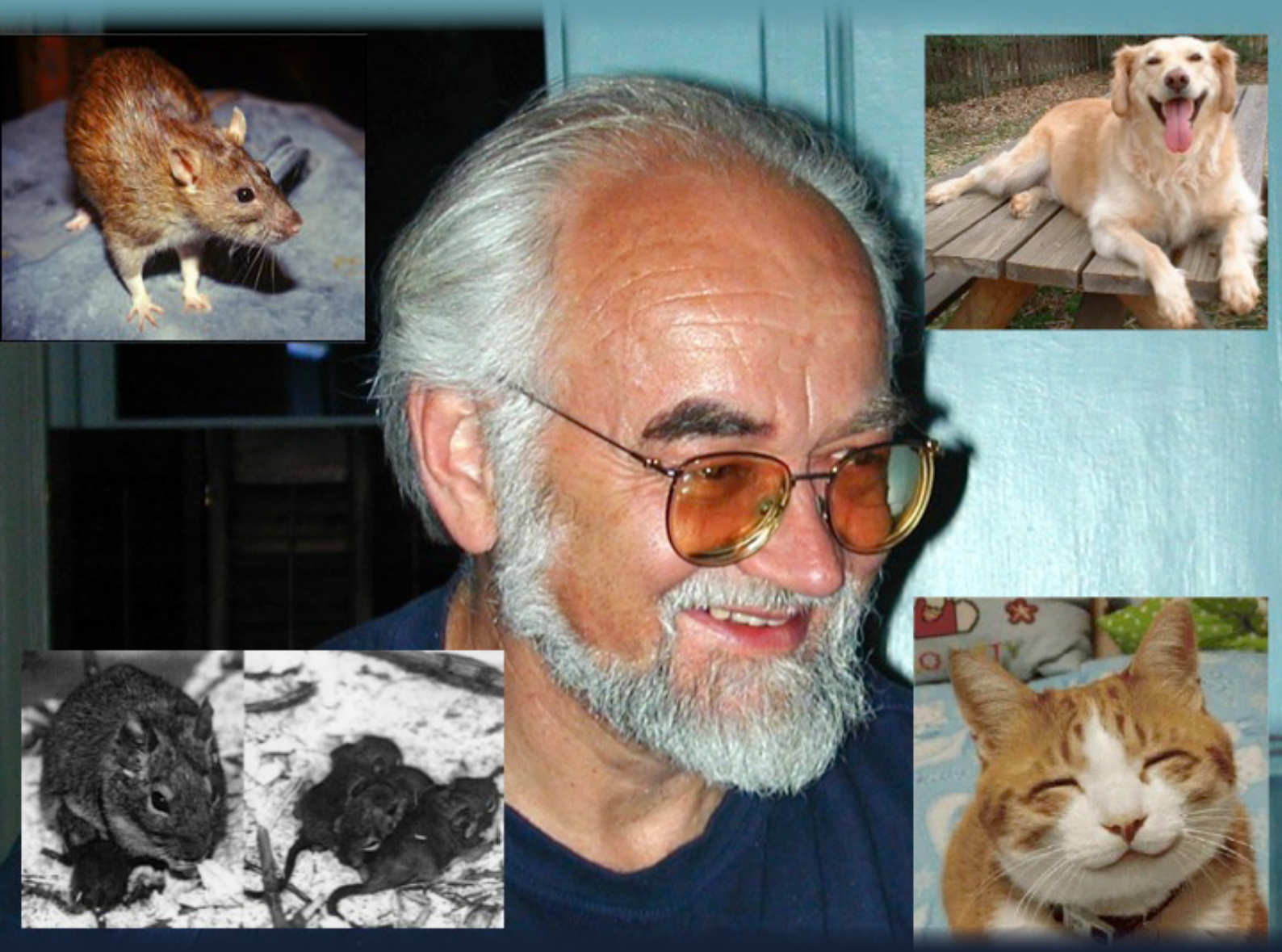
The Emotional Foundation of Mind

Dr. Jaak Panksepp



A Dr. Dave Van Nuys Interview

Dr Dave: I have to say, I am in awe of your work and its potential impact for both psychology and psychotherapy. I've been spending time with your book, *The Archeology of Mind: Neuroevolutionary Origins of Human Emotion*, and it's intellectually very exciting, and I believe it will become a classic. And as I was getting ready for our discussion here, I took a look at the cover again and the subtitle "Neuroevolutionary Origins of Human Emotion". Your book is so wide-ranging and yet you capture it in that subtitle. I think you've really captured its essence.

Jaak Panksepp: Well, I appreciate that, and I appreciate that you're finding it very useful. It was written to bring a naturalistic view of the brain and mind to the discussion, which often is lost in cognitive science—which takes a top-down approach—and very few people realize that we have to take the bottom-up approach to understand the whole.

Dr Dave: Now, you're a psychologist, but rather than being in a psychology department you're currently housed in the College of Veterinary Medicine at Washington State University. How did that come about?

Jaak Panksepp: Well, I've been a psychologist ever since my senior year in college. When I worked in the back wards of a psychiatric hospital, I decided that the only way I could participate in the adventure of understanding human emotions was by perhaps going into clinical psychology, which I did—at the University of Massachusetts—and I had the good fortune to end up with a Veterans Administration Traineeship, which put me in the Northampton State Hospital where the training program eventually led me to spend most of my time in the electroencephalography lab. So I had early interests in the brain and emotions. The emotions came from dealing with psychiatric patients as a night orderly, and I thought I would learn a lot about emotions in clinical psychology, which I did not. It was the heyday of behavioral modification.

Dr Dave: Much of your research has focused on affective systems in the brain, and your work has turned the spotlight on emotion. Why? What's the importance of emotion in the big picture?

Jaak Panksepp: Yeah, well, I think all of us have these emotional powers that have remained mysteries. We attach words to them, and, you know, we can't agree on what the words mean. Even we can't agree what an emotion is for real. I tend to follow a Darwinian approach that the emotions of animals have certain displays; like when an animal gets angry, it's very clear. When they're scared, it's behaviorally very clear. So I think that tradition was not cultivated too much in psychology except in facial expressions.

