In our Time Programme 39

Pain

Melvyn Bragg : Hello, I'm joined today by two neurologists. Patrick Wall and Semir Zecki, to look at pain and subjective experience. What can our experience of pain tell us about ourselves and about human consciousness? Is each individual human experience unique, or are there experiences we say can apply across all human consciousness?

Patrick Wall is a world expert on the nature of pain and Professor of Physiology at St Thomas's Hospital London, he's the co-originator with Ron Melzack of the influential "gate control" theory of pain, a reversal of the idea that there's a straightforward relationship between pain and injury. His books include "Defeating Pain". "The Challenge of Pain", and a new book out this week called simply "Pain: The Signs of Suffering". Later this year he'll be awarded a Queen's medal by the Royal Society. Professor Semir Zecki is a renowned neurobiologist, and Professor of Neurobiology at University College, London. In the 1970s he pioneered the work on vision, which caused a revolution in our understanding of the brain, by showing that the brain separated different aspects of vision, form, motion and colour. Since then, he's examined many different aspects of the brain relating to human consciousness and art. He's written about his discoveries in " A Vision of the Brain", and he has a new book out in the autumn called "Inner Vision: Art and the Brain".

Patrick Wall there's a classical theory of pain, could you explain as simply as you can what that was, and why now your theory differs from it?

Patrick Wall : So the classical theory goes certainly back to Descartes, and is perhaps what people feel intuitively is what is going on inside them is the idea that you've got a hard-wired, fixed system in you, something like a burglar alarm or a fire alarm which is absolutely specialised in producing pain as a result of some stimulus. Now that turns out to be simply wrong. Pain is part of the spectrum of our sensations and it can appear and disappear not with this reliability of a fire alarm, but depending on many circumstances, what the general situation is, what your attitude is, what the injury is, all of these have profound effects on how much pain you feel.

Melvyn Bragg : So when you say it goes back to Descartes, can you just examine that a little more for us?

Patrick Wall : Descartes who was of course the great inventor of dualism proposed, and has a spectacular diagram that shows someone with a foot in a flame and leading from the foot is a representation of a nerve, which he knew about, leading straight from the foot to the brain and to what he believed was a common sense centre, that was sensation for Descartes, which was then inspected by something entirely different, the mind. So that you had a frontier there between a relatively mechanical process that produced a pure sensation and the mind that decided whether or not to pay attention to it and add.....adding all the decorations of feeling.

Melvyn Bragg : Semir Zecki, do you find that explanation given by Patrick Wall, does that accord with your analogous investigations into the brain?

Semir Zecki : Yes I think a very similar picture was put forward in vision, with the pure sensation of vision as it was called being elaborated by one area of the brain, and then another part of the brain interpreting that pure sensation. I think these were actually up to a point influenced by philosophical speculations, probably would include Descartes among the philosophers.

Melvyn Bragg : Can I ask you what is the purpose of pain, and I hope you'll excuse me if I use a quote from yourself referring...which refers to yourself, you say for instance, "cancer pain is worse than useless", you're suffering yourself from cancer, so why do you say, "cancer pain is worse than useless"? That'll surprise a lot of people listening. Could you tell us what you think is the purpose of pain?

Patrick Wall : To begin with we are evolved animals and evolved challenged by certain historical problems in how to remain alive. Now unfortunately, cancer was not one of them and so the origin of my statement there is that pain as a signal for the onset of cancer is terrible, it's hopeless. It's not an early warning for cancer, and then the pain of the cancer starts up and continues and continues and continues when you've got the message, why keep it up? So I think this is a design fault in us, if you like. Or that we simply were not evolved to cope with cancer.

Melvyn Bragg : It's often said that pain is all in the mind, what's your reaction to that?

Patrick Wall : (Laughs) I hate it! I hate it when doctors say that to patients. There was a recent survey of American amputees, both military and civil, 70% of them had had doctors say precisely that. "There's nothing wrong with you, it's all in the mind". Now that is a wicked thing to say. Amongst other things it simply shifts the responsibility from the doctor to patient. "It's your fault, you're inventing this". Now I don't know of any invention, I think I have once in my life seen a patient that I thought was genuinely symbolically inventing pain. I think there are a large number of pains, many low back pains, very, very common, where the best of medical diagnosis cannot find anything wrong in the back. Now there's then a traditional pathology driven medicine that says, "all pains originate from damaged tissue, if I can't find some damaged tissue, then the person must be inventing this".

I would say that maybe the doctor's method of diagnosis isn't all that hot, and that is particularly because of the sort of work that is now appearing and that I have been involved in, where the source of the pain may have started in the periphery but can be instability in the central nervous system itself, and that doesn't mean "in the head", it means a break down of control in spinal chord and places like that.

Melvyn Bragg : Semir how would you react to this "all in the mind" problem?

