

## SCIENCE OF THE NOOSPHERE

**Lesley Newson and Peter Richerson**

**With**

**David Sloan Wilson**

**David Sloan Wilson:** Hello, this is David Sloan Wilson, and I'm so happy to be with my good friends and colleagues, Lesley Newson and Pete Richerson. Hello, Lesley and Pete.

**Peter Richerson:** Hello, David.

**DSW:** And we are here to talk about your new book, "A Story of Us." There it is, a new look at human evolution, and so, such a great topic. And I want to begin by asking you, of course, so many books are coming out on this topic. We go all the way back to when you were pioneering the study of cultural evolution with Robert Boyd in the 1970s, I was with you then, at the University of California in Davis. We've come such a long way. There's now many books out on human cultural evolution, but yours is very distinctive, and I think that's due in part to Lesley's influence. And so I'd like to hear from you, what is it in your own minds that sets your book apart from the many other fine books that are coming out on human evolution?

**PR:** So it seems to me that there are two things that are distinctive about our book. The first is that we really do emphasize the fundamental role of cultural evolution in human evolution. Most of the human evolution stories are really stories of the genetic evolution of humans, and to my way of thinking, to Lesley's way of thinking, and to the way of thinking of many of our colleagues in the field of cultural evolution, cultural evolution is much more fundamental than that, and, so we think that gene-culture coevolution, culture driven gene-culture coevolution, is responsible for many of the features of humans. So, most human adaptations are fundamentally cultural adaptations, not genetic adaptations. So the whole of human biology and life history is organized around exploiting the advantages of culture. So, for example, our large scale societies are important in cultural evolution because the better people are connected, the more cultural innovations can be passed around from one person to another. So we're really dependent upon having a large social network to support the kind of fancy culture that we have.

If we take that kind of a position, then the basic tools that evolutionary biologists develop to understand evolution aren't really sufficient. So for example, cultural evolution includes the inheritance of acquired variation. The modern synthesis biologists were keen to get rid of the whole idea of inheritance of acquired variation. It really is a kind of a fundamentally different way of looking at human evolution. The other feature of it, of our book, that Lesley can speak to more than myself, is that we're really trying to appeal to people outside of academia. And one part of that is that we tell these fictional stories as part of each of the substantive chapters in the book.

In other words, we tell a little story about what life was like as an Australopithecine, for example, or what it might've been like. And the book is called "A Story of Us," rather than "The Story of Us," because the historical record, the paleo-anthropological record is really pretty depauperate. You can't tell a connected up story based upon the hard scientific evidence. If you're going to tell a connected up story about how people live, you're going to have to engage in a certain amount of science fiction. There just isn't enough evidence to really tell us exactly how people lived in the past.

**Lesley Newson:** And at least we're honest about it, to sense that we don't want to preach-

**DSW:** I was very sternly lectured by Lesley when I said "The Story of Us" on Twitter, and in no time it was "ahem, 'A Story of Us,' David."

**LN:** Yeah, well it's arrogant to think you're going to give the last word on anything in science, right?

**PR:** So the young paleontologist at the University of Arizona, Charles Perreault, has written a whole book about why the archaeological and paleoanthropological record is too skimpy to tell a completely connected up story about how people lived. The same thing is true, actually, with the historical record. Several years ago, Joe Henrich, and with a certain amount of assistance from Rob and I, published this paper on monogamy. And one of the ancillary things that Rob did was organize a little symposium at the Santa Fe Institute, and invited some historians concerned with ancient societies, and the question was, what were the actual marriage patterns of Romans and other classical civilizations? And the answer, is we have a few anecdotes from the elite, what the elite classical authors wrote down about...for example, the scandalous behavior of some of their colleagues with their concubines and slaves, but we have no idea even whether that really characterized all Romans or whether it was the exception, and when it comes to the marriage patterns of the non-elite, we know practically nothing. So, even the historical record is really lacking in lots of details that would be necessary to tell a complete story about even life in ancient Rome.

**LN:** Can I come in now and say that it isn't just lack of information that leaves stuff out of stories. It's also lack of thought about what must have gone on. Because we're all in our own little world, right? We live in a modern society and we can't help imagining that whatever happened in the past was a bit like today. And yet a moment's more thought makes us realize that it wasn't like today. And so there's a lot of really good room for speculation. And one of the things that I really wanted to bring to the book was that there must have been women involved in evolution. You know that Sarah Hrdy started preaching about that a long time ago, that women, if anything, must've played the major role in evolution, because what evolution is all about bringing up children. And that was what women did.

And so, if you started thinking about the problems that the females had bringing up children and staying alive themselves, you just bring a much richer story. You create a much richer story. And yes, it is a bit creative, speculative, but we understand reproductive biology. We know what kind of roughly went on. And, that's what I wanted our stories to do it. I wanted to create stories that would make people think about the problems our ancestors faced at different stages in their evolution. And then once they read that story and kind of got washed over with a feeling of what it was like to live 3 million years ago, 7 million years ago, a hundred thousand years ago, then hit them with the evidence. Because by this time they're going, "why do they say that? Why do they say that?" And then hit them with the evidence for it. And because I think that will be a more interesting, realistic way of going about telling the story. But of course, you have to be really interested in it. You have to be obsessed with evolution, really, to want to know what happened in the past. We tried to feed that obsession.

**DSW:** We've said a lot already, but I think that on multiple stories, I think, that's true just in the present without worrying about history or different cultures, even within our own cultures at this moment, there's multiple stories. That's in part, because stories are not just renderings of facts, stories are much more than that. They're tools and world views and all of that. And then as you add history and other cultures, it becomes even more complicated, more speculative, more partial, therefore, room for still more stories. Then there's that. And I think that also, Lesley, the perspective, we all have to say that, of course right now, male domination, and all of their forms is on everyone's mind, and that goes to the science. And so the idea that the human evolutionary stories is not just about what men did, it's the women and children, and the whole thing is another thing, which I think is certainly very distinctive about this book in comparison to other books.

