

Occam's Razor and the Avoidance of Rational Pitfalls

In order to do good science, there are a number of human foibles that can get in the way of rational and valid methodology. According to R. T. Carroll (*The Skeptic's Dictionary*):

"The trick is to know how to develop tests in reality that avoid confirmation bias, wishful thinking, self-deception, selective thinking, subjective validation, being seduced by communal reinforcement or persuaded by ad hoc hypotheses and post hoc reasoning, as well as having a healthy skepticism and an ability to apply Occam's razor when needed."

Let's examine each of these in turn.

Circular Reasoning or "Begging the Question"

The following argument is a standard example of circular reasoning: "The Koran says God exists, and the Koran must be right since it is the revealed word of God, so God exists." Obviously enough, no one who doubts the conclusion has any reason to accept the second premise, which presupposes it. This is, of course, a blatant example meant solely to illustrate the fallacy; less contrived instances may be much more subtle.

It is important to note that such arguments are logically valid. That is, the conclusion does in fact follow from the premises, since it is in some way identical to the premises. All circular arguments have this characteristic: that the proposition to be proved is assumed at some point in the argument. This is why begging the question was classified as a Material fallacy rather than a Logical fallacy by Aristotle, and similarly, is classified as an informal fallacy today.

The following text is excerpted from Carroll's excellent *The Skeptic's Dictionary*.

Confirmation Bias

"It is the peculiar and perpetual error of the human understanding to be more moved and excited by affirmatives than by negatives." --Francis Bacon

Confirmation bias refers to a type of selective thinking whereby one tends to notice and to look for what confirms one's beliefs, and to ignore, not look for, or undervalue the relevance of what contradicts one's beliefs. For example, if you believe that during a full moon there is an increase in admissions to the emergency room where you work, you will take notice of admissions during a full moon, but be inattentive to the moon when admissions occur during other nights of the month. A tendency to do this over time unjustifiably strengthens your belief in the relationship between the full moon and accidents and other lunar effects.

This tendency to give more attention and weight to data that support our beliefs than we do to contrary data is especially pernicious when our beliefs are little more than prejudices. If our beliefs are firmly established on solid evidence and valid confirmatory experiments, the tendency to give more attention and weight to data that fit with our beliefs should not lead us astray as a rule. Of course, if we become blinded to evidence truly refuting a favored hypothesis, we have crossed the line from reasonableness to closed-mindedness.

Numerous studies have demonstrated that people generally give an excessive amount of value to confirmatory information, that is, to positive or supportive data. The "most likely reason for the excessive influence of confirmatory information is that it is easier to deal with cognitively" (Gilovich 1993). It is much easier to see how a piece of data supports a position than it is to see how it might count against the position. Consider a typical ESP experiment or a seemingly clairvoyant dream: Successes are often unambiguous or data are easily massaged to count as successes, while negative instances require intellectual effort to even see them as negative or to consider them as significant. The tendency to give more attention and weight to the positive and the confirmatory has been shown to influence memory. When digging into our memories for data relevant to a position, we are more likely to recall data that confirms the position (ibid.).

Researchers are sometimes guilty of confirmation bias by setting up experiments or framing their data in ways that will tend to confirm their hypotheses. They compound the problem by proceeding in ways that avoid dealing with data that would contradict their hypotheses. For example, some parapsychologists used to engage in optional starting and stopping in their ESP research. Experimenters might avoid or reduce confirmation bias by collaborating in experimental design with colleagues who hold contrary hypotheses, as Richard Wiseman (skeptic) and Marilyn Schlitz (proponent) have done.* Individuals have to constantly remind themselves of this tendency and actively seek out data contrary to their beliefs. Since this is unnatural, it appears that the ordinary person is doomed to bias.

Wishful Thinking

Wishful thinking is interpreting facts, reports, events, perceptions, etc., according to what one would like to be the case rather than according to the actual evidence. If it is done intentionally and without regard for the truth, it is called misinterpretation, falsification, dissembling, disingenuous, or perversion of the truth.

Self-Deception

Self-deception is the process or fact of misleading ourselves to accept as true or valid what is false or invalid. Self-deception, in short, is a way we justify false beliefs to ourselves.

Ninety-four percent of university professors think they are better at their jobs than their colleagues.

Twenty-five percent of college students believe they are in the top 1% in terms of their ability to get along with others.

Seventy percent of college students think they are above average in leadership ability.

Only two percent think they are below average.

