

## ONE

*The Game of Logic – What Follows  
from What*

**T**he 2016 US presidential race was one of the most contentious in recent history for one very important reason – the reliance on ad hominem attacks by both candidates to bolster their bids for office. Ad hominem attacks are a type of reasoning fallacy<sup>1</sup>:

**Fallacy:** Arguments that violate the rules of logical thought, but often seem plausible or even convincing.

**Ad Hominem Fallacy:** Attacking an opponent rather than an opponent's evidence and arguments.

Ad hominem is an example of bad reasoning because a person could have a bad character yet still be conveying factual information or sound arguments. As the saying goes, even a broken clock is right twice a day. For that reason, fact-checking is a better strategy than character-checking in political debates. What we want to know is whether we can trust what we're being told.

Yet over the months-long political debacle, presidential candidates Donald Trump and Hillary Clinton repeatedly launched ad hominem attacks on each other to undermine each other's credibility. Trump variously declared that "Hillary Clinton may be the most corrupt person ever to seek the presidency of the United States" and was a "world-class liar" who has engaged in "theft."<sup>2</sup> Firing back, Clinton referred to supporters of Donald Trump as a "basket of deplorables";

drew parallels between Trump and Hitler; and described him as narcissistic, sexist, racist, and predatory in his business practices.<sup>3</sup> Subsequent analyses of the debates indicated that Trump and Clinton were guilty of launching a nearly equal number of ad hominem arguments.<sup>4</sup> Even more striking was the finding that the frequency of ad hominem use in the 2016 presidential debates was more than twice as high as it was in 2008, which reflected (and perhaps facilitated) the rise of extreme polarization in American politics.

During the debates, Americans became increasingly more likely to succumb to ad hominem beliefs concerning opposing parties. For example, a 2016 Pew Foundation poll found that 47 percent of Republicans believed that Democrats are more “immoral” than other Americans, and 35 percent of Democrats held that view about Republicans. Other research showed that Republicans and Democrats ascribe positive motives to themselves and hateful ones to their opponents at a level comparable to that of Palestinians and Israelis, a phenomenon referred to as motive attribution asymmetry (“Our motives are pure, yours are evil”).<sup>5</sup>

Our weakness for ad hominem attacks is not restricted to the realm of politics. A set of studies involving 700 participants investigated the impact of ad hominem attacks on scientists compared to attacks on the scientific basis of claims. The results indicated that ad hominem attacks had the same degree of impact as attacks on the scientific basis of the claims. In other words, claiming “This is an evil scientist” is as likely to cause people to reject scientific results as claiming “This is bad science.”<sup>6</sup>

Ad hominem attacks are so enticingly persuasive because they seem to warn us against trusting unreliable sources. “Don’t bother considering what this person is saying,” ad hominem warns us, “because the speaker isn’t a reliable source. In fact, the speaker is a bad person.” We find ourselves wondering “Can I trust this person?” rather than “Is that statement true? Is the argument sound?”

We prefer to assess the speaker’s character rather than the quality of the argument and evidence brought to bear because we falsely believe we are better at judging character and motivation than we are at evaluating arguments and evidence. But the truth is, we’re not.

Over the course of more than 50 years, psychologist Paul Ekman has had over 15,000 people watch video clips of people either lying or telling the truth, and found that only 50 people (fewer than 1 percent) could identify honest individuals.<sup>7</sup> Similarly, a review of 247 studies of lie detection found that people were accurate in identifying liars only 54 percent of the time. Despite this, most people think they can reliably tell whether or not a person is trustworthy.<sup>8</sup>

What do we think a trustworthy face looks like? It is a face that looks happy (even when the person is not smiling) and has feminine or baby-like features.<sup>9</sup> We are suckers for people who look like this. We make judgments about trustworthiness in a fraction of a second, outside of awareness, and these judgments greatly impact our decision-making. For example, judgments of facial trustworthiness by naive participants have been found to predict the actual court sentences imposed on inmates by well-informed juries.<sup>10</sup> We also trust people who have trustworthy faces to invest for us, regardless of their actual financial competence.<sup>11</sup>

