

BRAIN SCIENCE PODCAST

With Ginger Campbell, MD

Episode #9

A Discussion of the Book, *The Future of the Brain: The Promise and Perils of Tomorrow's Neuroscience*, by Steven Rose

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INTRODUCTION

This is the *Brain Science Podcast*—the podcast for everyone who has a brain—and I'm your host Dr. Ginger Campbell. On the *Brain Science Podcast* I explore how recent discoveries in neuroscience are unraveling the mysteries of how our brains make us who we are.

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This is the *Brain Science Podcast* [Episode 9](#). Today I'm going to discuss the book, [The Future of the Brain: The Promise and Perils of Tomorrow's Neuroscience, by Steven Rose](#). Dr. Rose is a neuroscientist in the United Kingdom with a long history of researching the biology of memory. He has written several other books including, *The Chemistry of Life*, *The Conscious Brain*, *The Making of Memory*, and *Not In Our Genes* with Richard Lewontin and Leon Kamin.

The Future of the Brain is a little different from most of the books I've discussed so far on this podcast because instead of talking about specific discoveries and

their wonderful implications, Dr. Rose is concerned about some of the potential dangers that could arise from the power of understanding how the brain works.

I seem to be developing a tendency to choose books that have many complicated ideas and are hard to summarize in a brief podcast, so I've worked really hard to try to figure out what the main ideas are in *The Future of the Brain*. This means I'm going to leave out a lot of material that you would get if you actually read the book. Also, I have sent an email to Dr. Rose and I am hoping that perhaps I might be able to get him to do an interview on a future podcast.

DISCUSSION

First off, Dr. Rose seems to have two main concerns. He points out the old saying that 'knowledge is power,' and when it comes to knowledge about how the brain works he's concerned that we are going to overreach our actual knowledge—in other words, draw conclusions that aren't really supported by the actual evidence. I'll give some examples of this problem as I talk later. His other concern is that we consider the ethical dilemmas that could arise from having a more thorough understanding of how the brain works. I will come back to both of these issues near the end of the podcast.

First we need some background information to lead into the discussion of these two issues. I want to mention that I am not going to discuss the content of the book that relates to brain science per se. He talks about how life evolved, and how the nervous system evolved, and how it evolved into the mammalian brain, and what we know about how neurons work. And he talks a little bit about neurotransmitters and some of the interesting findings on memory.

Most of this duplicates what we've talked about in past podcasts, and I don't have time to go through it again. There is some interesting material on memory in this book that I hope we can come to on a later podcast. Instead I'm going to try to

concentrate on the big ideas in this book. When I was trying to prepare for this podcast I realized that there are really sort of two main ways that scientists approach the world. Some tend to concentrate on the details; so they might spend 20 years trying to unravel one particular biochemical pathway, or something like that. Others are interested in the big picture.

Dr. Rose has done a lot of work on the chemical details of memory, but he is interested in the big picture. One of the most important points that Dr. Rose makes in this book is that in his view the mind is more than the brain. Now, this doesn't mean he thinks that there's some mysterious non-physical thing going on. It refers to the fact that since the brain and the body are intimately interconnected you really can't consider the brain separately. If anything, the mind is created by the combination of the brain, the body, and its interaction with the world.

A corollary of this idea is a second point he makes in the book, which is that the mind is more than genetics and biochemistry. He spends a lot of time attacking reductionism. Reductionism is the idea that you can explain a phenomenon completely by breaking it down into its parts. While I think criticisms of reductionism are valid I'm not sure that any scientist really completely has a reductionist approach to the brain, because clearly most of the function of the brain is a result of the interconnections between its parts.

Another thing that he spends a great deal of time attacking in this book is an area that is currently called evolutionary psychology. Evolutionary psychology is a very controversial field. There are a lot of scientists who seem to think it really isn't a valid scientific field; and I think the jury is probably out on that. But the point Rose is making in this book is that you can't just point to genetics as an explanation for behavior, because from the very beginning the environment interacts with genetics

If you took two people with the exact same genetic make-up, even from the beginning their genes are going to be in a different environment and they're not going to turn out to be identical people. I always think about this when I see one of the sci-fi stories about cloning because, clearly, even if I made a clone of myself—which is not likely to happen—it wouldn't turn out to be me. But in order to appreciate that fact you have to realize that the genetic code is just the beginning instructions; it's not the total picture of what's going to happen.