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But, you know, the facial expressions are fairly clear signals that something is happening inside the mind, but there have been battles between the different schools of psychology, and you know, one of the most powerful schools has been constructivism, that we actually construct meaning through our use of words and complexities of the world; and the other approach is more basic: that we do have fundamental processes—sensation, perception, you know—maybe some low level cognitions and emotions. And my own attitude was that if you want to understand emotional feelings—these things are called affects, the affective component of emotion—then we literally have to go into the brain, otherwise we're just talking about it on the surface and often disagreeing with each other. And it has been very common in the study of emotions in psychology: many theories, many people talking past each other, but no one having any idea what an emotional feeling really is.

Dr Dave: You know, you mention the

Jaak Panksepp kissed by a timber wolf.
(Courtesy of Jaak Panksepp)

study of faces as part of the early study of emotions, and animals have faces too, and much of your research has focused on animals. I remember my own graduate school training many years ago; that they kept pounding into our heads that any ideas we had about emotions in our cats or dogs we were simply anthropomorphizing, that we were simply projecting, and could have no way of knowing what the animal might or might not be feeling, and I think people who have pets have always found that a bit hard to swallow. And in fact you've written that behavioral scientists need to get real about the emotional feelings of other animals, so this is clearly something that you feel very passionate about.

Jaak Panksepp: Well, I think that is the aspect of emotion that links up to human psychiatric problems most. Most psychiatric problems have an emotional feeling component, and if we don't understand the feeling component then we will not make progress on psychotherapies, as well as somatic and pharmacological therapies. I mean, we might by chance, but it won't be scientific knowledge, so my attitude was that when I entered graduate school there was already enough data to point us where in the brain we have to go, which were very low regions, very subcortical regions.

And you know, this was based upon Olds' and Milner's discovery of rewarding effects by stimulating very deep brain regions. And all that was preceded by Walter Hess' work in Switzerland, where he was trying to map the autonomic nervous system back in the twenties and thirties, and he was using deep brain stimulation to do this, to find which areas you stimulate and get cardiac changes and blood pressure and respiratory changes and other autonomic effects, and he just stumbled on the fact that often the cats would become enraged—show anger display that was very clear on their body surface. But, and you know, he didn't want to deal with the feeling component because he was…he confessed in his last writings after he took retirement that he did not want his work to be marginalized by the powerful American behavioralists, but he always felt the animals had a feeling, but he chose to call it sham rage.

Dr Dave: Fascinating.

Jaak Panksepp: Which was, you know, which was a tragedy.

Dr Dave: Yeah.

Jaak Panksepp: But understandable. I met the RAGE system in rats for the first time in my PhD dissertation. That was 1969, and I went the additional step and asked the animal, do you like the stimulation or do you dislike it? Namely, is it a reward that you turn on, or is it punishment that you want to turn off? And the answer was very clear. Every place you activated an anger display, the animal wanted to turn it off. But there are other areas that also produced aggression, but this was predatory aggression. And guess what? The animals liked to turn that on.

Dr Dave: Aha! No wonder we have so much crime.

Jaak Panksepp: I think a lot of psychopathic behavior is really predatory.

Dr Dave: Yeah. Well, building on what you've just been saying, you've been studying the emotional side of the brain and you have identified seven what you call core mammalian emotions, which are SEEKING, RAGE, FEAR, LUST, CARE, PANIC/GRIEF,

and PLAY, so I don't know if this is too big a task or not.

Maybe you can tell us a little bit about each one and why they're important.

Jaak Panksepp: Well, let me just highlight that I put them in that sequence for a very specific reason. I put SEEKING first because that is the biggest and most universal of the emotional systems, and that is really a good name for what Olds and Milner call the brain "reward system". The system is clearly rewarding, but it's nothing like pleasure—at least our typical understanding of pleasure as a sensory feeling like, you know, sugar on the tongue, or bitterness being a negative feeling. So, you know, we have lots of sensory feelings. But sensory feelings that lead to pleasure and displeasure are not emotions. They are affects. So *affect* is a generic term for valanced feelings.

So in my view we have three types of feelings: the sensations that come into us from the external world, the sensations that our body collects, namely homeostatic affects…so there are sensory affects from the outside world, there's homeostatic affects like hunger and thirst from the inside of the body—we have specialized receptors in the brain for that—and then we have *within brain* affects, the most subtle ones of all, which I call the emotional affects, and the most primitive one is this SEEKING system, because it serves the general function of finding resources. An animal, to survive, has to chase resources with enthusiasm. So the actual feeling produced by this system is one of, in its highest form, maybe euphoria; in milder forms, enthusiasm. The animals engage with the world, and this is the general-purpose system for finding all of the resources for survival. Now, often you have to compete for resources with other animals, and one good way to compete is to get angry, so we have a RAGE system that allows us to protect our resources. Now, other animals often want us as a resource, so we have to protect ourselves.

Dr Dave: Yeah.

Jaak Panksepp: Now, we do have a FEAR system that produces a very characteristic fear response, and of course, to be a mammal is to reproduce, and you don't leave reproduction to chance, so there have to be LUST systems— rather different in males than females, but also with many shared components. And the function of lust is to bring forth babies and continue into the future generations, so you have to be prepared. The brain has to be prepared to take care of the babies, so there's a CARE system. And many people studied sexuality and maternal behavior in animals. I've not spent too much time on that. But once you have babies, the babies also have to communicate to the mother how desperately they need them, especially if they are lost. So we started mapping a separation distress system by monitoring the crying of little young ones separated from Mom for short periods of time, and we identified the neurocircuits for this and we called them the PANIC circuit, or sometimes flash GRIEF circuit because people don't understand why we called it the PANIC system. We called it a PANIC system because we suspect that psychiatrically it is the fundamental source of panic attacks, which people know is not the source of generalized anxiety disorders—that's more the FEAR system. And finally, we were rather surprised that, you know, when we contemplated what other systems might exist at the primary process level, people said, "Well, disgust," and I said, "Well, that's a homeostatic feeling." That's your body's attempt to remove toxic substances from the body, and we use this symbolically, as in social disgust. Other people said, "Dominance surely must be a fundamental process." I said, "Well, we haven't seen it with brain stimulation, and surely dominance needs to be learned." If you build that into the system then animals really can't compete and come out on top. That is just a genetic issue. But we started saying, maybe play is a fundamental process of the brain, and we…there was no neuroscience of play, and we decided simply to make animals hungry for play. Young animals. Put them alone and then put them together, and lo and behold, they showed a wonderful play sequence—very dynamic, very rich and very positive—animals would run for it very readily. We had trouble mapping it in the

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brain because you have two animals interacting. But one of the first studies we did was take the whole neocortex away to see if play required the neocortex, and the answer was a resounding no. A totally decorticated animal plays normally.