--Thomas Gilovich *How We Know What Isn't So*

Fortunately, it is not necessary to know whether self-deception is due to unconscious motivations or not in order to know that there are certain situations where self-deception is so common that we must systematically take steps to avoid it. Such is the case with belief in paranormal or occult phenomena such as ESP, prophetic dreams, dowsing, therapeutic touch, facilitated communication, and a host of other topics taken up in the *Skeptic's Dictionary*.

In *How We Know What Isn't So*, Thomas Gilovich describes the details of many studies which make it clear that we must be on guard against the tendencies to

misperceive random data and see patterns where there are none;

misinterpret incomplete or unrepresentative data and give extra attention to confirmatory data while drawing conclusions without attending to or seeking out disconfirmatory data;
make biased evaluations of ambiguous or inconsistent data, tending to be uncritical of supportive data and very critical of unsupportive data.

It is because of these tendencies that scientists require clearly defined, controlled, double-blind, randomized, repeatable, publicly presented studies. Otherwise, we run a great risk of deceiving ourselves and believing things that are not true. It is also because of these tendencies that in trying to establish beliefs non-scientists ought to try to imitate science whenever possible. In fact, scientists must keep reminding themselves of these tendencies and guard against pathological science.

Selective Thinking

Selective thinking is the process whereby one selects out favorable evidence for remembrance and focus, while ignoring unfavorable evidence for a belief. This kind of thinking is the basis for most beliefs in the psychic powers of so-called mind readers and mediums. It is also the basis for many, if not most, occult and pseudoscientific beliefs.

It should be noted that selective thinking works independently of wishful thinking and should not be confused with *biased thinking*, whereby one seriously *considers* data contrary to one's belief, but one is much more critical of such data than one is of supportive data.

Subjective Validation

Subjective validation is the process of validating words, initials, statements or signs as accurate because one is able to find them personally meaningful and significant. Subjective validation is an essential element of any successful cold reading done by astrologers, palm readers, tarot readers, mediums, and the like. The sitter in such readings must cooperate. Fortunately for the medium, most sitters are usually eager for the reader to succeed and are willing to work hard to find personal meaning in whatever the reader throws out. In a successful cold reading, the sitter will be convinced that the accuracy of the reading was not due to her ability and willingness to cooperate but rather to the powers of astrology, palmistry, tarot, or mediumship.

Subjective validation, however, occurs not only in cold reading but in other instances as well. For example, subjects given phony personality or astrological readings often rate their accuracy as very high. Why? Because human beings are very good at finding meaning where there is none and giving significance to what is actually meaningless in itself. We are especially good at relating things to ourselves. Words, symbols, signs, sounds, gestures, and the like have no meaning in themselves. Human beings give them meaning and often we give them a *personal* meaning when none was intended. We're very good at this and you might say it is what distinguishes us from most other creatures on this planet. Sometimes, however, we don't see what is right before our eyes. We see what we want to see and hear what we want to hear. If our motivation is strong enough we can sometimes even bring the dead back to life or come to believe that mundane things about our lives are imbued with paranormal or supernatural significance.

Communal Reinforcement (“Group Think”)

Communal reinforcement is the process by which a claim becomes a strong belief through repeated assertion by members of a community. The process is independent of whether the claim has been prop-

erly researched or is supported by empirical data significant enough to warrant belief by reasonable people. Often, the mass media contribute to the process by uncritically supporting the claims. More often, however, the mass media provide tacit support for untested and unsupported claims by saying nothing skeptical about even the most outlandish of claims.

Communal reinforcement explains how entire nations can pass on ineffable gibberish from generation to generation. It also explains how testimonials reinforced by other testimonials within the community of therapists, sociologists, psychologists, theologians, politicians, talk show hosts, etc., can supplant and be more powerful than scientific studies or accurate gathering of data by disinterested parties.

Communal reinforcement explains, in part, why about half of all American adults deny evolution occurred and believe that God created the universe in six days,* made the first man and woman out of clay, and a snake talked the woman into disobeying an order from God thereby causing all our problems.

Ad Hoc Hypothesis

An ad hoc hypothesis is one created to explain away facts that seem to refute one's theory. Ad hoc hypotheses are common in paranormal research and in the work of pseudoscientists. For example, ESP researchers have been known to blame the hostile thoughts of onlookers for unconsciously influencing pointer readings on sensitive instruments. The hostile vibes, they say, made it impossible for them to duplicate a positive ESP experiment. Being able to duplicate an experiment is essential to confirming its validity. Of course, if this objection is taken seriously, then no experiment on ESP can ever fail. Whatever the results, one can always say they were caused by paranormal psychic forces, either the ones being tested or others not being tested.

