



Conscious Life presents

How Psychedelics Can Change your Brain

Guest: Professor Robin Carhart-Harris

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[00:00:05] Alexander Beiner

Our next speaker is Professor Robin Carhart-Harris, who is one of the most influential psychedelic scientists in the world.

In 2020, The Times named him one of the world's top medical scientists, and the following year, he was included in Time Magazine's 100 Next List of 100 Notable People Poised to Make History.

Currently, he's a distinguished professor and director of the Neuroscape Psychedelics Division at the University of California, San Francisco. And before that, he founded and was the head of the Center for Psychedelic Research at Imperial College London.

Professor Robin Carhart-Harris

Thanks for having me.

Alexander Beiner

Great. Robin, the first thing I wanted to ask you about was just a little bit giving people a bit of a sense of your backstory. As a neuroscientist, there are lots of things you potentially could have researched in your career. So why psychedelics? What is it that drew you toward researching psychedelics?

Professor Robin Carhart-Harris

Well, what to share? I guess as a young man, I was curious going about my life, and I came across psychedelics and had some experiences that stuck with me. But really a pivotal intellectual event, or sequence events would have been drawn to psychology, in my teens and especially depth

psychology. I guess ultimately, maybe especially people who are drawn to psychology are interested in understanding themselves, me, such as they say, I was drawn to depth psychology because it seemed to really go deep on the mind, on the psyche.

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Yet I was also frustrated about its lack of scientific discipline, perhaps. I could see that, notice that. I wanted to know more confidently whether the unconscious mind exists and this kind of thing. Around I'd asked, formally asked in a seminar, if that's formal, whether a drug could allow us to see deeper into the psyche. No one knew in that seminar, they just could tell it was an interesting idea.

I then went back with the idea firmly fixed in my mind, did a library search online and saw *Realms of the Human Unconscious* by Stanislav Grof. Ever since reading that book, my life has changed because there it was. Psychedelics reveal the unconscious mind or a way into the very depths of the psyche. In a sense, that was a light bulb moment, an awakening, an enlightenment moment for me because I felt, Oh, that's what the unconscious is. That's what happens when you trip. That was my thread in.

The neuroscience came later on as I realized the tight mapping between mind and brain. I wanted to understand what the heck is going on in the brain when we trip and what could that tell us, perhaps, about the biology of phenomena of interest to depth psychology, like the ego and its dynamics with the unconscious and so on. I know that's very abstract, but that was my way in.

Alexander Beiner

That's fascinating. I don't think I've actually ever heard you talk about that. A few questions come up. The first thing I'm curious about is, as a neuroscientist now, having done a tremendous amount of very important psychedelic research, how do you view the unconscious? Because you're looking at what's actually happening in the brain. Is there a way to correlate what you're seeing in brain scans of people who are on a psychedelic and unconscious activity? Is it that easy to do? How do you approach that question?

Professor Robin Carhart-Harris

It's very hard because it's an intrinsically vague abstract construct. What is the unconscious? It's hard to pin down. I guess the way I go at it is to think of the unconscious as a system. This goes back to Freudian metapsychology. He'd call it 'The System Unconscious', and only later on it became 'The It'. It was then translated into 'The Id' in English, the English translation of his work.

What is that system? Well, it's a primitive system, an archaic system, a mode of being, a mode of... You could say a mode of cognition, but it's more a mode of mind, of existing, that is primitive, that is yet to be, in a sense, stitched up and controlled and filtered through the ego and the conscious mind. It's a mode of mind that you would see in an infant, and it's a mode of mind and brain function, of course, that you would see, if you could, in primitive human beings.

In a sense, that's a fascinating question, when in our evolutionary development did we inhabit that state of mind and when was there a threshold point? Or was it a phase in which that mode of consciousness was suppressed and taken over by the chattering analytical ego mind that we're

inhabiting right now and do a normal waking consciousness? When did that point, when was it reached evolutionarily?

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Anyway, I think what you can see when you look in the brain and make mappings from brain function to mind function is a mapping between the loss of the ego mind, of ego consciousness. That's something that we can make mappings from subjective ratings and maybe some behavioral stuff as well to brain function.

And of course, we're feeling our way in the dark because it's such a hard problem. But it's not like we have nothing to go on now. We do have some insight.

