BRAIN SCIENCE PODCAST

With Ginger Campbell, MD

Episode #58

Interview with Dr. Alva Noë, author of *Out of Our Heads: Why You Are Not Your Brain and Other Lessons from the Biology of Consciousness*

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INTRODUCTION

This is Episode 58 of the *Brain Science Podcast*, and I'm your host, Dr. Ginger Campbell. Today I will be talking to Alva Noë from the University of California about his book, *Out of Our Heads: Why You Are Not Your Brain, and Other Lessons from the Biology of Consciousness*.

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I am happy to announce that we will soon have transcripts available for all 58 episodes of the *Brain Science Podcast*. I want to thank listeners Diane Jacobs, Jenine John, and Lori Wolfson for helping make this possible.

I want to give a special thanks to Diane Jacobs, because she helped get this project started when she volunteered to transcribe several episodes for free. Besides mentioning the *Brain Science Podcast* regularly on her own blog, Diane is currently helping me run the Discussion Forum at brainscienceforum.com.

You can get these transcripts absolutely free at brainsciencepodcast.com. Donations from listeners like you make this possible.

If you are a new listener to the *Brain Science Podcast*, I hope you will go back and enjoy the older episodes. Most listeners like to start at Episode 1 and work their way forward. But even if you are totally new to the show, I think you will enjoy today's interview.

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Many neuroscientists use the words 'brain' and 'mind' almost interchangeably. But today's guest challenges this approach in his book, *Out of Our Heads: Why You Are Not Your Brain, and Other Lessons from the Biology of Consciousness*. Alva Noë shares numerous examples from neuroscience, and explains why he thinks there is much more to our minds than just our brains.

Let's get on into the interview.

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INTERVIEW

GC: Alva Noë, I am really glad to have you on the *Brain Science Podcast* today.

AN: I'm really pleased to be here.

GC: The first thing I'd like to do is to give you a chance to just tell us a little bit about yourself.

AN: I'd be delighted to begin with that. I am a professor of philosophy at the University of California. I'm also a member of the Institute for Cognitive and Brain Sciences. For the last 15 years or so—really since I came out of graduate school—I have been working on issues very much at the intersection of philosophy and neuroscience and psychology; especially on issues having to do with perception and consciousness.

I think of myself as carrying on research in cognitive science, which is a term people use to refer to the interdisciplinary study of mind and experience. For a long time I've been fascinated by the importance of looking at mind in context: thinking of mind in the context of action, thinking of mind in the sort of ways our lives are structured by activity. That has really been the center of my research focus.

My first book was called, *Action in Perception*, and my most recent book is very much carrying on some of those ideas. It's called, *Out of Our Heads: Why You Are Not Your Brain, and Other Lessons from the Biology of Consciousness*. That just came out a few months ago.

GC: And that's going to be the focus of our discussion today. From the very onset of your book you challenge the mainstream approach to the study of consciousness. So, I thought perhaps I should start by asking you what are the basic assumptions that your book challenges.

AN: The basic positive idea of my book is that we can think of consciousness—think of experience, think of the way the world shows up for us in full Sensaround color, significance, form; the whole works—as something we achieve thanks to our skillful, active, dynamic interaction with the world around us.

And the basic idea of my book negatively—that is, the negative point; the idea that I challenge—is the idea that consciousness, or experience, is something that happens inside of us. And in particular that it is something that happens, say, in the brain, understood in isolation from the active life of the human animal, or other kinds of animals.

I think cognitive science has tended to be committed to three ideas, each of which is very questionable. One is that mind is something interior. Another is that mind is divorced from action and the outside world—the outside world is just a sort of perturbation of something which is going on inside of us.

Another idea which I challenge is the idea that mind should be thought of as fundamentally computational or intellectual. I'm much more interested in developing the idea of animals or people as skillful wholes whose mental lives only unfold thanks to the way they're organized, but also thanks to the way they are placed in an environment and the way they interact with that environment.

GC: OK. So, maybe we should back up for a minute and let me ask you—because everyone seems to have a different definition—what's your definition of consciousness?