Astrologers are often fond of using statistical data and analysis to impress us with the scientific nature of astrology. Of course, a scientific analysis of the statistical data does not always pan out for the astrologer. In those cases, the astrologer can make the data fit the astrological paradigm by the ad hoc hypothesis that those who do not fit the mold have other, unknown influences that counteract the influence of the dominant planets.

Finally, rejecting explanations that require belief in occult, supernatural or paranormal forces in favor of simpler and more plausible explanations is called applying Occam's razor. It is not the same as ad hoc hypothesizing. For example, let's say I catch you stealing a watch from a shop. You say you did not steal it. I ask you to empty your pockets. You agree and pull out a watch. I say, "Aha!, I was right. You stole the watch." You reply that you did not steal the watch, but you admit that it was not in your pocket when we went into the store. I ask you to explain how the watch got into your pocket and you say that you used telekinesis: you used your thoughts to transport the watch out of a glass case into your pocket. I ask you to repeat the act with another watch and you say "ok." Try as you will, however, you cannot make a watch magically appear in your pocket. You say that there is too much pressure on you to perform or that there are too many bad vibes in the air for you to work your powers. You have offered an ad hoc hypothesis to explain away what looks like a good refutation of your claim. My hypothesis that the watch is in your pocket because you stole it, is not an ad hoc hypothesis. I have chosen to believe a plausible explanation rather than an implausible one. Likewise, given the choice between believing that my headache went away of its own accord or that it went away because some nurse waved her hands over my hand while chanting a mantra, I will opt for the former every time.

It is always more reasonable to apply Occam's razor than to offer speculative ad hoc hypotheses just to

maintain the possibility of something supernatural or paranormal.

Post Hoc Reasoning / Fallacy

The *post hoc ergo propter hoc* (after this therefore because of this) fallacy is based upon the mistaken notion that simply because one thing happens after another, the first event was a cause of the second event.

Post hoc reasoning is the basis for many superstitions and erroneous beliefs.

Many events follow sequential patterns without being causally related. For example, you have a cold, so you drink fluids and two weeks later your cold goes away. You have a headache so you stand on your head and six hours later your headache goes away. You put acne medication on a pimple and three weeks later the pimple goes away. You perform some task exceptionally well after forgetting to bathe, so the next time you have to perform the same task you don't bathe. A solar eclipse occurs so you beat your drums to make the gods spit back the sun. The sun returns, proving to you the efficacy of your action.

You use your dowsing stick and then you find water. You imagine heads coming up on a coin toss and heads comes up. You rub your lucky charm and what you wish for comes true. You lose your lucky charm and you strike out six times. You have a "vision" that a body is going to be found near water or in a field and later a body is found near water or in a field. You have a dream that an airplane crashes and an airplane crashes the next day or crashed the night before.

However, sequences don't establish a probability of causality any more than correlations do. Coincidences happen. Occurring after an event is not sufficient to establish that the prior event caused the later one. To establish the probability of a causal connection between two events, controls must be established to rule out other factors such as chance or some unknown causal factor. Anecdotes aren't sufficient because they rely on intuition and subjective interpretation. A controlled study is necessary to reduce the chance of error from self-deception.

Philosophical Skepticism

The passion for philosophy...may only serve...to foster a predominant inclination...of the natural temper....There is, however one species of philosophy which seems little liable to this inconvenience, and that because it strikes ... no disorderly passion of the human mind, nor can mingle itself with any natural affection or propensity; and that is the Academic or sceptical philosophy....It is surprising, therefore, that this philosophy, which in almost every instance must be harmless and innocent, should be the subject of so much groundless reproach and blame.

--David Hume, *Inquiry Concerning Human Understanding*

The worst speculative Sceptic ever I knew, was a much better Man than the best superstitious Devotee & Bigot.

--David Hume (Letter to Gilbert Elliot of Minto, March 10, 1751)

Philosophical skepticism is a critical attitude which systematically questions the notion that absolute knowledge and certainty are possible, either in general or in particular fields. Philosophical skepticism is opposed to *philosophical dogmatism*, which maintains that a certain set of positive statements are authoritative, absolutely certain and true.