Yes, we have Sarah, we have others and so on, but I think this is a big bias to correct. And then the style of the book, that you begin with the story, and then you say, here's the facts that caused us to make this

story. So you separate the story from the best of our knowledge, which is in the first place, makes it very readable, and then second place, it's great that you can just kind of involve the reader in that partitioning. But there's still something else which is distinctive about your book, which is that it starts a lot farther back than a lot of books. And I was really fascinated that you push the history back to our ape ancestors while they were still forest apes, and then our ancestors, as they moved out into the savanna. And I'd just like to hear from you, why was it that you felt the need to start that far back? I really appreciated that you did, but why was it that you felt that need to start so far back? Lesley, why don't you go first? And then Pete.

**LN:** My feeling is that people who are interested in evolution, but not really trained in it, often look to chimpanzees or bonobos or whatever and say, "well, they do it like this, so maybe that's what humans do too." And they can't help but look to what chimpanzees do. And there are scholars who encourage them in that, they go, "all the way back to chimpanzees, we were already committing murder." And, I mean, yeah, okay, but if you're going to have that kind of talk, you want it to be supported by some kind of real understanding. And we have no idea if our ancestors 7 million years ago were going around and murdering other people, but we do know that they were having babies. And we do know that they were apes, and we know enough about apes and how our shared ape biology is, that we know it must have been really, really hard for those females, raising those little apes on their own.

And not just keeping them alive and feeding them, but also allowing them to learn all the things that they would need. Because we know that the reason why apes have this quite big brain compared to other mammals, is that they have to learn the intricate environment they live in and how to exploit it. And that's what baby apes get from their mothers, along with so much protection, and so much food, everything like that. It's all about women. It's all about female apes. And so we wanted to start there and then talk about the stages, which gradually introduced males into the really important job of producing the next generation, which I think happened maybe 2 million years ago. Okay, over to you, Pete, when do you think we got males involved in reproduction? Other than the few seconds it takes to conceive a baby?

**PR:** Well, hard to know exactly when males got involved, but we certainly know by the time we get to the ethnographic hunter-gatherers, that we know from the work of anthropologists, that males became extremely important because we do have these very expensive kids to raise, and without help from other women and from men, mothers just can't raise so many offspring.

**LN:** I just want to say that we need to explain why our kids are so expensive. It's not just because they need toys, and want clothes, it's because they have these enormous brains that have to grow and require so much energy, and so many nutrients to get big enough.

**PR:** Human babies compared to other ape babies are much more helpless and require much more time and investment on the part of mothers to just take care of them until they're at least toddlers are just an enormous burden on the labor of mothers. And so mothers can't go out and forage enough to keep their babies alive. They have to be assisted by what are called allomothers. People who help them, including males, work hard. So one of the great transitions from apes to humans is that males get put to work. In most mammal species, males, all they do is fight amongst themselves for access to females. In terms of contribution to the raising of the next generation, aside from their genes, they're worthless. And somehow in a few species, humans being a conspicuous example, males actually do something useful to help women with the material aspects of raising kids. They don't contribute just their genes. They contributed a ton of calories to the rearing of offspring.

**LN:** Protection too, protection as well.

**PR:** Yeah, physical protection from other males that might molest them and so on, from predatory animals.

**DSW:** This is a point I want to establish with all of us, that I think many readers or many listeners don't really know, and it's quite disturbing to focus on. It is how many animal societies, including primate societies, are despotic in human terms. They're not highly cooperative, and part of that despotism comes from males, but it also comes from females. So there's societies in which the females are highly hierarchical. And they're not all cooperating with each other. There's primate societies in which, actually, a female is pretty much on her own, or maybe with her just immediate kin, raising her offspring, was really threatened by other female lineages, and so on. So they stay together as groups, they're social. Often they're social because to be solitary would be a certain death warrant, but nevertheless, they're not societies that we would want to live in.

We would classify them among the most despotic of human societies. And that even goes for chimps to a large extent. Richard Wrangham is a person who does that, and also Joan Silk, Rob Boyd's wife, has done great work on that, showing that when you do behavioral economics experiments with chimpanzees, in which they get to choose between a reward for them compared to the same reward for them, plus a reward for another chimp, they're indifferent. By that measure, they just don't care. And so, that's one of our closest relatives, a different story needs to be told for bonobos, but something happened in human evolution, which resulted, basically, in a quantum jump of cooperation, including both females and males, that we need to understand. And I think that another thing I love about your book, and let me just take a little more in general terms, that we know theoretically, that cooperation can be promoted in two ways.

One is social control, so that cheating behaviors are punished, to put it briefly. And the other is environmental circumstances, where the environment really requires more cooperation. So, people cooperate more in an emergency situation than during everyday life, the environment demands it. And I think that if I understand your book correctly, and what you showcase as you move through time, is moving out into the savanna ecologically sort of shifted things to make cooperation much more important than before. In the forest, then, females, the act of foraging and stuff like that just did not require a lot of cooperation, but it surely did on the savanna. And if you could elaborate on that theme, first of all, I want to know, did I get it right? And then, for you to tell the story since you're the storytellers. So, if you could dwell on just the environmental demands for cooperation for our ancestors when they moved out into the open environments.

**LN:** So, can I tell you the origin of my obsession with the idea of leaving the rainforest and going into the savanna. It goes back to when I was breastfeeding my daughter. So, you guys probably have never breastfed anybody, so you don't realize that at the moment, when the baby latches onto your nipple, you are just overwhelmed with this incredibly powerful desire for something to drink. And it's all got to do with vasopressin, and it turns out that there's really good reason for this. Why there's this instant trigger of, "oh my gosh, I need a glass of water. I need a cup of tea. I need something to drink," but it makes sense because humans produce very watery milk. And as soon as this baby latches onto your nipple, you're pouring liquid into that creature, and losing it from your own body. You can't do that in the middle of a desert, unless you've got somebody or some source of water handy.

And I kept obsessing about that because how could you just move out into the dry heterogeneous savanna, if you didn't have some way of dealing with that. And I'm assuming that Australopithecines didn't have vessels full of water that they could carry around with them. And so this is when I thought that there must've been some kind of daycare or some kind of caring so that babies could be kept near the water.

And so the mothers could be near water when they fed them. And they didn't even necessarily need to be feeding their own water. But, you can't be a half a kilometer away from the source of water if you're breastfeeding your baby. And so it grew out of that. And it grew out of this, that that had to be a story

that needs to be told. Because poor men, you've never had that experience of breastfeeding. So, you need to be informed of what it feels like.