I think play is the most wonderful of the emotions because it takes us into the social terrain to learn about the social world, and I think that's the basic function. You cannot—all mammals cannot—have all the social rules built in by genetics, but they should have a system that allows them to joyously learn about the social world when they are young, and play seems to fulfill that.

Dr Dave: So this is great, the way that you've laid it out in sequence for us, and so this is sort of an evolutionary "given" across mammals, and even, you've suggested, maybe even birds and other species…kind of a fundamental set of, you know—we use computer metaphors so much—a fundamental set of routines that we all come into the world with.

Jaak Panksepp: Yeah. I like more, kind of a human description: they are tools for living.

Dr Dave: OK.

Jaak Panksepp: You know, they are built in. They are instinctual. It doesn't mean they are not refined by experience or modified by experience; of course they are, but they seem to actually ground the organism in certain fundamental capacities that are absolutely essential for survival, and if evolution had not built those in and you had to learn everything then it would truly be rather incredible that organisms would survive. So that is the foundation of behavior. I think it's also the foundation of mind, and I think that's where psychology begins and that is where the least amount of research has been done.

Dr Dave: Now, sticking with play a bit, one of the things that you're known for is tickling rats and recording their laughter, which I think I recall is ultrasonic. Does that mean it's beyond our range of hearing? Tell us a bit about that and how you discovered that.

Jaak Panksepp: Well, it was chance. We had been studying play as a fundamental process for about twenty years, and one of the big projects was to see what sensory systems were most important for play, and for rats it turned out to be touch; and we used touch to follow the pathway up into the thalamus and see that the projections into the cortex were less important for play than the lower projections into the reticular systems. And we also looked at hearing, and we did not cut any nerves. We just put wax plugs in the animal's ear, and play was reduced about 25%. Not as much as anaesthetizing various parts of the body, but still substantial and the vision wasn't important for rats at all, surprisingly.

Dr Dave: So that gave you the clue that there was something social involved, and that it had something to do with hearing and not vision?

Jaak Panksepp: Yes. Touch was the most important one; but remember, hearing is a specialized form of touch, so our cochlea has these hair cells that are measuring the vibration in the air, and that's transduced in a kind of somatic vibration of the eardrum, and that is really a specialized form of touch. And I had a post-doc, Brian Knutson, who, you know, came in without any experience in neuroscience research; he was a social personality in an NIH training program that was coming out of Berkeley, and, you know, I explained all the things we were studying, and he asked me, "Is there a play vocalization?" and I said, "Well, not that we've heard, because when you listen in there's no sounds the animals are making."

And he was a little disappointed on that, and I said, "But don't be disappointed," that, you know, "these animals communicate in the ultrasonic range that we can't hear, and we don't have the technology for it, so if you want to study that, we will buy the ultrasonic equipment and see whether animals make play sounds."

When the equipment came in, the very first day Brian found there was this chirping, and he studied the chirping for a solid year and made a lot of progress. And he thought it was a general measure for appetitive desire, and he was partly correct. But I still thought it was something very special for play, and when he went to NIH to do some of the first brain imaging in neuroeconomics, I had an undergraduate working with me that I was training on how to do some of the experiments: Jeff Burgdorf. And, you know, we were doing play studies and looking and listening to the ultrasonics, and then I got my hands dirty with it a lot more than I had to when Brian had been working on it. And I just woke up one morning and said, what if that is laughter? I came in and Jeff was waiting for me, and I simply said, "Jeff, let's go tickle some rats." Jeff looked at me and said, "OK." And we went. He was listening to the ultrasonics and I was tickling the rat, which was really hand play for the animal instead of playing with another rat. I was playing with it as if my hand was another rat but a very dominant one. And they all chirped: so, first one, second one, third one, fourth one. We had not found a young animal that didn't chirp at all.

Dr Dave: Did they seem at all drawn to it? You know, was there evidence that they liked it in the sense of...?

Jaak Panksepp: Oh, yes. We…one early experiment was that Jeff would pet a rat and I would tickle the same rat in a systematic way, so they had the same amount of touch, and then we'd just put our hands in opposite corners of a large box and see where the animal went. The animal overwhelmingly went to the tickle hand.

Dr Dave: What a clever and simple—simple, yet clever, design. I love that.

Jaak receiving the White Star Award for National Service from Estonian President Toomas Ilves.

(courtesy Jaak Panksepp)

Jaak Panksepp: And then Jeff did a project where he trained rats to press a lever to have his hand come down and tickle them. And they worked for that. So we'd done it every possible way that you can: you know, place preference, etc. We'd even mapped the circuitry, and this was Jeff's PhD dissertation; and every place that you evoke the chirp in the brain is rewarding. The animal wants to turn the juice on to produce that feeling, and it turns out that all of the chirping runs along the SEEKING system. So Brian, the post-doc who first discovered the play vocalization, he was correct too, that this is a general measure of desire. So we had been using that measure; maybe we'll come to it later, as a way to develop new anti-depressants.

Dr Dave: So you've pointed out that these primary emotional circuits…and by the way, in a number of places in the book you refer to *primary process*, and that puts me in mind of Freud, who had made a distinction that I've always found very meaningful between primary process thinking and secondary process thinking. How are you using primary process? Are you referring to something related to that, or is it different?

