

Rethinking the Relationship Between Mind and Brain: Dr. Angus Menuge

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Announcer:

Greetings, and welcome to Mind Matters News. We spent some time recently discussing the mind-brain problem. That is, what is the relationship between the mental stuff that is our mind and the material stuff that is our brain. This week, we have Mike Egnor and Angus Menuge to discuss a number of the proposed relationships, ranging from the purely physical to the purely non-physical and some that fall in between. Enjoy.

Mike Egnor:

Welcome, everyone, to Mind Matters News. This is Mike Egnor. I have the great privilege today to interview Dr. Angus Menuge, who has edited a wonderful new book called *Minding the Brain: Models of the Mind, Information, and Empirical Science*. Thank you for joining us.

Angus Menuge:

Thanks for having me, Mike.

Mike Egnor:

Thank you, Angus. I contributed a chapter to your book. But when I contributed the chapter, I didn't have a chance to read all of the chapters. So when I got the book in the mail, I've been reading all the chapters, I can't put the book down. It's really an incredible book. It's one of the best books... In fact, it's the best book I've ever read on the mind-brain interactions. So, congratulations on an incredible job with this book.

Angus Menuge:

Oh, thank you. It was certainly several years of hard work, but we were just so pleased with the range and depth of all of the contributors. And to bring together people from so many different academic disciplines so that we can start to break out of these silos and that philosophers can listen to neuroscientists, and computer scientists, and psychologists and vice versa I think was quite a coup.

Mike Egnor:

I think that's one of the great strengths of it, is that each chapter is, frankly, brilliant in its own way. And they come at the question of the mind-brain relationship from all different directions. And there seemed to be themes that consistently arise. Why did you want to put the book together? What really was new about this book? You had mentioned that it brings people from different disciplines together.

Angus Menuge:

Really, what we thought was that there is a danger within every area of contemporary science of people feeling like they're locked into one implicit paradigm, and that implicit paradigm is some version of materialism. And so we thought, "Well..." But actually, there are lots of criticisms of materialism and they come from philosophy. They even come from neuroscientists such as yourself. They come from all over the place. And wouldn't it be nice if there were a fair airing, first of all, of these criticisms of the

materialist view, but then also an exposition of all the alternatives? Because it seems as if many people aren't aware that there's not one, there are many alternatives out there to materialism, and perhaps some of these would actually be a lot more fruitful for scientific work than the implicit materialism that they may have unconsciously picked up.

Mike Egnor:

Yes, yes. To help our listeners wrap their minds around this, what is materialism, or what is physicalism, which is another word for it?

Angus Menuge:

Basic idea of physicalism, which was the dominant position in philosophy of mind and certainly in psychology throughout the early and mid-20th century, was that we could understand everything about the human being in just the same way that we could understand physical processes going on in nature. So when we're looking at the world around us, it seems there's all kinds of things that we can explain just using physics and chemistry. Well, why not apply that same kind of understanding to us?

And really, the key thought is this: In natural science, we make this assumption that we can understand things in purely impersonal terms. In other words, we don't need to bring in subjectivity, or goals, or purposes or anything like that. We can simply say that, "Well, given this particular undirected, cause you will have this particular undirected effect." That's the kind of thinking that we would use if we wish to explain a chemical reaction or a glacier going down a valley. Maybe we can apply that same kind of thinking to human persons and reduce us to really nothing very special, just another part of the physical world.

Mike Egnor:

It seems like kind of a bizarre way to look at a theory of the mind to remove from it everything that's mental. That is that if you try to understand the mind as a series of physical interactions, you can only do that if you strip everything mental from what the mind is because there's nothing about the mind itself that would lead you to think. It's a physical interaction. The mind involves thoughts, and concepts, and propositions, and intentionality, a sense of aboutness, and physical things don't share any of those properties. So it's kind of a bizarre idea that you would try to explain the mind purely in physical terms.

Angus Menuge:

Yeah, it really is. There's a great essay by C.S. Lewis called *Meditation in a Toolshed* where he makes a distinction between two ways you can try to understand something. One is from the outside. So it's like the scientist who is looking at what's going on in the brain of someone when they're in love. The other is from the inside. What is it like to be in love?

And of course, when we're investigating the mind, we have a vast amount of information about what's going on in the mind, which is directly available to our own consciousness. And it does seem to be almost a kind of insanity to discount that enormous amount of evidence that we have, that every ordinary human being has when we're trying to investigate the mind and saying that, well, in the end, none of that really matters. We ought to be able to understand ourselves in just a way that we understand a rock slide or something else where-

Mike Egnor:

Sure.

Angus Menuge:

... there's nothing distinctively mental going on.

Mike Egnor:

The other kind of bizarre thing is that we have direct access to our own minds. We experience it first person. It's not perceptual. You can turn the lights out in your room and you still have your own mind there with you. Whereas material objects, we only know secondhand. We only know through our senses. So why we would deny the reality of the things that we experience directly and attempt to ascribe that reality to things that we can only experience indirectly and experience through the thing we're denying, which is our mind, is a bizarre way to look at the world.

Angus Menuge:

It really is. It seems to go back to a point that C.S. Lewis made. When we're looking out of the window, we focus on what we're seeing out of the window, but we don't think about the fact that we're looking out of the window. And so to some degree, this kind of thinking about natural science is so focused on the object that we're investigating, it forgets about the subject. And as you say, we have immediate access to all kinds of things in our consciousness.

And science itself, in fact, relies on them, as you're also pointing out, because every scientific experiment in the end is experienced by a human being, and they convey a report to somebody else who has an experience of understanding what that data may show. And so without conscious experience, you really wouldn't have any activity of science going on. And the same, of course, for reasoning, the same for intentionality, that is thinking about things. All of these things are actually presupposed by the activity of science, even though they may not be the objects that most scientists are studying.

Mike Egnor:

Absolutely. One of my favorite insights in philosophy of science was made by Werner Heisenberg, one of the pioneers in quantum mechanics. And he said that we have to be careful that nature reveals herself to us according to our method of investigation. So that if we approach a particular problem in science as if it were just a material question of, "How does the brain work?" and the mind must be a part of the brain, well then a scientist may come to the conclusion at the end of his research that that is the case, that the mind is purely a material product of the brain. But nature, in that case, is simply revealing herself according to our materialistic methods. It doesn't mean that's what she really is. It doesn't mean that's what the mind really is.

Angus Menuge:

Yeah, that's a great point. We can sometimes artificially set ourselves a limit, like methodological materialism, which basically says we'll only allow physical causes or any phenomenon, and then conclude, "Well, there must only be such causes." The analogy I give my students is that this is a bit like saying there aren't any small fish because you never catch them in nets with big holes.

Mike Egnor:

Right. Right. Right. That's very true. On the question of materialism or physicalism, what have been the dominant theories? This is such a bizarre way to look at the mind. How have people tried to make this work materialistically?