So, then it seemed to me that it was essential. Women could not travel more than half a kilometer away from a river with their baby. They had to leave their baby. So, human babies, you can't just tuck them into little holes, like you can with some babies, they're really active little things. So the best way to do it is to leave it with another mother. And maybe your sister, maybe your own mother, maybe an aunt. And that, I think, is a reasonable story we can tell about what happened with the move into the savanna. So yes, cooperation between women, not sure what men were doing.

**DSW:** Well, it goes on, Peter, maybe you could fill in the male perspective here, but in terms of foraging, or the kind of food that was being eaten. Of course, defense, to chase off, you know, throwing projectiles. So, speak up for our sex, Peter.

**PR:** Well, an alternate story you could tell is that, maybe both are true, is that out there on the savanna, australopithecines would be terribly exposed to predation. They can't run very fast compared to quadrupeds. So how did we not just fall prey to hyenas and leopards and lions and other such creatures? We know that big cats preyed on australopithecines. So, it's certainly a plausible story that at least one hazard of living in the savanna was a predation. Now, one thing that australopithecines, because they were bipedal could do, would be to carry sticks and stones, and you can imagine a mob of stick and stone carrying australopithecine males, a little bit bigger than females, so a little bit meaner and tougher, traveling around on the savanna and even big cats might be deterred from attacking a mob of stone-throwing stick-wielding australopithecines.

**DSW:** And Paul Bingham has developed that concept of basically stone-throwing as one of the important adaptations, which then fed into social control. But, there could be an anatomical trace for that because the ability to throw stones with high velocity, which is really one of the signature human adaptations compared to any other primate, that's a whole body kind of an adaptation. And it should be, if you know what to look for, it should be reflected in the anatomy.

**PR:** So to follow up on your ecological hypothesis, another thing to consider is that cooperation is really, as we've already mentioned, heavily under-supplied by nature. Because it's very difficult given, for example, selection based upon inclusive fitness, to get large groups of cooperating individuals together in animals like mammals.

And so the ability to cooperate on a large scale, means that there are lots of niches that humans can get into that other animals can't. One example is our tool-making abilities. If it takes a large group of people to exchange information, to build a large repertoire of tools and to maintain fancy tools against sort of mutational attack, then there's a whole series of niches that are open to people that aren't open to other animals. And one of these is extractive resources.

So Kim Hill and colleagues have argued that the human diet is largely based upon resources that require tools to exploit, that require cooking. Or opening packages of seeds that are defended by very hard shells. And so it takes pounding with stones or something like that to open them, fermentation. So we have a whole bunch of techniques for transforming crummy food into food that we can eat. Of course, we require a really high quality of food by comparison to other apes, even much less specialized herbivores. But we can go after packages of food that other animals can't, because we essentially have a cooperative system for maintaining fancy culture.

**DSW:** You're mansplaining, Pete, you're mansplaining. Lesley wants to talk.

**PR:** Well, that's fair. We got to get our word in here. Women use tools, too. It's not like there's a gender difference in the use of tools. I wouldn't say.

**LN:** Right, but I want to talk about social tools. Because one of the things, this phrase that I heard and I immediately thought what a great phrase to describe what humans have is social tools. And so these are tools that we can use to help us work together in some ways. And even though despotism is terrible, it can actually be seen as a social tool, inasmuch as if you have a hierarchy, at least it keeps down the fighting. I mean, if everybody knows that Joe—you can never, ever win with Joe because he'll always win, because he can beat you up. That's a useful piece of knowledge. That's a social tool. It's a pretty nasty social tool, but it's what chimps use.

**DSW:** It's one step up from anarchism, but keep going.

**LN:** Right, yeah. I mean, I reckon, again, I'm thinking from the woman's perspective, is that a really important social tool was learning to teach your children not to beat up on one another. Because one of the things about this place, we're imagining where the babies are kept and the toddlers are kept safe near water, there's going to be a lot of kids. And you don't want the big kids to beat up on the little kids because it's damaging your own fitness to have the older kids beating up on the younger kids. So what do you do? You invent the social tool of preventing bullying by punishing it. So you say you've got to learn not to hurt your brother. You've got to learn not to steal from your brother. You've got to learn. And kids that couldn't learn that, they had to go. I mean, you can't have an unteachable bully in a group. They had to go. And that meant they couldn't survive.

So I think that the social tool of parenting and making decisions about which kids to keep and which kids to pack off was the one that selected genes for youngsters who could learn and learn that they shouldn't bully and learn how to control anger and greed. And so many of the other emotions, which are potentially very damaging for cooperation.

**DSW:** Yeah. I think you're providing a parental context for a thesis which has been developed in the context of male interactions, whereby Christopher Boehm, Paul Bingham, Richard Wrangham of the need basically to control bullying. And then, you're basically stressing the same need among children and the role of mothers or other alloparents in doing that.

And I wanted to quote from a book I'm reading now by Tyson Yunkaporta, who is an Australian Aborigine, who has written a book called *Sand Talk: How Indigenous Thinking Can Save the World*. So this is an indigenous person, although one who is very familiar with modern life, as well, you could call him a cultural hybrid, is explaining indigenous thinking to us Westerners. And he has a wonderful passage here in which he is describing the emu and how it figures in Aborigine folklore.

And he says emu was a troublemaker who brings into being the most destructive idea in existence. I am greater than you. You are less than me. This is the source of all human misery. Aboriginal society was designed over thousands of years to deal with this problem. Some people are just idiots and everyone has a bit of idiot in them from time to time, coming from some deep place inside which whispers you are special, you are greater than other people and things, you are more important than everything and everyone, all things and people exist to serve you. This behavior needs massive checks and balances to contain the damage it can do.

And so I think this is such a wonderful affirmation of what we have come to as scientists. I think we have correctly intuited this need for social control in all phases of life. Women, children, men. Always there will be this impulse for self-serving behavior, which needs to be controlled in addition to whatever the environmental forces favoring cooperation, no matter how strong those environmental forces are, there will be cheating strategies. And so that's, for me, so important. And if you could both just kind of speak to that theme in any context. Men, women, children, any context.

