific career as a theoretical physicist, looking at elementary particles. For him, religion and science are united in their quest for ultimate truth in the universe, and Margaret Wertheim is fascinated alike by religion and science, author of the critically acclaimed, "Pythagoras's Trousers", which looked at religions intimate historical connection with physics, today she publishes her latest book, "The Pearly Gates of Cyberspace: A History of Space from Dante to the Internet".

Just for those who are slightly fuzzy, and unclear about it, Margaret Wertheim, could you briefly tell them what cyberspace is?

**Margaret Wertheim** : Well I think that you can see cyberspace basically as being this collective immaterial space, that I, in some sense "go into", when I'm on-line on the internet. Now the internet, is, if you like, the physical collection of technologies, the computers that make up the servers, and the connections in between them, the physical land lines and the optical fibres, and cyberspace, is, if you like the immaterial non-physical space that is the emergent property that comes out of this physical hardware. I think the best way of looking at it is perhaps to say that when I'm on-line, I am sitting there, my body is sitting there in the chair in front of the computer, but I, or at least some very important part of me, some powerful part of me, is, in a very real sense, in another place, another space of being which I actually think is becoming an increasingly important space of being, as another space of being in addition to the physical space of our bodies.

**Melvyn Bragg** : So you're sitting there, and you're pumping in these messages, and they're being pumped back to you around the world, and you're communicating with people by as it were, electronic letters, and you're raiding libraries, and you're raiding their libraries, and you're going to web-sites, and so out there somewhere is your mind and maybe more than your mind. That's what's going on, really, as you're sitting in your study?

**Margaret Wertheim** : Well, I wouldn't say that your mind leaves your body and goes into cyberspace, obviously your mind in some sense, stays with you in the physical body too, but I think there is a very real sense in which, in some sense, your mind also goes out into this other space, I mean when one is surfing around, one has a very powerful sense, at least I do, and a lot of other people I've talked to who do spend a lot of time on-line, have this sense that there is a very real landscape and geography there, particularly when you're in these on-line worlds known as MUDS. They have a very powerful sense of being in another world, which not only enables you to communicate, but it actually has its own architecture, its own geography if you like.

**Melvyn Bragg** : Well, yeah, there's these huge claims. Is it much different from reading a book? I mean, when I read a book, my body's there and I'm reading, I don't know, Anna Karenina or Salman Rushdie or whoever it is and off you go, following the characters, the plot, the situation. Can you explain to people who are not as intrigued by cyberspace as you are, why this is *fundamentally* different?

**Margaret Wertheim** : Well, actually I don't think it's fundamentally different from that, I totally agree, and this is the point I actually make in my book, that in fact, all literature, is in fact, a creation of a virtual world, something like "The Divine Comedy", or "The Illiad", is of course an expression of a very powerful virtual world that one very much *does* feel a sense that on is in when one is reading such.....

**Melvyn Bragg** : We could use "fictional" for "virtual" couldn't we?

**Margaret Wertheim** : Yea..... well not in....well, I think there is a difference, in that, you are..... yes, when I read Anna Karenina, I feel I am in the virtual world of Anna too. The difference with cyberspace..... .

**Melvyn Bragg** : Why do we have to use "virtual" instead of "fictional"? I'm not trying to be clever, but just as a matter of interest?

**Margaret Wertheim** : Oh well, well it's just that historically that is the word people have...people are using. We talk about "virtual worlds", that's not a term that I use, in fact it's not a term I'm entirely happy with, but it is the historical term that people have decided to use. The difference I think with cyberspace, is simply that it allows these things to happen in real time, collectively, with all sorts of other people. When I'm reading Anna Karenina, I'm reading it by myself. If I'm in a MUD world, I can be in it with thousands of other people all over the world. But I totally agree with you, and one of the claims of my book is that in fact, cyberspace is not this totally new thing. That all of these other things, like fiction are, in fact precursors, and so, I believe very much, is television.