Angus Menuge:

All right. So in the beginning, the earliest materialist theories were behaviorist. And there were different versions of behaviorism, but what they thought was we could try to understand our attribution of mental states to other people, like so-and-so is in pain, on the basis of their behavior. So perhaps what we mean by the word pain or what pain signifies is simply an aptness to, for example, withdraw one's limbs, or wince, or cry out and so forth, and that, really, pain can be understood as a behavioral response to some kind of physical stimulus. And if you do that, you don't need to have anything distinctively subjective in the middle. You can just rely on behavior.

That view, of course, did not last for very long because there are just so many counterexamples. You can have method actors or football players who will create enormously convincing behaviors to indicate they're in pain when they're not. Maybe they want a penalty or something like this. And on the other hand, you can have very stoical people who actually are in incredible pain but don't produce any pain behavior. So, it became obvious that no pain is... Whatever it is, it's an internal state of some kind. You can't really define what something is in itself just by its causes and effects.

Mike Egnor:

Well, it would also seem... I mean, it's kind of self-refuting. You would imagine if a behaviorist wanted to understand the processes in his own mind when he's thinking about behaviorism, would he then simply videotape himself sitting at his desk thinking, and thereby understand what he's thinking? I mean, behaviorism itself is a mental process that often involves no behavior whatsoever. You're just contemplating it.

Angus Menuge:

Right. Exactly. So there's a number of these positions involve this same kind of problem that you have to make an exception of yourself from what you believe is going on in general. So yeah, that theory fell to the ground quite quickly.

And then, the next wave of theories were various forms of the identity theory, said, "Well, if pain or in other states really have to be understood as internal to the organism in some way, maybe what it means to be in pain is to be in a particular kind of brain state." And there were different kinds, type identity, token identity. But of course, then the basic problem is that as we study the brain from a variety of physical approaches, whether from physics, or chemistry, or biology, we don't discern that it has any of these distinctive mental properties.

And then Leibniz's Law applies that two things cannot be identical if they have different properties. And no state of the brain in and of itself seems to have subjectivity, or intentionality, or rationality, but our thoughts and experiences do have all of those properties. So, that didn't seem to work either.

And then the more recent approaches have been functionalist approaches. They were really inspired by developments in the new field of artificial intelligence as computers became more available. And they noticed, "Wow." In a computer, what the computer does is based on many factors, including the input, also the interaction between internal states of the computer and then the output. And it seems as if these functional states are very abstract in the sense that they could be realized very differently in different organisms.

So, one problem for the type identity theory is just that different organisms that feel pain turn out to have incredibly different neurophysiological setups, so it seemed quite implausible that you could say that pain was the same type of state in every organism that feels pain. But if you have an abstract view

of it, a functional role, then maybe that functional role can be realized very, very differently in different organisms. And that approach is still probably the dominant physicalist approach.

But again, it has the same underlying set of problems that we can very easily develop a computer or a robot which will realize the functional role of pain, but without experiencing pain. All we have to do is give it sensors, for example, for heat and then program it so that when it detects a certain level of heat, it will withdraw its robot limb or it will say, "Ow," or whatever we program it to do. And it will produce all the clusters of behavior that will define that functional role. But the problem is it isn't really in pain, and its states are not really about anything. We don't think that it actually has an experience of pain or that there's something it's like to be the robot.

Mike Egnor:

And it would also seem to me that... And Bob Marks has a wonderful book, *Non-Computable* You out now on this topic that the mind is not any kind of computation, that you really can't explain mental processes at all by computation. And it seems to me that the hallmark of a mental process is intentionality, is the aboutness of a thought. And the hallmark of computation is that it lacks aboutness.

That is, for example, a word processing program simply processes the keystroke and makes it into a letter on your computer screen. But the word processing program doesn't know or care about the opinion that you're expressing. If you're typing an essay, you can type an essay expressing one opinion and then the opposite opinion, and the word processing program doesn't know anything about it at all. In fact, if the word processing program did have intentionality, if it did contain a meaning that would only allow certain opinions to be expressed but not others, it'd be much less valuable as a program because then not everybody could use it. So, computation is the opposite of what the mind is. So, I think it's a bizarre theory.

Angus Menuge:

Yeah. And because anything that's computational can be reduced to some set of rules, an algorithm or a recursive procedure, but it seems as if we actually have insight. And right now I'm teaching a class in advanced logic, and we're going through Gödel's theorems.

And what's so interesting about those is that, at the end of the day, you can see that for any particular sentence... Sorry, for any particular theory, there's going to be a sentence which you can see is true, but that the theory cannot prove. And so there's an interesting argument philosophically, "Well, if we were machines, then the theorem would apply to us, and they would have to be a good old sentence for us." Well, would we be able to see that it's true even though we couldn't compute it? And it seems that we would be able to see that it's true.

Mike Egnor:

Right. And if we couldn't compute it, then our mind couldn't be a computation. Right, right.

Angus Menuge:

Right.

Mike Egnor:

Right. That's fascinating. How about eliminative materialism? I know that that's growing in popularity.

Angus Menuge:

Yeah, that's one of the two extreme options. I say the extreme options in philosophy of mind are either eliminative materialism or panpsychism. So the first one, eliminative materialism, says that, well, our common sense views of the mind that we have beliefs and desires and that these are the reasons for our action, are all of them simply false? Like the belief in phlogiston or the humors. It's just an old pre-scientific theory that we have to get rid of. And so then, people like Paul and Patricia Churchland will claim that you can explain everything about what a human being does in terms of the transitions between neural activation patterns, and at no point do you actually need to appeal to what an individual beliefs, or wants, or their goals, or anything like that.

The position is, I suppose, in a way, consistent. Because if the mind presents a problem to physicalism, well, then you can get rid of the problem. But the difficulty is, can anybody make any coherent sense of the theory? Because if we try to understand it, for example, then it seems that understanding is an intentional state. Or if they give an argument for it, how exactly are we supposed to accept the conclusion if we're not capable of accepting things? Because again, accepting something is an intentional state.

Mike Egnor:

I kind of think of eliminated materialism as kind of an implicit confession. And I actually have some respect for eliminated materialists, like Paul and Patricia Churchland, in the sense that they're admitting that the mind can't be explained materialistically. Unfortunately, they've jettisoned the mind instead of jettisoning materialism, which would seem to be the more reasonable approach.

Angus Menuge:

Yeah, I agree. In a way, it is an internally consistent position, but there seems to be too small. There's a great quote from G.K. Chesterton where he said that the materialist world seems to essentially exclude everything that is really in it. When you understand clearly what they're saying, that none of the ordinary things that people believe exist actually fit within that picture. And so to achieve consistency by throwing out the data doesn't seem to be a good approach. We kind of prize theories that can account for as much data as possible.

Mike Egnor:

Yeah. John Searle, who's a philosopher at Berkeley, who's not a dualist at all, but Searle has commented that it almost seems like the materialist will just say anything to justify a purely materialist perspective, irrespective of the evidence. They'll just say anything.