AN: It's true, isn't it, that everybody has a different definition? I think the importance about definitions and clarity is just being honest and explicit about what you're talking about when you're talking about it. Sometime we use words in different ways in different contexts. Basically my rule of thumb about what I'm talking about when I use the word 'consciousness' is what you could call experience. We have visual experiences, we have olfactory experiences, we have emotional experiences.

Experience is, I think, nicely characterized as the way the world shows up for us. This is a term I use in my book a lot. Right now I'm sitting in front of my window

in my office at the University of California and I'm seeing the rain pounding down against the redwood trees. The colors, and the shapes, and the forms, and the trees, and the rain, they all show up for me. And in a way the problem of consciousness, as I see it, is to explain how that works.

But my starting point is that this fact about us—that we are conscious, that we do have experience, that the world does show up for us—is something that we need to understand as part of our nature; as part of the natural world. It is our nature to have conscious experience, and so we want to understand it as part of, or consistent with, a science.

Anyway, I understand consciousness to refer to experience of the way the world shows up for us. And that can be contrasted with more or less inclusive notions of mind. So, one might think that cognition—understanding, thought, for example—can be differentiated from experience. It's one thing to see something; it's another thing to think about it. And for certain purposes I think that's a very important distinction to make. So, I sometimes will speak of 'mind' to refer to consciousness plus other aspects of our mental lives that may not be experience, and I'll use 'consciousness' to refer to those aspects of our mental lives that are experiential.

GC: OK. Alva, one of the things that I got from reading your book is that you really challenge the assumption that the mind equals the brain. Would you like to talk a little bit about that?

AN: Yes. I think that's a very fair characterization. There's this old idea that people have, that goes back to Descartes, I think. Descartes thought that inside of each of us there was a thing. He called it a thinking thing—a 'res cogitans' in Latin—and this thing inside of us, it thinks, it feels, it decides. And Descartes thought that each of us is that thing: We are that thing inside us that thinks and feels and decides.

Now, Descartes supposed that that thinking thing inside of us must be something immaterial. Because he couldn't understand how anything material—anything physical, anything obeying the laws of physics—could be something that thinks and feels and decides. And so, for him the big puzzle was how does the immaterial soul think and feel and decide? And then further, how does it interact with our bodies?

Now, the standard orthodoxy in the current science of consciousness is to agree with Descartes that there is something inside of us that thinks and feels and decides; that we are that thing—that each of us is that thing. But whereas Descartes thought it was the immaterial soul, the current view is that it's the brain. What the brain does is it's called on to play a role in a theory which was really articulated in its basic outlines by Descartes.

And one of the things I argue (and here I think this could hardly be called a controversial claim, this is really true; I think all sides of the debate will agree with what I'm about to say) is that at the current time we don't really have any better idea how the brain gives rise to consciousness than we do how an immaterial soul does—or than Descartes did how an immaterial soul does.

Because we have all this information about the events in the brain—about the actions of cells, about the molecular processes, or the metabolic processes, or large scale dynamic processes that happen in the brain—but we don't have anything like an insight into what it is about those processes that enables them to give rise to experience. And we don't have any better idea how the brain does that than Descartes had how the soul does that.

And so, I think that sort of negative finding, that we just don't even have a good back-of-the-envelope sketch of what a theory of consciousness should look like, gives me pause and makes me wonder whether the problem is that we're looking for consciousness in the wrong place. We're looking for it in the brain, we're

looking for it in these patterns of neuronal or cellular actions, but that's just the wrong place to look. Because it's only the larger context—that includes the brain but also goes out of the head and includes the dynamic with the world—that gives us all the ingredients we need to frame a better explanation of how consciousness works.

GC: So, you're not questioning that consciousness arises in the brain; you're just saying there's more to it than that.

AN: Well, I don't like the phrase, 'arises in.'

GC: OK.

AN: I think maybe what you're asking me is this: I'm not questioning that the brain is necessary for consciousness—no consciousness without the brain. I'm just saying that the brain is not sufficient. It's not the whole story.

GC: OK. So, why does this distinction between the mind and the brain matter?

