

In our Time Programme 6  
*The Brain*

**Melvyn Bragg** : Hello, as the century progresses, so our knowledge of the function of the brain has accelerated, promising to change our view of our own nature, and our approach to the behaviour and treatment of others.

With me to discuss this, is Steven Rose, Professor of Biology, and director of the brain and behaviour research group at the Open University, where he researches the cellular and molecular mechanisms of memory. He's the author of 15 books, including "The Chemistry of Life" and "The Making of Memory", and he's most recently edited a collection of essays on the new sciences of the mind called "From Brains to Consciousness", and Dan Robinson who's distinguished research Professor at Georgetown University, and occasional visiting lecturer in Philosophy at Oxford University. His books include "An Intellectual History of Psychology", "Wild Beasts and Idle Humours: The Insanity Defence from Antiquity to the Present", last month he edited a series of essays on the mind, and this evening he's taking part in a debate, at the London School of Economics on "Are Brains Computers?".

Steve Rose, could you give us a thumb-nail update on, as it were, the latest lines of engagement in the Brain/Mind debate?

**Steven Rose** : Well, we're coming to the end of what the Americans call "the decade of the brain", it's an extraordinary time to be alive as a neuroscientist, because there's a flood of data coming in. Everything from the molecular to the brain imaging in terms of the way that brains function, and I think that more and more, neuroscientists are becoming sufficiently confident or arrogant, that they will be able to explain everything, not just from memory but even to consciousness, in terms of brain processes, and where does the mind come in that? I think there are a lot of neuroscientists who are, if you like, completely hard-wired, reductionists, in the sense that they will eliminate the mind from discussion entirely, and yet, I really feel that there are great problems about this, and we what we lack, despite the enormous quantity of data that's coming in and the excitement of laboratory work, and so on, we really don't have a very good theory even of the brain, let alone of the mind, and I think a lot of the very deep philosophical and moral questions are as alive now as they were a hundred or a thousand years ago, despite the neurosciences.

**Melvyn Bragg** : You call the brain "the most complex structure in the universe", in a sense how do we know that?! (laughter)

**Steven Rose** : Well, that's of course the paradox of studying brains and minds with our own brains and minds, but it is in the sense that you're dealing with a structure which has got something over a hundred billion cells, something over, probably a hundred trillion different potential connection points, interactions between them, and that leaves you with a permutation that is more than all the potential particles that there are known to be by cosmology in the universe, and that's a formidable structure.

**Melvyn Bragg** : Kind of stunts the growth that sort of statistic, doesn't it? (laughs)

**Steven Rose** : Yes, I mean it blows the mind, blows the brain I suspect! What it does give you is some indication of the extraordinary capacity and intricacy of what neuroscientists are trying to study at the moment, and the difficulty of doing so.

**Melvyn Bragg** : Dan Robinson, approaches to the study of the and the brain have traditionally taken the form of the dualist versus the materialist approach. Can you tell us, briefly, the distinctions between these two ways of thinking, and where do you stand on this?

**Dan Robinson** : Well the distinction is what in philosophy is called an ontological distinction. The question really is to account for the actual constituents of the universe. How many kinds of stuff do you have to propose?

Materialists, a monist argues that all of reality finally is reducible to matter, or at least to something physical and a dualist thinks that when you add up all the things that are material or physical there's still something left over, which can be called the mental or the spiritual.

I think Professor Rose's comment about a certain arrogance taking over in the brain sciences, is quite apt. If you want to sample a controversial claim, namely that consciousness, mental life, perception, learning and memory all depend upon the brain, that controversial claim was made by the Hippocratic physicians in ancient Greece. Gaul who had as much to do with launching what today we would call "the brain sciences", with his very controversial claims, insisted that there were four incontestible truths, namely that everything about us mental is based on the brain. Gaul is the father of phrenology, he's the fellow who would have you judge the moral and intellectual dimensions of life by feeling bumps on the head. So my own position is, I said to my wife once that I would hope my epitaph would be "he died without a theory"! I think this is work in progress, it's marvellously interesting. The technology almost beggars the imagination, no one who did graduate work in neuro-psychology when I did imagined that you could actually look at the intact human brain in operation, and see changes in its functional performance.