**Melvyn Bragg** : John Polkinghorn, what 's your view on cyberspace, before we get on to the ideas inside it?

**John Polkinghorn** : Well, I think it's not qualitatively different from the world of literature. It differs perhaps, in some details, one is that it is of course very, very extensive and it creates these fantasy worlds. Now literature also deals with fantasy, but great literature deals with real life. It creates fictional worlds that reflects back on real life, that's the power of Anna Karenina, that it deals with human relationships. One of the dangers of the cyberworld, I think is that it does prove very addictive, and addictive in the sense of helping people to live diminished, illusory, fantasy worlds, in which they are, you know, great heroes, or whatever it may be.

**Melvyn Bragg** : Why does it have to be diminished? It is illusory....that it is illusory, we'd grant you, but why does it have to be diminished?

**John Polkinghorn** : Well, it's diminishing if er....if the pictures and images, that are being presented do not themselves reflect back on human reality, if it's just a constructed world, with a great emphasis on fantasy, and of course that's not true of all of the cyberworld, there's a great deal of information in it, and things like that, but I think the things we're particularly thinking about, these virtual worlds, these MUDS and things, and things like that, are very encouraging, and obviously very addictive, to people who spend, you know, tens of hours a week in an unreal world. I'm just a little bit worried about that.

**Margaret Wertheim** : I think that's very right that they can be addictive, and certainly I know people who have been....become addicted to to them. In fact one friend of mine almost lost his relationship because he was spending so much time in a MUD world. But then, on the other hand, I have other friends who....one woman who said to me, that in fact she found the experience of participating in this MUD very powerful, because she was someone who was very shy, and rather overweight, and she felt that in the flesh, she was often judged by the fact that she was overweight, and she actually found it a very liberating, and for her, a very positive experience, to be able to be on-line, in this world, where people couldn't immediately judge her by the way she looked. So I think it works both ways, there's no question it can be addictive, escapist fantasy, so can television, so can literature..... .

**John Polkinghorn** : Of course.

**Margaret Wertheim** : ..... and cyberspace, in a sense, just has all the dangers that all these other things too.....

**John Polkinghorn** : But perhaps it enhances....in an enhanced form..... .

**Margaret Wertheim** : ...both positive and negative.

**John Polkinghorn** : ....because of its powerful.....

**Margaret Wertheim** : Yes.

**Melvyn Bragg** : Can I come to somewhere near the centre, and the most fascinating thing about Margaret's book, and put a quotation of hers, to you, John?

**John Polkinghorn** : Sure.

**Melvyn Bragg** : In the book you write, " Cyberspace is an attempt". , I'm quoting, "is an attempt to realise a technological substitute for the Christian space of heaven, a place where we will be freed from the limitations and embarrassment of physical embodiment". Now what's your reaction to that?

**John Polkinghorn** : My reaction to that is a great deal of caution. The cyberworld is a human created world, containing a great deal of illusion, and it's a world that comes to an end when you pull out the plug. The Christian Heaven is a divinely sustained world of a destiny beyond death, that is concerned with reality, and which will be everlasting, because God's faithfulness will keep it that way. So I think the two should not be confused in any way, and that's again an illustration of the dangers of fantasy, if you make any equation between them.

Secondly, it is intrinsic to us as human beings that we are embodied. It is dangerous for us to think that we are angels, because that's not what we are, and that's of course the Christian hope of a destiny beyond death, has always been that of resurrection, of a re-embodied life. We are not floating free in a sort of astral plane, whether it's a spiritual astral plane or a cyber plane. We mustn't replace...turn pie-in-the-sky, which is a distortion of the Christian thing, to pie in the computer, which would be even more distorting.

**Melvyn Bragg** : What's your reaction to that Margaret Wertheim ?

**Margaret Wertheim** : Oh I'd actually totally agree with everything that John just said, because, in effect what I'm trying to say in my book, is not that I buy into this notion, but that there are an enormous number of people particularly in America, who are saying that cyberspace will be a new form of heaven, a place where we can ultimately download our selves as disembodied spiritual beings and live forever in cyberspace.

