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The following is an excerpt from the Introduction of Prof. Sapolsky's *Behave: The Biology of Humans at Our Best and Worst*.

I make my living as a combination neurobiologist—someone who studies the brain—and primatologist—someone who studies monkeys and apes. Therefore, this is a book that is rooted in science, specifically biology. And out of that come three key points. First, you can't begin to understand things like aggression, competition, cooperation, and empathy without biology; I say this for the benefit of a certain breed of social scientist who finds biology to be irrelevant and a bit ideologically suspect when thinking about human social behavior. But just as important, second, you're just as much up the creek if you rely only on biology; this is said for the benefit of a style of molecular fundamentalist who believes that the social sciences are destined to be consumed by "real" science. And as a third point, by the time you finish this book, you'll see that **it actually makes no sense to distinguish between aspects of a behavior that are "biological" and those that would be described as, say, "psychological" or "cultural."** Utterly intertwined.

Understanding the biology of these human behaviors is obviously important. But unfortunately it is hellishly complicated. Now, if you were interested in the biology of, say, how migrating birds navigate, or in the mating reflex that occurs in female hamsters when they're ovulating, this would be an easier task. But that's not what we're interested in. Instead, it's human behavior, human social behavior, and in many cases abnormal human social behavior. And it is indeed a mess, a subject involving brain chemistry, hormones, sensory cues, prenatal environment, early experience, genes, both biological and cultural evolution, and ecological pressures, among other things.

How are we supposed to make sense of all these factors in thinking about behavior? We tend to use a certain cognitive strategy when dealing with complex, multifaceted phenomena, in that we break down those separate facets into categories, into buckets of explanation. Suppose there's a rooster standing next to you, and there's a chicken across the street. The rooster gives a sexually solicitive gesture that is hot by chicken standards, and she promptly runs over to mate with him (I haven't a clue if this is how it works, but let's just suppose). And thus we have a key behavioral biological question—**why did the chicken cross the road?** And if you're a psychoneuroendocrinologist, your answer would be **"Because circulating estrogen** levels in that chicken worked in a certain part of her brain to make her responsive to this male signaling," and if you're a bioengineer, the answer would be **"Because the long bone in the leg** of the chicken forms a fulcrum for her pelvis (or some such thing),

allowing her to move forward rapidly,” and if you’re an evolutionary biologist, you’d say, “**Because over the course of millions of years**, chickens that responded to such gestures at a time that they were fertile left more copies of their genes, and thus this is now an innate behavior in chickens,” and so on, thinking in categories, in differing scientific disciplines of explanation.

The goal of this book is to avoid such categorical thinking. Putting facts into nice cleanly demarcated buckets of explanation has its advantages—for example, it can help you remember facts better. But it can wreak havoc on your ability to think about those facts. This is because the boundaries between different categories are often arbitrary, but once some arbitrary boundary exists, we forget that it is arbitrary and get way too impressed with its importance. For example, the visual spectrum is a continuum of wavelengths from violet to red, and it is arbitrary where boundaries are put for different color names (for example, where we see a transition from “blue” to “green”); as proof of this, different languages arbitrarily split up the visual spectrum at different points in coming up with the words for different colors. Show someone two roughly similar colors. If the color-name boundary in that person’s language happens to fall between the two colors, the person will overestimate the difference between the two. If the colors fall in the same category, the opposite happens. In other words, when you think categorically, you have trouble seeing how similar or different two things are. If you pay lots of attention to where boundaries are, you pay less attention to complete pictures.

Thus, the official intellectual goal of this book is to avoid using categorical buckets when thinking about the biology of some of our most complicated behaviors, even more complicated than chickens crossing roads.

What’s the replacement?

A behavior has just occurred. Why did it happen? Your first category of explanation is going to be a **neurobiological** one. What went on in that person’s brain a second before the behavior happened? Now pull out to a slightly larger field of vision, your next category of explanation, a little earlier in time. What sight, sound, or smell in the previous seconds to minutes triggered the nervous system to produce that behavior? On to the next explanatory category. What hormones acted hours to days earlier to change how responsive that individual was to the sensory stimuli that trigger the nervous system to produce the behavior? And by now you’ve increased your field of vision to be thinking about neurobiology and the sensory world of our environment and short-term endocrinology in trying to explain what happened.

And you just keep expanding. What features of the environment in the prior weeks to years changed the structure and function of that person’s brain and thus changed how it responded to those hormones and environmental stimuli? Then you go further back to the childhood of the individual, their fetal environment, then their genetic makeup. And then you increase the view to encompass factors larger than that one individual—how has culture shaped the behavior of people living in that individual’s

group?—what ecological factors helped shape that culture— expanding and expanding until considering events umpteen millennia ago and the evolution of that behavior.