**PR:** My way of thinking about it is that emu, and chimpanzees, and many other species of social animals, their societies are structured by dominance hierarchies. And dominance hierarchies have exactly that vice that your author describes. So it seems to me that the human analog of an individual that seeks

dominance are human psychopaths. So psychopathic people believe just as your emu does in your Aboriginal story, that everything revolves around them. They seek to exploit and dominate others in a very selfish way. Human societies are also structured by prestige. Many years ago, Joe Henrich and Francisco Gil-White wrote a paper about how human societies have these two sources of leadership, if you want. One based upon prestige and one based upon dominance.

So to get a prestige-based system, the leaders are prosocial, because their status comes from voluntary grants of recognition of their leadership role by their followers. Dominance comes from the use of force or the threat of force to work your will. So in humans, the frequency of psychopaths amongst males is something like 2% or 3%. It's presumably, as your Aboriginal person suggests, it's a continuum. We've all got a little bit of the psychopath in us, but the clinical cut point would suggest that maybe 2% or 3% of human males and about half that percentage of females are psychopathic. So in the course of the evolution of us from our ancestral apes, we've reduced the frequency of psychopathy from something like a hundred percent to something like 3%. And psychopaths, at 3%, are still a big problem. I mean, our jails are full of them and our boardrooms are full of them and they cause a lot of trouble. But human life is only possible because we've squeezed down the frequency of psychopathy to a few percent.

**DSW:** Richard Wrangham elaborates on that theme in his Goodness Paradox book and his other books. Lesley?

**LN:** I'm just thinking about, if throughout our evolutionary history, humans have grown up in a situation in which they have expected control. In a way, could it be true that they have to have that little spark of selfishness or else they could be completely vanquished? I mean, I think that with so much, there's a bell curve for continuum. And on the one side are the psychopaths and on the other side are people who are just sort of so selfless, it's hard for them to survive. And, maybe there's a huge role for the social environment, especially with young children to actually play down the psychopathic aspects of our personality and play up the cooperative aspects of our psychology and in ways that we haven't really explored enough because people haven't taken this evolutionary understanding of the environment in which humans evolve.

**PR:** I think that the problem with humans is that we can't, at least so far, haven't figured out any way to be like social insects. And so to create workers, if you want, that don't reproduce at all. So for humans to survive, all of us, or pretty much all of us, have to engage in reproductive behavior. And the ordinary rules of genetics apply to the inheritance of genes. So we have to look after our own reproduction.

Nobody is going to just let us reproduce if we can't compete in the marriage market, for example. So that means that the sort of perfection of humans, along the lines of a social insect colony, where the workers are completely selfless, that pathway is not in any obvious way open to us. So that humans are always going to be sort of a balance between enough selfishness to compete in the marriage market and enough altruism to participate in all of these cooperative things that humans do. And, to my way of thinking, we're in any obvious way of perfectible, in terms of cooperation. There's an irreducible element of selfishness that we inherited from our ape ancestors, but there's-

**LN:** No, I don't think we just inherited it. I think it had to be maintained throughout the whole thing.

**PR:** Yeah.

**LN:** That's what you're saying.

**PR:** Exactly.

**DSW:** So I think that this is the distinction between so-called fraternal versus, what is it? Egalitarian and... What's the two terms that are used for major transitions? What are they? Alan? Egalitarian and fraternal. Two paths to cooperation. And social insects, by virtue of their genetic relatedness, are... Why

they call them fraternal, I don't know. Sororal would be the other would be the more apt term. Whereas, if you're not genetically related, basically fairness and democracy is called for.

It's like basically equal opportunity. And so that's the form that human cooperation must take. It requires being assertive. And so when we talk about selfishness, if the form of selfishness says, you can't push me around, you can't bully me. We're going to do what we decided to do. I mean, so basically there's an individualistic element to that, but there's also a communal element to that.

Another model for that is the rules of meiosis. There are rules that dictate that every chromosome has an equal chance of getting into the next generation. That's fraternal. I mean, excuse me, that's egalitarian, not fraternal. But I think that that can be perfected. So I think that human cooperation is not intrinsically flawed for that reason. In principle, it could be so highly fraternal that it ends up being ultra-social and so on. So I want to segue to kind of the cognitive dimension...

**LN:** Before we move on, can I just say, isn't that what we need social tools for? I mean, it's going to be a cultural solution and we're going to have to develop, in our culture, tools so that we can look at the rough material that our genes provide us with and teach us how to be cooperative and yet maintain our autonomy, if that makes sense.

**DSW:** The entire concept of morality hinges on this. The whole nature of moral systems, with its obligatory dimension and its voluntary dimension, hinges upon this. If that's what you mean as social tools, then that's absolutely right. Moral systems is like the system that evolved in order for this to take place basically is the way I would put it. Pete, please.

**PR:** So social scientists use the term institutions. So they argue that human societies are bound by more or less formal rules of morality, if you want to put it that way. And that is one of the distinctive features of our use of culture, to organize our social systems. As far as I know, there's only the most rudimentary and controversial examples of institutions in the societies of other organisms.

**DSW:** Yeah. So we've already segued in the direction I want to go, which is the mental cognitive component of all of this. How did this reflect itself, manifest itself as our distinctive human cognition? And, just to put my own view on for you to comment upon, I often refer to it as the cooperation came first hypothesis. First, we became very cooperative and then that cooperation took on both physical and mental forms, but just about everything that's mentally distinctive about our species is a form of cooperation. So cooperation came first, and then a distinctive and a distinctively cooperative form of mentality emerged. Of course, that includes the capacity for symbolic thought and language as one kind of symbolic thought. So, as you talk about your own understanding of this, please comment on the cooperation came first hypothesis. Lesley, why don't you go first, and then Pete?

**LN:** Well, I think that as soon as people started raising children together, that was a huge step on the road to cooperation, right? You passed on your genes to your child, to your own genetic child, but there were other children, too, that you were giving everything that was necessary for them to become an adult. I mean, what could be more cooperative than that? And, yeah, I think absolutely, it came first.

A good question is though, meerkats are really, really cooperative. How come they're not like us in other regards? And I guess it's because they're not cultural, not as cultural, not as capable of having complex culture that can shoot them forward. So yeah, I think cooperation came first, but something else came after.