Semir Zecki : Well I think Pat, you're going too far, and from your book it is partly in the mind anyway. I mean the influence of certain culture and previous experience of learning, so it is partly the mind, but I'm quite interested when you say to me that we are dominated by the cortex as indeed you're right we are, would you experience much pain without the cortex?

Melvyn Bragg : Could you just explain to to listeners, I would like everybody to be up to speed on this, because it's really important for a lot of people, just can you briskly tell people how vital the cortex is?

Patrick Wall : Well the cortex is the most highly developed layer on top of the brain. It is the part of the nervous system which we are told gives us our higher faculties, of learning, of intelligence, of experiencing and so on. It is vastly expanded in the human brain, indeed the characteristic of the human brain is a huge, huge amount of cerebral cortex. I would agree with you of course, that we have been rather dominated by a study of the cortex, but could you have someone experiencing pain without a cortex?

Fine, so just to go over that again, of course I agree with you that pain is in the mind, my objection is dualistic doctors who are trying to essentially blame the patient for their pain, and not say that this is something with a pathological medical cause. But now getting on to your question of the cortex, if you take vision as an example, it is sadly true that destruction of the back of the cortex really produces absolute total blindness and that's it, and it's a justification for saying "at least these pathways are crucial for vision". No such pathway has been discovered for pain. And of course it's been looked for massively, because people with intractable pain, why not take out the piece of cortex which they are using in order to generate pain? It's been tried, and of course it's tried by accident, injuries and strokes and so on. You do not get analgesies, and this is...you modify the pain, and this is one of the reasons for saying that deeper structures, Thalamus, brain stem, mid-brain and so on, are evidently sufficient, unfortunately to produce an agonising pain.

Semir Zecki : But is it not true to say that every time people in pain have been imaged through....within a scanner, there has been some cortical activity, although not in any given specific place, as it would be in vision?

Patrick Wall : Exactly. But one of the absolutely crucial events preceding pain is to pay attention. Now there are certainly images of attentions switching mechanisms in cortex. I agree with you, of course cortex lights up in people in pain, and part of that, and the most consistent part of that, I think is to do with the attention mechanism.

Melvyn Bragg : You've also said Patrick, "Injury may occur without pain, and pain without injury", could you develop that, you use examples from soldiers and so on?

Patrick Wall : Injury without pain, and here I think it's fascinating that this not only occurs actually quite commonly in humans, but also in animals. The most famous example of that was Henbit broke a leg while running

in the Derby, and accelerated out of the pack and won the Derby on a broken leg. Of course, there are a mass of experiences of people being injured and not feeling pain at the time. Battle field, sports fields are a very common source of this, and actually every day life, and the characteristic is that people are doing something that is dominating their attention, it maybe scoring a goal or finishing the race, these are not heroic, non-pain, complaining people, these are people, who under those circumstances, in those circumstances didn't create pain.

Melvyn Bragg : Well let's talk about pain without injury.

Patrick Wall : Now given one example which is 70-80% of the acute low back pains, awful pains, a huge number of people have experienced. The most intense diagnosis fails to find injury in the sense of damaged tissue. Now that could be either we are not good enough at making the diagnosis of damaged tissue. Perhaps there *is* some damaged tissue but we can't see it. The alternative is that we have an unstable nervous system which sometimes starts generating false signals. But we don't yet have good enough diagnostic tools to see if that's the case.

Melvyn Bragg : This pain without injury, for quite a few people there's a great deal of emotional pain, real pain, the loss of someone, someone that you loved very much, various forms of loss, and people experience this as pain. Now how does that fit in?

Patrick Wall : I think we're really talking in analogies, we say this is closest to being personally injured and it is.

Melvyn Bragg : So our nervous system is making an analogy with physical pain?

Patrick Wall : That's right.

Melvyn Bragg : But people do have broken hearts don't they? And so how does....can you explain how this turns into that, as it were?

Patrick Wall : I think we humans are clever people, but we're classifiers, and especially in our language, we want to say, "What word do I have that best expresses this?" and we put this in the class of pain. Pain's associated with injury, have many, many different classes. Why not extend that outside yourself and include other people?

Melvyn Bragg : Semir?

Semir Zecki : There's also the injury happening many years before the pain sets in, and a very good example which actually also tells us something about pain being in the mind is the pain which people who become blind often have, many.....well not often, but sometimes have, many years after they have become blind, and they see colours. These colours are golden or purple usually and they are extremely painful, but painful in a way that you and I have not experienced, and actually they are almost driven to suicide. Now the interesting thing about those patients of whom I've seen about five or six, is that they have always written to me with these...showered me with letters of gratitude, and I asked them...I have not done anything for you, I can't do anything for you. They say, "But you have believed us".

Patrick Wall : Hmmm, quite.

