

What makes an explanation good enough?

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Left: Conspiracy meme "Pepe Silva"; Right: Simon DeDeo at the Santa Fe Institute. Credit: Michael Garfield/Santa Fe Institute

"If you look at the biggest and most divisive arguments we're having right now," says Simon DeDeo, SFI External Professor and Carnegie Mellon University Professor, "we often agree on the facts. We disagree on the explanations."

What makes an [explanation](#) good enough? As a personal matter, people

have different answers to this question, and not all of them agree, says a recent paper in *Trends in Cognitive Sciences* by DeDeo and first author Zachary Wojtowicz (Carnegie Mellon). The authors use Bayes' Rule, a famous theorem in probability and statistics, to investigate what we value in scientific and moral explanations.

Simplicity is one feature of a good explanation. In the sciences, for example, some people strive for a principle of simplicity known as "parsimony," eg: "What is the shortest program I can write to produce these results?" Others prefer what Wojtowicz and DeDeo call "co-explanation," which looks to solve multiple puzzles with one answer, then evaluates the results in the light of new revelations. In physics, this often manifests as a search for a unifying principle or mechanism acting through seemingly disparate patterns.

But the most enchantingly simple explanations can clash with complex ones that account for the world more fully. Part of the challenge is that explanation and prediction aren't the same; deep learning algorithms might predict the near future with uncanny accuracy, but can't explain the models they produce to do so. "Theories of Everything" can fail to predict the world outside their training data sets.

Conspiracy theories are a great example of how a preference for what the authors call "co-explanations" can go awry. Take the Oklahoma City bomber Timothy McVeigh, who was arrested shortly after the bombing because he was driving without a license plate with a loaded gun in the passenger seat. People had trouble understanding how a criminal mastermind could be so careless, and it was easier for some to believe that McVeigh was a scapegoat for an elite conspiracy.

"Conspiracy theories are in many ways great explanations," says DeDeo. "Where conspiracy theorists go wrong is often in a lopsided aesthetic," neglecting the common sense of a domain and over-emphasizing the

values associated with, for example, "unifying" explanations.

All-encompassing answers, by the virtue of neglecting true complexity, have a price.

"Explanations, when they work, enchant us," DeDeo says, citing James Clerk Maxwell's theory of electromagnetism as an exceedingly useful explanation that "unifies" two invisible forces. But that same enchantment can also be abused when one aesthetic dominates.

What ultimately keeps anyone honest, according to DeDeo, is interacting with other people with different ideas of what constitutes a satisfying explanation.

More information: Zachary Wojtowicz et al. From Probability to Consilience: How Explanatory Values Implement Bayesian Reasoning, *Trends in Cognitive Sciences* (2020). [DOI: 10.1016/j.tics.2020.09.013](https://doi.org/10.1016/j.tics.2020.09.013)

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