Angus Menuge:

Yeah. Searle is interesting in that way because he's recognized, for example, that if you think through what we mean by acts of reasoning, they presuppose free will. And of course, free will is a real problem for any version of physicalism because it requires the mind to have some kind of independence from the processes that are going on in the brain. But if we don't draw a conclusion because we see that it is a right answer, if somehow we're only impelled to draw a conclusion, then it seems that we are no different from our computers and calculators. And although they've been engineered so that they follow logic and arithmetic, we don't think that they are actually reasoning. They're just designed in such a way that they follow the dictates of arithmetic and logic. And that isn't the same as endorsing a conclusion because you want to find the truth, for example.

Mike Egnor:

Precisely. Precisely.

We had discussed in our last segment physicalism, and I wanted to just move on a little bit to some other ways of looking at the relationship between the mind and the brain. And if it's okay with you, I'd love to start with one that I don't know a whole lot about and haven't really been an advocate for, but it's a fascinating way to look at things, and I think that there is some deep truth in it, and that is idealism. So, how would an idealist philosopher or idealist neuroscientist look at the relationship between the mind and the brain?

Angus Menuge:

So for the idealists, they take a rather radical position. They take the position that matter, as we ordinarily understand it, that is some kind of mind-independent stuff, doesn't really exist. Rather, what there are are a range of minds or spirits, and there are also their ideas. And it can account, interestingly enough, for what we would call mind-independent truths. Because if you include God's mind, then there will be plenty of things which are in God's mind which are not in humans' mind.

And we can also account, for example, for laws of nature, a law of nature on the idealistic view would simply be a train of thoughts that God regularly thinks. And then there's kind of an interaction between God's mind, our mind, and this world of ideas. And what's interesting is that you can seemingly reconstruct a perfectly commonsensical view of the world in this way. So for example, things, ordinary things like tables and chairs are just bundles of ideas. You can do all this without supposing there is some utterly mind-independent matter.

Mike Egnor:

I never knew much about idealism, and I think in part because it's been kind of pushed to the side in the 20th century. I know that I think Bertrand Russell was rather critical of it. There were some philosophers in the early 20th century who really cast it away.

And I've talked a lot with my friend Bruce Gordon, who has a wonderful chapter in your book about idealism. And Bruce has started to convert me, meaning that the idealism makes a lot of sense in a lot of ways. Bruce especially talks about quantum mechanics and the observation that when you drill down on what we know about the subatomic world, matter seems to disappear, that is that it's Schrodinger's equation, and waveforms, and almost concepts rather than little physical balls of things zipping around. I think he's right that the more closely you look at matter, the more it looks like an idea more than matter, per se. So, it's a fascinating way of looking at things.

Angus Menuge:

Yeah. It's interesting that how much of physicalism was built on, essentially, a classical view of physics where, essentially, the paradigm in the background is particles that behave like billiard balls in motion, and they all have definite locations. Their behavior is deterministic, and we can always tell where they are and what they're up to.

But of course, with the quantum revolution, all of that is thrown out. We can no longer simultaneously determine the location and momentum of a particle. It's often the case that in the particular development of a wave function, all we can say is, "Well, there's this superposition of possible states." And so, there is no definite fact to the matter of what's going on. And so it seems as if matter, as traditionally understood, disappears and is replaced instead by a lot of transitions of abstract possibilities.

And it would seem that what's going on is a lot of transactions that are dealing really at the level of information... So when you do a scientific experiment and you finally come back with a result, well, what's happened is that there was a collapse of the wave function perhaps. And now that you've got some definite piece of information... So, it raises the question of whether we can understand what's going on in the physical world in terms of something very abstract, namely transactions of information of one kind or another. Do we really need to bring in the idea of definite bits of physical stuff anymore to do physics? It's not so obvious.

Mike Egnor:

An observations that I read many years ago that absolutely fascinated me, I still think about it and it gives me chills, because it's such a fascinating observation, is that if you look at electrons and you look at, say, for example, the mass of the electron, there's only one mass that is that... For example, if you take acorns and you want to say, "Well, what's the mass of the acorn?" You measure a lot of acorns and you do a statistical average. You take the mean of the mass, and you can say, "That's the mean," but each acorn is a little different. There's no difference between electrons. It's not as if one electron has 1% more mass than the next electron. They're all the same. They're all identical.

In fact, what I read was that it could even be possible that there is only one electron that we're seeing everywhere, that it's just one thing. And that's fascinating, and it's completely not what you expect from the material world. An electron is much more like an idea than it is like a thing. That fascinates me.

Angus Menuge:

Right. And so it seems like you enter a space of, essentially, conceptual possibilities. And then the idealist move is to say, "Well, if we're dealing with concepts and information and those kinds of things, where do they naturally belong? They seem to naturally belong in minds. And if they're out there to be discovered, and so they don't inherently exist in our mind, then that leads you to think that they must exist in some higher mind.

Mike Egnor:

It would seem to me that kind of ironically, the conundrum in idealism is not explaining the mind, it's explaining matter. The mind-brain relationship, it's the brain that's the harder thing to explain rather than the mind. And of course, I don't think the brain is all that hard to explain because the brain itself may be a thought in God's mind, just like we are a thought in God's mind.

Angus Menuge:

Yeah, that's interesting. Yeah. So I mean, the real test is to see whether you can do something that's highly complex and would at first sight seem to be obviously involve the interaction of many commonsensically physical elements, like the brain. Can you account for everything that's going on there on the idealist terms, essentially in terms of signals, and information, and things of that kind which is so abstract that they could exist purely in the mind and don't require some kind of independent material existence?

Mike Egnor:

Of course, there are many quite venerable ways of looking at the mind-brain relationship that are kind of a composite of idealism and materialism, that is dualism. And, what do you think of the dualist perspectives on the mind-brain relationship?

Angus Menuge:

Of course I have my own views on a matter. But I think the main thing that people should understand, and this is covered beautifully by Stuart Gertz and Charles Tolliver in their chapter on the history of different views of the soul, is that there are many different kinds of dualism.

And so on the one hand, there's the one that everybody knows about. There's Cartesian dualism that supposes that the mind and the body are substances of fundamentally different kinds. And that, of course, leads to the classic mind-body problem of how they interact. But there are many others.

You've got, for example, Augustine taking the view that the mind is in fact located in space, which Descartes denied, but it's simply located in a different way. That is to say that the whole soul is present everywhere in the body where there is sensation. It's rather analogous to the idea with God's omnipresence. God is fully present everywhere where he is present. So, that's another view.

And going back to Aristotle and, of course, Aquinas, you have the idea that, well, really, the person is a combination of matter, and form and that we should understand the soul not as an independent substance in Descartes sense, but rather as the form of a human body, and that the person is the composite of those two. And there are many other sub variations as well. Some people think that the self emerges from the brain. So, you've got emergent subject dualists like William Hasker. So, the point is that there are many, many forms of dualism, not just the one that many people seem to think is the only option.