**Melvyn Bragg** : Can you specify that just a little for our listeners?

**Dan Robinson** : Well when I was doing my graduate work in neuro-psychology, if you wanted to know something about the human brain, you either had to wait for a post-mortem, or used a very, very crude technique like electro-encephalography, or you used something very state-of-the-art which in the old days we used to call average evoked responses, and if you were lucky, you could get a nice clean record of what the brain does when you repeat clicks or flashes of light, that sort of thing. Today, of course, with functional MRIs and PET scans and the like, it's possible to have people solving problems, memorising lists, being in various emotional states and actually see specific systems within the brain activated as these events go on. So the technology here, as Steven Rose points out, we don't have a good theory, and integrated theory of brain function, the technology has greatly outstripped our theoretical resources, and I think much of the work needs to be done there.

**Melvyn Bragg** : Can we talk a little bit about the mind and brain, that the brain is this strange porridge in the skull, it's something that has been examined and examined and examined, but examination doesn't tell us really what the mind and consciousness is. Could you just say a little about this Steven?

**Steven Rose** : Yes, I mean firstly I think that, I mean my position, which is, I think, different from Dan's is I am a thoroughgoing materialist, though I wouldn't say I was a reductive materialist, I don't actually think we can eliminate the language of mind, although I think that when we're talking about mind processes, and we're talking about brain or biological processes, we're talking about the same thing but using different sorts of languages, and the problem for me is always to try to understand what I would call "the translation rules", between the language of brain and the language of mind. Having said that, of course I think it's also important to remember, that mind isn't just in the brain, and that is the way that we think, the way that we behave, the way that our emotions come are also because brains are in bodies, and bodies are full of hormones, they are full of interactions with brain, and of course both brain and body are open systems, we're constantly in interaction with the world around us. So what constitutes, if you like, our mind, our thinking, our consciousness, isn't just the shape and connections of what's going on in the brain at any given moment, but they themselves are influenced by our past history, by our history as a human species, by history, as it were, a society, and by our present cultural state, and of course by our own personal development.

So it's a sort of...not my view as a sort of a non-determinist view, which, in order to understand where we are now, we have to understand both our past history, and the history of the interactions of brains and minds with the rest of the world.

**Melvyn Bragg** : What about you? What's your view on this duality, Dan Robinson?

**Dan Robinson** : Well, I think Steven's position, I'd be inclined to call it a kind of realist materialism, that really nothing is gained, if you ask that character who rides the Clapham omnibus, you know that metaphysically challenged person who's always found on the Clapham omnibus, if he has a Cheltenham and Gloucester mortgage, how the terms of that will change, just in case he becomes a materialist or a dualist or an , well the fellow will look you in the eye and say, "It doesn't make any difference to me. The problems I went to bed with last night, I get up with this morning, whatever theory we have about mind/brain relations". I think the right way to go, is to take the large projection of human life in culture, the aesthetic and moral and political and institutional projections of

human mind, and then ask whether it's plausible to try to account for all of this solely in terms of brain function.

I'll give you one illustration. The recently concluded neuroscience meetings in California featured some papers on functional MRIs while listening to different genres of music. The short script is this, and I hope everyone listening to Radio 4 hears me loud and clear. Mozart makes you smarter! (laughter)

Now, not only do I want to plug Mozart, which I think is always a good and virtuous thing to do, but the point I want to make builds on the point Steven made. We are cultural creatures. The brain is an incredibly plastic organ. It is shaped by daily experience and lifetime experiences. The ancient Greek world had as a maxim "polis andre de daska" (sp?), "man is shaped by the polis". The political and cultural and moral dimensions of our lives finely determine the functional characteristics of that organ. A developed neuroscience will not ignore these things. It will recognise the need to approach these with proper reverence and respect. Otherwise we're simply saying that the brain is necessary, if we're not going to walk with a limp or if the left eye-lid isn't going to droop, no one including Descartes ever doubted that sort of thing.

**Melvyn Bragg** : Given the huge advances that you outlined, into, let's call it, the neurological ways, the technical ways of looking at the brain, and examining the brain and the galloping interest, and conviction about these sort of results, as Steven outlined at the top of the programme, what place is there for philosophy?

**Steven Rose** : (laughs) Your turn!

**Dan Robinson** : Yes well of course twice in ancient Rome the philosophers were exiled, I think on the quite legitimate grounds that they constituted a threat to the civic life. I think the place of philosophy is the place of criticism in general. Scientists at their best *are* philosophers, in that they're challenging the core assumptions that guide research and theory. Philosophy I think has certain formal contributions to make, these are largely logical contributions, analytical contributions. I think philosophy is also the repository of that very large chapter of the human experience that does include the moral, the dispositional, the intensional, the interpersonal. The brain sciences, of course, must come to grips with what it is that defines our human nature, and I say that philosophy along with the humanities at large, is more or less the keeper of the text. Then there are very specific contributions that philosophy has to make. Philosophy of mind has well worked out analytical resources to test the sorts of claims likely to come from the developed brain sciences.