Jaak Panksepp: I think I am using it rather differently. I think it was certainly inspired by Freud's usage, but I think there has to be a general concept for things that are built into the brain that have psychological meaning, and for me that is primary process. And as far as I can tell, that…you know, there are two types of things that are built in low: one is a series of feeling systems, affect systems, sensory affects, homeostatic affects and emotional affects. Only the last one is really important for psychiatry. And there is no thinking down below, but there are rewards and punishments down below, and, you know, we can tell that there's a psychological aspect to these systems only by asking, if we artificially activate them, are they rewards and punishments. That is our access to the animal mind. On top of that, we've got learning and memory, and learning and memory gives us simple ideas about the world, but usually it's guided by our affects. So I think the actual lower level that is pre-cognitive is the part that actually controls those neural circuits, controls the learning process. But the learning process is deeply unconscious.

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You know, there is no reason learning and memory have to be conscious. They are just brain mechanisms to parse the feelings into space and time, into the real world that you're living in.

So Freud, I think, made the fundamental mistake of making the id unconscious, whereas these drives, homeostatic ones—these powerful internal brain feelings, emotional feelings, sensory feelings—they are built in as guides for living. And so the fundamental primary process I'm talking about has affective consciousness already and is monitored by rewarding and punishing effects of circuits. The next level is the unconscious. You know, there is no reason learning and memory have to be conscious. They are just brain mechanisms to parse the feelings into space and time, into the real world that you're living in. You have to identify those sensory rewards that support your body. You have to be able to identify the objects in the world that your SEEKING system should be devoted to; or the things that you have to avoid, things that create fear and panic.

So, you know, I think the original concept of the law of effect—that the behavior is generated as a general-purpose model for learning—should have been the law of affect. I think Thorndike's original words were affective words; namely, as something increases your positive feelings of comfort you will do more of it. If anything produces discomfort you will do less of it. So Thorndike actually had affective words, but the affect was thrown out as basically just verbal trash as opposed to biological reality. And I think they made such a dramatic mistake, which led the field of psychology without proper guidance for over a century. And you know, some emotion researchers tried to get it back on track, but they were not doing neuroscience, and I think it's the neuroscience that is really the most solid nail in the argument—that those systems actually mediate these rewards and punishments, which behaviorists used to control behavior. Remember they only have two made-up words for the whole level, which were *unconditioned stimuli* and *unconditioned responses*. In fact all of those things are experienced affectively, and they control learning.

So on top of that, there is a level of, you know, cognitive processes that are incredibly important, but we cannot study those very well in animals. And when we have such a massively enlarged cortical space for doing these, obviously we can have thoughts that other animals can't imagine. We are

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the most cognitive creature in the world. It doesn't mean the other creatures aren't cognitive also, but that is a mental landscape that one cannot do as rigorous neuroscience on as the basic emotional feelings and other affects. —That's a long answer!

Dr Dave: Well, that's a good answer, and it anticipates two questions I was going to ask you, you know, about the relationship between the…the old brain and the neocortex.

Jaak Panksepp: It's pretty clear that the top of the brain could do nothing at all without the bottom of the brain. The bottom of the brain can do a heck of a lot without the top of the brain. Now, a lot of people don't realize this, and may think the bottom of the brain is unconscious, deeply unconscious and implicit. Well it is not, at the affective level. That's where the affects actually emerge from, so there is a certain primitive form of consciousness, and that primitive form probably is absolutely essential for higher forms, and that idea is not yet common currency. It's not even being talked about in psychology and even consciousness studies.

Dr Dave: So it seems like the behaviorists were on the right track, in a way. I mean, they had zeroed in on reward systems but they were leaving out—if I understand you correctly—they were leaving out the experiential component, but for both, for both animals and humans.

Jaak Panksepp: They threw it away completely as nonsense, and if you look at their ontology you know the kind of knowledge they really wanted. They did not seek understanding; they sought behavioral control. They thought that was sufficient. Now, of course, wonderful experiments were done. Wonderful rigorous methodologies were done, but the organism was left out of the equation. And the ethologists spent a lot of time studying the natural behavior of the organism, but I think everyone should have recognized and explicitly said that to understand the organism, we have to understand the brain. The rest is description, surface description. Ethologists were not satisfied with a surface description, and neuroethology emerged fairly early in the neuroscience game. The behaviorists were in denial that one even had to understand the brain to understand behavior.

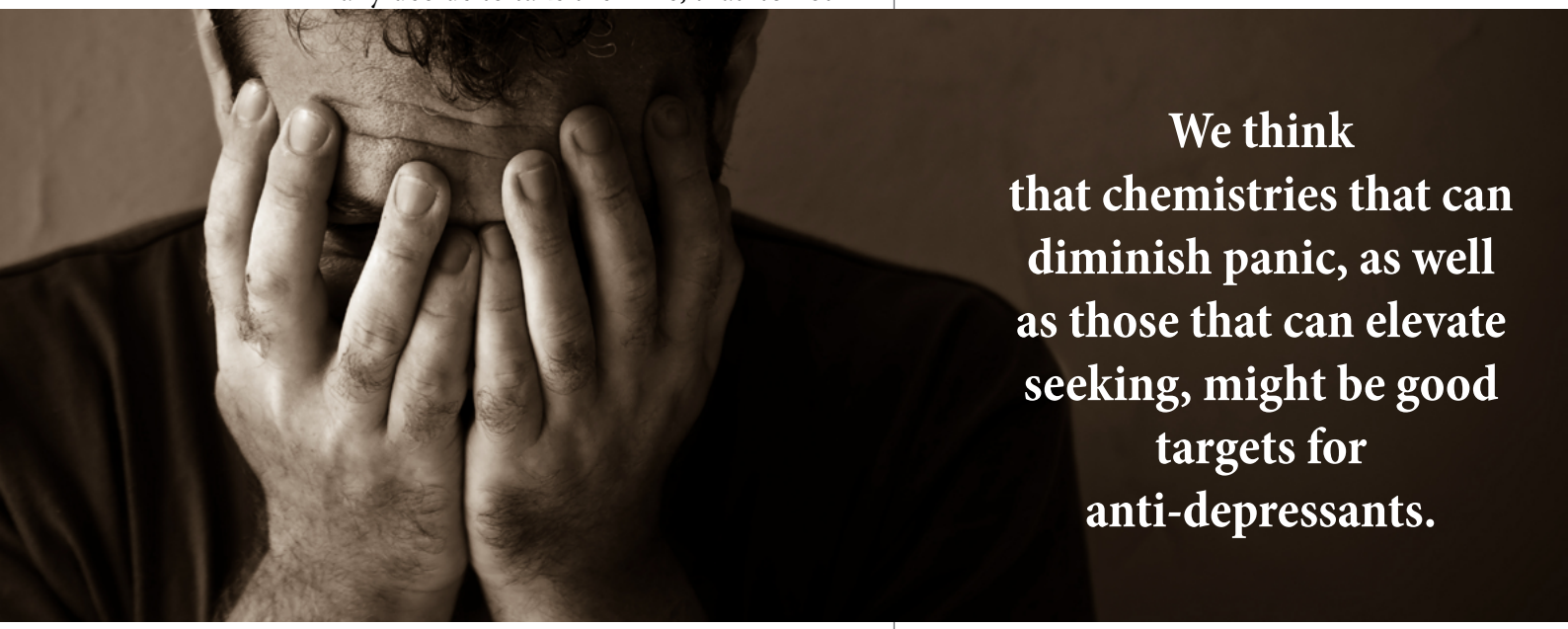
Dr Dave: Yeah, they…they said it was the "black box", and all you needed to study was input and output and it didn't matter what was going on in the black box.