AN: Because the mind is what we want to explain. The mind is the puzzle. We think, we feel, we have experience, the world shows up for us, we have emotions: this is the mind and we want to explain it. And then the question is how to explain it. Now, we not only want to explain it, but as I said before, we want to explain it naturalistically. That is, we want to explain it in a way which doesn't posit supernatural processes and mysterious processes. We want to explain it as part of nature. We are, after all, natural. We're natural beings.

And so, the question is how to do it. And in a way what I'm saying is we make a mistake if we think the only material in terms of which we can explain that is the brain. So, the mind is what we want to explain and the brain is used as part of that with which we do the explaining. The brain is meant to be part of the

machinery that makes the mind possible. And what I think is that the brain is only part of the machinery that makes the mind possible.

GC: I'm going to ask you a question that's going to seem redundant, but I think that it's important to keep from getting any misunderstandings among my listeners. Where does the brain fit into your view of consciousness? You sort of addressed that, but I'd appreciate it if you'd talk about it a little more explicitly.

AN: Right. The first point is it's my view that the brain is part of the machinery of mind. So, for example, take an automobile. The engine in the car is part of what makes it possible for that car to run. The car also has to have a chassis, and a drive chain, and it has to have wheels, and it has to have fuel, and it has to be situated on a flat surface, and it can't be underwater. There are a lot of other conditions that need to be satisfied if the car is going to drive.

And I think the brain is something like the engine. It's crucial, it's central, it's necessary; but it's only one element in a larger process. Sometimes scientists say you are your brain—you are nothing but a collection of neurons and their associated molecules. And I say, nonsense: your brain is a part of you. Your brain is a part of the mechanism that enables you to be you, but the brain is not all that plays a role. Your body also plays a role, and the environment plays a role.

And your environment plays a role thought of in different ways. The physical environment plays a role, but also the cultural environment plays a role. Think of the role of language in our mental lives; and language is something shared and cultural—at least it is in my view. So, the brain is necessary, but it is not the whole shebang, and therefore a science of consciousness cannot confine itself only to looking at the brain.

That's my basic answer to your question. But in fact I'm very interested in going into more details in my research about how the brain plays a role in supporting human experience. I think that historically there's been a tendency to make certain kinds of assumptions about that. For example, we assume that the role the brain plays is that of producing consciousness—that it produces consciousness the way the stomach produces digestive juices.

And my thought is that a more productive way to actually conceptualize what the brain does is to think of the brain as playing the kind of crucial linchpin role in enabling our relations to the world. In my view, when we explore the world in perception we're engaged in a temporarily extended activity—we move our eyes, we move our heads, we move our bodies, we move around—and all of our movements produce further sensory changes.

And what we call seeing, in my view, is one way of exploring the world; and what we call touching is a different way of exploring the world. And so then if we want to understand how the brain contributes to visual experience, or how the brain contributes to touch experience, what we need to ask ourselves is how is the brain playing a role in that kind of movement, in that kind of exploration, in that kind of interaction. So, in a way I want to say not only can we not explain mind in terms of brain alone, but we can only explain the brain, and its role in helping give us minds, by thinking of the place of the brain in the context of our interaction with the world.

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GC: One of the things I liked about your book was you have a lot of examples from neuroscience research. And interestingly, most of the examples you describe in your book are things that I've talked about at some time or another during the two-plus years I've been doing the show.

One of the subjects we have talked about that my listeners have been very interested in is neuroplasticity. Would you like to talk a little bit about what recent findings about neuroplasticity tell us about consciousness?

AN: Yes. Thanks a lot for bringing that topic up. In a way that's the very heart of my argument—the phenomenon of neuroplasticity. So, first of all, what is neuroplasticity? Well, I don't need to tell your listeners, neuroplasticity is the brain's ability to change itself in response to novelty. For example, if you have a stroke, or if you're in an accident, or if you take on some very new activity—if you learn a new skill—the brain actually reorganizes itself.

It turns out, as I've done more investigation into this, that we shouldn't think of neuroplasticity as a kind of special thing that the brain does sometimes. But in fact, plasticity—constant changeability over time—is the hallmark, or defining feature of our healthy brains. Think about it. Our bodies are constantly changing as we grow up. If the brain were not changing continuously as we grow, we wouldn't have a hope of managing. And the same thing continues on through life.