Alexander Beiner

It'll be really interesting to hear then what is actually happening in the brain when we take, for example, psilocybin, the active ingredient in magic mushrooms, because I know some of your research into this is quite pioneering, and I think it's very useful for people to get a sense of what's going on, and then perhaps how it relates to our sense of an egoic self and why that matters. Why is that so healing, potentially?

Professor Robin Carhart-Harris

I guess that's another angle that it's healing at all. But if we go to the more fundamental question of what's going on in the brain, whether it's a good or a bad thing. It depends on the lens that we're looking at brain function, and we're always seeing the brain through a lens. Something I didn't fully appreciate when I first got into neuroscience, but we're very much limited by the resolution, the scope of our tools.

We've got a couple of powerful tools, at least, to look at brain function. One is an old technology that goes back to the '20s, electrophysiology, EEG, the swimming cap, things that you see on people's heads and lots of sensors often. They're recording through the skull, through the scalp electrical activity underneath from the brain. You can detect it, which is pretty remarkable. We can look at changes in the quality of that ongoing brain activity under a psychedelic.

When we do, perhaps the most robust and reliable finding in psychedelic brain imaging is an increase in the signal complexity or entropy of ongoing brain activity under a psychedelic. It very markedly goes up. It tracks with the intensity of the trip. Recently, we've seen that it tracks, especially strongly with people's ratings of the richness of content of conscious experience. It's like the more bits in your conscious experience, the more bits in the brain activity.

That's cool because that's a pretty recent finding. We first published on it about five or six years ago. Until we'd shown that brain entropy or complexity goes up under these drugs, under psychedelics, we thought that brain entropy or complexity more or less topped out in normal waking consciousness. And brain entropy does as we age and mature, almost as if we're bringing more depth and complexity into our conscious experience as we mature, even into our 60s, brain complexities going up.

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But it's also cool because most interventions, psychoactive interventions, the typically dull conscious content and experience, drop brain entropy. Anesthetics do this very reliably and dose-dependently. Recently, it's been found that stimulants don't increase brain entropy, so it's not a simple arousal thing. Even THC doesn't do it. My view, yeah, it's quite a profound altered state of consciousness to be stoned on THC in cannabis, but it's not strictly in my book, a psychedelic. It's close, it's psychedelic-like, but not really a classic psychedelic like LSD or psilocybin.

That's interesting. There's a degree of specificity now as well. Very excitingly, some recent findings, we've seen that the entropic brain effect, as I call it, is predictive of changes in people's psychological presentation, and more specifically, changes in their mental health one month later. You can look at brain entropy changing under the drug, potentially in real-time, like in a matter of minutes, and predict how someone's mental health is going to, in this case, improve one month after the psychedelic, this is with psilocybin.

That's pretty cool because all of a sudden, it's taking us onto potentially firmer ground, more objective biological ground in terms of understanding, yeah, now we're going to therapeutic action. How can you change someone? How to change your mind? This could be a biological account, at least part of the picture for how you can change the mind. That's cool.

If we look through the lens of fMRI and we can see with fine-grained spatial resolution, millimeter resolution now, different brain systems and networks and their dynamics. We're moving away from that phrenology-like approach to brain function, this region does this. I think in time, we realize that a given region does a million things, and there's a lack of specificity there.

Now we're better understanding brain networks or systems that are distributed across the brain and understanding their dynamics across time. I believe we're getting closer to making mappings between brain function and experience that are more compelling, more satisfactory than that old phrenology approach of turning on the, I don't know, the God experience through activating the God region, something silly like that, the pineal gland or whatever. That's nonsense pseudoscience.

Now we're thinking and learning that certain systems that are associated with high-level cognition, systems that have expanded disproportionately in our species that especially develop through ontogeny, or our development from infancy into adulthood, like the default mode network, not just the default mode network. I could explain the default mode network, but this is a distributed system that, yes, has expanded massively in our species, that is tonically active in the background, hence default mode. It's associated with things like self-reflection and imagination.

Once upon a time, I proposed that its functioning may relate to ego functioning. We have found under psychedelics that the integrity of this system, not just this system, but yes, this system is included, the integrity breaks down under psychedelics. As it breaks down within the system, it opens up and becomes more communicative with the rest of the brain.

That effect, now quite well replicated across teams, correlates with some of the abstract phenomenology of the psychedelic experience, like the unitive experience, or that sense of oneness that comes as the positive to the negative of ego dissolution. So the things are very closely related.