Mike Egnor:

Your observation about Augustine and his viewpoint that the soul is present everywhere in the body, which I saw in the chapter that you're referring to, which is a fascinating way of looking at things, dovetails, in a rather amazing way, with research that was done in the mid 1950s by Benjamin Libet. Libet, as our listeners may want to know, he was a neuroscientist who worked mainly in San Francisco in the mid 20th century.

And Libet was fascinated by what he called mind time. He was obsessed in some sense with knowing exactly what's happening in the brain at the moment you have a thought. And doctors and neuroscientists had measured brainwaves in people and correlated brainwaves to thought in a very general way without paying too much attention to the temporal correspondence, that is that the moment you have a thought, what's happening in your brainwaves was not really their concern, in part because it's very difficult to time the brainwaves and the thought with the kind of precision that Libet wanted.

So, he set up an experimental technique of timing within 10 or 20 milliseconds of when a person would have a thought and then recorded what was happening in their brain and other parts of their body at the moment they had that thought and had a lot of fascinating results. And one of them was his famous free will experiments, which there's a chapter devoted to that in our book, and I mention it in my chapter.

But actually, to me, his most interesting experiments were things we didn't get into in the book, were his experiments on sensation. And what he did is he recorded brainwaves, and he would prick the subject's finger and record the moment the subject's finger was pricked and the moment the subject reported that he felt the pain and then correlated that with the occurrence of brain waves according to time.

And what he found was that it took about half a second for there to be a change in brain waves, probably related to activity in the thalamus of the brain, which is known to be related to sensory input. But the person would feel the pain of the finger prick within a few milliseconds. So, the person was

feeling the pain in his finger before his brain showed any changes related to the pain. And that intrigues me. It implies that you can feel before your brain knows you felt something, which would go along very nicely with Augustine's notion that your soul is everywhere in your body. We've become so brain-centric that we think of almost the brain as the substitute in materialism for the soul. But the human being is a complete thing. It involves your body, too.

Libet was perplexed by this. The idea that you could feel pain before your brain knows you're having pain freaked him out. And his explanation for it, which I think was ad hoc and I think was not true, was that your brain backdates it. That is, your brain will get the information, say, a half a second later, but then make you think that you felt the pain a half a second earlier as kind of a survival mechanism so you can function in the world. But, that strikes me as ad hoc. But, I was always fascinated... I was more fascinated by his sensory experiments than I was by his free will experiments, actually.

Angus Menuge:

Yeah. It's interesting, too, that if you think about the complexity of the human body, that no matter where you are hurt, no matter where someone sticks a pin in you, your report of it is, "I am in pain." In other words, that it always refers to the same I.

And the same issue then ties in with one aspect of the binding problem, which is that we have massively parallel brains. And we know now that when you are processing information about an object, that some of the properties may be processed in one part of the brain and other properties in another part of the brain. And yet at the end of the day, there is one I that experiences an apple, let's say, or the taste of some food, even though it's been distributed in many parts of the body. And pain signals are like that. It seems that they come from anywhere, and yet they're reported always as the pain of a single subject. And that's something that cries out for explanation.

Mike Egnor:

And it seems there have been efforts to address the binding problem with various kinds of materialistic neuroscientific models of how all these axons and neurons all get together. But, I think they all fail.

An interesting perspective on the binding problem has been some of the research in the last half the 20th century and going into the 21st century on patients who've had split-brain surgery. Split-brain experiments sort of get right to the heart of the binding problems. Basically, the hemispheres of the brain are completely disconnected surgically, so they're two separate hemispheres. Yet, people can think and behave in some situations in a completely unified way.

For example, Yair Pinto, who's a researcher at the University of Amsterdam who's worked on split-brain patients, has noted that if you look at the way the brain is connected, that the right visual field is connected to the right hand the way the hemispheres work, and the left visual field is connect to the left hand. And normally, we can respond, say, with our left hand to what we see in the right visual field because we have a corpus callosum and the information can pass between the hemispheres. If you've had the corpus callosum cut, then you would think, by the materialistic way of looking at things, that the left hand could only respond to what's in the left visual field, and the right hand could only respond to what's in the right visual field.

But, Pinto has found that that's not true, that if you give people buttons in both hands and you ask them to push the button with either hand they choose when they see an apple, and you put a picture of an apple in, say, the right visual field, they'll push the button with either their right or left hand about 50/50. There's very little difference in which hand they choose, even though only the right hand has seen the apple. The left hand has no access to the visual field that sees the apple, but the patient still pushes the button with that left hand. So, it implies that there's a binding going on, that there's this

unified self, and that the unified self is not in the brain. And it fascinates me. It's a very important finding.

Justine Sergent, who is a neuroscientist at McGill back in the 1980s, found something very similar. She would take split-brain patients and put arrows pointing in different directions in their visual fields, and she would ask them, "Are these arrows pointing in the same direction or different directions?" And the patients usually could tell, even though no part of their brain saw both arrows. So they could make judgments as a unified individual, even though no part of their brain had a unified input. So, I think the binding problem is solvable if we assume that the solution is not materialistic, if we assume that there's an immaterial soul that binds it all together.

Angus Menuge:

Right. And the interesting thing, too, in general, in those cases of split-brain patients... Tim Bain has done a lot of study of that as well and points out that even if there are some particular visual or other deficits, still, when it comes to the unity of consciousness and reasoning, the individual behaves as one person. He does not turn into two people. And that's rather obvious from the fact that split-brain patients can still ride a bicycle, or play the piano, or do other things that require there to be just one subject that's in control of their body.

Mike Egnor:

Well, it's funny. I've done the surgery, and I've taken care of the patients, and I couldn't tell. You see these people, they're perfectly normal people. And I don't think that I could tell that a person was a split-brain patient unless I saw the scar and knew they had had the surgery. You really have to be a specialized neuroscientist who has the ability to study these people in that kind of detail to pick up the neurological deficits. So yeah, these are completely normal people in everyday life. Totally normal. Which I think is the most amazing thing about split-brain surgery. Roger Sperry won the Nobel Prize for his studies of their disabilities, but it's their lack of disability that is the most amazing thing.

Angus Menuge:

Yeah. So, there seems to be sort of a hierarchy. In other words, anything that is closely tied to the senses, of course, if the senses are damaged in some way, well, then maybe you can't see or here. But yet the further you go up, when you get to the level of abstract reasoning and the unity of consciousness, it just seems as if you get more and more independence of anything that is specifically physical. And that seems to explain why...

This goes back to Aristotle. He wanted to understand how is it that human beings can reach conclusions which are universally and necessarily true. Because, of course, through our senses, all we ever get information about is contingent events, things that have happened, but that won't ever tell us what must be true. And yet, the human mind can demonstrate things in mathematics and say, "Look, this always has to be true." That can't be explained by information we derive contingently from the senses.