Another point he makes is that we are still a long way from a complete understanding of how the brain and body generate the mind. This is very important because the drug companies are trying to rush into market therapies—mostly drug therapies—that are based on incomplete ideas about what neurotransmitters do. So, again, he's really keen on emphasizing that reductionism can't explain the mind.

Not only does this mean that the mind is more than the brain, it also means that even if we understand all the chemistry behind the brain, the body, and how it interacts with the world, we still don't understand everything. And I guess the main thing that the antireductionists are trying to attack is the hubris that we will someday understand everything.

But one of the key points I think he is trying to make in this book is that reductionist thinking can lead to dangerous choices. For example, if we look at depression as being just about a lack of a particular neurotransmitter, such as serotonin, we're really missing a large part of the picture. Not only does serotonin have more roles in the body than just mood, but there's more to depression than having a lack of serotonin.

If we look at everyone that has depression as having a biochemical abnormality we may not even see the person. What about their life circumstances? Is their depression a clue that perhaps they need to change something about their life?

Before the current biochemical model of mood took hold, people used to think about things like depression and other problems of this sort as being part of the soul journey. And whatever you think about what the soul actually is, the point is that depression had a meaning in the person's life.

Now, it can also be recognized that there do seem to be people whose depression is largely biochemical—that is, there's nothing particular going on in their life, but they have severe depression. And I would certainly not want to deprive them of their antidepressants. I'm just saying it's like if you take anti-anxiety medicine when something bad happens so that you won't be upset, then have you really dealt with the problem?

Another example he gives in the book is he talks about the phenomenon of ADHD or ADD, which he points out until recently was being diagnosed in the United States at a rate of 10 times its rate of diagnosis in the UK (Rose is in the UK.) And he questions why this would be. One of his points is that this model of treating people for ADD with drugs like Ritalin really doesn't even have any scientific underpinning. He doesn't even address the recent concerns that are beginning to arise about the long-term effects of treating people throughout childhood with these drugs.

What would happen if we actually could develop drugs that could do the kinds of things that some people dream of? That in itself would have its own set of concerns that he thinks we should start thinking about ahead of time. For example, the issue of mind control.

There was a book written back in the 30's called *Brave New World*, by Aldous Huxley, in which they have a drug called Soma that everyone is given so they'll be calm and happy. What if such a drug could be invented? It's not that far from reality now and we should think about it; perhaps even consider making decisions about whether we want such drugs before they're developed.

The other end of the spectrum is drugs to enhance performance. There's already a controversy about people who aren't depressed taking antidepressants because of assumptions that it might improve their learning or other performance. So, the issue of mental performance enhancement with drugs is one that he thinks we should be addressing beforehand.

Both of these—the issue of controlling behavior and enhancing behavior—bring up issues of personal responsibility and freedom. Should a person have the right to refuse to take one of these drugs? If a person has a condition where they need to be treated with a drug and they're not taking the drug, and so then they do a crime, or supposedly the drug has caused them to do a crime, are they responsible? Issues like these are already arising.

I think the point that Dr. Rose is trying to make is that we shouldn't just jump head-on into futuristic scenarios without thinking about the implications. You might think that his concerns are unfounded, but there are real problems that can be seen in the history of science that demonstrate the kinds of problems we could expect in the future: For example, the human tendency to jump to conclusions prematurely.

Let's consider just a few examples of this. Back in the 19th century there was a so-called science called phrenology where they had decided that they thought they could figure out people's behavior by the shapes of their skull. Obviously this turned out to be completely false, but it is a good example of how jumping to conclusions could lead to problems.

Now we have functional MRI scans where they observe different patterns of activity in the brain when people are thinking about certain things. They've actually shown that the same areas of the brain for some things are activated when you're thinking about doing them as are activated when you're actually

doing them. So, what if they decided that they were going to try to predict people's behavior using something like a functional MRI?

This would be somewhat like the early use of the lie detector test. When it first came out it was assumed that it was 100% reliable, but we now know that it's relatively unreliable; which is why we don't use it very much anymore. On the genetic front one example he gives is a scientist who discovered what he thought was a gene for being homosexual. But his results were never reproduced. And the problems with these kinds of approaches gets back to not only this tendency to jump to conclusions, but the problem with reductionist thinking—in other words, thinking that a piece of the puzzle is the whole puzzle.