Jaak Panksepp: That's a tragic view, but you know, these people are still guiding a lot of the powerful places within academic psychology, and they still carry their biases. They are more implicit now. Many of them are neuroscientists, but now they are saying only neural systems count. The psychology still does not count without the recognition that some of these neural systems generate psychological states, and that's a tragedy still.

Dr Dave: Well, that leads into my next question, which has to do with the implications of your work on the emotional circuitry of the brain for psychotherapy.

Jaak Panksepp: Well, that's a very, very large question, but it's easiest to address with the most emotional disorders, such as anxiety disorders. When a person comes in with generalized anxiety disorder or specific phobias, the thing that's bothering them is an internal psychological state that feels terrible. And if that terrible feeling can't be taken away, often they would not have the desire to see someone, a psychotherapist that can help them talk through things. Schizophrenia is more chaotic, you know, it's much more of a cognitive disorder. But the person gets isolated, and this isolation

leads them to lead very unsatisfactory emotional lives. We have panic attacks, and the only reason a person comes in is because all of a sudden the psychological bottom, the psychological floor, seems to drop out of them. And they are just in total insecurity. And that's one reason we think that insecurity is very similar to the insecurity a young animal feels when they are separated from mother or caretakers. We've got obsessive compulsive disorders. Often they are to regulate unusual feelings, that if you do certain behavior patterns the intensity of the feelings is diminished. And then the common cold of psychiatry is depression. The reason people come in is because they are so lacking in the desire to live. They don't have enthusiasm for life. They are not getting the pleasure out of life that they used to, and many decide to take their life, that it's not worth living. So that's the psychopathology that we've been working on more than any other, because it's the biggest one, and it connects up with our emotional systems very nicely.



We think that chemistries that can diminish panic, as well as those that can elevate seeking, might be good targets for anti-depressants.

We know that depression, the most… biggest cause of depression, is losing loved ones, losing social support. So we studied the separation distress or panic system, PANIC/GRIEF, and we think that that is one of the major entry points into this anhedonia, that lack of desire to live that characterizes very severe depression. And so we had a very simple theory about the main emotional source of it, and we know a lot about the chemistries—all derived from animal research. The human investigations are consistent with our findings. So when we said that the feeling of loneliness and grief is mediated by the neural circuitry of separation distress, people that have done PET imaging of human sadness find the same areas in the brain light up. And we think that too much activity in this system leads to a depletion of the seeking urge, which is the number one system for enthusiasm to live and do things. And we think that chemistries that can diminish panic, as well as those that can elevate seeking, might be good targets for anti-depressants. So that's the general way we've approached one psychiatric disorder.

Dr Dave: OK, now, as we think about disorders, there are sort of basically two ways to go. One would be the sort of bio-chemical medicine approach, and the other would be talk therapy. We know that talk therapy can impact the brain and change circuitry within the brain. I think there is some evidence for that, and on the biological side you've written that big pharma has slowed down their development of psychiatric drugs, and that those that they have, that they have been using, were developed as a result of fortuitous accidents rather than any kind of systematic planning, and you advocate for a different approach. Can you take us through that?

Jaak Panksepp: Yeah, I think it's pretty well recognized in the biological psychiatry community that something has gone wrong

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I think it's pretty well recognized in the biological psychiatry community that something has gone wrong in translating our basic knowledge about the brain into new mind medicines that might be useful for people with psychiatric disorders.

in translating our basic knowledge about the brain into new mind medicines that might be useful for people with psychiatric disorders. And you know, why has there been such a big failure? First of all, American companies almost uniformly have dropped their psychiatric drug development programs where you study animals as the foundational level of understanding. Europe is going the same direction but not so severely yet. So we do know that everything that we have that psychiatrists prescribe was literally discovered by chance, not by any systematic human knowledge. The molecules were refined and made cleaner and more specific once people discovered some of their main effects in the brain. So science has been very good at polishing up the molecules but not generating new concepts. And my personal bias is that this is because the behaviorist revolution, where, you know, people developed wonderful models of learning and memory, and you know, some of them were fear learning, and you had what commonly would be called emotional components—but they were never designed for psychiatric disorders. They were not even addressed to attack…or what I think is the most important question, which is, what is the nature of an emotional feeling? Because people come in with imbalanced emotional feelings, unregulated, not coordinating with their cognitive activities. So we have been now advocating a different perspective, that on the basis of science, we can claim that animals do have emotional feelings.

Now, the power is against us at this moment in time. For instance, Joe LeDoux wrote a paper this year in the journal *Neuron*, and he basically used me as the way you *shouldn't* go—he said we will never understand what animals feel. It's a categorical statement. The book is closed, and Panksepp trying to open it with anthropomorphism is silly. He took two pages to have an *ad hominem* attack on me without covering my data, and the attack was again the attack against anthropomorphism. And I wrote him a note promptly and said, you know, "Joe, I don't understand the *ad hominem* attack on me," and he wrote back and said, "It's not an *ad hominem* attack," and I said, "Of course it is; you haven't talked about my research, you've talked about me as being anthropomorphist, which I am not." I said, "What I have been doing all my career is zoomorphism. I have been trying to bring our animal past into our present understanding of psychological processes. I have been trying to bring our animal emotions back to the human species." And he chose not to respond to that.