Mike Egnor:

Right. Well, mathematicians can work rather easily with a concept of infinity, but we have absolutely no perceptual knowledge of infinity. Infinity is, by definition, not something that we could ever perceive.

Angus Menuge:

Right.

Mike Egnor:

Yeah, I mean, I find that an absolutely fascinating, fascinating observation. You had mentioned one other thing I just wanted to close with here, and that is about emergence. You had mentioned emergence as a theory in the mind-brain relationship. What is emergence, and do you feel that there are weaknesses in the concept of emergence?

Angus Menuge:

Well, there's a couple of different kinds of emergence. You can have what might be called a weak emergence view and a strong emergence view. The weak emergence view is often called supervenience, and it says that there can be no mental difference without a physical difference. So theoretically, if you had an individual and you physically cloned them, then if the first one was thinking about the Eiffel Tower, the second one would have to be thinking about the Eiffel Tower as well.

Now, that view, for one thing, is an extraordinary metaphysical speculation because there never are going to be two physically identical individuals. But also, it has no explanatory power whatsoever. It just asserts that... Really, it's just a theorem of physicalism. Well, gosh, if everything is physical, then you can't have anything mental that varies independently of the physical, but it doesn't explain anything. So that the stronger view wants to say that, "Well, there is some sort of causal process, and somehow the neural processes cause us to have various mental states."

And in the strongest views, they want to say perhaps then the mind can have some independent causal power, and some of these individuals will say that perhaps the mind that emerges can then act back on the brain. But of course, if they do that, at this point, they have granted some form of dualism. They may not be substance dualist, but by definition, if you give the mind any independent powers, then you're no longer saying that everything that happens happens because of a physical cause. And so what I think is so interesting is that as time has gone on, the more plausible positions that call themselves physicalists actually really are not obviously physicalists anymore. They seem to be at least on the road to a view that is in some way or other dualistic.

Mike Egnor:

Well, I had a long-running internet debate with a neurologist at Yale who was a materialist. And he summed up his view of the mind-brain relationship as the mind is what the brain does. And I thought that was hilarious because that's an overtly dualist viewpoint.

Angus Menuge:

Yes.

Mike Egnor:

He was just admitting he was a dualist in the middle of an argument that he was a materialist. It was kind of a funny way of looking at it.

So in this segment, we might want to talk about the most popular dualistic theories of the relationship between the mind and the brain, which would include Cartesian dualism and Thomistic dualism. Could you tell us a little bit about those perspectives?

Angus Menuge:

So, the Cartesian dualist wants to say that mind and the body are substances of a fundamentally different kind. So as Descartes develops it, the mind is this immaterial substance that has no extension

or location in space. And on the other hand, anything material does, of course, have an extension and location in space.

And one of the reasons for his view is that in introspection, it would seem that the experiences and activities of the mind cannot be understood as separable parts of the mind. So that is when you have an experience of a sunset and perhaps you hear cranes flying by and you smell a barbecue wafting down the breeze, it seems that they all refer to one and the same subject, and so that those experiences cannot be separated. And in general, he thinks that you can't separate a thought from a thinker in the way that you can separate a part of somebody's body or of their brain from their physical body.

So that his test seems to be this, that if it's physical, you can locate it and you can divide it up into parts. But the mind, it seems, is fundamentally simple. That's what leads him to think that they are fundamentally different kinds of substance. So, that's sort of the Cartesian view.

The other main alternative to that, that already begins in Aristotle and is further developed by Aquinas, is to say, no, what the person is really one substance where a certain kind of being, a human being, which combines a rational soul and also the matter that makes up the human being. And we should understand then the rational soul not as an immaterial substance, but rather as the form of a human being so that we are basically composite individuals.

And of course, then there seem to be some obvious advantages to this view. It doesn't seem as if the same kind of mind-body problem arises for this view, as does for the Cartesian view, although that may be argued in the end, but that certainly seems to be the case.

And it's interesting that as it's developed, the Aristotelian-Thomistic view sort of draws a boundary between those aspects of the mind which are heavily dependent on the physical body and those that are more independent. And so that it will say that, well, of course, when you're dealing with sensation, that depends on the physical apparatus of the sense organs and things of that kind. However, when you move up to abstract thought and free will, it seems that you've reached a point that is independent of the physical organism to a high degree.

Mike Egnor:

Yes, yes. And I must admit that my experience in neurosurgery and with neuroscience really led me to the Thomistic view, because the Thomistic view dovetails so nicely with what we see in neuroscience. But I mean, there certainly is a lot to say for the Cartesian view, and the Cartesian view is enormously more plausible than, for example, the materialist way of looking at things.

I see two big problems with the Cartesian view. Well, three perhaps. The first big problem is that I think Cartesian metaphysics is very much a step backward from Hylomorphic metaphysics from looking at the world as matter and form. Aristotle's way of looking at the world, I think, is a profound, beautiful way of understanding nature. And Descartes' way of simply separating mental substances, the *res cogitans*, from physical substances, *res extensa*, and describing physical substances being essentially just things that are extended in space is a real step backwards in terms of metaphysics. It's, I think, pretty crude primitive metaphysics that doesn't really explain much. So, I don't like Cartesian metaphysics, so I don't think the mind is understood very clearly in a metaphysical system that's that deeply flawed.

The other problem with Cartesian metaphysics, or with Cartesian understanding of the mind-brain, is the interaction problem, which is not as intractable as the materialists may claim. That is, that it's certainly true that things can interact that don't share substantial properties, but they interact by formal causation rather than by material or efficient causation.

So yes, I think the mind and brain could interact if there are separate substances by virtue of formal causation. But the problem is that if you're invoking formal causation, you're invoking an Aristotelian

hylomorphic way of understanding the world. So, why not just jettison the Cartesian way and just accept hylomorphism? So, I think the interaction problem is fatal to Cartesianism, not because it's not solvable, but because it's only solvable by embracing a different metaphysical perspective than Cartesianism.

The third problem with Cartesianism is that I believe, because I think it's basically a metaphysical error, it has led to some pretty terrible errors as the centuries have gone by. If you understand a human being as a composite of an immaterial substance, the mind and the material substance, the body, and you are of the opinion that immaterial substances don't exist, then you can just jettison the mind completely and take an entirely materialistic view. And that's basically what modern neuroscience has done. It's just said, "Well..." Modern neuroscientists are sort of closet Cartesians. They just accept *res extensa* and they deny *res cogitans*. So, I think Descartes kind of set us up for this modern materialistic clown show that we experience nowadays.

Angus Menuge:

Yeah. I mean, I think it's certainly true that one thing that I find problematic about Descartes, despite brilliant defenders of his view like Richard Swinburne, is that it moved away from the understanding that you see in Aristotle and earlier thinkers that the soul isn't just there to explain consciousness, it's also there to explain life, what it means to be alive. And so you had those several levels of the soul, the nutritive soul, the sensitive soul, and then the rational soul. And I think that the soul is also necessary to explain the unity of the organism.