**Melvyn Bragg** : You actually talk of the "soul", I mean not to get to the heart of the matter..... well the *soul* of the matter, you say that "cyberspace is a technological substitute for that ultimate Christian space called "the soul"". Can you develop that?

**Margaret Wertheim** : Yes, what I would just like to make clear though, is I'm not saying that I believe that. What I'm reporting on is the sociological phenomena that a lot of the gurus and champions of cyberspace in America, are making these claims, and so what I'm trying to do is understand why the claim is made, and on what basis such a claim could be made.

**Melvyn Bragg** : Well, let's start with why first and then go on to on what basis. Why is the claim is made? And why is it being made now?

**Margaret Wertheim** : Well I think that what is going on here is that many people in the modern world are not like John a formal religious believer, but they are desperately seeking for some sort of spirituality in their lives , and they *do* have a very real sense they are not just the matter of their bodies, they are in some sense a spiritual being, and they want to have if you like a home for the soul. And in the age of modern science we've had profound problem because we have had a picture of reality that recognises only physical space , and therefore we've had a cosmological picture in which we could recognise only our bodies, and we could locate only our bodies, and this immaterial "I", this soul, spirit, psyche, whatever word you want to use, has if you like, kind of been pushed out of the realm of reality because there's no space for it, which the medieval world picture had. And I think that has caused, if you like, not only a spiritual crisis, but a psychological crisis, and so many people, if you like, are looking for a space for their spirit, their soul, and by being a non-material space, people are saying, "Ah because it's a non-material space, cyberspace must be a place where my soul could be".

**Melvyn Bragg** : You are talking very specifically about space, if I can reassure listeners that what we are talking about is exactly that, at the time of Dante, we'll come to Dante in a moment, there was literally space in Dante's scheme of things. You drew a diagram of the world as it was known and outside the known world there was this huge space which was heaven and that is the space to which the soul could go, where angels belonged, where God was, that was that;space, and you're saying, particularly since Newton, going back to the ideas of Aristotle, there is no nothing, there is no space for anything, and so cyberspace, this interconnection is a place where there can be a

soul, and that's what's being picked up by your gurus.

. Okay, John Polkinghorn, what's your view?

**Margaret Wertheim** : Yes.

**John Polkinghorn** : Well, I agree with Margaret that I think there a lot of wistful non-believers around, who would certainly want to believe that there is **more than simply matter** , simply the bits and pieces, the atoms and molecules that make us up. But I think to look into cyberspace for that is the wrong way to look, because we're not just computers made of meat, we're something much more subtle than that. There are good arguments for saying that the brain is much more than just a very complicated computer , and in fact interestingly enough, there are just hints, and encouraging hints from science itself of how one might think about it , you see, if we're thinking about information, about pattern, as a lowly picture of what the soul might be, then we want it to be embodied in some way, we want it to be connected with the human body, not just floating out there in this electronic artificially created space . Now there's something called "complexity theory" that's coming along , it's just an infant science at the moment, people are just studying computerised models, and they find that when they study these very complex systems, that they develop quite astonishing patterns of large scale order . In other words, if you're going to describe these systems, of course you need to describe the exchange of energy between the bits and pieces, but **that's not enough**, you need a complementary description in terms of pattern and structure .

**Melvyn Bragg** : But complexity theory is only..... . its' very tentative at the moment, isn't it John?

**John Polkinghorn** : Yes it's tentative.....

**Melvyn Bragg** : The randomness, the interdependence of states, but it is technical, there's no **mathematical equation** for it it at all. Why do you seek to have, as it were, physical proof and validity for your religious conviction?