**DSW:** Yeah. Well, the capacity for culture. So Peter, go ahead and carry the baton here.

**PR:** Well, I'm a heretic in this discussion, I guess. So I think that the changes in the brain are largely, in terms of cooperation, are largely emotional, not cognitive, if that is a proper distinction. The neurobiologist, Cecilia Hayes, I don't know if you know her work, David. She argues that cognition is built by experience and by culture. That the neocortex, to make a crude story about it, is culturally

constructed. There's no genes involved. But then, the mechanism by which it is constructed has a lot to do with reinforcement, and reinforcement is generated by the emotional circuits. So a neurobiologist by the name of Jak Panksepp had this idea that there are, I think he described about six or seven, emotional circuits that are highly conserved in mammals and can be investigated in things like rats. And humans have the same basic emotional structure as rats.

Now, the differences are twofold. One is that evolution can modulate these emotion centers and the most conspicuous modulation of the emotional centers—in humans, compared to most other mammals—is that we're really tame. We're really not nearly as aggressive as most other mammals.

**DSW:** This is the self-domestication hypothesis.

**PR:** This is closely related to the self-domestication hypothesis. Exactly. Rob and I called it a different thing. We called it the social emotions, so modulation of the social emotions. This goes back to Darwin's idea that humans had these emotions like empathy and patriotism that were much stronger than other animals, so we could develop these tribal-scale social systems. And then the other biological differences that we have this huge cortex that is built, in developmental time, by learning and social learning. This is an idea that goes back, as far as my reading goes, to Gerald Edelman, who wrote a book on, he called it neural Darwinism back in the mid-eighties. He was a kind of a friend of mine, or a patron of mine I guess would be more accurate. And so he had this idea that there just aren't anywhere near enough genes to specify in detail how the cortex works. At best, genes can form a rough anatomical map. And then all of the actual circuitry has to be generated by these developmental processes. If this is true, the cognitive revolution was barking up the wrong tree. At least in terms of the direction evolutionary psychologists talk about. They were looking under the wrong rock. It's the emotional side of cognition, or the emotional side of the brain, that was modified genetically, and of course the size of the cortex.

**LN:** Can I just say something else, about the emotional side, as well as humans being so tame, is our incredible ability to bond with almost anything. Chimps, there's this really strong bond between mothers and infants. In some organisms, there's also a really strong bond between mated pairs. In humans, strong bonds pop up on a long distance airplane journey. We can be bonded with our phone. We're just really promiscuous bonders. If bonding is an emotion, or involves a lot of emotions, that's really important for us.

**DSW:** Absolutely. To emphasize these points, I don't think forecloses other points. There's a whole piece that we could spend on evolutionary psychology, its merits and demerits, but I actually want to go in a different direction. And that is the idea of conscious evolution, consciousness, conscious intentions. One of the things that really strikes me about human cultural evolution, is how much it is driven by intentions. Most recently, I had a conversation with Josiah Ober on the classical Greek period. The emergence of democracy and how much all the elements of democracy were basically...they were just setting about to build a democratic city state. That was their explicit objective.

The idea of consciousness, and directing all of this, is part of the story. It doesn't deny everything we just said about emotions, and so on, but somewhere along the line... In fact this is by no means merely human. All kinds of non-human species, of course, have their own forms of the Baldwin effect, in terms of directed learning, and so on and so forth. Let's speak a little bit about conscious intentions and things like that. That gives an intentional aspect or what people strive to do, and therefore directing evolutionary processes, genetic and cultural.

**LN:** Going back to what I was saying about bonding, you can see all kinds of intentions, in trying to create bonds between people, or bonding people to a country. The Star-Spangled Banner, that we love our flag. We have this anthem, and it makes everybody cry. There's a huge amount of intention in that. Just the invention of a social tool, the sentimentality, and that kind of thing. We do that all the time, to try to get people to pull together. Is that, is that the sort of thing you're talking about David?

**DSW:** I think so. I think so. Pete, do you want to add to that?

**PR:** Yeah. Going back to Darwin, in addition to a natural selection, he described sexual selection, and artificial selection. The latter two are agent-based processes. In the case of female choice, sexual selection, females choose their mate in the classic model, and therefore they affect evolution. They affect the evolution of secondary sexual characteristics in Darwin's classic formulation. In the case of artificial selection, dog breeders, for example. Darwin was a dog fancier, and wrote about pigeons, and dogs, and other domestic animals, that humans had deliberately created morphology and behavior in these animals. In the case of cultural evolution, it seems to me the classic forces of cultural evolution are agent-based forces. Natural selection can operate on cultural variation, as well as it can operate on genetic variation. But in addition, we have what Rob and I call guided variation. Basically, individual learning, plus social transmission of variants, that are learned socially. It's sort of a classic inheritance of acquired variation process.

And that's agentic, right? People invent stuff because they think it will help them to make a living. And similarly, what we call the bias forces, where people selectively adopt cultural variants that are out there in their social networks. That's also an agent-based process. One of the problems with the modern synthesis, it seems to me, is it downplays those kinds of forces in favor of natural selection on random variation. Cultural evolution is fundamentally different. Well, it's not fundamentally different. It's quantitatively different, from genetic evolution, in the relative importance of these agent-based forces. I think that emphasis on that point is what you were pointing to.

**DSW:** Yeah. It makes you realize how much the modern synthesis was a constriction of thinking around Mendelian genetics. Even leaving out such things as the Baldwin effect, which was known at the time, but didn't make it in there. We're recovering from that, we're in recovery from the modern synthesis. I'm so amused by the controversy about the term extended evolutionary synthesis. That term, which is a judicious term, what could be more modest than that? There's still many of my colleagues, in evolutionary biology, that say, "How dare you call this the extended synthesis?" When, in fact, it's more than that. The whole return of agency and consciousness. The idea of evolution as can be consciously driven, which has only commonsensical, in retrospect, when you start bringing in such things as artificial selection, and sexual selection and all of that. It's just commonsensical, in retrospect.

I want to bring in, it's not really new, but just to bring in Pierre Teilhard de Chardin a little bit, he had this provocative phrase where he said, "Consciousness is evolution reflecting upon itself." I think, "You know, actually that's pretty good." What exactly does that mean? When you think of what's going on inside the head with such things, as scenario planning, and storytelling, and so on, really is variation and selection process going on internally, which then gets played out externally. So the idea of consciousness being a kind of an evolutionary process, yet another evolutionary process, built by another evolutionary process, just the way cultural evolution is an evolutionary process, built by genetic evolution. What do you think about the idea of consciousness as evolution and reflecting upon itself?