[00:15:49] Alexander Beiner

That's fascinating. Thank you. There's a few threads I'd be quite keen to pick up on. One is just I just want to give a sense of a metaphor that just came up and sense check it with you. But it seems like, what I thought was very interesting is that this idea that there's different brain regions which are responsible for each individual thing is quite outdated now. And in fact, it's a much more complex system where different systems, it sounds like, in the brain are interacting and speaking to each other.

Would it be safe to say that when we take a psychedelic, those systems all speak to each other in new ways, or do they speak to each other more, for example, or different systems connecting that wouldn't connect before? How does that all work?

Professor Robin Carhart-Harris

The honest answer is that I don't know how it all works, but we see these systems are patterns. That's one way to think of them. Yes, they have an anatomy. You'll see fibers that are really strong from one region, say at the back of the brain, to a region at the front of the brain. There's literal cabling between those regions. But there are also patterns of activity. When we're using something like fMRI to look at these systems, that's what we're looking at. We're looking at these patterns and they come into prominence and then fade, and another system comes in and then fades. Those are the dynamics.

What we see under psychedelics, actually, is that there's a global pattern that seems to be more prominent. We've seen this under DMT, LSD, psilocybin. It's a globally undifferentiated pattern. It's almost patternless. It probably does have patterns, but they're very granular and so higher spatial resolution. And yeah, so that's what we're seeing.

What we're also seeing is the patterns that are quite prominent in normal waking consciousness, like the default mode pattern, it will come in, these regions being synchronous in time, going up and down together in their activity, that pattern is diminished. The brain doesn't reside in that pattern.

For people who are familiar with this notion, this term of attractors, like attraction, like an attractor beam, or imagine a landscape with a literal depression in that landscape and you've got a marble rolling in it. If it gets near the zone of the depression, it's inclined to fall into the bottom of it. That's an attractor.

These patterns are a little bit like that. It can have a gravitational pull. And maybe in certain psychiatric disorders or mental illnesses, certain patterns may have an excessive gravitational pull, and we can get stuck in them. But under psychedelics, it seems that these attractors, these patterns, are less attracting in a sense. It's as if the landscape flattens out and the dynamics are more flexible within that landscape.

[00:19:43] Alexander Beiner

I think I've heard you use the phrase that psychedelics might open a window of plasticity. A time in which new connections might be able to be made. And I think this idea of neuroplasticity is a really interesting one to talk about because it seems very important. Could you define what neuroplasticity is and how does it relate to psychedelics?

Professor Robin Carhart-Harris

I quite like the dictionary definition of plasticity without the neuro bit, which means the ability to be shaped or molded. It's changeability, malleability. These are synonyms for plasticity. That's what plasticity is in its purest sense. It's not a change per se, but changeability. How easy is it to change? You think of a plastic material, malleable like plasticine. That's plasticity.

Neuroplasticity is hijacked plasticity. Through the experiments that have been done and the way that we look at plasticity, it's almost become an index of literal change, and specifically, anatomical change, especially. Things like the strengthening of certain circuits or connections, and the growth of certain aspects of neurons. That's become a favored index of neuroplasticity. If you were to look up a definition of neuroplasticity, you might see something like the ability of the brain to reorganize itself. It's not a million miles away from changeability in the brain. That's how we should think of it.

It's just that through our measures, which become operational definitions, we've become quite wedded to a certain type of neuroplasticity. It's called Hebbian plasticity. People might be familiar with this term, "Cells that fire together, wire together". That's been associated with Hebb because it's similar to the work that he did, but he never actually used that phrase, which is curious.

But anyway, it is this potentiation or strengthening of certain circuitry. That's Hebbian plasticity. The problem I have with our weddedness to Hebbian plasticity in neuroscience is that I'm not confident that psychedelics do that. Actually, many drugs of abuse do that, like cocaine and other stimulants, a bunch of hedonic drugs, alcohol, opiates. They strengthen certain circuitry, actually, the reward circuitry.

But psychedelics don't really do that. If anything, they do the inverse of that. They weaken specificity and broaden possibility. That's why I think it's quite important to be specific about the action of psychedelics on plasticity. I would say that I do think psychedelics promote plasticity in that dictionary definition sense of the ability to be shaped or molded, or changeability. But it's not that Hebbian plasticity thing that neuroscience has run with and co-opted the meaning of plasticity to specifically mean Hebbian plasticity.

Anyway, you can tell it's a bit of a bug bear, but I felt it necessary to give that first formal definition of plasticity in its purest sense.