**John Polkinghorn** : Well, I'm not quite seeking that , what I am seeking is to understand what I am as a person. I think I'm a psychosomatic unity as people say. In other words I don't think I am an apprentice angel, I don't think my soul is a detachable spiritual bit of me. I think I'm just an animated body . But I am more than the material of my body , which is changing all the time, through eating and drinking, wear and tear, and what I really think the soul is, is the almost infinitely complex information bearing pattern in which the material of my body is organised. That's a very old idea, it goes back to Aristotle, who said that the soul was the form of the body, and Thomas Aquinas in the middle ages took that up. Aquinas didn't believe in the Platonic picture of apprentice angels, he thought we were just exactly that. And I think that if people have this wistful desire to recover the soul, which is absolutely right, we are certainly more than just bits and pieces, that's the direction in which to look . Of course, it's a very infant rude undeveloped subject at the moment.

**Melvyn Bragg** : This, your view, would be very hotly contested by people who are in the driving seat of intellectual science at the moment. Dawkins, Dennet, Pinker, the idea of seeking a soul in this way ?

**John Polkinghorn** : Well, it would be contested by them, whether they are in the intellectual driving seat of science at the moment is extremely contestable judgement....

**Margaret Wertheim** : Yes I would, I would say....agree with John on that.

**John Polkinghorn** : ....I think. It would be contested by Reductionists who go for a quick fix an easy answer. Dennet says that essentially, that we are just computers, he is in his grandiosely entitled book "Consciousness Explained" , he never deals with awareness, he never deals with "feels", what it is to perceive a patch of pink. I mean tremendous claims are being made which are just unsubstantiable, I don't think that's the dri.....if that's the driving seat of intellectual class, we're going the wrong way.

**Melvyn Bragg** : Well, I think I'll hold out..... that could be..... . they could be going the wrong way, but there's no doubt they are making the argument, John. Margaret Wertheim ?

**Margaret Wertheim** : They are, but..... .

**John Polkinghorn** : Well, of course they're making the argument, but we're making the argument against, aren't we?!

**Margaret Wertheim** : Yes I know but....

**Melvyn Bragg** : This is, this is Opportunity Knocks, but Margaret Wertheim?

**Margaret Wertheim** : The interesting thing I think is, that precisely what you're saying John is what is going on with the cyber community, and what I think is interesting about these cyberspace people is that they do actually represent the opposite trend to the Dawkins and Dennets and....

**John Polkinghorn** : Well, some do, some don't.

**Margaret Wertheim** : Pinker..... . well, many of them do, because their claim is that, in fact, there is this immaterial pattern that is the essence of a human being , and in fact, I think what their doing is reinventing in cyber form some sort of version of the soul, which I sort of..... .

**John Polkinghorn** : Yes but it's a diminished version..... .

**Margaret Wertheim** : It's a dimin..... oh no..... I totally agree....

**John Polkinghorn** : ..... . just think, well you know, "the soul is the software running on the hardware of the body". That doesn't work.

**Margaret Wertheim** : No, no exactly, but their claim is the very opposite to the people like the Dawkins, Dennets they actually want to say that there is this immaterial, essential "me" that can potentially live forever, that I could potentially download into cyberspace.

**Melvyn Bragg** : Can I bring us to Dante, who plays a big part in your book? And you and John may disagree here. You make the claim that Dante's great poem "The Divine Comedy" was the first virtual world, and we can go from Dante's , "The Divine Comedy" to cyberspace and get lessons from it. can you briefly tell us why this is important to your notion?

**Margaret Wertheim** : Yes I think the remarkable thing about "The Divine Comedy", for me, is that it's the most beautiful and poetic vision of the medieval world picture, and that what we see there is not only a complete picture of the physical world as described by medieval science, but we also see a complete picture of what medievals really understood in a sense as if you like a spiritual cosmology, and....