Semir Zecki : "Because all we've been told, 'this is in the mind'", but the interesting thing that this pain occurs many, many years after the blindness has set in, so that that's another example of pain without injury.

Melvyn Bragg : Your talking about that in the phantom limb in your book it's similar .

Patrick Wall : Right so here really is an example of a phantom sensation. All of us have experienced a phantom, which is really very educational. Go to the dentists, get a local anaesthetic block, you have a numb lip. Come out of the dentist. That lip isn't a hole in you face, there are no nerve impulses coming from that lip at all, and yet you feel a swollen lip, an attraction getting lip, you keep on poking it. That's a phantom lip, and what has happened is the brain has said to itself, "I normally receive a trickle of messages from the lip. I'm not getting the news. Pay attention, something is curious there". Now what happens then is that the brain says , "I'm still not getting the news, maybe I should increase the gain", and the phantom becomes more and more intense, and these translations of the brains

reaction, which are quite mechanical and reasonably well -understood, in which excitability builds up, can build up to the stage where these cells simply start screaming by themselves announcing this missing limb, and then you have a painful phantom limb, which is an invention of the brain, a way in which it is attempting to restore normality, so that you can say that it's "in the mind" doesn't help the patient at all, and doesn't lead to any possible therapy, because therapies are on their way, where the signal which the brain recognises as missing, perhaps you could replace it, so that the brain said, "okay, I'm getting the news, I won't make a phantom".

Semir Zecki : But is a phantom painful usually?

Patrick Wall : Initially no. But then a high percentage of amputees have a pain which simply continues for the rest of their lives.

Melvyn Bragg : What does the placebo....placebo effect have in your thinking about pain?

Patrick Wall : Here is a hugely important practical issue, that someone in pain who believes and expects that they have been given a successful therapy, responds, although the actual drug has no physiological effect at all, and yet the response is great. What's that about? Very powerful, very common. I think what the person has done is too themselves take or volunteer to take a therapy, and they have done something which they believe will abolish the pain, and it goes.

Melvyn Bragg : That's what you call "taking control of your pain"?

Patrick Wall : Yes, by a belief.

Melvyn Bragg : Semir?

Semir Zecki : But all this really suggests, seems to me your a good recruit with a cortical involvement in pain (Pat laughs), we're going to motor planning. You plan of course for all sorts of things and many of them are not painful, some of the motor planning that you must do to avoid pain, such as removing your finger from fire, is also the same motor planning that you use for other situations, so the brain must be able to distinguish very precisely between two motor plans which have common features, the withdrawal of the finger, but one of which is associated with pain, the other one is not.

Patrick Wall : Dear Semir, you must read the book! (laughs) In fact I noticed you lurched straight back to the cortex and ..... neglecting this remarkable pathway, all of which is modifiable from the point of injury up to and including the cortex and down to the motor system.

Melvyn Bragg : Talking about the placebo effect, we're taking something which has no...seems to have no intrinsic value, but has great value for them, and there's a culture effect too, isn't it, you use the example of Kenyan women in your book, and we know about Christianity one of the things that Christianity said was basically "learn to suffer in silence" and our own English tradition gained a great deal, especially in war, from the "stiff upper lip" idea, which, in war, was extremely valuable, indeed. Can you talk about culture and pain?

Patrick Wall : Well I make a big distinction between private suffering and public display. Obviously public display is tremendously culture bound. It's a method of communication, so that the labour ward in Oslo is very different from the labour ward in Naples, because of the social expectation. One is rather quiet, the other's rather noisy, and people in Naples would be worried if they saw a quiet mother. So, but now the question is what about the individual, is the private suffering, is that really exempt from the culture in which they live? And the answer is surely no. So that these placebos are themselves tremendously culture bound. Placebos in terms of medicine, especially injections, don't work on young children, you have to have grown to learn that people in white coats with syringes are good and help you. At the age of 5 you don't know that and you don't have a placebo effect of that. You *do* have a placebo effect of "mummy will kiss it better".

Melvyn Bragg : What do you say about this business of a culture behaving, I refer to Kenyan women "chatting quite casually while their children were born" as I learn in your book, a later investigation found out that they were suffering as much as any....as *every* woman suffers when they have children, but they said "the custom of our people

is not to show it". What does that say to you about external objective, and subjective experience of pain?

Semir Zecki : There is no metric of pain because partly of these cultural influences, for example if we were to take some other sensation, let us take a favourite example of mine, colour vision. You can actually specify the stimulus in considerable detail and you can get them to match, so you know that you've got some kind of guide as to what they're perceiving, but in pain there isn't that, and the fact that the threshold can vary a great deal, I mean I cannot come and tell you, "Look, I feel intensity of pain X", is that not right?

Patrick Wall : Quite.

