The Evolution of Human Sociality Transcript

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Here's a fun thought experiment: do you ever wonder, if other animals could use social media, would they? Would a Facebook for monkeys or a LinkedIn for turtles fundamentally alter their way of life as much as they have for us? If you ask me, I'd probably say, no offense to any monkey or turtle aficionados out there, that even given the platform, they simply don't have the mental capacity to utilize it. Really, if you think about it, humans are pretty weird in that respect.

After all, we're arguably the most social creatures on the planet, with huge acquaintance networks and the ability to cooperate with others living on the other side of the world, who we may never even meet in our lifetime. What other organism can come close to humans in social complexity or magnitude? Or perhaps the better question is, how did we become so uniquely elevated in social capacity among other organisms?

It's a question that has eluded scientists for a long time. And they've tried a lot of things. While doing my research, I found that you can basically categorize the existing literature into three general categories, based on their approach to answering the question. The three categories are: biological, mathematical, and psychological. Each approach has its limitations, but today we're going to put it all together, and by synthesizing the three approaches, maybe we can shed some light on this fascinating mystery: the evolution of human sociality.

So, the first one up is the biological perspective. This one's fun, because we've all heard our parents complain about moody teenagers and their darn hormones, and oh, the angst! And hey, that's a fair complaint. But as it turns out, the story goes deeper than that, a *lot* deeper. Down the rabbit hole all the way to the origins of social behavior.

If we go back to the very beginnings of social evolution, we might see that the concept of altruism all started with parent-child caretaker instincts. Makes sense, that the earliest form of selfless social interaction would be between a mom and her kid. And then, as time went on, nature expanded the neurophysiological mechanisms and processes behind childcare to allow for more general family-based and alliance-based relationships, so organisms could be nice to their family and friends as well.

As it turns out, this kind of prosocial behavior, I already mentioned parent-infant recognition and caring, and friendship formation, but we can also extend it to things like pair bonding—in human terms, we'd call that love—as well as general trust and social memory, these behaviors are all regulated by a hormone called oxytocin.

But oxytocin isn't all hugs and kisses. Scientists have found that it's also linked to greater hostility towards outsiders and maternal aggression to potential threats to infants—momma bear type interactions, for example. So while oxytocin helps us form social bonds, it might also make us less tolerant of those we perceive as foreign, and scientists have proposed that oxytocin plays a role in tribalism and conflict between social groups.

Another big player in the hormone game is testosterone. Now, testosterone also has a bit of a reputation in popular culture, but let's see what science has to say. Studies have shown that human facial morphology, or structure, has trended towards feminization over time, along with higher levels of caring and social affiliation behavior within groups. It sounds like we're all becoming nicer, and scientists hypothesize that this is due to changes in testosterone levels as humans have evolved.

We can actually see the effects of testosterone in play even today. Scientists conducted a study on African foragers and pastoralists and found that lower testosterone levels were associated with increased paternal care. Apparently, men with lower testosterone levels tended to spend more time taking care of the kids. Go figure.

Testosterone and oxytocin are just two examples, but they make a fairly clear point that our social behavior as humans can be affected by hormones, and that changes to hormone levels over time may have influenced the development of our social behavior to what it is today.

Another facet of biology is genes. For this one, let's take a step away from humans and look at some examples from our fellow critters in the animal kingdom.

In both song sparrows and honeybees, changes in gene regulation had dramatic effects on social behavior. And more generally, studies have shown that, at least in birds and mammals, there's this thing called the mesolimbic reward system, and it plays an important role in managing motivations for behaviors like reproduction, fighting, parental care, pair bonding, and sociality. Since we're focusing on humans here, we won't go too in-depth into these studies, but suffice to say, genes can definitely affect our social behavior.

Interestingly, the other way around might also be true. Our social behaviors may affect our gene expression. Researchers found that eudaemonic well-being (positive emotion associated with having meaning in life and helping others), in contrast to self-focused pleasure and hedonic well-being, was associated with healthier patterns of inflammatory gene expression. They used a gene composite they referred to as Conserved Transcriptional Response to Adversity (CTRA), which is basically just a collection of different genes which they evaluated together to see whether they were more or less active in these different people they studied. So be nice! It's good for you.

Going back to what we talked about earlier, with mother-child behavior being co-opted into other forms of pro-social behavior, there's a parallel idea in the genetics world of sociality. The original mother-child social behavior is based in a specific set of genes, which may have arisen in a common ancestor to both us and other social animals. This is the "genetic toolkit". Over time, the descendants of that common ancestor used this toolkit, and its genes, to independently and convergently evolve social traits. Whether it's meerkats, molerats, monkeys, or man, we took those tools and built a genetic house with them, it's just that those houses look a little different between species.