**Steven Rose** : The more clear cut of my colleagues would probably say that philosophy is a discipline a way of understanding the world which is steadily being driven back by advances of science, that it, as it were, remains in very small terrains, where science has little purchase at the moment, of course mind/brain issues are there, and in many, many areas whether you're dealing with issues of morality, whether you're dealing with issues of the way the world is, you need either the social sciences or you need the biological, the physical sciences. I have some sympathy with this point of view, I do think however that philosophers have a, particularly in this area, have a role in trying to clear up muddled thinking, and I think about the relationships between mind language and brain language, there is an awful lot of muddled thinking, and I think that is a help for us, and I think also if you look at the way in which philosophers like Mary Midgeley who was on this programme a couple of weeks ago for example can cut through a lot of, I think the very dubious thinking that comes out of the sciences at the moment, I think that's a great contribution that remains to be made.

**Melvyn Bragg** : Can I turn to what could be in some way a test case, I mean can you Steven Rose tell us how our increased understanding of the brain has been used or misused, in the analysis of criminal behaviour or insane behaviour, because Dan Robinson's written about the insane dimension, can we just spend a few minutes discussing that?

**Steven Rose** : I think there are two or three things that are happening at the moment. The more that the brain sciences and the more that genetic sciences advance, the more we know about the relationship between events going on in our body, events going on in our brain, and our actions, okay. The classical issue in debates about criminal responsibility was, as I understand it, as not a criminologist, to try to decide whether a person was in mens rea "in sound mind", when they performed a particular act that was defined as criminal, and there was a very clear cut distinction then made between "mental activities", thinking, causes, rationality, and so on, and organic brain dysfunction, you've got a brain lesion, which meant that you couldn't help but do X or Y or Z, then this was a claim for diminished responsibility, in a criminal case.

Now, what's happening at the moment, of course, is that we are, seeing a surge of claims made that there are for example, genetic determinants of criminal behaviour, there are genes for quotes "behaving in a particular sort of way". There are brain processes associated with behaving in a particular sort of way, with being violent or quotes "psychopathic" or whatever else it is. Now I'm pretty dubious about the claims .....

**Melvyn Bragg** : You're passionately against that actually, in your writing.

**Steven Rose** : I'm against....I'm certainly...I certainly don't believe many of the claims that have been made in this particular context, but let's put the criticism of those claims apart for one moment, and let's assume, as I have to do as a neuroscientist, that we are going to end up with some sort of a description of the brain which is a more reasonable description of being able to account of how people behave at particular moments. I think that there's no doubt that the classical mens rea time of legal argument cannot withstand those advances in the neurosciences, and a lot of philosophers and psychologists and forensic psychologists have been wrestling with that problem at the moment.

So, if someone says, as is the case in a diminished responsibility case at the moment, that, "I shot person X because I had a gene which predisposed me, or a set of neurotransmitters in my brain which predisposed me to violence", how does one actually deal with that? And I think there are very real problems there. I've come rather gloomily to the conclusion that however much we advance in the neurosciences, to argue simply that we want to medicalise quotes "criminal behaviour", taking out of the realm of the social and back into the realm of medicine is probably a mistake, and basically the law probably knows better what it is doing in this context than the brain scientists do.

**Melvyn Bragg** : Dan Robinson, you've written greatly about this?

**Dan Robinson** : Well I think the culture of law has resources that are very often underestimated until one actually comes to study the history of it. There's a fair amount of hi-tech Calvinism that's going on within genetic science and the brain sciences. Medieval philosophers were quick to note that there are many things that incline us in a certain direction without determining us in that direction. Clearly a radical determinism would not alter our sense of law, it would essentially eliminate it, the courtroom would become a clinic. It's important to understand the insanity defence has been on the books throughout the recorded history of Western law.

The homicide law of Draco, distinguishes between intended and unintended criminal acts. The furious...the chap likely to squander the family resources because of a manic state has a custodian appointed to him as early as Rome's twelve tables. So there's long been a recognition that there are conditions of body and spirit, conditions of character that might be mitigating. The only way the brain sciences, I think, could radically change our conceptions here, would be by establishing a rigorous psychological determinism of the sort both Steven and I would resist. I don't see that coming along, and I'm also quite fearful, psychiatry having done its business in the courtroom, I'm quite fearful that the application of seemingly more scientific neuro-psychology and neuroscience conjectures will further erode that juridical sense that really is the glue of civic life.