Alexander Beiner

I think it's actually quite important because there's a big difference between tightening wiring, and just metaphorically and embedding something, even the subjective experience of that.

Let's say if I start learning how to play guitar, and I'm getting the muscle memory and I'm getting really into it, there is at least subjectively in my experience. And a lot of people I've seen in retreats,

for example, of an opening up and people saying, reporting afterwards, "Oh, I have a sense of spaciousness". If there's one word, actually, I've heard the most from people after retreats, it's space, spaciousness, some sense of possibility, of an expansion.

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I'm curious about how that might relate to something you mentioned earlier, which is people having potentially lasting changes, let's say a month later from a psychedelic experience. What might be going on? Or where is your thinking right now on what might be going on that someone might go in with, say, depression, and then a month later, their symptoms are much lessened and they have a different perspective? It'd be good to hear you talk about that.

Professor Robin Carhart-Harris

Happy to. Again, I come back to that landscape. People, I could invite to have in their mind's eye, a vision of a landscape. And within that landscape, again, imagine this literal depression like a dark hole. And let's think of depression and how to fall into a depressive episode is like falling into that dark hole. It sucks you in and it's hard to get out of.

If you have chronic recurrent depression, like treatment-resistant depression, it's all too easy to fall back into it. Maybe there are triggers for someone with that presentation that draw them into the depressive episode that wouldn't draw a healthy, resilient person so easily into that mode, into that state. I think that's what a lot of psychopathology is. In fact, recently I proposed it's the main thing of mental illness is the over-potential or over-strengthening of certain substates of mind and brain and behavior that get over-reinforced.

Maybe the practice that reinforces them is often implicit. We're not conscious of it, but we're practicing on, say in depression, negative thoughts about ourselves, negative thoughts about the world. That's an internal chatter that is all the time reinforcing the problematic pattern.

The term I use is canalization, which comes from evolutionary science, and formerly it's the inverse of plasticity, where in evolutionary science, they treat plasticity in a manner that's consistent with this dictionary definition of the ability to be shaped or molded. So that's like a phenotype, a property of an organism becoming more sensitive to its environment, more plastic, more changeable.

The opposite of that is a phenotype or property of an organism that gets stamped in and becomes resistant to anything that's happening in its environment. Like a depressed person gets, I don't know, very lucky in some way and doesn't notice. They're blind to it because of the way they've reinforced their negativity. They are canalized. They're resistant to environmental information.

Now, I think what psychedelics do, and I feel increasingly confident about this, is that in opening up the landscape, and they do this through that entropic action, I think, through dysregulating, it's a bit jargony, but statistical regularities in brain function, through increasing noise in a system, increasing temperature that makes molecules, move around with more motion, the psychedelic is dysregulating, but the function of that is to weaken patterns that have become over-reinforced.

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It is that window of plasticity. It's that opportunity for revision, for maybe de-weighting these patterns that have become over weighted. Through the acute or short term, immediate relaxation of those patterns, the weighting of those patterns. There's that fresh opportunity or change.

There's more to the picture than just that. I think you need to twin that with psychological support, nurturing supportive conditions such that when you open someone up, they're vulnerable and they need to be cared for. Like an open, unsuspecting child needs to be cared for. It's vulnerable. We have a responsibility there to do that care. It's a similar scenario with psychedelics, I think. So those are some ideas. There's more, of course. There's always more.

One question that really intrigues me is, what is the apparent insight that people have under psychedelics? Psychedelic means psyche revealing, making the the soul manifest or visible. What's going on in the brain when people say, "I get it now. I can see how these things happened in my life. Then I probably went inside and ruminated too much. Then actually, I developed that habit, and that was an unhealthy habit. Maybe I did that because of a way to forget or something".

Why they have that insight is a fascinating question. There's a couple of ideas. It's almost as if there might be more... If we think of it in computational terms, it's like a data decompression. It's like cracking a file that was compressed up, reduced in a sense, and is now allowed to open back up, and we can see all the information that before had been reduced down and suppressed from awareness.

There's insight and ability to see granularity that before had been suppressed away through the reducing function of, maybe, ego consciousness. There's that, and there's also an analogy of the overview effect, like an astronaut up in space, looking back on the Earth and then seeing the bigger picture and being able to put things in perspective.

It's a bit of a paradox there because it's like one aspect of the insight is seeing more granularity, data decompressed, information suppressed out that is now available again. But the other one is seeing a really vast bigger picture. So it's funny that you can have insight in those two different ways.