This is, by the way, one of my criticisms of animalism that says that people are just human animals, and that that can be a physicalist view. The problem is that the unity of the organism can only be explained if you have some sort of non-material principle, because we now know that there are vast exchanges of the particular bits of matter in our body and in our brain during our lifetime, and yet we think that the same person persists.

So, it seems as if you need to have some kind of organizing principle that makes you still be you, despite the fact that you've lost lots of bits of matter and acquired lots of other bits of matter. So, I think that certainly is an issue.

I find Descartes myself most plausible in his account of the unity of consciousness. I think there he is helpful. But I agree with you that the danger with his metaphysics is that you end up simply with conscious beings, so God and human beings, and then the rest is turned into a machine. Descartes' view is that even the human body is just a machine, and everything in the world is a machine.

And I tell my students there's a danger here that Descartes sets us up for a kind of a deistic view because everything in the world carries on mechanically by itself, and the human body is actually essentially an organic robot. And it is not surprising that eventually you're going to have thinkers, like modern thinkers, who say, "Well, perhaps it can all manage just by itself," and they get rid of the immaterial altogether. Whereas if it's baked into what it means to be a living organism in the first place and it organizes our life and our reason in a more holistic way, then it's going to be a lot more difficult to get rid of it.

Mike Egnor:

Yes, yes. Yeah, it's funny that you mentioned that the strength of the Cartesian view is that it explains in a very natural way the unity of the soul. And I think you're right. I mean, that's the one thing in the Thomistic view that has always made me a little bit uncomfortable, is that understanding the rational soul of a human being, which is a composite of immaterial and material powers, leaves you as a composite. But we all know that we're not composites. I mean, I'm me. There's a unity to me that's not material and immaterial powers. It's just me.

It always seemed to me that the Thomistic view had to strain a little bit. We call the human soul a spiritual soul, and I think that's kind of the solution to the problem, that we have a special soul that's spiritual. But, Descartes maybe explained that in a more natural way as a separate substance. Of course, Saint Thomas would say that we have a subsistent soul, that is a soul that is capable of existence independently of matter and that confers on us eternal life. But yeah, I can see where Descartes did offer a more compelling account for the unity of the soul.

Angus Menuge:

Yeah. And that's kind of an interesting thing that Josh Farris and some others investigate in their chapters in the book. There's this other issue, too, of what are we to make of the so-called evidential near-death experiences where it seems as if people, after being resuscitated, are able to report things that they had some sort of conscious experience of, but at a time where there was no measurable brain activity and that they can't be dismissed as confabulations of the waking brain because they can be independently verified as true. So, such as being able to recall the exact serial number of a medical machine on top of a machine-

Mike Egnor:

Yes.

Angus Menuge:

... far above the patient's head. And of course, we're all going to struggle to make sense of these things. But nonetheless, that evidence is strikingly robust. Even when you get rid of many stories which are not reliable, those ones where you can independently confirm this is factual seem to have some serious weight.

Mike Egnor:

Yes. The near-death experiences, the reality is that they would be accepted in science as being very well-established, obviously true science, that some people do have continuing experiences after cessation of brain activity of a very specific nature. And the only reason that that's not accepted is because of the materialist, even atheist bias of modern science, because the evidence is compelling. I mean, there's massive evidence for it.

The only kind of evidence we don't yet have, and people are working on this... I have a friend named Sam Parnia who's doing research on near-death experiences at NYU and is trying to solve this problem. But, the only problem is that it's very hard to do prospective studies on near-death experiences. And prospective studies are sort of thought of as the gold standard for scientific studies. And obviously, a near-death experience is something that almost always happens in an unexpected situation, and there's a panic and people are trying desperately to save someone's life. So, how do you prospectively study that? That's a difficult thing to do.

But, the nature of the evidence right now is retrospective largely and relatively anecdotal, but it's absolutely massive. And there are probably at least 20% of near-death experiences are veridical, meaning that they can be checked, and the people have awareness of things during the time that brain function has stopped that they could not have been aware of by any normal physiological way.

And even if there was some remnant of brain function going on, as you've pointed out, they know things that they could not physically see, serial numbers hidden away or what's written on someone's back instead of someone's front while they're providing care. There's a million different examples of that.

One of the examples that fascinates me was one that was given by Catherine Kubler-Ross, who was a psychiatrist from... I think she was in Switzerland, who studied death and dying and was very famous for that. And she reports in one of her books that she was on call in a hospital as a psychiatry consult, and a child came in from a car accident, very severely injured. And the child had had a cardiac arrest at the scene of the car accident, had been resuscitated, and was in the emergency room waiting to go into the operating room to have further surgery. So, Ross went there to comfort the little girl. She was like 10 years old.

And Ross asked her, "What was your experience like?" And the little girl said, "Well, when I had the accident, I found myself in this dark room and going down a tunnel and there was a beautiful light. And I saw my mother and my sister there. And my mother and sister said, "You can't come here now, but you'll be joining us soon." So, the little girl came right back down the tunnel, and then she was resuscitated.

So, the child was taken into the operating room and died during the surgery. And Ross then checked, and she had a father, and a brother, and a sister, and a mother who were with her in the car. And the sister and the mother had died at a different hospital, but the father and brother lived. So, the little girl knew that her mother and sister had died from the near-death experience, although she had no way of knowing that otherwise. And they told her in the near-death experiences, "You'll be joining us soon."

Near-death literature is full of things like that. So, it's unequivocally real science, good science. And as I said, if it wasn't for the materialist bias in science, this would be accepted as a scientific fact.

Angus Menuge:

Yeah. And that's a good example of just the overall purpose of the book, is to just call people's attention to as wide-ranging as possible examples of data and theories which are not being taken seriously by the mainstream but actually have been developed with considerable rigor and really leaving it to them. There's many options on the table, but we leave it to them to draw their own conclusions about what's useful and plausible and what they might apply to their work. And having an open-minded perspective, we argue, would help them to be better investigators.

Mike Egnor:

Yes, yes. There's a chapter at the end of the book by Bill Demski entitled How Information Realism Dissolves the Mind-Body Problem. And I'm kind of trying to wade through it. It's brilliant, but there's a lot in it. Do you have any perspectives on that that could help me or could help our audience about information realism?

Angus Menuge:

Well, Demski's always been a kind of iconoclast who's willing to say something that's very different from everyone else and therefore will cause you to rethink. And what's interesting about the way he sets up his theory is, why don't we begin from something that we all know that's not one of the things that's in contention, and that is that there are all kinds of transactions of information going on into the world?