**Melvyn Bragg** : The circles of hell, and the cosmology of the earth was.....

**Margaret Wertheim** : Yes, the circles of hell, the circles of heaven and the various cornices of purgatory, and what Dante really shows you is in a poetic form , how for the medievals, the immaterial reality of the soul, the cosmology of soul in a sense mirrored and reflected the physical cosmology which their science described. So the medievals lived in a genuinely dualistic world, they did believe there was a spiritual space of the soul, and a physical space of the body, and these were two parallel realities. For them, however, unlike in the modern world, the primary reality was the underlying reality of the spirit, of which the material world was if you like, the secondary reflection, and Dante shows us this, not only in beautiful theological terms, and poetic terms, but I also think, as the point John made before, that it is, in my mind, one of the most, remarkable articulations of what it is to be a human being in a psychological sense, and it can be seen as the great work of pre-Freudian psychology. So he weaves together theology, science and poetics in a way that is a truly holistic vision, but he shows us that for medieval people reality was not just the physical.

**Melvyn Bragg** : What's your reaction to that, John Polkinghorn?

**John Polkinghorn** : Well, my reaction is a little bit cautious, I mean I'm not at all sure, the extent to which Dante

took his geography seriously. It has a high symbolic element to it. I think the best part of "The Divine Comedy" actually, is purgatory. Which is really hopeful. People work their way up the mountain, and the mountain shakes with hallelujahs when anybody takes the next step upwards. Hell's too sadistic, and Heaven's too vague, as I think you say in the book?

**Margaret Wertheim** : Yes, yes.

**John Polkinghorn** : I think these things are symbolic and I don't think that Dante thought he was fusing physical geography with spiritual geography in quite the way I think that you're suggesting.

**Margaret Wertheim** : No, no I don't mean to imply that it's a literal thing. I think for the medievals it is symbolic. But the question arises, for instance did Dante and his contemporaries really believe there was a conical mountain of purgatory in the Southern hemisphere? And I think that question is really a modern question, because for us, it couldn't really exist, because we've circumnavigated the globe and we *know* there is no physical mountain of purgatory. But for them it wasn't a physical question, they weren't obsessed with the notion that things were only real if they could be located in physical space.

**John Polkinghorn** : Can I say something about..... ?

**Melvyn Bragg** : Yes please.

**John Polkinghorn** : ..... . not being real? There's one cyber world, if you like, which is not a humanly created world, to which we have access, and most scientists will agree we have access, and that's the world of mathematics.

**Margaret Wertheim** : Mathematics, yes.

**John Polkinghorn** : Most mathematicians think that they are *discovering* things. The MANDELBROT SET was there before Mandelbrot found it, so to speak. Now that's a sort of.....

**Melvyn Bragg** : You mean things already exist, and they're discovered?

**John Polkinghorn** : They exist. They exist and you find them out. We have this amazing power to explore that world and make big discoveries. It's not just a game that we're constructing , in the way that we might construct a cyber game. That's a very interesting thing.

**Margaret Wertheim** : Yes, I know I agree.

**John Polkinghorn** : You've discussed that already of course in your book, and that seems to be a world, which is a world of thought, and not a world of physical things to which we undoubtedly have access, and I think that's where I'd look for a way of anchoring if you like, a knowetic (??) world, a mental world, in modern thought

**Melvyn Bragg** : What is it , "Galileo I've discovered that the language of the Lord is written in mathematics"?

**Margaret Wertheim** : That exists yes.

**John Polkinghorn** : Absolutely yes, yes.

**Melvyn Bragg** : And so what does that tell you, John Polkinghorn, if things are there to be discovered, is your conclusion, or do you draw from that, that they were put there by someone to be discovered?

**John Polkinghorn** : Well I think that the world of mathematics..... .

**Melvyn Bragg** : Or something like that?

**John Polkinghorn** : The world of mathematics seems to be a world of everlasting truth, and you're absolutely right, that that world, which is an abstract world, in some sense, that we can explore in our minds, is also anchored

in the physical world, in the sense that mathematics is the key to unlock the secrets of the physical universe. The search for beautiful equations, is a technique in theoretical physics.