But you know, it really is a tragedy. We share so many processes with other animals. Modern medicine has been based on studying animal bodies. The study of animal bodies has told us more about our own biochemistry than the study of human bodies. This doesn't mean they are exactly the same, but there are general principles to be discovered, and I believe this is the same for emotional feelings. Like, one reason I capitalize my emotional terms SEEKING, RAGE, FEAR, LUST, CARE, PANIC/GRIEF and PLAY is because I'm talking about an emotional circuit in the brain that can generate emotional behavior issues in deep brain stimulation. And that is rather miraculous. You're putting electrical garbage into the brain and coherence comes out. That means that the animal's brain has the coherence built in. And one might say you're only generating behavior, but we always evaluate whether the states are rewarding or punishing. And that is our access to the feeling. We would never say they are identical. You know, everyone that does evolutionary approaches realizes evolution's diversity. There are always differences among species, and

Jaak in his office with his zebra painting

(courtesy Jaak Panksepp)

we cannot study those differences very well, but I think the general principle is the same. And the general principle is that emotional circuits, these ancient powers of the brain, actually have feelings as indicated by different rewards and punishments. So that's the story, and I think psychiatry can use it more.Dr Dave: You have speculated that PLAY, one of the seven core emotions, may be important for the treatment of ADHD. Tell us a little about that.

Jaak Panksepp: Well, I mean it came to us through studying play, and not just a pure idea off the top of our heads. When we started analyzing the pharmacology that might modulate play, it turned out that all of the psychostimulants that we used to treat ADHD, you know—Ritalin, amphetamine in earlier days—they all reduce play. Even other psychostimulants, they do not activate the play urge. So that immediately suggests that we are taking play away from our kids by giving these medicines, and many parents complain that when they get on these medicines…find they are sitting still in school, but it looks like the child has been taken out of them. So, you know, they kind of just look out blankly through windows, and they are not the engaging, wonderful creatures that our children are in our lives. So then we started doing experimental studies. You know, not only do they reduce play but they sensitize the brain, and when you give these drugs to animals repeatedly, certain systems in the brain, especially the SEEKING system, seem to get more powerful. So I think psychologically one might say that instead of just wanting stuff they become very urgent to want stuff. So instead of saying, "I want it," you say, "I want it *now*," which is not a well regulated response. I've encouraged clinicians to evaluate this in humans for a dozen years—more, more than a dozen years. No one has yet tested that idea. It's very testable, since so many kids are getting into the medication pipeline, and others have had it for a long time. And we just have to evaluate whether the same dose has slightly different autonomic effects.

So it's easy to do, but it hasn't been done. But we did the following study: we know that when you do structural imaging of the brain, the ADHD brain is not dramatically abnormal in any way, but it's a little shorter in the frontal lobes, especially in the right frontal lobes. It's about five percent smaller. Now, that's statistically significant. So we took a bunch of regular rats and we took away the right frontal lobe or the left frontal lobe, and it turns out these animals are wild. They play like crazy, you know, they are out of control with their play urges. And if a child comes into class and is too playful, it's a problem for the teacher, right? So we simply asked, if we take these frontal lobe animals, deficit animals, and we allow half of them plenty of play and the other half no play, are they better regulated as young adults? And the answer was clear: if you have lots of play you are a more regulated young adult—less impulsive, which means that play helps the upper brain to mature. And then we did a lot of genetic work and, you know, looking at neuronal activation in the cortex. The whole cortex lights up during play. It turns on piles of genes. So are we, by giving anti-play drugs and, in a sense, marginalizing play as a necessary part of childhood—are we taking something valuable away from our kids? I think we are, and I have tried to open up a new conversation on those issues.

Dr Dave: Yeah, yeah that's a very interesting way into that conversation, and it's something that I've noted and mentioned on this series before, that kids' lives are so much more regimented than they were when I grew up. We had sort of vacant lots nearby and we would go away, and then we would play and throw dirt clods at each other, and play football and baseball and so on. And now most kids, for example, my grandkids, they really can't go out of the house on their own. The yard isn't big enough for them to go play in. The world is too dangerous to let them just roam like I roamed Los Angeles when I was growing up, on a bicycle, all over the place. Now kids are taken to ballet, taken to karate by their parents, etc. and it's a very regimented life, and maybe not one so full of play.

Jaak Panksepp: Yeah, I think, I think it needs a much wider conversation, and you know, I've been trying to advocate for a long time that for the real young kids we have to literally design playgrounds, play sanctuaries where they can really do it their way. You know, they probably will not have the flexibility that you and I had to roam as we wished, and you know, join up with your buddies for games of your own making. But by golly, kids love this stuff, and we have to have large spaces preserved for them and where they can play as they want. You know, maybe have a couple of youngsters, teenagers, sportspeople hanging around making sure that, you know, when things happen, that you can go in there and readjust the dynamics a little bit.

I mean, we had a play sanctuary project at Bowling Green when I was still there at Bowling Green State University, and after a year of negotiating, the school system allowed us to take a gymnasium in an old school administration building and retrofit it with wrestling mats and, you know, some sound systems. And pre-schoolers, kids before they get to kindergarten that have preschool classes, they could come. Parents could bring them in half an hour early, and they would have a play sanctuary to play as they pleased and of course we learned they loved it. And bad things happen too, and they were perfect moments to go in and resolve the conflict and give the reward of going back to play, which was the most important thing for them.

Dr Dave: Now, early on in my reading of your book, I found myself thinking that your work must have implications for PTSD. I found a whole section when I looked under the word "trauma", and I felt fairly traumatized myself just by reading it. In a very personal way, you share first of all a traumatic event of being scalded in early childhood, but then an even more harrowing account of cancers that both you and your wife endured, along with side effects and doctor-caused complications of various sorts. So first of all, I have to congratulate you on your courage and your will to live. I won't ask you to recount here that litany of traumatic experiences in your life. I was fascinated...