All the experiences we have produce events in the brain, and events in the brain strengthen, or weaken, or alter connections in the brain. So, the brain is plastic. It's plastic from the get-go; and it's uninterruptedly plastic. Now, it's also true that this plasticity starts to happen already in utero. As the mammal develops in the womb, the brain undergoes all sorts of processes of change and growth and

development; and in particular, functions get assigned to certain anatomical structures and regions.

Now, what interests me particularly about the phenomenon of neuroplasticity is that we can speak of neuroplasticity with regard to consciousness itself. That is, what brain areas are involved in what kinds of experience we have isn't fixed, once and for all, by genetic make-up or by the nature of the brain tissue itself. One area of the brain can now support hearing, and at another time support visual processing.

If that's true—and I think the evidence clearly shows that it is—then it means that there's never a necessary link between certain brain regions or processes, and certain kinds of experiences. There's not a one-to-one link. It's a many-many link. The same brain area can support different experiences, and different brain areas can support the same kind of experience. There is plasticity with respect to the brain and consciousness.

So, that means when we find that a certain area of the brain is supporting a certain kind of experience, we need to ask ourselves why is that area of the brain supporting that kind of experience when it might have been different—it might have been otherwise; things might have developed in a different way?

And what I give a number of different examples of in this book, and in other writings of mine, is merely this: That the answer to the question why a certain kind of quality of experience goes with a certain kind of neural activity is something that we can really only understand by looking at the behavioral and environmental context of the animal.

So, in a way, at the heart of my book there's an argument that we can only empirically, scientifically, respectably explain the neural basis of experience if we realize that the neural basis of experience is fixed by these complicated, ongoing,

dynamic interactions with the world. And thus, the brain in itself can only be a part—it can't be the whole story—in understanding why we see when certain patterns of cells fire.

GC: Would you mind taking a little bit of time to talk about the example of Paul Bach-y-Rita's work?

AN: Yes, I'd be very happy to. Paul Bach-y-Rita (that's a Spanish last name) was, I believe, an engineer and a physiologist. And he was interested in devising a way of enabling the blind to see. In specific, he wanted to make a kind of prosthesis for sight. You lose your eyesight; he wanted to see if he could engineer a way of seeing. He had the idea that you could do it by allowing one sense modality—and in his case he was interested in using touch—you could allow touch to substitute for seeing.

Now, you say, how can you substitute touch for sight? Well, what he did was the following: He gave you a camera, and you mounted it on your head or on your shoulder, so that you actually sort of wore the camera. So, when you moved, it moved. And he wired the camera up to an array of vibrators, or electrodes, that were put against your skin. The wiring was such—the transduction was such—that visual information presented to the camera produced a pattern of tactile (touch) stimulation on your skin. So, you move around with this camera, and there's a pattern of buzzing sensations, or electrical sensations, on your skin.

Now, all of that is pretty straightforward. But here's the remarkable thing. After awhile (and after a short while; a matter of hours) people who wore this apparatus found that they were able to make perceptual discriminations that were strikingly visual in character. For example, normally when I touch something or investigate it using my tactile sense, what I do is I bring my body into connection with it and I inch-by-inch, point-by-point, map its surface against my body.

But one of the things that sight allows us to do is take in a manifold, or an array, of qualities and properties that may be spatially removed from us—across the room. So, sight allows me to say there's a woman sitting on a chair, and to her left there's a dog, and to her right there is a television, and they're about 10 feet away. So, it's a very different kind of perceptual judgment than what touch allows us to do.

What Paul Bach-y-Rita found was that his subjects were able to make discriminations like that: Just like that. They could describe things, reach out and touch things, describe the spatial relations of things, how near or far they were, using the vibrations on the skin driven by a camera.

GC: I think I read that someone was even able to catch something like a ball.

AN: That's right—catch a ball, or swat a ping-pong ball with a paddle, or reach out and pick something off a conveyor belt in a factory. The reason why this plays an important role in my own research is that the part of the brain that is activated by vibrations on the skin is what's called the somatosensory cortex: the touch part of the brain. And yet, the experiences this person is having are visual—or at least are very similar to vision and very dissimilar from normal touch.