We are ripe for manipulation because we (perhaps rightfully) distrust our ability to evaluate truth and evidence, but are overconfident in our ability to spot liars. This unholy combination of cognitive features renders us vulnerable to conformity pressure within our ideological tribes. In a 2016 paper entitled “The nature and origins of misperceptions,”<sup>12</sup> three political scientists note that in polarized situations we feel intense social pressure to think and act in ways that are consistent with important group identities. Instead of thinking for ourselves, we tend to reason toward conclusions that reinforce existing loyalties rather than conclusions that objective observers might deem “correct.” In other words, we trust members of our tribes to tell us the truth. Blind trust is mandatory, and questioning the beliefs of our tribe can mean ostracism.

In our current divisive political climate, reasoned dialog is too often shunned by people on both sides of controversial issues. In a 2018 CNN interview, Hillary Clinton asserted that “You cannot be civil with a political party that wants to destroy what you stand for, what you care about.”<sup>13</sup> This sentiment was echoed by *New York Post* op-ed editor Sohrab Ahmari, who argued that conservatives should view

“civility and decency” as secondary values in what he calls a “cultural civil war.”<sup>14</sup>

Reasoned dialog is simply listening with respect while evaluating the claims made by those with opposing views. Yet assertions like those of Clinton and Ahmari belie a fear that engaging in dialog puts one at risk for surrendering one’s beliefs and signing on to the other side’s position. Indeed, reasoned dialog is treated with suspicion precisely because persuasive argument and objective evidence can cause us to change our minds. To those who are deeply emotionally committed to their beliefs, this is tantamount to risking unprincipled compromise on significant moral issues. But as Harvard cognitive scientist Steven Pinker points out, if controversial ideas are left to fester unaddressed instead of debated openly, then individuals susceptible to those ideas may seize upon their “most toxic interpretations” and decide that those interpretations are in fact forbidden “truths” that the establishment has conspired to keep hidden.<sup>15</sup>

The irony is that, if we hone our skills at listening with respect, evaluating the soundness of arguments, and assessing evidence cited to bolster an argument, we are likely to find that we agree more with our opponents than we thought we did: For example, 90 percent of Americans support universal background checks for gun purchases.<sup>16</sup> Yet political debates on the issue typically cast gun owners and gun control activists as widely opposed on gun regulation.

That is why it is in our best interest to hone our reasoning skills. For our own protection, we need to become experts at assessing the soundness of arguments and the weight of evidence, and at spotting fallacious and weak arguments. The most powerful tool to achieve these goals is logic.

### *1.1 Logic: An Overview*

Logic is a branch of mathematics. Logicians seek to do with sentences what mathematicians do with numbers, namely, translate them into symbols that can be manipulated according to specific rules. In mathematics, these rules preserve the relationships among numbers, quantities, and space. For example, if we want to know how much 84 plus 35

is, we can translate that into an arithmetic function (+) defined over numerals (84, 35), and apply the function to get the answer:

$$+(84,35) = 119$$

(Putting the plus sign out front is called “Polish notation.” It means the same thing as  $84 + 35$ .)

In logic, the rules are truth-preserving, that is, they tell us which inferences can be reliably drawn from the information given. For example, suppose we encounter this argument:

*If Fido is a dog, then Fido is an animal.  
 Fido is a dog.  
 Therefore, Fido is an animal.*

Is this a valid argument, that is, should we accept the conclusion? We can answer that question in the same way we found the answer to the math problem: We translate those sentences into symbols and apply a truth function to test the validity of the argument like this:

$$\begin{array}{l} D \supset A \\ D \\ \therefore A \end{array}$$

The truth function for  $\supset$  allows us to determine that this is a deductively valid argument. (For more on truth functions, see Chapter 8.) Now consider this argument, called “Denying the Antecedent”:

*If Fido is a dog, then Fido is an animal.  
 Fido is not a dog.  
 Therefore, Fido is not an animal.*

Again, we would translate this argument into symbols like this:

$$\begin{array}{l} D \supset A \\ \neg D \\ \therefore \neg A \end{array}$$

The truth function for  $\supset$  (if-then) tells us that this is not a valid argument.