And then we start out from there. And as we analyze the transmission of information... So, there's a signal. There's something that sends the signal. There's something that receives it. We can then ask this metaphysical question of what would make most sense of all of these informational transactions. And the beauty of that way of setting this up is it would seem to be a level playing field, because physicalists are always talking about information being processed by the brain. And Dualists also, such as myself, talk about information that's going on. For example, when I will my arm to move and my arm goes up, it seems as if that involves a transaction of information going from a mental form to a physical form so

that you can start with his framework and then develop from there an open-minded understanding of what is the best metaphysical to make sense of it all.

Can we capture everything we know about the transmission of information using a kind of machine-like model? If we can, then materialism presumably wins. But what if we can't? What if there are reasons... And there are many chapters in the book that will look at this as well. But thinking that there are aspects of cognition that will not be captured by any kind of machine, then we're going to need something that's different to account for these informational transactions.

Mike Egnor:

Very interesting. One question that I have, and I've been asking people this question for a couple of decades now because I still have a little trouble wrapping my mind around it, although I kind of know the dictionary definitions, but, what is information in this context?

Angus Menuge:

Well, information can be understood in lots of different ways. So as it was developed to understand signals, you have, for example, measures of information, like Shannon information, and you have other measures which try to understand it in terms of bits. But, the sort of intuitive idea is that information involves a reduction of possibilities.

So when you ask somebody what they're doing and if they say, like a teenager, "Stuff," well, unfortunately, stuff doesn't actually exclude any possibilities, and so it doesn't convey any information. But if on the other hand they say, "Well, I'm going out to the store," well, okay, that gives you a bit more information. Or take something more concrete. If you're trying to figure out what cards somebody else has in their hand when you are playing cards and maybe you're good at counting and you're trying to figure it out, and when they play a certain card, you say, "Okay, then I can figure out what those other cards are," well, that reduces a huge number of possibilities, and therefore you just gained a whole lot of information.

So, I see that what's really going on in a transfer of information is the reduction of possibilities, but there are indeed many different ways that it can be measured. If you have on Robert Marks, he's a specialist in this area and can tell you about Chaitin-Kolmogorov information, for example, and there are many different ways of understanding it.

Mike Egnor:

Yeah. In some sense, and I know that this plays a role in thermodynamics, and there are ways of looking at information in terms of entropy, that information relates to the amount of entropy in a system. And basically that a low entropy state is a high information state because it's a marked reduction of possibilities in the system.

Clearly, information is a fundamentally important thing in the world. And I've always wished that we had a more rigorous... I wouldn't say rigorous, but a more unified definition of what it is. But, it's a fascinating thing. In some ways, it's analogous to energy. That is that energy is such an important thing in everything we do, in science and everyday life. But, what really is energy? It's a rather tricky question philosophically.

Angus Menuge:

Yeah, it is. And I think that this is a case where it is wise to investigate the phenomenon at first with the intuitive concepts that we have. Because if we settle too early on a specific definition that's drawn, for

example, from the use of information in computer science, it might turn out that that's wholly inappropriate for understanding how the mind works. So, I'm sort of always in favor of... In any area of philosophy, I think you should investigate the phenomenon on its own terms. So, what is language? Unlike the physicalist who wants to say, "Well, from the outside you are making certain sounds or you're making certain marks on a page." Yeah, but we know what language is from the inside because we're language users.

And it's the same issue with understanding the mind. We sort of know what it's like to gain some information by solving a problem in logic or making a decision where we weigh up various alternatives. And then again, there's that reduction of possibilities. There were many things I can do. Now I find a decisive reason to do this one and not the others. So, I tend to think we need to start with that intuitive idea and be open to persuasion as to which is the best sort of precise model.

Mike Egnor:

I think you're exactly right. It's interesting. I've, as of late, become kind of a fan of Wittgenstein because he addresses issues like this, I think, in very clear and very important ways. And his viewpoint on philosophy is that the real work of philosophy is to clarify things, not to explain things. The work of philosophy is to learn to express ourselves as clearly as possible, in many ways as simply as possible.

And the final line in his Tractatus, which I think is one of the most beautiful lines ever written in philosophy where, and I paraphrase, that, "What we can say, we can say clearly. But what we cannot say, we must pass over in silence." And it may be that in trying to define things, even to define the mind or to define information or energy or things like this, that our efforts to define it necessarily move us further away from really understanding what it is.

Angus Menuge:

Yeah, that's a great point. Parallel something Chesterton said. He said that the logician tries to fit the heavens into his head, and it's his head that splits, whereas the poet is content to put his head into the heavens. And so, he's sort of saying that when we adopt reductionist models, and what we end up doing is try to force everything into that mold, and we'll just end up falsifying the phenomenon. We should get as far as we can. And if we can see that something is there, we should acknowledge it's there whether it fits our current theories or models or not. And I think for many paradigms, the near-death experiences or the unity of consciousness are just like that. What we should never do is deny them because our model doesn't make sense of them.

Mike Egnor:

Are you acquainted at all with the work of Bennett and Hacker?

Angus Menuge:

Yes. Yes. Yeah.

Mike Egnor:

Yeah. For our listeners, they're a neuroscientist, Bennett, and a philosopher, Hacker, who have published a number of books, including one of their most famous is the Philosophical Basis of Neuroscience. And I really love their approach. There's a real strain of Wittgenstein in their approach that these reductionist materialist ways of explaining neuroscience generally lead us much farther away from really understanding the phenomenon, and that there are phenomena that we just have. We just

have thoughts. You don't have to explain it in terms of the chemicals. It's really not explainable in terms of chemicals. The neurotransmitters are different things than thoughts. And there can be correlations and correspondences between particular brain states and mind states, but a mind state is not a brain state and vice versa. And I think the approach they take is a very good one.

Angus Menuge:

Yeah. And it's rather like the approach of Brentano and Husserl, the great phenomenologists. And they did such incredible work exploring the nature of intentional states from within, just saying, "Well, look, these are given to us. What are they like?" without worrying about, "Oh, how can these fit within a modern scientific view?" Forget that part of it. Let's first of all find out just what the phenomena really are on their own terms.

Mike Egnor:

Yes.

Angus Menuge:

And that that's always valid to do. And I like some of the things in the book on... For example, there's a chapter in there on social psychology pointing out that social psychologists have to accept, just to do their work, a relational view of human beings, which is utterly incompatible with materialism. And the people who are doing this, they may think of themselves as materialists, but it's simply that the nature of their study forces them to adopt a different paradigm. And once you've had that thought, it makes you think, "Well, so why should I assume that I have to accept that paradigm in other areas?" If it works, fine. But if it's not working, let's say in neuroscience, at least be open to the idea that there are very serious competent neuroscientists who have found value in adopting a different perspective.

Mike Egnor:

Absolutely. Absolutely. I really enjoyed in Bennett and Hacker the comments that they make in a number of places that in order for a neuroscientific perspective to be helpful and not in understanding some aspect of the mind, it first just has to make sense. And there are many things that neuroscientists say that simply don't make any sense, like the fallacy of saying that the occipital lobe of the brain sees things and where... You could say we see things by virtue of the activity of the occipital lobe, but there's no vision in the lobe itself. The inside of the skull is dark. You can't see anything there.