So, somehow the character of the experience changes and the role the somatosensory brain area plays for consciousness changes. And the question is why? What's going on there? What explains this kind of perceptual plasticity? Note there's no internal rewiring or reorganization. It's not as though there's any surgical intervention. It's not as though the skin is being wired up to the brain in a new way. Note also that it only takes a few hours for the effect to be achieved. So, something is happening, and it's quite puzzling.

Now, my theory explains it. Because what my theory says is, look, seeing is a particular way of interacting with the world. It involves a certain set of skills and

a certain kind of practical knowledge about the sensory consequences of movements and explorations. And then what I argue is that what the tactile-vision sensory substitution system that Bach-y-Rita invented does, is it sets up a new way—a novel way—of interacting with the world: one which is in crucial respects like seeing.

GC: It was really important that the camera be near the real location for our eyes. Right?

AN: Well, I don't know if it was important that it be near the location of our eyes, but it was important that it be attached to us. In the original experiments they actually had the camera on a tripod, and they got no effect at all. And it was only when the person picked up the camera and started carrying it around that the effects were noticed.

In fact, I've even been told that the way it worked was, in frustration the blind subject just picked up the camera. They said, 'This is not working,' and picked up the camera, and suddenly had the perceptual effect. So, what was critical there was, I think, not the location of the camera in relation to the body, but the fact that the person was controlling the camera, and that it wasn't stationary.

GC: OK. We'll come back to some more about that later. So, basically this comes down to your central claim that although we can't have consciousness without our brains, we also can't do it without our bodies and the world around us.

AN: Exactly. Because if we ask ourselves what is it about what's going on in the somatosensory cortex during these studies that explains why our perceptual experience is what it is—if we ask ourselves that question, the answer is it's not really what's going on in somatosensory cortex that's doing the work; it's the way what's going on in somatosensory cortex depends on what happens around you.

It's the way what happens depends on your movements and explorations, relative to the environment, that seems to be making the critical difference.

GC: Which is why they had to have control of the camera.

AN: I think so. And what this also shows is that in a way the question is what is a visual cortex—what is the function of the cortex to enable sight? My hypothesis is that it's to help govern certain kinds of patterns of contingency between movement and sensory events, rather than something intrinsic to the way the cells are firing. So, in my view, instead of thinking of the brain as making the seeing—instead of thinking of the seeing as something that happens in the brain —I think of the seeing as something the animal does, in exploration of its environment, thanks to the fact that it has a brain.

GC: Right. So, I'm going to return to the more mainstream way of looking at things for a minute. A key implication of the assumption that you're challenging —the assumption that the mind is the brain—is that the brain creates the world and that what we experience is some sort of grand illusion.

Now, my last guest was Chris Frith, who during his interview actually said the brain is the mind. So, naturally it caught my attention when I was reading your book and you made reference to his chapter—the one called, "Our Perception of the World is a Fantasy." Can you explain why you reject that conclusion?

AN: Yes. I should say that this is a long, and fabulous, and complicated story. And I'll try to describe my view as succinctly as possible, and then we can talk about it and see where we go. But take this question: We all know that the retinal image is upside down. The way the eye is constructed and the way the optics of the eyes work, when the light is brought to a focus and creates an image of the scene in front of the eyes, that image is inverted relative to the world in relation to us.

This was something that had been proved, I think, for the first time by Johannes Kepler, who was the first person who figured out the optics of the eye and its geometry—the refraction processes, and so on. A question that Kepler asked, and that scientists have asked since then, is why do we experience the world upright when really it shows up for us upside down? Or, why do we experience the world upright when the retinal image is upside down? And one sort of answer scientists give to that is to say that somewhere in the brain's representation of the world it's flipped over again; and so, what we see is not really what projects to the eye, but we see something that the brain does to what projects to the eye.

Or to give another example, we've known for many, many years now, given our study of the physiology of the eye, that there is a place on the surface of the retina where there are no light-sensitive cells—where there are no photosensitive cells. This is called the blind spot. So, there's a sense in which the image which projects to the eyes contains a gap. There's a place where there is no information about the environment represented.