Most of us probably aren't very worried about someone using a functional MRI to try to predict our behavior or control us. This might seem somewhat far-fetched. But let's think about pharmacology and drugs, because their use is already a reality. We have to recognize that the drug companies are motivated by profit, not by a search for knowledge or a desire to benefit mankind. Drug companies are already getting into developing drugs to manipulate neurotransmitter receptors and drugs related to genetics. They see this as a growth potential where they can make huge amounts of money—as if they aren't already making huge amounts of money.

If you listened to the last episode about neurotransmitters, then you have a feel for how complicated this area is and how incomplete our knowledge remains. When you design a drug that is going to interact with a particular receptor for a neurotransmitter the first problem you see is that it tends to act in ways you don't desire. Now, of course the drug company's goal is to develop drugs that are so targeted that they get only the effects they want. However, that doesn't take into account the fact that people tend to have idiosyncratic reactions to drugs, and it is actually pretty unlikely that in the near future they will be able to make these drug effects as completely predictable as they would like us to believe.

Obviously, thinking about the problems of overreaching our actual knowledge and the ethical implications of the knowledge that we might obtain is not as much fun as talking about the recent discoveries about how the brain works, such as the recent discovery that adult brains actually do make new neurons. But I do think that this is an important topic, and that Dr. Rose's book is one that gives much food for thought.

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This episode has so far been a little bit shorter than the recent episodes, and most of you seem to like longer episodes so I'm going to take some time now to talk about some of the other ideas that are in Rose's book. I mentioned that he is very keen on distinguishing the idea that the mind is more than the brain. One of the points he makes is about the role of emotions. Emotions engage not just the brain but also the body via hormones and other biochemicals. He discusses this in the context of trying to figure out what it is that makes humans truly unique.

He also talks about language and refers to the work with the bonobos. He says two things about language that relate to previous discussions we've had on this podcast. One is that he argues against the hard wired language viewpoints of people like Chomsky. Instead he argues for the point of view that the brain has critical periods when it is ready to acquire things like language, but experience is required for them to actually arise. And this is supported, as we have discussed before, by the current evidence.

On the subject of nature vs. nurture—which we never can get away from when we're talking about the brain—he says that we should get rid of the whole 'nature vs. nurture' phrase and replace it with 'specificity vs. plasticity.' In other words, the genes specify what the brain and other parts of the body can become, but the brain has plasticity in that what actually occurs is a result of experience. And the

brain has plasticity in the sense that it does not get wired once and stay the same for our entire life—thank goodness.

Because of the role of emotions and the fact that the brain has to interact with the body, he thinks—and this is not an original thought—that the whole brain-body distinction is obsolete. That really does fit with the growing evidence from all fields, including neuroscience, about the fact that the brain and the body are so intimately interconnected that they need to be considered together. That’s one of those ideas that seems obvious, but I can tell you that when I started medical school in 1980, this was not an idea that people really recognized as being valid.

I wanted to take time to talk a little bit about what he says about memory, because I know this is a subject that we’re all interested in. At one point about midway through the book he talks about what he calls “the paradox of memory.” He says that this is an argument against reductionism. One of the points he makes is that even though we know there are synapses that change when memories are formed, that’s not where the actual final memory resides.

Remember we talked several episodes ago about a famous patient named HM, who had damage to his hippocampus—which is the part of the brain that is necessary for forming new memories. He didn’t lose any of his old memories, he just lost the ability to make memories. So, we know that the hippocampus is needed for making new memories, but where the long-term memories are is very poorly understood. It’s not like you have a certain memory and it’s in a specific file, like in your computer. That’s the key idea to remember.

And there seem to be different kinds of memory. For example, knowing how to do something, and knowing what, are two different things. Consider the difference between knowing how to ride a bike and remembering the state capitals. You’ve no doubt heard the expression, ‘It’s like riding a bike,’ as a

reference to something you never forget how to do. But I bet you can't remember those state capitals that you memorized in the fifth grade. I know I can't.