Alexander Beiner

Yeah, it just really fascinates me. The other thing that comes up for me hearing you describe that is this increase of complexity in the brain and all this stuff happening. And then subjectively, very often there is an awful lot going on. Subjectively, there's imagery, there's memories, there's feelings, but there can be a very rich coherence, a sense of purpose and a sense of directionality, and a sense of a story that we might be going through within ourselves in that process. I find that absolutely fascinating. That also seems a bit like a juxtaposition between the two things.

The last thing I wanted to ask you about was what you're most excited about in the research right now. Obviously, there's been a lot of headway in clinical research and in helping people who might be suffering from, for example, depression that you've talked about. There's also, of course, research into creativity and chronic pain now at Imperial. There's lots of other areas as well. I'm curious about what's exciting you the most.

[00:33:37] Professor Robin Carhart-Harris

It's a hard question because there's so much. I was ping-ponging around in my head about what I could say because there's a lot. It's interesting. I don't think it would be one indication because that's a game in the sense that everyone's playing, which is a bit of a glib way to put it, but there's a lot of different psychiatric disorders and beyond that could and is already showing signal with psychedelic therapy. Anorexia, chronic pain, a bunch of addiction disorders.

We'll see some impressive results come out with psilocybin therapy for cocaine use disorder shortly. There's going to be, might be today, a paper coming with amazing results in bipolar, too. People with depression, but also having hypomanic episodes, sub, really frank psychotic manic episodes, but an attenuated version of that, and amazing results. I think 12 of 15 reaching criteria for remission, being symptom-free for 12 weeks. 12 of 15, that's better than any... It's a very small study, but it's better than current response and remission rate, say, with psilocybin in therapy and depression.

There's all that promise, and it's real. I'm of the view that there's something actually happening here with the treatment that goes beyond a mere placebo response, that whole chestnut, the idea that this is all being carried by a breaking of blind and positive expectancy.

We've assessed that by measuring expectancy pre-trial and seeing that it wasn't predictive of response to psilocybin therapy in depression. Whereas, flip it another way, in that trial that I'm referring to, the other arm got escitalopram, SSRI, conventional antidepressant. Pre-trial expectancy for that did predict quite reliably response to the escitalopram, to the SSRI.

What am I most excited about? I propose that entropic brain thing in 2014. I wrote my first paper on it, which is an entropic paper in itself. It's a little bit all over the place. Bunch of ideas went into it. It matured over time, for better or worse. But I think it's holding up, so I'm excited about that. I think it can tell us something about the therapeutic action of psychedelics in treating psychiatric disorder.

Maybe it could tell us something even beyond psychiatric illness in terms of how to elevate or help even neurological disorders through inducing functional plasticity and then twinning that with some trainings, some rehab. I'm fascinated by that possibility.

And what it can tell us about consciousness. If, as I'm proposing, really that hypothesis states that the entropy of spontaneous brain activity reads out on the richness of content of conscious experience. If that holds, then that's pretty cool. That's pretty exciting.

I think, especially given where we are with other theories of consciousness, quite recently, the Integrated Information Theory of Consciousness came in for a hard time from some peers in the neuroscience community. A little bit uncivil, I felt, how that all played out, accused of being pseudoscientific and so on.

But I do wonder, a bit of a daring time to come in and say something like this, but I do wonder whether the meat that's on the bone is in the entropic brain effect. That does track with richness of content of conscious experience. The integration component may be wrapped in such that, for example, you could overshoot with an entropic brain effect and lose some aspect of consciousness.

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I'm not sure you would lose consciousness per se, but you might lose the ability to report back on what actually you experienced. The content was so rich that it was everything. How to put that into words is a challenge, but people wouldn't describe that as being a full loss of consciousness, like they might have with an anesthetic. They might use buzzy terms like pure consciousness.

Yeah, a sense of oneness again or the interconnectedness of all things. I know this is horribly abstract now, but it is a very interesting question of where does that entropic brain top out? If it does track with the richness of conscious experience, is there an upper bound to that above which you lose some aspect of how we typically understand consciousness?

Alexander Beiner

It might be somewhat abstract, but also, I think, points to one of the most important questions that human beings ask, what is consciousness? So I'm also very excited to see what the research, what it might point us towards in the coming years.

Robin, this has been really rich, entropically rich and really fascinating. So I really appreciate it. Thank you.

Professor Robin Carhart-Harris

It has been a pleasure. Thanks, Ali.