Now, we don't experience a gap, just as we don't experience the visual world as upside down. So, it's been supposed by scientists that the brain must fill in that gap at some deeper, higher level of representation. We experience, not the retinal image, we experience some other image which the brain produces on the basis of the retinal image. And this line of reasoning comes up again and again and again throughout vision science.

The eye is in constant motion. It moves three or four times a second. It's constantly jittering. And yet the visual world seems to be stable. This means that the brain must compensate for that jittering. Or, we have two eyes and yet we see only one impression of the world. So, somehow the images from the two eyes must be combined into one.

And so, the picture we have is this: The brain is given data—input—which underdetermines what we experience, and then the brain's job is to compensate for all of that. And in a way, the world we know and think that we see is really something made for us by the kind of developing photo powers—of the picture-making powers—of the brain itself. And I think this is one of the main ideas that supports the view that in some sense the visual world is an illusion, or a fantasy, or a grand illusion, or a confabulation.

OK? Now, I think there are a number of ways that we can criticize this line of reasoning. But here's one basic way of doing it. And I think it's very compelling, what I'm about to say. I'm going to go back to the inverted retinal image case again to illustrate the point here; but I can make it for any of the examples I might give.

Notice that there's a fallacy implicit in the worry about the inverted retinal image. After all, you don't see the retinal image. The retinal image is not something you look at—the retinal image is in your eye, and you see what is in front of your eye. So, in a sense, when somebody says that the retinal image is upside down, it would be upside down if we were looking at it and if we were trying to figure out the orientation of things around us—but we're not.

The retinal image is not itself an object of thought or contemplation that we examine to learn about the world; so the fact that it's upside down actually is irrelevant. We don't see it, and therefore its being upside down doesn't make a difference to how we see. Or, another way to put the point is, one might say upside down relative to what? Maybe that's what right-side up counts as inside the brain. It's only upside down if you're sort of supposing it's a picture that you look at.

Once you appreciate that it's not a picture that you look at, you realize it is just a bit of the causal processing that underlies your ability to see. But if you've given

up crucially the idea that what we really see are retinal images, then there's no need for the brain to compensate for the upside-down nature of the retinal image. The same thing goes for the blind spot. If we don't see the retinal image, then the fact that there's a blind spot in the retinal image doesn't give us reason to think we need to compensate for that blind spot.

And one of the thoughts I've tried to develop in my writing—in the recent book I have a lengthy discussion of this, I hope in non-technical and available discussion; but I also discuss it in my first book—is that really the whole way of thinking about the visual system, that generates this idea that the world is an illusion, is optional. It was a starting point we didn't need to take for granted.

The traditional science of vision supposes that the data for vision is light irradiating the retina. But we have another way we can think about it—another idea. Instead of thinking of what we see as what projects into the eyes, and then thinking of the seeing as something that happens in our brain, I think we should think of what we see as what is available to a skillful animal from a particular position in space. Then the question of how we see is the question of how the animal actively and dynamically explores the environment, not how images of the environment are computed on the basis of defective images inside the animal.

So, it's a different paradigm. It's a different starting point. It's a different way of framing the problem. And if we do frame it that way we don't have the same motivation for thinking that the world is something generated by my brain inside of me. In fact, the world is there, and I have the skills needed to explore it and interact with it.

GC: So, the reason that we experience the world as stable, instead of jittery, is because it really is out there, and we know this because we're actively engaged with it. That makes other findings make more sense; like the fact that an animal that doesn't ever get to move around in the world won't get normal vision.

AN: Yes, that's a very interesting finding you're referring to. This was something discovered quite a long time ago, back in the 60s I believe, by Held and Hein. They set up a rather gruesome experiment where they created a kind of carousel with on one side a basket with a cat inside of it, and on the other side a harness which a cat could wear. Now, the harnessed cat was able to walk. Its feet could reach the ground and it could walk, turning the carousel. And so, as it walked it moved itself, and it also moved the cat that was at the other arm of the carousel. I'm not sure if I'm describing that so you can picture it.

