

COMMON GROUND SPEAKER SERIES

ROBERT SAPOLSKY

September 27, 2017

The Common Ground Speaker Series kicked off its 2017-18 season with Stanford Professor and MacArthur Fellow Robert Sapolsky discussing his latest book, *Behave: The Biology of Humans at our Best and Worst*. Over a decade in the making, *Behave* has been referred to as a game-changing book, one of the most dazzling tours d'horizon of the science of human behavior ever attempted, and a landmark, genre-defining examination of human behavior, both good and bad.

In *Behave*, Sapolsky takes the reader on an epic journey backwards through time and through different scientific disciplines. His governing question is: *what explains the fact that humans can massacre one another but also perform spectacular acts of altruistic kindness?* He starts by looking at the factors that bear on a person's reaction in the precise moment a behavior occurs, and then hops back in time from there, in stages, ultimately ending up at the deep history of our species and its genetic inheritance.

If you ever thought that neuroscience was deathly boring or too complicated for pleasurable reading, *Behave* will change your mind. For any layperson trying to understand why we behave the way we do, Sapolsky has created an immensely readable, often hilarious trip through the multiple worlds of psychology, primatology, sociology and neurobiology.

Sapolsky begins with the statement that it's "totally boring" to understand the motoric aspects of behavior. Your brain tells your spine - tells your muscles - to do something or other, and you have behaved. Harder is understanding the *meaning* of the behavior and the context of the *biology* of our behaviors. What is clear, though, is that you are not going to get anywhere if you think there is going to be "the" brain region or "the" hormone or "the" gene or "the" childhood experience or "the" evolutionary mechanism that explains everything. Instead, every bit of behavior has multiple levels of causality.

Here is an example. You have a gun. There's a crisis going on - rioting, violence, people running around. A stranger is running at you in an agitated state. You cannot quite tell if the expression is frightening, threatening, angry - holding something that kind of looks like a handgun. You are not sure. The stranger comes running at you, and you pull the trigger.

It turns out that the thing in this person's hand was a cellphone.

So we must consider this biological question: What was going on that caused this behavior? This one question, however, becomes a multitude of questions. Let's start.

What was going on in your brain **ONE SECOND** before you pulled that trigger? This brings us into the realm of a brain region called the amygdala. The amygdala, which is central to violence, central to fear, initiates volleys of cascades that produce the pulling of a trigger. What was the level of activity in your amygdala one second before? But to understand that, we have to step back a little bit further.

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What was going on in the environment **SECONDS to MINUTES** before, that impacted the amygdala? Now, obviously, the sights, the sounds of the rioting were pertinent. However, in addition, Sapolsky tells us that you are more likely to mistake a cellphone for a handgun if that stranger was male, and large, and of a different race. Furthermore, if you are in pain, if you are hungry, if you are exhausted, then your frontal cortex is not going to work as well. The frontal cortex is the part of the brain whose job it is to get to the amygdala in time, saying “Are you *really* sure that’s a gun there?” But we need to step further back.

Now we have to look at **HOURS to DAYS** before. With this move, we have entered the realm of hormones, for example, testosterone. Regardless of your sex, if you have elevated levels of testosterone in your blood, you are more likely to think that a face with a neutral expression instead looks threatening. You get elevated levels of testosterone, elevated levels of stress hormones, your amygdala is going to be more active and your frontal cortex will be more sluggish.

Pushing back further to **WEEKS to MONTHS** before takes us into the realm of neural plasticity. The fact that your brain changes in response to experience. If your previous months have been filled with stress and trauma, your amygdala will have enlarged, the neurons will have become more excitable, your frontal cortex will have atrophied - all relevant to what happens in that one second.

But we go back further. Back **YEARS to your ADOLESCENCE**, where the central fact of the adolescent brain is that all of it is going full blast, except the frontal cortex which is still half-baked. It does not fully mature until you are around 25 years old. Thus, adolescence and early adulthood are the years where environment and experience sculpt your frontal cortex into the version that you are going to have as an adult in that critical moment.