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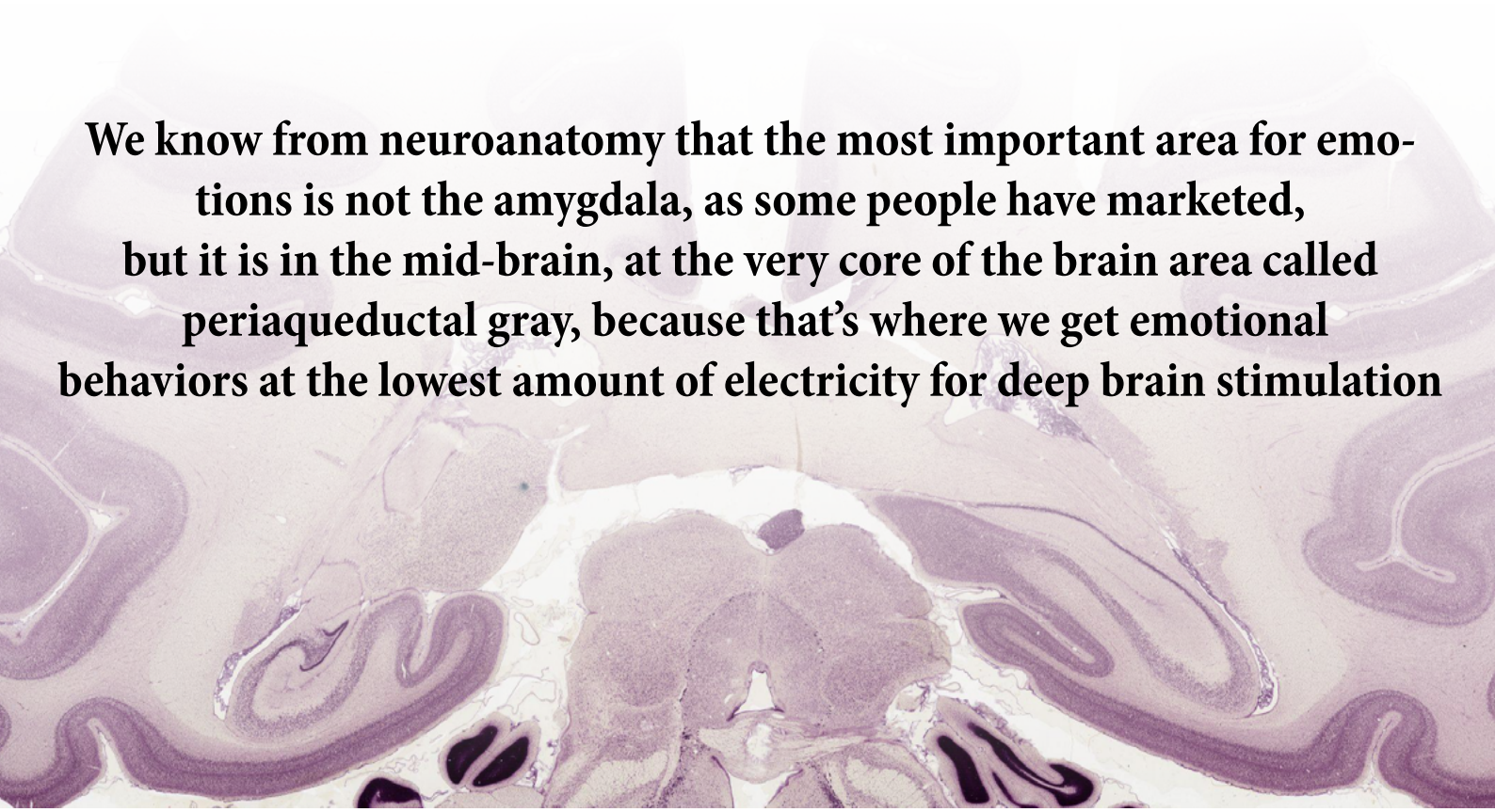
Jaak Panksepp: Thanks.

Dr Dave: I was fascinated to read about your experience of the EMDR therapy for trauma developed by Francine Shapiro, who it was my pleasure and privilege to interview several years ago as well. I've also been covering the work on memory reconsolidation, and was glad to read your discussion of that in the same section. So maybe you can say a little bit about your experience with EMDR and give us some of your "top of mind" thoughts about how it might work.

Jaak Panksepp: Sure, yeah, I think PTSD is something that can be very easily mod-

We know from neuroanatomy that the most important area for emotions is not the amygdala, as some people have marketed, but it is in the mid-brain, at the very core of the brain area called periaqueductal gray, because that's where we get emotional behaviors at the lowest amount of electricity for deep brain stimulation



eled in animals. Bob Adamec at Memorial University in Canada has done wonderful work on it. You know, you can even traumatize animals simply by stimulating the amygdala, for instance; then the animals become hyper-fearful. So there are plenty of animal models for it, but the human situation, you know, really that's been one of the most difficult disorders to deal with.

Now Francine Shapiro's discovery many years ago that, you know, these exploratory eye movements seem to be able to dampen the negative traumatic state that becomes chronic…no one knows how it works, and I certainly don't either, but when I was in the middle of this stem cell transplant and I had one iatrogenic thing after another, Sandra Paulsen and a couple of other clinicians in Seattle said, "Well, why don't you come by and, you know, we hear that you have ideas on PTSD, and you maybe have some ideas on EMDR that might work." Then Sandra essentially gave me the kind of sessions that she usually does, where she, you know, very skillfully brings up emotional material to the point where you are feeling it. So she basically had me feel fear and loneliness and, you know, hugely negative feelings, and she used a light bar which they sell now. Some people still tap the knees or, you know, move their fingers, but she used a light bar, and once I said I was feeling emotion she turned the light bar on back and forth, and my eyes would follow the lights. And lo and behold, as soon as I started moving my eyes, the emotion just melted away. The feeling melted away, and we said, "Oh, let's do it again!" and we did it with every emotion, and the same thing happened to me, so…this is me-search, not research, but I had been advocating, you know, that some clinicians who really wanted a really fine and simple experiment, they should document that little bit of me-search.