GC: I can.

AN: The result of that was that both cats received the same visual stimulation because both were moving in exactly the same way in relation to the environment. But one of them was moving as a result of self-actuated movement, and the other was being moved passively by the movement of the other cat. And the one who was being moved passively developed—I believe the study shows—visual abnormalities. It didn't have a normal ability to use what it could see to interact with the world.

GC: So, that really argues against that whole passive view of vision.

AN: That's right. So, the proposal then is that we should think of vision as active and as dependent on a whole range of contextual factors.

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AN: One maybe useful way to step back and try to frame this issue is, visual experience is part of consciousness—it's part of the fabric of consciousness—so, if we're interested in consciousness, one of the things we want to understand is how seeing works. But if we want to study it we need to ask ourselves, well, what is vision? And what is vision for? And what does vision do?

And if we want to understand how the brain enables us to see, we need to ask what is it the brain is trying to do in so far as it's trying to enable us to see? What is the function that is being computed, or solved by the brain so that we can see? And there has been a tendency for theorists to suppose that that question has only one answer, and it's very straightforward. And the answer is the brain's job is to build up a detailed internal representation of the world so that you can then act in relation to the world, independently of the world, based on your internal representation.

And this view has been criticized by many people—including I might add, Patricia Churchland[1], who I believe was somebody who's been on your show before. And one of the insights that critics of this idea have had is, why do we need a detailed internal model of the world, or picture of the world, when, after all, we have access to the world? We can let the world be its own model; let the world be its own representation. And if that's the case, then the brain simply doesn't have to be in the business of building up a detailed internal representation of the world.

Instead what the brain needs to do is be enabling us, facilitating us, in gathering information about the world in real time as we need it. That's a very different picture of what the brain is doing. In the one case it's taking a defective mental image and it's converting it into a richly detailed image, and in the other case it's leaving well enough alone, as far as retinal images are concerned, and just enabling you to move your eyes, and move your head, and sample the environment for whatever task it is that you need when you need it.

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[1] Churchland was interviewed in Episode 55.

These are two very different paradigms that will lead to different theories. And by the way, the answer between which is right and which is wrong is going to be empirical. It's not one a philosopher can sit in his or her arm chair and figure out. It's going to be an empirical question.

But there's another issue that bears on the question, which I'd just like to mention if I may. And that is, I think there has been a tendency for people—if you ask them to think about what their seeing is like; what their experience is like—to think of seeing as somehow pictorial: as if when you see, you have a picture in mind, and what you see is represented in this mental picture. And so, then the challenge you face as a scientist is understanding how the brain produces that picture which you see. But I actually think that that's—to use the philosophical term—bad phenomenology; that that's a misleading and inaccurate way of describing seeing.

Like, right now I'm looking at my window sill where I have a baseball bobble-head collection. And I'm looking at my Oakland A's bobble-head collection, and I see some of them are clearly in focus right at the center of my visual field, but some of them are out on the periphery of my visual field and they're not in focus. It doesn't seem to me now, as I look at these items strewn across my window sill, that they are all represented sharply in my visual consciousness, in the way that they would be if my visual consciousness were picture-like.

Rather it seems to me, as a matter of the lived quality of my experience, as if they're all there in front of me, available to me; I have access to them. They're out there, they seem to me—not in here; not in my head; not in a picture. And what makes the things on the visual periphery present, even though they're kind of out of view, is that I have access to them. Not that I'm now pictorially representing them, but that I have access to them; I can turn to them and put them into the center of my field of view when I wish.

And so, I think we can give up a certain internalistic way of thinking about vision as sort of like the development of a photograph in the mind. Rather, vision, I want to say, is a way of achieving access to the world, deploying certain kinds of skills, and using the body in a certain kind of way. And I think this is really an exciting, and fresh, and new way of thinking about ourselves and our mind: one which in no way closes us off to scientific investigation. In fact, one which maybe for the first time helps us begin to see how we can explain ourselves to ourselves.