**PR:** Seems a bit metaphysical to me, but never mind. Consciousness is an interesting concept. It intrigues a lot of people. My take on consciousness, I got from this neurobiologist Merlin Donald. I don't know if you know him or his work, David, but he said, "Well, consciousness, we know all about consciousness. Every night, we're unconscious, and every day we're conscious. So it is with every other organism we know very much about. Sometimes they're conscious, and sometimes they're unconscious. It's not a very mysterious concept, really." The metaphysicians have reified it into something that is terribly abstract, and self-important.

**DSW:** Lesley, what do you think? Then I have another chapter to bring into our conversation.

**LN:** It seems to me the whole consciousness thing seems like such a hard problem. I don't even know if other people are conscious. It goes back to that, really. Other people do stuff. It's very hard. We don't

just reflect on our evolution, but we're fascinated, or some of us are, by how our mountains moved and grew. In our single lifetime, we can learn about the lifetime of the whole planet. We can speculate about the future, when the sun becomes a big red giant, and swallows the earth. It's extraordinary that we can sit in the middle of this time, and see the whole universe. I find it too amazing to think about. I find it extraordinary that a lot of people aren't even interested in this. Other people don't do science. How is that possible, David?

**DSW:** They're narrowly adapted to their environments, I think.

I think the next chapters is, as you know, the thinking on major evolutionary transitions, including biological transitions, such as the eukaryotic cell, and multicellularity, is kind of dialectic between cooperation and information. With an increase in the scale of cooperation, there needs to be also an increase in the scale of information, everything that that represents. In the case of human evolution, this is where cultural revolution comes in big time. This is also where we think about human society at the scale of not just a small group but what we call tribes.

For example, the individuals sharing a language. This as being a pool for information storage and transmission, that might among other things, explain the distinction between anatomically modern humans and culturally modern humans. I know you've thought a lot about that. Let's talk about the relationship between information and cooperation, and the increase in the scale of both. Especially with cultural evolution and human societies becoming larger and larger. Starting with tribal scale, which somehow knit together the actual small groups of people that were with each other at any particular time. Pete, do you want to go first on that one?

**PR:** Sure, if you like. A number of years ago, Rob and I wrote a paper on why possibly language evolved, or how possibly language evolved. There are two interesting features of language, from an evolutionary point of view. One is the thing you pointed to, was the tribal aspect of it. Tribal cooperation is based around a common language, typically. The other interesting thing is, why don't we just have one language? Why do we have this plethora of languages? Our speculation was that it's important not to listen to some other people. Particularly people from different tribes, who may have completely different ideas about how to solve games of coordination and cooperation. If you imitate the social mores of your neighboring tribe, they're liable to conflict with the social mores of your tribe.

You'll get all scrambled up and crossways with your fellow tribesmen. On the one hand, as we've discussed already, having a wide social network and lots of communication with other people, is critical to having complex cultural adaptations. On the other hand, not communicating with people, who have different cultural adaptations, may be a real problem. Rob and I wrote a theoretical paper, a long time ago now, on why you shouldn't listen to your neighbors if you're on an ecological gradient. We imagined that some people are farmers, and some people are cattle keepers, and they're on a gradient of aridity. Wherever you are, there's an appropriate mixture of cattle-raising and horticulture that is optimal. You don't want to imitate your neighbors, who are living in a drier or wetter environment, with a different mix of cows and farming.

**DSW:** When I learned that there's actually some languages that are not just a matter of isolation by distance. There's people that mingle with each other. There are multi-languages, and they remain separate languages, despite the fact people are actually even intermarrying among those languages, those languages remain separate. I was amazed by that, because I always thought it was just matter of just isolation by distance, but this made something much more complicated about language. Even people that mingled with each other might have separate languages, which speaks to the thing that you're talking about.

**PR:** People strategize over these cultural boundaries. In addition to language, of course there is dress, and dialect, and diet, and then a bunch of other symbolic differences between groups. Generically, Rob

and I speak of these symbolically marked social boundaries. People deploy these extremely strategically, even within societies. I worked for the EPA for a while. The EPA has its own private jargon for a whole bunch of things. You can't interact with EPA until you learn their jargon. It's annoying as hell. College professors have an annoying bunch of symbolic markers. I run into this in scientific meetings sometimes, because there are always a few non-academics that drift into these meetings. Typically, they complain that they're frozen out. As soon as somebody detects they're not a card-carrying academic, they turn their back on them. They're just rude.

**LN:** This makes me want to ask, David and Alan, how they intend to get over this problem of, even if we have Google translate, allowing people from different cultures to share information? How is it going to be possible? Especially when we see now that our close relatives sometimes just doesn't seem to be on the same planet as us, when it comes to believing in global warming, or believing in vaccination, or democracy. How do you see us getting over this hump that we've suddenly found ourselves at the bottom of?

**DSW:** We could turn this into an important part of our conversation. Human society has always been fission–fusion. People have always participated in many different types of groups. Each type of group called for certain norms, and appropriate behaviors, and so on and so forth. Damned if we're not so good at this, as a species, that not only are we capable of living in cooperative groups, we're capable of living in many of them, recognizing the context, and adopting the right behaviors for each one. Erving Goffman, the old sociologists was one of the people who really accentuated that. I still have a memory from his book, 'The Presentation of Self in Everyday Life'.

For his first his thesis, he started a small hotel in the Shetland Islands. He'd noticed that the waiters would go back and forth, from the kitchen to the dining room, the kitchen to the dining room. They would have their waiter's persona in the dining room, and then in the kitchen, they'd make fun of the very clients they were being deferential to. It was just a back and forth through the doors. They would be able to do that. We're all good at that.

**LN:** Can I just say, I think there's variation in everything, and I think that some people are better at it than others.

**DSW:** Yup. Yup, of course.

**LN:** Partly for genetic reasons, and partly for cultural reasons.

**DSW:** Yup, absolutely. Absolutely. What that means, in a modern context, is you can turn that to your advantage. You can bring people together that are different. They're not on the same page, none of that, but you could actually cause that to happen by focusing attention asking, "Why are we all working together? What's valuable about it?" So on and so forth. That's what Elinor Ostrom's first core design principle is; a strong sense of identity and purpose. Then you could build in other things, which are basically anti-cheater devices. Monitoring, equitable decision-making, all of these things. What you're doing, basically, it's like a flash group. You're creating the group right then and there, and because we're such geniuses at operating in multiple groups contexts, you could actually do that. If it's a fulfilling group, then you can build upon it.