And what they recommend, which I think is vitally needed in neuroscience, probably more so than any other kind of science, is what they call conceptual hygiene. We need to clean up our concepts. There's a lot of work to do there.

Angus Menuge:

Yeah, no, that's a great point that they make. In other words, that we don't solve difficult philosophical problems by simply attributing mental qualities to different parts of the brain. That's kind of a form of cheating. It's like, "Oh, what these neurons are doing now is they're thinking about lunch."

Mike Egnor:

Right. Right. Right. And they actually make a point that I thought was absolutely fascinating, but it's so true. They point out that even such a common and seemingly intuitively obvious thing that our brain stores memories, or that we store memories. They say that that's just conceptually inexplicable, that is

that memories are not the kinds of things that can be stored. You can't have a pocket of memories. You can't say, "Well, I've stored a lot of memories, but I'm reaching the capacity, so I'm going to have to get another memory storage area." That's not how memories work. Now, some of that may come from the use of the word memory for a computer where information is stored on a computer, and indeed that is a storage matter, but memories themselves can't be stored. It makes no sense to say that.

Angus Menuge:

Yeah, that's very interesting because one... Here's the term engrams. And the idea is that as you have studied something and you memorize it, then there are these traces left in the brain. But although those traces obviously play some kind of role when you recall something later, it doesn't seem to make sense to say that they themselves are the memories. Because when you remember something, your memory is about something. So when Thomas Reed is remembering the Battle of the Culloden in the Highlands, well, what he's remembering there is some event that happened earlier in his lifetime. That's what it's about. But the engram is not about that. It's simply a physical trace in the brain. So yeah, that's a great, great example.

Mike Egnor:

Yeah. One of the ways I think about the engram memory issue is with the idea that an engram is a map, essentially. Engrams probably exist in one form or another in the brain, although we don't have a good handle on exactly how they exist. But there probably are brain states that more or less correspond to memory states, but it's just a correspondence. It's not an identity.

An engram is a map of a memory, but a map always presupposes that which it represents. So if I have a map of New York City, the map itself is not New York City. New York City is just what's represented in the map. So if I ask a neuroscientist, "What is a memory?" and he points to an engram, he isn't explaining anything. He's simply pointing to something that correlates with a memory, but the memory remains unexplained.

Angus Menuge:

Right. And it's similar to Wilder Penfield's observation when he was doing his pioneering work. He concluded that while there are some things that you can make somebody do by the stimulation of electrode, there are other things that you cannot. Or if you do make them do something, they will still distinguish it from their own action.

And his conclusion that the relationship of the mind to the brain is a bit like the relationship between the programmer of a computer and the computer, because obviously we know that the brain is a highly dynamic system and all the evidence of neuroplasticity. But, what is it that lays down these pathways in the first place? What is it that leads you to do one particular action when you're entertaining many possibilities? How is it that you end up changing the programming, as it were, of the brain? It seems that that requires there to be a distinction between the programmer and the computer.

Mike Egnor:

It's kind of funny that Penfield's observations, which were fascinating and just earth-shaking, have been completely ignored in neuroscience. That is that I've mentioned this notion that... One question Penfield asked is, "Why are there no mind seizures?" And I think what he meant by mind seizures really was sort of intellectual seizures, no seizures that involve kind of abstract thought and things like that.

And he pointed out that there are only four different kinds of neurological states that can be evoked by a seizure. There's movement, there's perception, there's memory, and there's emotion. But there's

never abstract thought. There are no calculus seizures. There are no logic seizures where we can't stop talking about modus pollens or something. Or modus ponens.

And Penfield said, "That's really odd that so much of what goes on in our mind has this abstract nature to it, but that never happens during a seizure. It's never evoked. So maybe that aspect of the mind doesn't come from the brain." And you would think that that would revolutionize the way neuroscientists understand the mind and brain, but it's basically been ignored.

Angus Menuge:

Yeah. The sad thing is in any area of science, and neuroscience seems to be no exception, is you get what Thomas Kuhn called a development of normal science within a paradigm. And people say, "Well, we'll accept these default assumptions and do our investigations within them." But the pioneers in all of these areas, what's so interesting, the real giants, because they're thinking about the foundations of their discipline, they do step back, and they are willing to ask these questions. "Are there some things here that really don't fit what I expected?" And they're more willing to accept that those phenomena are real.

Mike Egnor:

Right. It's kind of funny. I've mentioned to some friends who are neuroscientists these particular viewpoints, and they're basically kind of informally open to them. They think it's interesting. But you can tell in their eyes as I'm talking to them that they're thinking, "If I ever said this publicly, it would be the end of my career," that they'd be thought of as crazy, even though it's solid neuroscience. It's very good neuroscience. It's just there are certain things in neuroscience that you don't say out loud.

Angus Menuge:

Yeah. And scientific progress, though, in the end seems to depend on people who are willing to be the gadfly, like Socrates, and kind of stand outside the accepted views. In the class I'm doing now with Gödel, I mean, he had to go against a whole slew of mathematicians that were absolutely convinced that you could reduce all mathematics to logic, and you could make mathematics purely mechanical, right?

Mike Egnor:

Right. Russell and Whitehead, yeah.

Angus Menuge:

Yeah. And these are all very smart people. But because he accepted something that was transcendent, because Gödel in this case was a mathematical platonist, he wasn't convinced that truth could ever be reduced to something that we can compute. That was his gut feeling. And so then he went about investigating, well, can you find examples of things like this. And I think that's a sort of a salutary thing for any scientist who is in love with a particular model or a theory. Are you, as Karl Popper would advise, looking for the things that don't fit? Because that's where the progress and the new understanding is going to come.

Mike Egnor:

Sure. Sure. The problem is, to push the Socrates analogy a little further, that there's always somebody waiting with a cup of hemlock. So, it's just why I think a lot of these penetrating ideas are made by either very well-established scientists who don't have a lot to fear or retired scientists.

Angus Menuge:

Well, at least hopefully that they've got nothing to fear from just reading a book in the comfort of their own home.

Mike Egnor:

It's a great book to read. It's a great book to read. And we won't tell anybody if people read it, okay? It's just our little secret.

So, this is Mike Egnor. I've had the great pleasure of having a wonderful conversation with Angus Menuge. And Angus is the editor of a great book called *Minding the Brain: Models of the Mind, Information, and Empirical Science* recently published by the Discovery Press. I'm reading it for pleasure because it's such a great book, and I encourage everyone to get it. It goes into the kind of fascinating stuff that we've been talking about here in great detail, and it's highly readable. So, thank you, Angus, for joining us. And this is Mike Egnor from Mind Matters News.

Angus Menuge:

Thank you very much, Mike.

Announcer:

This has been Mind Matters News. Explore more at mindmatters.ai. That's mindmatters.ai.

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