In addition to genes that specifically influence social behavior, we also have to consider genes with a more general purpose. For example—genes involved with cognitive abilities like learning are likely to play a big role in cultural acquisition. While cognitive genes aren't specifically related to social behavior, they provide the foundation and the means for human behavior to adapt to a changing environment.

That about does it for the biological side of things. The next one up is math! Very exciting sounding, I know. But trust me, it actually is!

To start things off, have you heard of the Prisoner's Dilemma? It's a two-player game, where each player is a "prisoner" and must make a difficult decision. They were co-conspirators in a crime, and both have been arrested, and are now being pressed for confessions. Of course, they have the right to stay silent, and maybe that will be enough to see them through. At least, until the officer makes them both a very generous offer. They don't need to confess to their own crimes, they just need to testify that their partner-in-crime is guilty. If player 1 testifies against player 2, and player 2 stays silent, player 1 will be rewarded and get off scotch-free, while player 2 will enjoy a nice vacation behind bars for five years. Or vice-versa. If they both snitch on each other, well, the officer can't exactly let either of them go, but on account of their honesty, the judge will decrease their sentences to three years each. However, if both decide to stay silent, there won't be sufficient evidence to convict either, and they'll get off on just misdemeanor charges, and perhaps one year jail time maximum. So, the important thing here is that they don't know what choice the other person is going to make. They make their decision independently, and the result is revealed simultaneously, kind of like rock-paper-scissors.

Now, you might say at this point, that the answer is obvious. Snitches get stitches, so they should just both keep their traps shut and wait for it to blow over. But is that really the case? If player 1 is really only out for himself and is trying to save his own butt more than anything else, he should snitch. After all, that guarantees that his maximum jail time is three years if his partner snitches too, and he even has a chance to just go home right from the station if his partner is dumb enough to keep quiet. On the other hand, if he stays quiet, he might get backstabbed and end up rotting away for five whole years! Even mathematically, the expected jail time for "defecting" or snitching, is only 1.5 years on average, while the expectation for being a nice guy in this case is 3 years on average. This assumes that the other player's choice is made randomly, so it doesn't necessarily hold in reality, but the point is that from a purely selfish perspective, the optimal choice is actually to defect.

This game, Prisoner's Dilemma, is actually a pretty popular model for simulating social cooperation in humans. But since it's a relatively simple game with very defined rules, you can actually do something pretty cool, which is to replace humans with computers, and simulate an AI hunger games to figure out the optimal survival strategy in this cruel game world.

In fact, that's exactly what happened. In the 80's, a researcher named Robert Axelrod and his team hosted a tournament, and invited programmers from around the world to submit their AI creations to duke it out in a Prisoner's Dilemma battle royale. What was unique about this version of Prisoner's Dilemma, though, was that the game was iterated. That means instead of just one round, there were many. After each round, the results would be revealed, and the players would be able to use that information to inform their decision for the next rounds. So, you can learn about what your partner's tendencies are and adjust accordingly. Sorry for spoilers, but at the end of the day, there was one clear, undisputed victor among all others, and its name was TIT-FOR-TAT. Basically, this was an-eye-for-an-eye but put into computer form. If his partner cooperated in the previous turn, he would cooperate. If his partner defected, he would defect. It was a copycat, if you will. Why was this behavior so successful? Well, to answer that, we have to dive into the second tournament.

Yes, that's right. They had so much fun with the first one, the researchers got together and did it again. And they were able to improve upon TIT-FOR-TAT, to truly create the Terminator of Prisoner's Dilemma algorithms. By studying this new and improved version, they were able to conclude several properties that were intrinsic to a successful player in this game.

The first one is niceness. You never want to be the first one to turn traitor or mess with others. This keeps you out of unnecessary trouble.

The second is forgiveness. Even if you've been backstabbed, you have to forgive and forget, or else cooperation will never be restored. Besides, sometimes in real life accidents happen. You can't hold these things over someone's head forever because no one's perfect, and if you don't respect that, you won't have any friends at all soon enough.

Third, the last one, is provocability. This is the flip side of forgiveness. You can't be a doormat. If someone pokes the bear and cheats you, don't just sit there and take it. You need to fight back and show them who's boss. This prevents people from exploiting you and discourages long-term defection. So, taken together with forgiveness, you need to stand up for yourself, but don't hold grudges. Be open to cooperating again if the opportunity arises.

At least in computer simulations, this evolved TIT-FOR-TAT model will almost always overtake the others and become the dominant "species" so to speak in the population. That's interesting, because it gives us some insight into the key features of social behavior tendencies in humans that would be necessary to give rise to and sustain cooperative behavior.