So it's in that sense that what we're discovering scientifically about our social abilities, and especially all mediated through culture, is something that could be turned into a practical change method. We could use that to manage the cultural evolutionary process.

Okay, so one way to think about cooperation is still quite individualistic. We think of individuals cooperating, but remaining individuals in their own mind and thought processes. Then we can think about cognition itself has becoming a group process, something like a group mind. That sounds like science fiction, until you start to study the social insects. We have wonderful work, by people like Tom

Seeley and Deborah Gordon, in which really the idea of the individual as being a bit more like a neuron than a decision-making unit in its own right, is actually very well documented. In the early days of social psychology, as you know, it was more customary to think that way.

The last 50 years has been an age of individualism, methodological individualism in the social sciences, but it's coming back. I have a paper here, a psychological review paper, by Garry Shteynberg, and others, 'Shared worlds and shared minds: A theory of collective learning and a psychology of common knowledge', which basically talks about all forms of cognition. Perception, memory, decision-making, all of these things, which we axiomatically think of as our individualistic processes. Well, no, not at all. Even at the smaller group level, these things are really collective.

I'd like to have your thoughts on this idea of collective intelligence, group mind. First at the small scale, something that basically evolved as part of the package of human cognition, and then we can expand it, to technology of course, to talk about global brain, and things like that. What that might mean. But first at the small-scale. So do you think about kind of collective intelligence in this way? Have you done much thinking about that, Lesley first and then Peter?

**LN:** Well, I tried to use a story in our book to help people understand how having, even a million and a half years ago, having a collective consciousness, could be really practically useful. So it was talk, we were talking about how a group of humans had to go out and be a group. And in that way, they were able to fight off scary animals. Like what happened in our story is that there were three hyenas who brought down a buffalo and they were standing on it.

And the early humans needed to get some of that meat. And so they needed to scare the hyenas off, and the hyenas were much bigger than they were, but by working as a group all shouting together, all having confidence in themselves as not a bunch of individuals, but as a giant, noisy, confident, big animal. As long as they kept that in their mind that they were that together, that they could scare off these large hyenas. I mean, of course we have no idea if this happened a million and a half years ago, but we can easily see how it would have been useful. And so go from that to lots of other things. But that ability would have been useful for us and remains useful for us.

**DSW:** Great. Thank you. Peter?

**PR:** Well, on the cognitive side, Rob and I think of human groups as a problem-solving collective via the creation of culture. So if each of us had to create our culture for ourselves, it would be an impossible task. Learning is expensive. So what we do in effect is share out the task of learning among all of us. Everybody's trying to learn. And if I make a small improvement in the mouse trap, I can communicate that to the rest of my group, and someone else in turn can make another modification that improves it. So each of us does a little bit of work in creating and learning, but we share it. And so the otherwise impossible task of creating a complicated technology or a complicated social organization is a shared task.

So the idea of calling this collective consciousness or something like that, if that term appeals to you, I'm happy with that. But it seems to me that the concrete aspect of it is that the task of innovation and curation of ideas is a shared task operating through our extensive social networks and through time. So we inherit the culture of our ancestors and often make little improvements on it and transmit those improvements.

Now, a second thing that I think is important, that's the sort of the cognitive side, if you want. On the emotional side, people form attachments to the social groups that they belong to. I think you've alluded to that, David. There's this field of social psychology called social identity theory. And the thrust of it is that our own private identities are in part social. We are emotionally the groups that we belong to. You see this in phenomena like sports fandom. I mean, it's pretty crazy, but so professional sports are in the business of selling a tribal identity to you.

If you buy into being a fan of a particular pro sports team, I mean, it's emotionally salient to lots of people. Rob, for example, was a 49ers football fan because his father took him to games when he was a kid and he got into it really early. And in the heyday of the 49ers, he could barely watch a 49ers football game live because he was so emotionally upset when they lost. Of course, he was emotionally thrilled when they won, but there was this social bond and with a host of other fans that was completely impersonal.

So you get the phenomenon of tailgating parties on the parking lots of the stadium where people literally collect, or they collect in the stadium itself to cheer their team on. It's a sort of an ersatz tribal identity that's cleverly peddled to sports fans by entrepreneurs who stand to make a lot of money out of your desire to belong to a tribe.

**LN:** Do you think this is a modern phenomenon? Because we don't have such a strong identity nowadays because we're always moving around and meeting different people that we're kind of so desperate to fall in love, that we're quite vulnerable to joining other groups or do you think this is something that was always the case? I don't know.

**PR:** Well, I think that the tribal identities were the primitive, or original form of this, and in modern societies, tribes themselves have gone away, but we have all of these quasi-tribal systems. And I think as David said, we can belong to several of these. You can be a 49ers football fan and a patron of the arts and an anthropologist. You can belong to, a Democrat or a Republican, and you can belong to and identify with, I don't know if it's an unlimited number of groups, but certainly multiple groups.

**DSW:** Well, the whole origin of sports in Greece, for example, was another one of these deliberate constructions in order to actually stitch together cooperation at the larger scale, that you'd be fielding sports teams rather than warring with each other and so on. So I think that it plays a role in social physiology. The tribe becomes actually a part of something larger and the competition takes a benign form and so on and so forth. So there's much of interest to be said there.

I'd like to finish up by just looking into the future. Now, everyone knows we need to expand cooperation to the global scale, that's not new with us. But we might have, I hope we have, maybe something to contribute knowledge-wise as to how that might happen. We now have the technological ability to create a global brain, for example. We're talking, for example, as if we were by each other's sides. So we have the technological ability, but that doesn't mean it's going to self-organize, surely it's not.

And so how can we use this knowledge as provisional as it is? We need to be humble about what we know, we've already said that, we know it's a story, it's not the story. But despite that, how can we use our provisional knowledge in order to build the scale of cooperation still higher to that final rung, basically, to global cooperation? Lesley.