The important point to grasp is that *deductive validity depends solely on the form of the argument*. All arguments of a particular form are either valid or invalid. Using the aforementioned examples, all truth functional arguments of the form Modus Ponens are valid. All truth functional arguments of the form Denying the Antecedent are invalid.

Again, this is the important point: In math, applying the rules to symbols mirrors the mathematical relationships among the numbers or quantities that the symbols represent. In logic, applying the rules to symbols mirrors the logical relationships among the symbols that represent the sentences. Once we translate the sentences into symbols, it doesn't matter what the symbols stand for anymore. We've lost that meaning in logic land. We manipulate the symbols according to rules, and that tracks the logical coherence of the argument. Then we have to translate the outcome back into the real-world meaning of the symbols. So there are three steps in this game:

1. Translate a real-world event into symbols in logic land.
2. Apply the appropriate rules from logic land to those symbols in order to determine validity.
3. Take that answer and translate it back into the real world.

In our Fido example, the rules of logic would tell us that Modus Ponens arguments are valid. That means we can safely conclude that Fido is a dog. They also tell us that Denying the Antecedent arguments are invalid. That means we reject the conclusion of the argument because that conclusion does not follow logically from the premises.

One last thing we need to consider when evaluating arguments is whether or not the premises are true. Consider this argument:

*If the moon is made of Swiss cheese, then cows are purple*  
*The moon is made of Swiss cheese.*  
*Therefore, cows are purple.*

This is an instance of Modus Ponens, so it is a valid argument: that is, *if the premises were true, then the conclusion would be true as well*. But this argument is not *sound* because the premises are not true.

**Argument Soundness:** A sound argument is a deductively valid argument that is based on true premises.

To refute this argument, you have to attack the premises – show that they’re false. You could not simply reject the conclusion. So, to reason well, we want to make sure that the premises of an argument are true, and that the conclusion follows logically from those premises.

### *1.2 Falling for Fallacies*

Good thinking means evaluating arguments on the basis of their logical consistency and the truth of their premises. But too often, we don’t do that. Instead, we are lured into bad thinking by persuasive fallacies.

Here are some of the most common fallacies that derail our thinking:

**Red Herring:** A diversionary tactic that avoids the key issues rather than addressing them.

Example: “I’m embarrassed by the things I said about women, but I’m going to knock the hell out of ISIS.”

Donald Trump offered this response to a question about demeaning things he said about women on a tape from 2005. Notice how the response not only shifts attention away from the issue of a presidential candidate’s view of women by referring to a military threat but also makes the former issue seem trivial by comparison.

**Moral Equivalence:** Comparing minor misdeeds with major atrocities, thereby implying that both are equally immoral.

**False Dichotomy:** Falsely arguing that there are only two sides to an issue.

Example: “Either you care both about Trump being sexual predator & Clinton emails, or u care about neither. But don’t talk about one without the other.”

This tweet from ABC News political analyst Matthew Dowd<sup>17</sup> encompasses both fallacies, along with ad hominem. He accuses Donald

Trump of being a sexual predator, implies that being a sexual predator is equivalent to using a private email server for official public communications, and insists that either one cares or doesn't care about wrongdoing among the candidates.

**The Straw Man:** Misrepresenting the opposition's view in order to make it easier to reject it.

Example: "Bernie is a Communist who admires Communist dictators and he should never be President of the United States of America."

Former Governor of Wisconsin Scott Walker tweeted that statement on February 24, 2020. This tweet appeals to the tensions between capitalist and Marxist countries that characterized much of the twentieth century. The problem is that the claim exaggerates Senator Bernie Sanders' left-leaning politics. As he put it during his 2016 presidential campaign, "When I talk about democratic socialism, I'm not looking at Venezuela. I'm not looking at Cuba. I'm looking at countries like Denmark and Sweden."<sup>18</sup>

**The Genetic Fallacy:** Dismissing an idea by pointing to its source.

Example: If Donald Trump/Barack Obama supports it, then it must be wrong.