**Steven Rose** : I want to be clear that so far....that what we define as quotes a "criminal act" is a socially defined act, and that the same biological processes could take place in someone who is performing....behaving in a way which is defined or not defined as criminal. Take a recent case in this country, take private Lee Clegg, for example, who was a soldier on duty on a guard post in Northern Ireland, joy-riders went past, he picks up his rifle and he shoots one of the joy-riders a young woman dead. He's tried and found guilty of murder. Later the case is quashed, and he's now back in the army, he's a Lance-Corporal, and the case is being re-tried at the moment.

Now the same processes are going on in his brain when he picks up this particular rifle, and shoots the young woman, the same activities are there, the same genes are there, the same neurotransmitters and so on, and yet in one case it's being defined as a criminal act, a serious criminal act, in the other it's not, and I think that poses the dilemma that I think we have to face, when we're trying to understand the relationship between brain processes, as a materialist myself and the way in which society interprets them.

**Dan Robinson** : Yes I think this is really quite on target. The understanding of an action as a criminal action carries with it so much cultural and contextual baggage, that it would be impossible to specify an act as criminal, simply by recording the events going on in the nervous system. The events going on in the nervous system are just morally and juridically neutral. They take on a certain meaning when they're correlated with something that a given culture has already decided to be criminal or unwanted.

**Melvyn Bragg** : And when you're talking in one of your books Steven, about...talking about a gene for violence being quite meaningless, because there's the violence of people in armies, there's the violence of people to each other, there's domestic violence, there's the violence which is open to several interpretations like those of private Clegg, and so it goes on and on. Can I just turn now, because there is such a lot to say, and we're zipping through this, can I turn to the business of drugs? Because the use of drugs and local anaesthetics in the brain, and so and so forth, that has led to all sorts of views on what the brain is, and the idea of using drugs on the brain predisposes us to having a view of the brain "we can do this by just jabbing in a drug it'll change that" (snaps fingers).

Now can you say what you think of the way that drugs are being used to, as it were, manipulate the way, even in small things like aspirins, manipulate the way our brains and minds work, at the moment, and what your view of it is?

**Steven Rose** : I think we have a very real problem here, and that is that, one of the things that the advances in the brain sciences and pharmacology have given us is a range of ways of altering the way in which we as individuals respond to the world around us, and clearly there are....I find it very puzzling the way in which distinctions are made, between, as it were, what is legally acceptable, what is illegal, ecstasy is illegal, viagra you can have on prescription only, alcohol we can buy over the counter, and yet in a sense, all these are drugs which affect the brain.

What really does concern me about this, is the ways in which, and it comes back to the ways in which we are more and more, despite the best efforts of people like Dan, looking to biology, and looking to genetics and neuroscience to explain the way in which the world is, and I think one of the clearest cut examples of this comes, not so much from Britain, although it's coming here too, but it's certainly prevalent in the States, and that is the way that, for example, in the States there is a phenomenon now, in which something like 10% of all young American children, mainly boys aged between 8 and 13 are being diagnosed, on the basis of being naughty at home, or poor learners at school, as suffering from a brain dysfunction, Attention Deficit Hyperactivity Disorder, and instead of looking for solutions which might relate to the teaching, to the class, to the society, to the parents, instead, the children are said to have a brain dysfunction, and you treat that with a drug, and the drug is called Ritalin, and something like 40, 000 prescriptions a year now are being issued for Ritalin in Britain, and this is a way, if you like, of transferring the problem from the social context in which the child is embedded into the child itself, and that seems to me to be deeply, deeply problematic, and it's something which is going to continue, because whatever we say, pharmacology is going to get more and more sophisticated at tweaking the neurotransmitters and manipulating the ways in which we respond to the world, and we're not very good at thinking about the implications of that yet.

**Melvyn Bragg** : Where does that leave your philosophy Dan Robinson?

**Dan Robinson** : Well I would like to say something about Attention Deficit Syndrome, one of our national epidemics, we usually have two or three at a time in the States! A fellow I was at school with called me up last year, because his grandson was diagnosed as having Attention Deficit Syndrome, and before putting him on Ritalin, his father thought he might want to check with me. I asked if the boy had any interest, as his father did, in sports, oh yes, was he particularly interested in football, oh yes, does he stay glued to the set while the game is on, oh yes. I said, "Next question?". Yeah, it's very, very easy to take complex social problems, and reduce them to a form that admits of some form of pharmacologic therapy. I'm very worried that we're going in that direction. I fear that one reason that we're going in that direction is that the brain sciences do tend to oversell themselves. It's one thing for brain scientists to get together and wrestle with questions of determinism. Once the official press is that everything that we are and will be, is determined by pathways in the nervous system, it's a very small step for a family to say, "Must be something wrong with Billy's pathway", and this is something I think the scientific community has to guard the rest of us against.