**Melvyn Bragg** : So where does that take you, to go back to.....

**John Polkinghorn** : Well where that takes me is to say that the world that is interpretable through mathematics, the physical world that is interpretable through mathematics in that way, is a world shot through with science of mind, in its beautiful pattern and structure, and that suggest to me that there is indeed a mind, a capital M divine mind behind it .

I see theoretical physics in that sense, as witnessing to the mind of the creator.

**Melvyn Bragg** : So, and how do move from that mind to the soul, and do you still feel with Margaret Wertheim, or Margaret Wertheim's gurus, let's presume it's your arguments, because it's too complicated.....

**Margaret Wertheim** : Well, except that I'd like to make the claim that I don't actually agree with these people.

**Melvyn Bragg** : But you do come in very emphatically behind it, again and again but I accept the distinction. It's just getting in the way at the moment. Where is this space for the soul?

**John Polkinghorn** : Well...it...it...its..... I think we're amphibians, that we have a foot in both worlds. We have a foot in the physical world just hitting me on the head with a hammer makes that pretty clear, we have a foot in a mental world of some sort, and I'm appealing to my mathematical experience, just as an illustration of that, and I think that we just have this dual character. But the dual character is not that there are two bits of us , a mental bit and a physical bit that are say for example separated at death, and the mental bits the real bit that really matters. They're somehow integrated in this way , and I'm looking for models, and of course they're kiddies toys, really, intellectual toys in the sense that we don't understand what we are ourselves, we play around a bit and wave our arms , but I think things like the generation of patterns through complex systems is just a little hint in a hopeful direction, and a hopeful direction, not of defending a religion, but of understanding humanity.

**Melvyn Bragg** : Yes, well, Margaret Wertheim we go in your book, we go through Newton, and we go through the enlightenment, but I'm belting through that because we belting through our allotted time (laughter), and I'm coming to the 20th century, now, when people like Paul Davies , Sir Steven Hawking have equated the drive for theories of everything, theories of everything - TOE a very unattractive.....never mind (laughter), theories of everything, equating that with God, yet you say that this is little more than a set of equations.

**Margaret Wertheim** : I think the problem is, I don't have any problem with the notion that theories of physics can ultimately in some sense be a reflection of God, because of course, in a Christian sense, the whole of Nature, is in some sense a reflection of God. What I have an objection to with some of these people is that they seem to want to reduce God to nothing but a set of equations, and of course that cannot be the case. God is not in any Christian sense, just a bunch of equations who created a God.

He must also be the God of salvation if He's to have any real theological meaning, and I do not see the link between the God of Christian salvation and the God who is expressed in the theories of Quantum Mechanics and Relativity.

**Melvyn Bragg** : But I come back to you John Polkinghorn, your a very eminent particle physicist, and so on, and you've got these people of great intelligence, I mean Hawking, let's not mess about, and they are bringing this to bear, this..... . this...this physicist, this scientific knowledge on the idea of religion. Now I come back to a question I asked you earlier, why is it important to you, why do you think that it is important that religion, which most people have seen hitherto, let's just take Christian religion of the last 2000 years, as being an act of faith, a leap of belief, why is it important that that should have the confirmation, the underlining, the consolation of physics?

**John Polkinghorn** : Well, it's important because truth is one, and truth is the essential religious question. Faith isn't a question of shutting your eyes and gritting you teeth and believing impossible things , because the bible tells you that's what you've got to do, it's the search for truth , and ultimately I believe the search for truth is the search for God.

**Melvyn Bragg** : Is it? I mean a lot of people thought it was that they received faith, didn't they? That they were

struck by faith?

**John Polkinghorn :** Well faith is a commitment to the truth . Science involves actually an act of faith in that sense, it involves a commitment to the intelligibility of the physical world. Now part of that truth is the truth that physics reveals, and I very much hope my friends and colleagues in my old (indistinct) of particle physics will one day discover a grand unified theory - a GUT as we....another unattractive acronym (laughter)....