According to a 2015 Huffington Post poll, support for universal health care dipped significantly when respondents were told Donald Trump favored it versus when they were told that Barack Obama favored it. Conversely, support for the Iran arms deal increased when people were told that Trump supported it compared to when they were told John Kerry did.<sup>19</sup>

**The Slippery Slope:** Arguing that taking a minor action will necessarily lead to major or even absurd consequences.

Example: "*The Democrats would, I believe – I think they'd give up the Second Amendment . . . and all of a sudden, everything gets taken away. We're not going to let that happen.*"

Here, President Trump expressed his concerns about gun control regulation by appealing to the "slippery slope" fallacy, namely, that expanded background checks for gun purchases will lead to the total erosion of the constitutional right to bear arms.<sup>20</sup>



Watch out for these common fallacies. When you hear them, reject them. Don't let these false beliefs generated by fallacious reasoning get into your head.

### 1.3 A Closer Look at How People Reason

For the past five decades, cognitive scientists and neuroscientists have been closely examining how people evaluate arguments. Most of these studies pit the believability of the arguments' conclusions against their logical form. Here is a study that shows the typical results of these studies.<sup>21</sup> These are the instructions people were given:

*This is an experiment to test people's reasoning ability. You will be given eight problems. On each page, you will be shown two statements and you are asked if certain conclusions (given below the statements) may be logically deduced from them. You should answer this question on the assumption that the two statements are, in fact, true.*

*If you judge that the conclusion necessarily follows from the statements, you should answer "yes", otherwise "no". Please take your time and be sure that you have the right answer before doing so.*

Here are examples of the syllogisms they were given to consider. Try your hand at them. **Remember: Assume the premises are true, and ask yourself whether or not the conclusion therefore must be true as well.**

*No police dogs are vicious.  
 Some highly trained dogs are vicious.  
 Therefore, some highly trained dogs are not police dogs.*

*No nutritional things are inexpensive.  
 Some vitamin tablets are inexpensive.  
 Therefore, some vitamin tablets are not nutritional.*

*No addictive things are inexpensive.  
 Some cigarettes are inexpensive.  
 Therefore, some addictive things are not cigarettes.*

*No millionaires are hard workers.  
Some rich people are hard workers.  
Therefore, some millionaires are not rich people.*

And the answer is . . . the first two are valid, but the second two are not.

If you found the answers surprising, that is probably because you succumbed to belief bias:

**Belief Bias:** The tendency to evaluate arguments based on how well they jibe with prior beliefs rather than on the validity (or strength) of the argument.

The conclusions of the first and third syllogism are believable. The conclusions of the second and fourth are unbelievable. If you based your decisions on the believability of the conclusion, you fell prey to belief bias.

People usually show strong belief bias in studies of logical reasoning. In this particular study, if people had evaluated the syllogisms solely on the basis of the form of the argument, the acceptance rate for the valid syllogisms would have been 100 percent and the acceptance rate for invalid syllogisms would have been 0 percent. But this isn't what happened. Instead, valid syllogisms with believable conclusions were correctly accepted about 85 percent of the time, but those with unbelievable conclusions were correctly accepted only about 55 percent of the time. Similarly, invalid syllogisms with unbelievable conclusions were correctly rejected about 90 percent of the time, but those with believable conclusions were correctly rejected only about 30 percent of the time!

People are far more likely to succumb to belief bias when they must reason under time constraints.<sup>22</sup> When decision time was restricted to 10 seconds in one study, the acceptance rate for valid syllogisms with unbelievable conclusions dropped from 60 percent to less than 40 percent, while the rejection rate for invalid syllogisms with believable conclusions dropped from 40 percent to 20 percent! When rushed, people were far more likely to rely simply on their prior beliefs when evaluating arguments.

If you are still unconvinced that our beliefs influence how we interpret facts, consider the example of the “flying horse.” Depictions