It's a slippery slope. It isn't long before we start homogenising ourselves and solving all sorts of social problems by writin prescriptions.

**Melvyn Bragg** : Does this bring us to the notion of the selfish gene, Steve Rose, and the idea which is being made extremely.....being very effectively put forward by Richard Dawkins, among others and taken up, and used, and elaborated, and entered into the thinking of a great number of people? What is your.....? You are not happy with that, as an idea, it seems to me that Dan Robinson is pointing us in that direction.

**Steven Rose** : Well, he is indeed, I'm not happy with the idea, partly because genes cannot be selfish. Genes which

are bits of DNA have a part to play in the orchestra of the cell, an important part in the orchestra of the cell, and there's a lot of technical argument about what genes are doing, what's happening in the cell, what's happening in the organism as it develops and changes, and the idea that there is a direct line between a gene, or even a theoretical gene, and a bit of behaviour is not the way that brains, and not the way that people work. It ignores history, it ignores development, and so on....

**Melvyn Bragg** : It ignores ontogenesis, the interplay between the genes and the organisms, and the organisms and society.

**Steven Rose** : It's more than just interplay, I mean the nature of a develop.....the selfish gene argument is a sort of preformationism. Everything, all of our behaviours and everything else, is locked into the gene, all that's happening is the unrolling of a program , so that these bits of DNA can replicate themselves, if they could replicate themselves.....

**Dan Robinson** : A sort of Hegel meets Mandel, when you think... (Steven laughs)

**Steven Rose** : Yes! They indeed do so, I think we've got to get beyond that, but without getting into the complicated evolutionary arguments about the role of the gene at the moment, let me say what I think we need to transcend, in the context of this discussion, that is the idea that we can partition behaviour into nature, a bit which is given by our genes, original sin, preformationism, or whatever and a bit which is given quotes "by nurture", by the environment. That is a stupid dichotomy . Brains as they develop, organisms as they develop, are constantly in interplay, they are constantly becoming, transforming themselves, and in order to understand how brains function, to come back to what Dan was saying earlier about the "plasticity" of the brain, we have to understand not nature versus nurture, but what I would call "specificity", the ways in which the brain has to wire up during development, in order, for example, that we can go on seeing, our eyes can record to our visual cortex what's going on, and plasticity, the way the brain changes during experience. Now the genes that we have, the cellular mechanism that we have are essential for that, but they're not as it were reducible to that. The specificity, plasticity is what we have to understand in understanding the development of the brain, and our behaviour.

**Dan Robinson** : There was a very informing debate in print in this previous century between Huxley and Matthew Arnold. Matthew Arnold found himself thumbing "Origin of Species", and discovering quote "our ancestor was a hairy quadruped, with pointed ears and a tail, probably arboreal in habit" close quote.

Arnold said "This is very possibly true and in any case how could I dispute the point?", he said, "But regarding this poor chap, this hairy quadruped, with pointed ears and a tail, there must have been something in him that inclined him to Greek"! (laughter)

**Melvyn Bragg** : Well can I finish on that, in a way, by asking you, sort of bowling a googly really, Dan, Descartes believed that what distinguished the human mind from other species is that humans have souls. Is there any place for a soul in your philosophy?

**Dan Robinson** : Oh I'm not.....I think Descartes is one of the most easily libelled philosophers ever. He made a distinction between extended things, like the table we're sitting at, and thinking things, which he regarded himself as being, and on the basis of his capacity to comprehend abstract propositions that could not exist anywhere in the material realm, he concluded that there must be something about this thinking thing that transcends the merely physical.

Descartes was probably as radical a physiological psychologist as there would be until well into this century. Now as far as whether there's anything in my philosophy that leaves room for a soul, I can only say "I hope so".

**Steven Rose** : And I would say paraphrasing Laplace, "Sire, Lord Bragg, I have no room for that hypothesis" !

**Melvyn Bragg** : No room at all. Do you think that your....finally, very briefly, I mean this is one answer, we've only got about 15 seconds, do you think that your sciences or thought systems, philosophy, neuroscience are going to come together, or diverge?

**Dan Robinson** : Steven wrote a wonderful foreword to Genesis which I read last night, and as I said before we went on today, the idea of a radical materialist introducing Genesis seems so apt that I'm confident about the future.

**Steven Rose** : What can I say!

**Melvyn Bragg** : " In the beginning", you can say! Steven Rose and Dan Robinson, thankyou very much.