Philosophical skepticism should be distinguished from *ordinary skepticism*, where doubts are raised against certain beliefs or types of beliefs because the evidence for the particular belief or type of belief

is weak or lacking. Ordinary skeptics are not credulous or gullible. They don't take things on trust, but must see the evidence before believing. Ordinary skeptics doubt the miraculous claims of religions, the claims of alien abductions, the claims of psychoanalysis, etc. But they do not necessarily doubt that certainty or knowledge is possible. Nor do they doubt these things because of systematic arguments that undermine all knowledge claims.

In addition to providing philosophical doubts about metaphysics, some skeptics aimed their arguments at specific types of claims. One of the most important figures in the history of skepticism is David Hume (1711-1776), whose skeptical arguments against belief in miracles is still considered by many skeptics to be the best single argument in the history of skepticism. In fact, Hume hoped his argument would serve as "an everlasting check to all kinds of superstitious delusion." Basically, Hume argues that for the same reason it is reasonable to avoid the vicious dog trying to bite us, it is reasonable to reject miraculous claims. Miraculous claims assert that a violation of the laws of nature has occurred. Laws of nature are based on experience. Experience is our guide in avoiding the vicious dog and must be our guide in judging the miraculous event. To accept an event as miraculous is to accept that experience is not a reliable guide. However, it is our *only* guide in such matters, unless we abandon reason and believe on pure faith. As he so eloquently and succinctly puts it:

A miracle is a violation of the laws of nature; and as a firm and unalterable experience has established these laws, the proof against a miracle, from the very nature of the fact, is as entire as any argument from experience can possibly be imagined.

Dogmatic philosophies have become rare. The age of metaphysics is long gone, indicating that the Skeptics have won the war with the dogmatists. Logic is about the only philosophical area left where professional philosophers still speak of absolute certainty with a straight face. The chance of another Plato or Hegel arising in the 21st century seems very slim. Most philosophers today content themselves with probabilistic arguments based on empirical knowledge and the application of logical principles to concepts.

Occam's Razor

"*Pluralitas non est ponenda sine neccesitate*" or "plurality should not be posited without necessity." The words are those of the medieval English philosopher and Franciscan monk William of Ockham (ca. 1285-1349). Like many Franciscans, William was a minimalist in this life, idealizing a life of poverty, and like St. Francis himself, battling with the Pope over the issue. William was excommunicated by Pope John XXII. He responded by writing a treatise demonstrating that Pope John was a heretic.

What is known as Occam's razor was a common principle in medieval philosophy and was not originated by William, but because of his frequent usage of the principle, his name has become indelibly attached to it. It is unlikely that William would appreciate what some of us have done in his name. For example, atheists often apply Occam's razor in arguing against the existence of God on the grounds that God is an unnecessary hypothesis. We can explain everything without assuming the extra metaphysical baggage of a Divine Being.

William's use of the *principle of unnecessary plurality* occurs in debates over the medieval equivalent of psi. For example, in Book II of his *Commentary on the Sentences* of Peter Abelard, he is deep in thought about the question of "Whether a Higher Angel Knows Through Fewer Species than a Lower." Using the principle that "plurality should not be posited without necessity" he argues that the answer to the question is in the affirmative. He also cites Aristotle's notion that "the more perfect a nature is the fewer means it requires for its operation." This principle has been used by atheists to reject the God-the-Creator hypothesis in favor of natural evolution: if a Perfect God had created the Universe, both the

Universe and its components would be much simpler. William would not have approved.

He did argue, however, that natural theology is impossible. Natural theology uses reason alone to understand God, as contrasted with revealed theology which is founded upon scriptural revelations. According to Occam, the idea of God is not established by evident experience or evident reasoning. All we know about God we know from revelation. The foundation of all theology, therefore, is faith. It should be noted that while others might apply the razor to eliminate the entire spiritual world, Ockham did not apply the principle of parsimony to the articles of faith. Had he done so, he might have become a Socinian like John Toland (*Christianity not Mysteriorous*, 1696) and pared down the Trinity to a Unity and the dual nature of Christ to a single nature.