Okay, so this represents an improvement—it seems like instead of trying to explain all of behavior with a single discipline (e.g., “Everything can be explained with knowledge about this particular [take your pick:] hormone/gene/childhood event”), we’ll be thinking about a bunch of disciplinary buckets. But something subtler will be done, and this is the most important idea in the book: when you explain a behavior with one of these disciplines, you are implicitly invoking all the disciplines—any given type of explanation is the end product of the influences that preceded it. It has to work this way. If you say, “The behavior occurred because of the release of neurochemical Y in the brain,” you are also saying, “The behavior occurred because the heavy secretion of hormone X this morning increased the levels of neurochemical Y.” You’re also saying, “The behavior occurred because the environment in which that person was raised made her brain more likely to release neurochemical Y in response to certain types of stimuli.” And you’re also saying, “. . . because of the gene that codes for the particular version of neurochemical Y.” And if you’ve so much as whispered the word “gene,” you’re also saying, “. . . and because of the millennia of factors that shaped the evolution of that particular gene.” And so on.

There are not different disciplinary buckets. Instead, each one is the end product of all the biological influences that came before it and will influence all the factors that follow it. Thus, it is impossible to conclude that a behavior is caused by a gene, a hormone, a childhood trauma, because the second you invoke one type of explanation, you are de facto invoking them all. No buckets. A “neurobiological” or “genetic” or “developmental” explanation for a behavior is just shorthand, an expository convenience for temporarily approaching the whole multifactorial arc from a particular perspective.

Pretty impressive, huh? Actually, maybe not. Maybe I’m just pretentiously saying, “You have to think complexly about complex things.” Wow, what a revelation. And maybe what I’ve been tacitly setting up is this full-of-ourselves straw man of “Ooh, we’re going to think subtly. We won’t get suckered into simplistic answers, not like those chicken-crossing-the-road neurochemists and chicken evolutionary biologists and chicken psychoanalysts, all living in their own limited categorical buckets.”

Obviously, scientists aren’t like that. They’re smart. They understand that they need to take lots of angles into account. Of necessity, their research may focus on a narrow subject, because there are limits to how much one person can obsess over. But of course they know that their particular categorical bucket isn’t the whole story.

Maybe yes, maybe no. Consider the following quotes from some card-carrying scientists. The first:

“Give me a dozen healthy infants, well formed, and my own specified world to bring them up in and I’ll guarantee to take any one at random and train him to

become any type of specialist I might select—doctor, lawyer, artist, merchant-chief and yes, even beggar-man thief, regardless of his talents, penchants, tendencies, abilities, vocations, and race of his ancestors.”

This was John Watson, a founder of behaviorism, writing around 1925. Behaviorism, with its notion that behavior is completely malleable, that it can be shaped into anything in the right environment, dominated American psychology in the mid twentieth century; we’ll return to behaviorism, and its considerable limitations. The point is that Watson was pathologically caught inside a bucket having to do with the environmental influences on development. “I’ll guarantee . . . to train him to become any type.” Yet we are not all born the same, with the same potential, regardless of how we are trained.*

The next quote:

“Normal psychic life depends upon the good functioning of brain synapses, and mental disorders appear as a result of synaptic derangements. . . . It is necessary to alter these synaptic adjustments and change the paths chosen by the impulses in their constant passage so as to modify the corresponding ideas and force thought into different channels.”

Alter synaptic adjustments. Sounds delicate. Yeah, right. These were the words of the Portuguese neurologist Egas Moniz, around the time he was awarded the Nobel Prize in 1949 for his development of frontal leukotomies. Here was an individual pathologically stuck in a bucket having to do with a crude version of the nervous system. Just tweak those microscopic synapses with a big ol’ ice pick (as was done once leukotomies, later renamed frontal lobotomies, became an assembly line operation).

And a final quote:

“The immensely high reproduction rate in the moral imbecile has long been established. . . . Socially inferior human material is enabled . . . to penetrate and finally to annihilate the healthy nation. The selection for toughness, heroism, social utility . . . must be accomplished by some human institution if mankind, in default of selective factors, is not to be ruined by domestication-induced degeneracy. The racial idea as the basis of our state has already accomplished much in this respect. We must—and should— rely on the healthy feelings of our Best and charge them . . . with the extermination of elements of the population loaded with dregs.”

This was Konrad Lorenz, animal behaviorist, Nobel laureate, cofounder of the field of ethology (stay tuned), regular on nature TV programs. Grandfatherly Konrad, in his Austrian shorts and suspenders, being followed by his imprinted baby geese, was also a rabid Nazi propagandist. Lorenz joined the Nazi Party the instant Austrians were eligible, and joined the party's Office of Race Policy, working to psychologically screen Poles of mixed Polish/German parentage, helping to determine which were sufficiently Germanized to be spared death. Here was a man pathologically mired in an imaginary bucket related to gross misinterpretations of what genes do.

These were not obscure scientists producing fifth-rate science at Podunk U. These were among the most influential scientists of the twentieth century. They helped shape who and how we educate and our views on what social ills are fixable and when we shouldn't bother. They enabled the destruction of the brains of people against their will. And they helped implement final solutions for problems that didn't exist. It can be far more than a mere academic matter when a scientist thinks that human behavior can be entirely explained from only one perspective.