**LN:** So I think that something extraordinary has happened that we aren't really appreciating enough. And that is that people are no longer competing for reproductive success. Now, I don't think that humans ever competed as individuals for reproductive success because we're cooperative breeders. But what's happened in the last couple of hundred years is that people are no longer having as many children as they can afford. The family, which was the main driver, I think, of reproduction is now very weak and so individuals are choosing not to have very many children. So we're no longer competing in the fundamental Darwinian way.

So in the future, there's going to no longer be this competition, that we're still experiencing now, for resources. In the lifetime of today's children, probably the world's population is going to start to diminish. Not because of war, not because of toxicity, but just because people aren't having that many children. And I don't think that we've really grasped that. And we haven't really grasped what that means. What do you think about that?

**DSW:** I think that's a great point and the point that not many people appreciate. So, yeah. Peter.

**PR:** Well, it seems to me that the history of the last century or so already points to a lot of progress on this project of creating a global social system. The necessity for this has been obvious to people since the creation of weapons of mass destruction before World War I. In the aftermath of World War I we created the League of Nations. Now, the League of Nations was a feeble thing by comparison to national political institutions. And even to this day, nation-states are the most powerful, single political force in the world. And they often have behaved very badly with respect to global commons problems, ranging from controlling nuclear weapons to global warming, to the extinction crisis and so on.

On the other hand, we've made a tremendous amount of progress and the United Nations is an improvement over the League of Nations. The United Nations has done really stalwart work with respect to the global climate problem. The IPCC for example, won the Nobel Peace Prize, right? For its contribution to turning basic science, basic atmospheric science into recommendations for policy. Now, this is all really great stuff. It's not good enough, but it seems to me that we just have to keep rolling the rock down the same road that created the IPCC. There's no magic in it, it's just plain brute political work.

So the world's biggest stumbling block, not the only one, but the world's biggest stumbling block to making progress on climate change is the Republican Party of the United States. And so if we're going to make progress on global warming, we've got to crush the Republican Party and Exxon oil company. It's just political work, right? It's just the same kind of thing that we've been struggling with for forever. But particularly, as problems that were once local have become global, the global commons problem, that really became manifest in the last century or so. We know how progress is made, we just have to do it and we need to push it faster because the rate we've been doing it in the past isn't good enough.

**LN:** But I think we also have to be patient because there's cultural lags, right? I think those require a certain amount of-

**PR:** Well, cultural lag is something to fight not to use as an excuse. Cultural lags should be a goad. We need to know how to reduce cultural lags not just use them as an excuse for doing nothing. So my thought about the future is the future is an adventure. We have no idea what the future will be, much of an idea about what the future will be like. And so it's just putting one foot in front of the other and trying to do the right thing and make improvements as best we can in the circumstances of the moment.

**LN:** But do you remember back in the 60s, the late 60s, early 70s, everybody was talking about the population explosion. And tons and tons of money was spent on trying to convince people to take birth control pills and things like that. And it turned out that none of that was necessary. It turned out that people... It was just a cultural lag in that within a half a generation or so people were reducing their fertility without birth control. They were actually choosing. You just had to wait until they kind of got it.

**PR:** That's fair enough. On the other hand, the decline in the birth rate has not resulted in a relaxation of the impact of humans on the environment because each individual aspires to affluence, that is characteristic of the west. And it's the number of people times their consumption that creates the impact. And consumption desires can increase without any known upper limit. I mean, we all might want to live like Saudi Arabian princes and princesses, and that would be extremely destructive.

**DSW:** Well, let me add just a couple thoughts of my own to finish up. One is that even without planning, I mean, the unplanned out of control globalization has still had the effect of making it easy to think of the whole earth as a single group. And that idea was, I think, unimaginable even 200 years ago. But it's only in the 19th century that the the whole universalist sentiment, as you were saying, Pete, that the first religion to be truly universal was the Baha'i Faith really, that was 19th century.

But now the more things are truly global in terms of economic processes and just the massive mixing, I like to say that in my tiny city of Binghamton, New York, such a small city and its public school, over 20

first languages are spoken. That's how much mixing has taken place. The average kid in Binghamton, New York, their friends come from 20 different places on earth, different primary languages. And so with all of this technology, it's almost like so reasonable to think of the whole earth as something that needs to be cooperative, whereas before it was unimaginable. So that's encouraging.

But then secondly, I think back to our particular ideas of cooperation and evolution—are that they're scale independent. And so the same dynamic that's needed for cooperation in a small group is needed for cooperation in the global village. And the more we actually convey this worldview, make that sensible to people, as opposed to other narratives, such as the narrative of laissez-faire, that the pursuit of self-interest just automatically permeates to the common good—that our narrative and our worldview, actually, if it could become more pervasive than... even the leviathan organizations that are currently part of the problem, the nations, the corporations, the big tech companies, if they actually had a change of perspective, they could actually become part of the solution not part of the problem. And we wouldn't just have to endlessly oppose them politically, we could actually win them over conceptually.

And I think that that is not naive. I think that, that actually is possible. And so I think that's why our knowledge, as provisional as it is, can play an important role, just conceptually. And that's one of the things that keeps me motivated. So any final thoughts, my friends? Final thoughts, and then we'll end this.

**PR:** Well, I agree with you, David. It's just that the nation-state and these other parochial kinds of attachments are hard to overcome. And so it's a struggle to do it, that's all. And we need to engage in the struggle, is my only recipe. You're right, people can manage to get along in spite of a huge cultural diversity. My favorite examples are some of the great cities of the world like, well, Singapore is a spectacular example, New York City, Los Angeles, the Bay Area, London, these polyglot cities.

I mean, they're just Binghamton, as you describe it, on steroids, right? And yet they're rich and they work pretty well by and large. And all of those parochial divisions exist, but the politics of those great cities manage those divisions fairly well. I mean, we saw the conflict in New York City between the Hasidic Jews and the rest of the city over COVID restrictions. So there certainly is plenty of conflict in those great cities, but by and large, the problems get solved.

**DSW:** Yeah. Yeah, thank you. That's great.

**LN:** I just think we need to put our heads together and make up some stories that people can buy into. It will be a lot easier for them to see a better future if we can create many stories of better futures. A world that our children can live in. Our grandchildren can live in, our great-grandchildren can live in.

**DSW:** Yeah.