Of course, also because it's a computer simulation, there are some important limitations. Humans aren't programs, and we certainly don't always interact in as ordered and predictable of a way as this game calls for.

In that case, we can look to experiments with human subjects instead, and see whether these principles carry over or not. This brings us to the psychological aspect of sociality.

What scientists have discovered is that humans have a tendency towards a type of behavior known as "strong reciprocity". This is when you cooperate even when there is no obvious benefit to doing so.

For example, in the ultimatum game, one player has a sum of money and can make an offer to the second player from that sum. The second player can accept the offer, in which case they both receive the according amount of money, or reject the offer, in which case neither players receive any money. The optimal move for the second player is to always accept the offer, as this maximizes profit. However, this was not reflected in the actual results: the second player frequently rejected "low" offers. Additionally, even though there is no apparent benefit to doing so, the first player also had a high tendency to make generous offers, with 50% of the money being the most common offer.

In a second type of game, the public good game, similar patterns arose. This is a game that is similar in structure to prisoner's dilemma, with advantages to defecting if others cooperate, and mutual benefits if everyone cooperates. However, because the public goods game is a multiplayer game, more complex relations can be observed. Specifically, when the players were empowered with the option to punish other players, even at a cost to themselves, they happily did so, using their power to punish non-cooperators. Additionally, when allowed to speak and make agreements (even if they were non-binding), near perfect cooperation was almost always achieved.

Thus, there is ample evidence that human cooperation in groups is sustained by the tendency towards strong reciprocity. This type of behavior is only evolutionarily beneficial if groups are frequently threatened. For example, if a group relies solely on reciprocal altruism (naïve TIT-FOR-TAT), cooperation quickly collapses when the short-term benefits of cooperation decrease, like when resources become scarce, or predator attacks become common. However, groups built on strong reciprocity can maintain cooperation even when there is no immediate benefit, and thus is a more reliable model of cooperation.

It’s important to note that even seemingly altruistic behavior generally has some kind of benefit, it might just be rather indirect. This is the case with altruistic punishers, who are individuals in a group who, at zero fitness benefit to themselves (or indeed, a fitness cost), punish others in their group who engage in non-cooperative behavior.

Batman and other superheroes are actually pretty good examples of what an altruistic punisher might look like. They take a lot of beating just to catch evil-doers and help out the general population. But that’s an extreme case, we can see examples of this in our daily lives as well. People who catch shoplifters, purse-snatchers, convenience store robbers, there are plenty of everyday superheroes.

And on an even more relatable level, within our own social groups, there are people who will call out friends, and sometimes strangers, for making insensitive jokes or for being inconsiderate. Scientists hypothesize that the presence of altruistic punishers within a population helps support cooperation and minimize social “cheating”.

But there might be more than just that. What we perceive as fair or punishable is likely influenced by our cultural norms and institutions. For example, food-sharing and monogamy are tenets present in various cultures across the world, and breaking these norms is often met with punishment, for example by ostracization, or even incarceration. Because anti-social behaviors are punished, it decreases the fitness advantage an individual may have earned by doing those behaviors, and thus prevents the decay of cooperation.

As we saw in the earlier studies, under laboratory conditions altruistic punishment does occur, and indeed prevents the decay of cooperation. When there was no option to punish others, cooperation in the groups inevitably decayed into pure self-interest near the end of each game. This supports the importance of punishment of non-cooperation, even at a personal fitness cost, to sustaining cooperative behavior.

Again, we have to remember that even with experiments with human subjects, laboratory conditions impose artificial elements on the social interactions, and thus the results aren’t necessarily completely accurate to an organic setting. In fact, it has been shown that human subjects are much more willing to cooperate or help in these artificial laboratory conditions than in real life.

Additionally, human societies living in different ecological and economic conditions have demonstrated vast differences in psychology, cooperation, altruism, and logic. Thus, experimental results derived from one population should be carefully evaluated before making any generalizations, and for the most part should be compared only to populations facing similar socio-ecological challenges.

In summary, social behavior may have arisen from behavioral wiring for other purposes like offspring care and was augmented into a complex system after taking on specific characteristics necessary to ensure sustained cooperation, and this was likely evolutionarily favorable because of frequent danger and fitness benefits of group living. Over time, evolution may have occurred as natural selection favored early humans with less combative tendencies and perhaps hormone levels that would have allowed for behavior similar to what was described in the TIT-FOR-TAT algorithm. Increased brain size may have allowed for the learning of complex cultural ideas and given rise to long-term behaviors like altruistic punishment. There may have been a parallel development in both the biology and psychology of human social behavior that allowed for the complicated social interactions we face today.

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