GC: Yes. I hope that a lot of my listeners will read your book, because there's so much more there that we're not going to have time to get into. You've sort of alluded to the idea of the extended mind in what you just said. But we're going to be running out of time. So, before we close, is there anything else you want to talk about—in particular, important ideas that you feel we need to address—before I ask you a closing question?

AN: There are two things I'd like to say. One is that I wrote this book to make a contribution to cognitive science. I think of cognitive science as sort of a big banquet. And what I want us to do is pull the chairs back from the table and allow people who may not have studied cognitive science, or may not have any specialized training, to get a real sense of what is at stake and why these issues are so important.

I wrote this book as a contribution to cognitive science, but also, crucially, for the general public. And part of the motivation for that is I feel that these problems about how we think about ourselves, while they are problems for science, are really also problems that we all have a real stake in. The view that I oppose tends to represent us as kind of trapped inside our skulls, and the world is a we-know-not-what outside the scope of our reach—all we get are little sparkles affecting the periphery of the cavern of our mind.

The view I want to suggest—that I want to offer your listeners and my readers—is that actually we are not trapped inside our skulls, we are at home in the world. We are already in the world. And the world—other people, other bits of the furniture of our lives—are part of what make us what we are; and they play an active and really constituting role in who and what we are.

We are not trapped inside our skulls. We are at home and linked to the world around us. That's really the positive vision of the self which I'm urging in this book. And when I read in the sciences pages of our newspapers about the neurological reduction of love or emotion, I often find myself thinking that there's just too much hype there and we need to really embrace a better way of understanding ourselves.

And then the second thing I want to say is that I think this alternative that I'm offering you is a rigorously scientific view. The subtitle of the book is, *Why You Are Not Your Brain, and Other Lessons from the Biology of Consciousness*. I'm not writing this as a philosopher standing outside of science criticizing it. I'm suggesting that actually the best new science of ourselves supports this kind of a view.

Just in connection with that I'd like to mention that in many ways cognitive science has been a battleground. The soul of cognitive science is being fought over. On the one hand, one of the parties to the fight is biology, and on the other side is something like engineering. And in the battle for the heart and soul of psychology and cognitive science, it's engineering that has tended to win.

That is, we're interested in the brain basis of consciousness, but we model the brain as a computational system—as a computational mechanism. We model it very abstractly in great remove from the messy wet biology of it. And the very thing that makes the brain tractable for cognitive science is that we abstract away from the brain as a brain and think of it is as a computer.

One of the morals of my book is we need to be more biological. We need to be less computational and more biological. And in particular I think the way we need to be biological is something like more ecological, rather than molecular biological. We need to take the perspective of the whole organism in its environment as the fundamental level at which we can discern mental phenomena and have a hope of explaining them.

GC: Well, I don't think I can top that. That's a very good summary. Thanks again for coming on the show. I really do appreciate it.

AN: I am so pleased to have this opportunity to talk to you and to share my research with your listeners.

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I really enjoyed talking with Dr. Noë, and I think you will enjoy his book, *Out of Our Heads*. Next month I will be talking to Dr. Guy Caldwell from the University of Alabama. He will tell us about how the tiny nematode worm, *C. elegans*, is being used to unravel basic questions in neuroscience. And he is also going to tell us about how his work may help find a cure for Parkinson's disease.

As I mentioned at the end of last month's show, in the next few days I will be heading off to Seattle and Alaska. I will have very limited Internet access from June 9th through the 20th, but you can post comments and interact with each other at the Discussion Forum at brainscienceforum.com.

Meanwhile, be sure to check out my other podcast, *Books and Ideas*, which you will find at booksandideas.com, and in iTunes. I hope to post an episode about my Alaska trip at the end of June. And remember to visit brainsciencepodcast.com for Show Notes, links, and transcripts.

Don't forget that the *Brain Science Podcast* relies on your word of mouth to reach new listeners. I want to thank everyone who's been blogging. I appreciate those of you who send me emails telling me about how you share the *Brain Science Podcast* with the people you know. If you have a chance, please put a review on iTunes, or talk about the *Brain Science Podcast* on whatever social site you use to share stuff with your friends.

Thanks again for listening, and I look forward to talking with you again very soon.

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Transcribed by Lori Wolfson
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