

## The Fine Art of Baloney Detection

Carl Sagan

The human understanding is no dry light, but receives an infusion from the will and affections; whence proceed sciences which may be called “sciences as one would.” For what a man had rather were true he more readily believes. Therefore he rejects difficult things from impatience of research; sober things, because they narrow hope; the deeper things of nature, from superstition; the light of experience, from arrogance and pride, lest his mind should seem to be occupied with things mean and transitory; things not commonly believed, out of deference to the opinion of the vulgar. Numberless in short are the ways, and sometimes imperceptible, in which the affections colour and infect the understanding.

FRANCIS BACON, *Novum Organon* (1620)

MY PARENTS DIED years ago. I was very close to them. I still miss them terribly. I know I always will. I long to believe that their essence, their personalities, what I loved so much about them, are—really and truly—still in existence somewhere. I wouldn’t ask very much, just five or ten minutes a year, say, to tell them about their grandchildren, to catch them up on the latest news, to remind them that I love them. There’s a part of me—no matter how childish it sounds—that wonders how they are. “Is everything all right?” I want to ask. The last words I found myself saying to my father, at the moment of his death, were “Take care.”

Sometimes I dream that I’m talking to my parents, and suddenly—still immersed in the dreamwork—I’m seized by the overpowering realization that they didn’t really die, that it’s all been some kind of horrible mistake. Why, here they are, alive and well, my father making wry jokes, my mother earnestly advising me to wear a muffler because the weather is chilly. When I wake up I go through an abbreviated process of mourning all over again. Plainly, there’s something within me that’s ready to believe in life after death. And it’s not the least bit interested in whether there’s any sober evidence for it.

So I don’t guffaw at the woman who visits her husband’s grave and chats him up every now and then, maybe on the anniversary of his death. It’s not hard to understand. And if I have difficulties with the ontological status of who she’s talking to, that’s all right. That’s not what this is about. This is about humans being human. More than a third of American adults believe that on some level they’ve made contact with the dead. The number seems to have jumped by 15 percent between 1977 and 1988. A quarter of Americans believe in reincarnation.

But that doesn’t mean I’d be willing to accept the pretensions of a “medium,” who claims to channel the spirits of the dear departed, when I’m aware the practice is rife with fraud. I know how much I want to believe that my parents have just abandoned the husks of their bodies, like insects or snakes molting, and gone somewhere else. I understand that those very feelings might make me easy prey even for an unclever con, or for normal people unfamiliar with their unconscious minds, or for those suffering from a dissociative psychiatric disorder. Reluctantly, I rouse some reserves of skepticism.

How is it, I ask myself, that channelers never give us verifiable information otherwise unavailable? Why does Alexander the Great never tell us about the exact location of his tomb, Fermat about his Last Theorem, John Wilkes Booth about the Lincoln assassination conspiracy, Hermann Goring about the Reichstag fire? Why don’t Sophocles, Democritus, and Aristarchus dictate their lost books? Don’t they wish future generations to have access to their masterpieces?

If some good evidence for life after death were announced, I’d be eager to examine it; but it would have to be real scientific data, not mere anecdote. As with the face on Mars and alien abductions, better the hard truth, I say, than the comforting fantasy. And in the final tolling it often turns out that the facts are more comforting than the fantasy.

The fundamental premise of “channeling,” spiritualism, and other forms of necromancy is that when we die we don’t. Not exactly. Some thinking, feeling, and remembering part of us continues. That whatever-it-is—a soul or spirit, neither matter nor energy, but something else—can, we are told, re-enter the bodies of human and other beings in the future, and so death loses much of its sting. What’s more, we have an opportunity, if the spiritualist or channeling contentions are true, to make contact with loved ones who have died.

J. Z. Knight of the State of Washington claims to be in touch with a 35,000-year-old somebody called “Ramtha.” He speaks English very well, using Knight’s tongue, lips and vocal chords, producing what sounds to me to be an accent from the Indian Raj. Since most people know how to talk, and many—from children to

professional actors—have a repertoire of voices at their command, the simplest hypothesis is that Ms. Knight makes “Ramtha” speak all by herself, and that she has no contact with disembodied entities from the Pleistocene Ice Age. If there’s evidence to the contrary, I’d love to hear it. It would be considerably more impressive if Ramtha could speak by himself, without the assistance of Ms. Knight’s mouth. Failing that, how might we test the claim? (The actress Shirley MacLaine attests that Ramtha was her brother in Atlantis, but that’s another story.)

Suppose Ramtha were available for questioning. Could we verify whether he is who he says he is? How does he know that he lived 35,000 years ago, even approximately? What calendar does he employ? Who is keeping track of the intervening millennia? Thirty-five thousand plus or minus what? What were things like 35,000 years ago? Either Ramtha really is 35,000 years old, in which case we discover something about that period, or he’s a phony and he’ll (or rather she’ll) slip up.

Where did Ramtha live? (I know he speaks English with an Indian accent, but where 35,000 years ago did they do that?) What was the climate? What did Ramtha eat? (Archaeologists know something about what people ate back then.) What were the indigenous languages, and social structure? Who else did Ramtha live with—wife, wives, children, grandchildren? What was the life cycle, the infant mortality rate, the life expectancy? Did they have birth control? What clothes did they wear? How were the clothes manufactured? What were the most dangerous predators? Hunting and fishing implements and strategies? Weapons? Endemic sexism? Xenophobia and ethnocentrism? And if Ramtha came from the “high civilization” of Atlantis, where are the linguistic, technological, historical and other details? What was their writing like? Tell us. Instead, all we are offered are banal homilies.