And then there's the fact that hormones affect memory and the fact that emotional content affects memory. That is, we remember things that have high emotional content. That's why the state capitals aren't very easy to remember for most people.

Another type of memory that he mentions is something called "recognition memory vs. recall memory." Back in the 50's a famous experiment was done where people were shown slides of various objects with only a second or so to look at them, and then later shown more slides and asked whether or not they had seen the slides before. And they were able to recognize which ones they had seen before, even if the number of slides went up into the range of 10,000.

What this implies is that our recognition memory is almost limitless. That certainly isn't true with regard to recall. That's the reason why when you can't think of something you ask somebody to give you some choices, because you know that you're likely to recognize a choice if it's a familiar one but you can't come up with it just by itself. Of course, the point he's trying to make is that we can't really explain these phenomena with our current knowledge.

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Looking back over my notes about *The Future of the Brain*, I think there's one other important idea I would like to share before I close. He points out that science can't be separated from its social context. It always happens within a certain world view, and that world view affects what questions are asked and what answers we look for. And so, he is concerned that having a completely reductionist world view is limiting the questions that are being asked.

He also points out that new tools lead to new ways of seeing the world. This principle can go back to the very beginnings of science. Before the microscope, the idea of a cell was impossible. Yet, once we know about that, it's sort of the way we see the world from then on. Now we have tools, like the functional MRI and genetics, which allow us to look at certain aspects of how the brain works. And the danger is that we'll become too focused on the questions that can be asked by these tools and lose sight of the overall picture.

I hope from this relatively brief discussion you get a feel for the fact that this book, *The Future of the Brain: The Promises and Perils of Tomorrow's Neuroscience*, by Steven Rose, is a very thought-provoking book. I hope you will put comments on the website at brainsciencepodcast.com, or send me email at docartemis@gmail.com.

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Before I close I want to read an email that I got last month from one of my listeners. This email is from Joanna. "Thank you so much for putting this podcast together and making it available. I am a busy NICU nurse (that means neonatal intensive care) fascinated with the brain/mind. I have dozens of books on my Amazon wish list on the subject but very little reading time, and wouldn't know where to start if I did."

"Your podcast not only makes formerly etherial concepts understandable and approachable, but your summaries of the literature and other media give me an idea of where to start. The technical content of your podcast is exactly the right level for me. If anything, you could go on longer, and in more depth, and more often."

"Your interview with Stuart Shanker was especially interesting to me, as I'm a former labor and delivery nurse with a degree in anthropology. I spent many

gruelling hours coaxing relatively large craniums out of their bipedal mother's pelvises. And now, as a neonatal intensive care nurse I daily experience how underdeveloped the neonate—especially the fetal people I care for—is neurologically.”

“All handling and positioning of these small patients is related to protecting that favored organ, the brain. It's exciting for me to see the results of those neurons connecting up almost before my eyes, such as with successful coordination of the suck-swallow-breathe that wasn't there yesterday. Thank you again. Your podcast is awesome.”

Thank you, Joanna. And thank you for giving me permission to read this comment.

I did want to make one comment about feedback. If you're trying to decide whether to send me email or to put a comment on the website, a guideline to follow is that if you have an idea you want to share with other listeners, post it as a comment. If you have something personal you just want to share with me, send me email. I get emails notifying me of all comments posted on the website, so I will reply to your comments just the same as if they were emails.

If you'd like to send me an MP3 of your comment to play on the podcast you can do that. Just be sure that it's relatively small, because my Internet provider won't let me receive anything bigger than 10 MB. Also, there's always the possibility that I won't be able to play it if the quality isn't sufficient. However, I would encourage you if you want to hear your voice on the podcast, send me an MP3.

Thanks again for listening. I look forward to talking to you again in a few weeks. I'm hoping that the next podcast will be about neuroplasticity; although I'm reading about three books on the subject and haven't chosen which one we're going to discuss.

One last thing that I almost forgot to mention. If you happen to subscribe to my [Books and Ideas](#) podcast you probably noticed that an episode did not come out last week on schedule. I'm having a hard time keeping up with both of these podcasts, since *Books and Ideas* has kind of evolved into a non-fiction book discussion podcast. However, I'm going to try to get *Books and Ideas* out at least once a month, so I appreciate your patience about this.

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Transcribed by [Lori Wolfson](#)

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