And the way I kind of see it happening is, we know from neuroanatomy that the most important area for emotions is not the amygdala, as some people have marketed, but it is in the mid-brain, at the very core of the brain area called periaqueductal gray, because that's where we get emotional behaviors at the lowest amount of electricity for deep brain stimulation. The same follows for the rewarding and punishing effects, and right above it you have superior colliculus that harvest visual information. So this superior colliculus is part of the four twins, corpora quadrigemina. The top two superior ones are for vision. The two bottom ones, inferior ones, are for audition, which means audition is more ancient than vision in brain evolution, by the way. You can read these passages of evolution if you really understand the brain, but the supe-

rior colliculus, the top layer on the surface, is for vision. The next layer gets auditory information. The next layer below gets touch information, and now you're almost to the PAG [periaqueductal gray] where the emotions are organized. But between those sensory layers and the PAG you've got a cell layer that controls exploratory eye movements. And those cells can control things above as well as things below, so one can imagine that eye movements are able to inhibit the PAG, which is the most powerful source of emotionality in the brain.

So that's the neuroscience point of view, and the more, kind of theoretical psychological point of view is that every human being knows that when they are in an emotional state, their upper brain, as Freud said, the secondary process, our complex thoughts, don't work very well. And at the same time, when we're really engaged and, you know, reading a novel, our higher part of the brain is really engaged; we cannot feel emotions as intensely as we would otherwise. And there's a pile of brain imaging indicating that the higher cognitive brain and the lower emotional brain are in see-saw balance, that when one is very active, the other is inhibited. So I see the exploratory eye movements of EMDR as shifting you from an internal state, which PTSD is, into an external world-oriented state, and that means that you're inhibiting the primitive emotions. So that's a testable theory, and you know I don't know whether it's right or wrong until someone tests it.

Dr Dave: I wanted to ask you about your relationship to, or the relationship of your work to that of depth psychotherapy, because for example I know you've done some work with Mark Solms, who I had the privilege of interviewing about neuropsychoanalysis, and I think you've gotten some awards kind of in that area, that you're co-author of this book is a, I guess is a Freudian psychoanalyst. Yeah, so, say a little bit about your relationship to neuropsychoanalysis.

Jaak Panksepp: Well, I think the relationship started by people at the New York Psychoanalytic Society becoming enthusiastic about affective neuroscience when it first came out. I would say psychoanalysts were the first group of clinicians and scholars that really found this very useful. And it is a description of a data-based neuroscience-based vision of our primary emotional lives. Now, they are working with the secondary process as they say, usually, as opposed to the primary process, but they know that the primary process is controlling a lot of your thinking. So they invited me to lectures there and eventually asked me to do an extended series of workshops which lasted for about six years. So I was delighted, since, you know, I had originally wanted to be a clinician, and my work has been inspired by clinical issues.

So I find that psychoanalysis is now in a transitional phase. They have always been the people that have stood up for understanding the mental depth of human beings, and they seem to be quite receptive that the mental depth of human beings is linked integrally to the primitive emotions that all mammals share. So it's been really a delightful relationship, and I think they even appreciate the kind of medicinal development that we are pursuing, 'cause we're pursuing our animal models, namely pre-clinical models, with an eye to actually modeling the feeling state which can be done, for instance, our happy calls that occurred during play that we can control with tickling.

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We actually have a cycle assay for positive social feelings, and, you know, this is one of the ideas we've shared therapeutically that links up with a reconsolidation hypothesis that is very hot, and many, many people are seeing reconsolidation as one of the keys to psychotherapy. Of course, reconsolidation is that a memory is not for ever and ever like Mount Everest. It is a dynamic thing, and every time you bring memories back, as in psychoanalysis, you probably do better than any other

"Jaak, why don't you start an affective medicinal development program." And we focused on finding new anti-depressants by how they facilitated happy chirping sounds in rats. And we tracked down molecules using genetic approaches, micro rays and other siRNA silencing certain genes, and lo and behold, we identified molecules that can increase chirping.

psychotherapy. Of course, you have rapid emotional dynamic therapies that are fast forms, where you bring the emotional material up. And by bringing it up, when it goes back into the memory store it carries the most recent feelings along with it. And our argument has been, well, at those moments of transition, it is wise for the therapist to find a positive affect. You know, we've done it in rats by tickling them, but we're not suggesting that, you know, clinicians tickle their patients. We can't tell, you know, lewd jokes or anything like that. But I think if you find moments of human relatedness where you share a perspective, where you see life in a humorous way…so, you know, we suspect that if a clinician is able to bring those moments to the forefront with a very reflected deep human eye, where both people have an insight—and that's what jokes are all about: you have an insight and you have shared laughter—then that awful memory is not going to be as awful in the future.

And we'd use this same concept for developing medicinals. Namely, we're looking for molecules that facilitate these happy chirps, and we've succeeded using powerful modern technologies. So when I retired from Bowling Green, an old colleague invited me to join their drug development group in Northwestern. So Joe Moskal and his group at Falk Center for Molecular Therapeutics said, "Jaak, why don't you start an affective medicinal development program." And we focused on finding new anti-depressants by how they facilitated happy chirping sounds in rats. And we tracked down molecules using genetic approaches, micro rays and other siRNA silencing certain genes, and lo and behold, we identified molecules that can increase chirping. And one of these has now actually gone through all the pre-clinical toxicology, and it recently went through stage two human testing, approved by the Food and Drug Administration. So, and it looks like it's really a fine anti-depressant that works rapidly, and, you know, it seemed to have a week-long therapeutic effect.

So, well, the bottom line for us is that we have to take the animal emotions seriously as excellent models for our own human emotions, not only behaviors and learning and memory, but also the actual feeling components. We can finally understand that level of complexity, but we have to shed at least a century of thinking in other ways—and that's a hard job.

Dr Dave: Well, that is a great wrap-up, a great place for us to close off here, although it would be easy to keep going on. So Dr Jaak Panksepp, thanks for being my guest today on Shrink Rap Radio.

Jaak Panksepp: Thanks, Dave.

This interview is an adaptation from the Shrink Rap Radio show #329, "Emotional Foundation of Mind with Jaak Panksepp, PhD", as interviewed by David Van Nuys, Ph.D., aka "Dr. Dave".
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