William was somewhat of a minimalist in philosophy, advocating nominalism against the more popular view of realism. That is, he argued that universals have no existence outside of the mind; universals are just names we use to refer to groups of individuals and the properties of individuals. Realists claim that not only are there individual objects and our concepts of those objects, there are also *universals*. Ockham thought that this was one too many pluralities. We don't need universals to explain anything. To nominalists and realists there exist Socrates the individual and our concept of Socrates. To the realist there also exist such realities as the *humanity* of Socrates, the *animality* of Socrates, etc. That is, every quality which may be attributed to Socrates has a corresponding "reality", a "universal" or *eidōs*, as Plato called them. William might be said to have been skeptical of this realm of plurality called the realm of universals. It is not needed for logic, epistemology or metaphysics, so why assume this unnecessary plurality? Plato and the realists could be right. Perhaps there is a realm of *eidōs*, of universal realities which are eternal, immutable models for individual objects. But we don't need to posit such a realm in order to explain individuals, our concepts or our knowledge. Plato's *Eidōs* (Forms) are excess and unnecessary metaphysical and epistemological baggage.

It might well be argued that Bishop George Berkeley applied Occam's razor to eliminate material substance as an unnecessary plurality. According to Berkeley, we need only minds and their ideas to explain everything. Berkeley was a bit selective in his use of the razor, however. He needed to posit God as the Mind who could hear the tree fall in the forest when nobody is present. Subjective Idealists might use the razor to get rid of God. All can be explained with just minds and their ideas. Of course this leads to solipsism, the view that I and my ideas alone exist, or at least they are all I know exist. Materialists, on the other hand, might be said to use the razor to eliminate minds altogether. We don't need to posit a plurality of minds as well as a plurality of brains.

Occam's razor is also called the *principle of parsimony*. These days it is usually interpreted to mean something like "the simpler the explanation, the better" or "don't multiply hypotheses unnecessarily." In any case, Occam's razor is a principle which is frequently used outside of ontology, e.g., by philosophers of science in an effort to establish criteria for choosing from among theories with equal explanatory power. When giving explanatory reasons for something, don't posit more than is necessary. Von Däniken could be right: maybe extraterrestrials did teach ancient people art and engineering, but we don't need to posit alien visitations in order to explain the feats of ancient people. Why posit pluralities unnecessarily? Or, as most would put it today, don't make any more assumptions than you have to. We can posit the ether to explain action at a distance, but we don't need ether to explain it, so why assume an ethereal ether?

Oliver W. Holmes and Jerome Frank might be said to have applied Occam's razor in arguing that there is no such thing as "the Law." There are only judicial decisions; individual judgments and the sum of them make up the law. To confuse matters, these eminent jurists called their view *legal realism*, instead of

legal nominalism. So much for simplifying matters.

Because Occam's razor is sometimes called *the principle of simplicity* some creationists have argued that Occam's razor can be used to support creationism over evolution. After all, having God create everything is much simpler than evolution, which is a very complex mechanism. But Occam's razor does not say that the more simple a hypothesis, the better. If it did, Occam's would be dull razor for a dim populace indeed.

Some have even found a use for Occam's razor to justify budget cuts, arguing that "what can be done with less is done in vain with more." This approach seems to apply Occam's razor to the principle itself, eliminating the word "assumptions." It also confuses matters by confusing "less" with "fewer." Occam was concerned with fewer assumptions, not less money.

The original principle seems to have been invoked within the context of a belief in the notion that perfection is simplicity itself. This seems to be a metaphysical bias which we share with the medievals and the ancient Greeks. For, like them, most of our disputes are not about this principle but about what counts as necessary. To the materialist, dualists multiply pluralities unnecessarily. To the dualist, positing a mind as well as a body, is necessary. To atheists, positing God and a supernatural realm is to posit pluralities unnecessarily. To the theist, positing God is necessary. And so on. To von Daniken, perhaps, the facts make it necessary to posit extraterrestrials. To others, these aliens are unnecessary pluralities. In the end, maybe Occam's razor says little more than that for atheists God is unnecessary but for theists that is not true. If so, the principle is not very useful. On the other hand, if Occam's razor means that when confronted with two explanations, an implausible one and a probable one, a rational person should select the probable one, then the principle seems unnecessary because so obvious. But if the principle is truly a minimalist principle, then it seems to imply the more reductionism the better. If so, then the principle of parsimony might better have been called Occam's Chainsaw, for its main use seems to be for clear-cutting ontology.

Today, we think of the principle of parsimony as a heuristic device. We don't assume that the simpler theory is correct and the more complex one false. We know from experience that more often than not the theory that requires more complicated machinations is wrong. Until proved otherwise, the more complex theory competing with a simpler explanation should be put on the back burner, but not thrown onto the trash heap of history until proven false.