Pushing back even further, to **CHILDHOOD and FETAL LIFE** and all its different versions. That is the time that your brain is being constructed, but not just by your DNA. In addition, experiences during that time produce what’s called epigenetic changes - some of which are permanent. Permanently activating some genes, turning off others. An example of this is if, as a fetus, you were exposed to a lot of stress hormones through your mother. Those epigenetic changes are going to shape your amygdala in adulthood to be more excitable, and you will probably tend to have elevated stress hormone levels.

We must go even further back - back to when you were just a **FETUS** - a collection of **GENES**. Genes are really important to all of this, but critically, genes do not determine anything on their own, because genes work differently in different environments. A key example is a variant of a gene called MAO-A. If you have that variant, you are far more likely to commit antisocial violence. *But, that is if, and only if, you were abused as a child.* Genes and environment interact, and what is happening in that one second before you pull that trigger reflects your lifetime of those gene-environment interactions.

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Now, remarkably enough, we need to push back even further - back **CENTURIES**. What were your **ANCESTORS** up to? If, for example, they were nomadic pastoralists, living in deserts or grasslands with their herds of camels, cows or goats, research has shown that they are more likely to have invented what is called a “culture of honor” filled with warrior classes, retributive violence, clan vendettas, and amazingly, centuries later, that would still be influencing the values with which you were raised.

But we’ve got to push even further back - back **MILLIONS OF YEARS**. Because if we are talking about genes, implicitly, we’re now talking about the evolution of genes. What you see in evolution, for example, are patterns across different primate species. Some of them have evolved for extremely low levels of aggression, others have evolved in the other direction, and in-between are humans. Humans are this confused, barely-defined species, that have all these potentials to go one way or the other.

WHERE ARE WE? Basically, what we are seeing here is, according to Sapolsky, is that if you want to understand a behavior, whether it’s an appalling one, a wondrous one, or confusedly in between, you have got to take into account what happened from a second before to a million years before and everything in between.

In sum, it is **COMPLICATED**. Sapolsky warns that you’d better be really careful and cautious, before you conclude you know what causes a behavior, especially if it is a behavior you are judging harshly.

The single most important point about all of this, according to Sapolsky, is **CHANGE**. Every bit of biology mentioned here can change in different circumstances. In fact, ecosystems change. Thousands of years ago, the Sahara was a lush grassland. Cultures change. In the 17th century, the most terrifying people in Europe were the Swedes - rampaging all over the place. As of today, they have not had a war in over 200 years. Most importantly, brains change. Neurons grow new processes, circuits disconnect - everything in the brain changes. And out of this, come extraordinary examples of human change.

There is the example of John Newton, a British theologian who played a central role in the abolition of slavery from the British Empire in the early 1800s. Amazingly, this man spent decades as a younger man as the captain of a slave ship and then as an investor in slavery, growing rich. And then, something changed in him - a dramatic change that allowed him to write the hymn *Amazing Grace*. There is also the example of Zenji Abe, who, on the morning of December 6, 1941, led a squadron of Japanese bombers in bombing Pearl Harbor. This same man, 50 years later to the day, came to a collection of Pearl Harbor survivors at a ceremony there and apologized for what he had done as a young man. There is also the example of the 1941 Christmas Truce between British and German soldiers that allowed the opposing soldiers to assist in burying each sides’ dead, share a meal, exchange Christmas gifts, and play soccer together. During the hours of the truce, these enemies developed a completely new category of “us” and “them”.

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These human examples of change, says Sapolsky in summation, are no more special than any of us. Same neurons, same biology, same neurochemicals. We are left with the inevitable cliché: *Those who don't study history are destined to repeat it.* However, what Behave stresses is actually the opposite: *Those who do not study the history of extraordinary human change, those who do not study the biology of what can transform us from our worst to our best behaviors, those who do not do that are destined to not be able to repeat these incandescent, magnificent moments.*