Semir Zecki : To go to the cultural influence, to give another example in vision, the Amazon Indians can apparently distinguish 200 different kinds of green, because they need to do that to distinguish various fruit. In a way it is similar is it not to your cultural influence? The absence of a metric for pain must be a tremendous problem?

Patrick Wall : Yes again because the unpleasantness is built in and dominating aspect of pain, which it isn't in terms of colour let's say. So that I don't think it is at all surprising that a sensation which is associated with an imperative action to stop this, to get rid of it, to help, to cure, which is clearly not the case in colour vision, which can be looked at as a neutral event, dissected, analysed, in which you can train people so that they all do more or less the same thing like, being able to read. That doesn't apply to pain. Now I do agree with you that for the treatment of pain, or for a person's attitude to their own pain, they do need to shift gears away from this sense of an automatic register that they are sitting inside their heads reading a dial on the wall that says pain, that's wrong.

Semir Zecki : But the consequence you see...the practical consequence from what you tell us is that the doctor says, "Look I have treated you for you pain, and you're now getting to be tiresome irritation, go away", and this is not good at all from the patient's point of view, who's actually genuinely suffering the pain, and part of the reason why the doctor says that is, is that he's got a different concept of pain. And you say that's quite wrong.

Patrick Wall : Absolutely, and particularly this action that you say where you dismiss the patient because you don't believe them. That is absolutely unacceptable.

Semir Zecki : How would you go about modifying this? If you were to ....be made the Secretary of State for Pain.....

Melvyn Bragg : He *is* the Secretary of State for Pain! (laughter)

Semir Zecki : He is the Secretary of State for Pain, yes!

Patrick Wall : Well I certainly have no easy answers, and the fascinating thing is that a very large number of therapies do work in some people, including placebos, and I think that needs exploration, and the first clue which I believe...I don't have an answer to...but needs intense study, is this question of attention. It is clear that whatever may be going on, some crucial step occurs in which attention becomes riveted on this. Many of the treatments are in fact an attempt to shift attention.

Melvyn Bragg : Shift attention from the pain?

Patrick Wall : Exactly, and the distraction, counter-stimulation etcetera.

Semir Zecki : But it doesn't work for everyone?

Patrick Wall : No and therefore I think we need to be able to study much better, this question of how to unlock attention other than the rather easy ways of learning distractions and even some things given rather pretentious names of cognitive behavioural therapy, which are really teaching people how to shift attention.

Semir Zecki : Can you ..if you're feeling pain in your shoulder..can you feel pain of the same intensity at the same time , for example, in your toe?

Patrick Wall : Absolutely not. It's the basis of folk therapy that counter-stimulation works, and it's an aspect of attention in every respect that you can only pay attention to one thing at a time, people would argue with that, but I think if you follow it through it's true.

Semir Zecki : And therefore Pat, you're only conscious of one thing at a time.

Patrick Wall : Exactly.

Melvyn Bragg : Do you think pain is available to solution through neurobiological methods? It will be found to rest in physical causes?

Patrick Wall : Well yes, and in terms of practical matters, I've already discussed that in terms of the phantom limb pain, which I think is due to a cascade of events starting with the amputation, or the cutting of nerves, which then sweeps forwards. Those are understandable transfer of information of messages from one part of the nervous system to another, which has reacted by becoming hyper-excitable. We should be on the edge of being able to detect the message and put in a counter.

Melvyn Bragg : What are Patrick's views on pain in this book, as it were, illuminating your area, which is much more to do with vision and culture and art? Did you find similarities of the way of approaching....?

Semir Zecki : Well tremendous...tremendous similarities. I think that we're both in agreement on the fact that these are constructions of the brain, that we've been doing a disservice to our subjects by carrying on with the separation of sensation from perception, and I agree with you also , that in vision too, motor planning is a very, very intimate part of the seeing process. What you're essentially saying in visual terms is that you cannot separate seeing from understanding.

Patrick Wall : Quite, quite.

Semir Zecki : And that I agree with absolutely, yes. It's been very instructive to see how similar in its basic organisation of a sensory system the brain is.

Melvyn Bragg : Finally Patrick, do you think that by addressing this in the way that you suggest, people will have their suffering alleviated? If doctors take into account the new propositions, the new discoveries you've made?

Patrick Wall : That would be overstating it, but at an absolute minimum, pain is unpleasant, produces tension, produces anxiety, and prolonged anxiety produces depression, and particularly if you simply don't know what's going on. I wrote this book in the hope that people would have some feeling of what is going on and feel less tense, less anxious about it.

Melvyn Bragg : Well thank you very much Patrick Wall and Semir Zecki. The book we've been talking about is called "Pain:The Signs of Suffering" by Patrick Wall. This is the last in the present series, I'll be back after the summer break in September for a new series of In Our Time, thank you for listening.