**Melvyn Bragg :** Yes your not very good at these acronyms are you, you guys!

**John Polkinghorn :** ..... but if they do discover a GUT, it won't be a TOE! It won't be a theory of everything, it won't even be a theory of everything in physics. If I could write the equations of particle physics on my T-shirt, that would be great, but it wouldn't explain to me how bulk matter behaves, it wouldn't explain turbulent fluids, and things like that, even in physics it wouldn't be a theory of everything, and we are very much more than just being physical things. The real theory of everything, I think is theology, because theology is the attempt, the human attempt, the limitedly successful human attempt to understand God, and if God is the ground of everything, then the more we understand God the more we understand everything.

**Melvyn Bragg :** Do you think that cyberspace, given that it is very , very recent, and it has developed with extraordinary rapidity, and the fact that it has developed with such rapidity, and people are so greedy for it, and I mean that in a ..... well if greed can be..... well anyway.....they are greedy for it, that it's got power. Where do you think it's going to take us?

**Margaret Wertheim :** Well I think there's no question that more and more things are being done on-line. Schools for instance are having kids..... .

**Melvyn Bragg :** Yes but intellectually where will it take us?

**Margaret Wertheim :** Oh well I think that it is developing into a very powerful collective alternative space of being another very powerful place, where we will increasingly spend time, and for me the really positive aspect of this is that I think that it is going to force back into our discussion about reality the notion that we must take seriously, that we are not, as John said before, "just the matter of our bodies". Not that there's necessarily something ontologically separate, but that we are beings of spirit and psyche as well, and that this in fact, I think, is going to actually be the thing that will finally kill the materialist reductionist view of life . Not that cyberspace is necessarily the answer, but I think it's going to force us to take seriously the discourse of non-materialism, and actually that's a positive thing.

**Melvyn Bragg :** So you think cyberspace is going to bring....is going to deeply challenge Dawkins and Dennet and so on?

**Margaret Wertheim :** It already is I think. I think it already is.

**John Polkinghorn :** I think it will help to challenge their purely reductionist view. The point is it's a good servant but a bad master, and one of the things it can do for us is to enable us, for example, to explore the behaviour of complex systems, and we are learning some things from that, and there's much, much more to learn, and the beginning of the next millennium will surely see great advances in our understanding of what the..... even just the physical world that science studies in it's impersonality, what that world is like, it's richer than the reductionists are prepared to say.

**Melvyn Bragg :** To come back to one of the basic things finally, in Margaret Wertheim's book, this business of the soul and the body, which Aquinas wanted to bring together, you see cyberspace, is the an analogy of cyberspace being the space for the soul, is it something you can live with at all?

**John Polkinghorn :** Well if its just a humanly created separate space I don't find it very helpful, if it's an integrated with the physical world, I do find it a helpful image, perhaps of how we exist as more than our bodies but in our bodies.

**Melvyn Bragg :** And therefore how if...if...how would you take on....what's your take on the soul then Margaret



Wertheim? You've done a lot of work on this, and we know you're quoting other people and so on, but what does this mean to the cyberspace kid?

**Margaret Wertheim** : Well I think that the real question is many people are looking to cyberspace for spiritual satisfaction. Can it actually provide that. I mean I think in a sense we have returned to something like the medieval system , in that we now if you like, live in a dualistic, we 're increasingly living in a dualistic world , of two separate spaces, one physical and one non-physical, and people are looking to that non-physical space-cyberspace and hoping that it might provide spiritual satisfaction. I think it's a very serious question, whether it will be able to provide that satisfaction, because it's not ultimately embodied in a real theology and ethics, and so I think it's really highly debatable that it will be able to provide that satisfaction.

**Melvyn Bragg** : Well there we are thank you very much Margaret Wertheim, good luck with your book, and Dr John Polkinghorn, very good to see you again, and thanks very much to you for listening.