Here, to take another example, is a set of information channeled not from an ancient dead person, but from unknown non-human entities who make crop circles, as recorded by the journalist Jim Schnabel:

We are so anxious at this sinful nation spreading lies about us. We do not come in machines, we do not land on your earth in machines ... We come like the wind. We are Life Force. Life Force from the ground ... Come here ... We are but a breath away ... a breath away ... we are not a million miles away ... a Life Force that is larger than the energies in your body. But we meet at a higher level of life ... We need no name. We are parallel to your world, alongside your world ... The walls are broken. Two men will rise from the past ... the great bear ... the world will be at peace.

People pay attention to these puerile marvels mainly because they promise something like old-time religion, but especially life after death, even life eternal.

A very different prospect for something like eternal life was once proposed by the versatile British scientist J.B.S. Haldane, who was, among many other things, one of the founders of population genetics. Haldane imagined a far future when the stars have darkened and space is mainly filled with a cold, thin gas. Nevertheless, if we wait long enough statistical fluctuations in the density of this gas will occur. Over immense periods of time the fluctuations will be sufficient to reconstitute a Universe something like our own. If the Universe is infinitely old, there will be an infinite number of such reconstitutions, Haldane pointed out.

So in an infinitely old universe with an infinite number of appearances of galaxies, stars, planets, and life, an identical Earth must reappear on which you and all your loved ones will be reunited. I’ll be able to see my parents again and introduce them to the grandchildren they never knew. And all this will happen not once, but an infinite number of times.

Somehow, though, this does not quite offer the consolations of religion. If none of us is to have any recollection of what happened this time around, the time the reader and I are sharing, the satisfactions of bodily resurrection, in my ears at least, ring hollow.

But in this reflection I have underestimated what infinity means. In Haldane’s picture, there will be universes, indeed an infinite number of them, in which our brains will have full recollection of many previous rounds. Satisfaction is at hand—tempered, though, by the thought of all those other universes which will also come into existence (again, not once but an infinite number of times) with tragedies and horrors vastly outstripping anything I’ve experienced this turn.

The Consolation of Haldane depends, though, on what kind of universe we live in, and maybe on such arcana as whether there’s enough matter to eventually reverse the expansion of the universe, and the character of vacuum fluctuations. Those with a deep longing for life after death might, it seems, devote themselves to cosmology, quantum gravity, elementary particle physics, and transfinite arithmetic.

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Clement of Alexandria, a Father of the early Church, in his *Exhortations to the Greeks* (written around the year 190) dismissed pagan beliefs in words that might today seem a little ironic:

Far indeed are we from allowing grown men to listen to such tales. Even to our own children, when they are crying their heart out, as the saying goes, we are not in the habit of telling fabulous stories to soothe them.

In our time we have less severe standards. We tell children about Santa Claus, the Easter Bunny, and the Tooth Fairy for reasons we think emotionally sound, but then disabuse them of these myths before they're grown. Why retract? Because their well-being as adults depends on them knowing the world as it really is. We worry, and for good reason, about adults who still believe in Santa Claus.

On doctrinaire religions, "Men dare not avow, even to their own hearts," wrote the philosopher David Hume, the doubts which they entertain on such subjects. They make a merit of implicit faith; and disguise to themselves their real infidelity, by the strongest asseverations and the most positive bigotry.

This infidelity has profound moral consequences, as the American revolutionary Tom Paine wrote in *The Age of Reason*:

Infidelity does not consist in believing, or in disbelieving; it consists in professing to believe what one does not believe. It is impossible to calculate the moral mischief, if I may so express it, that mental lying has produced in society. When man has so far corrupted and prostituted the chastity of his mind, as to subscribe his professional belief to things he does not believe, he has prepared himself for the commission of every other crime.

T. H. Huxley's formulation was

The foundation of morality is to ... give up pretending to believe that for which there is no evidence, and repeating unintelligible propositions about things beyond the possibilities of knowledge.

Clement, Hume, Paine, and Huxley were all talking about religion. But much of what they wrote has more general applications—for example to the pervasive background importunings of our commercial civilization: There is a class of aspirin commercials in which actors pretending to be doctors reveal the competing product to have only so much of the painkilling ingredient that doctors recommend most—they don't tell you what the mysterious ingredient is. Whereas their product has a dramatically larger amount (1.2 to 2 times more per tablet). So buy their product. But why not just take two of the competing tablets? Or consider the analgesic that works better than the "regular-strength" product of the competition. Why not then take the "extra-strength" competitive product? And of course they do not tell us of the more than a thousand deaths each year in the United States from the use of aspirin, or the roughly 5,000 annual cases of kidney failure from the use of acetaminophen, chiefly Tylenol. (This, however, may represent a case of correlation without causation.) Or who cares which breakfast cereal has more vitamins when we can take a vitamin pill with breakfast? Likewise, why should it matter whether an antacid contains calcium if the calcium is for nutrition and irrelevant for gastritis? Commercial culture is full of similar misdirections and evasions at the expense of the consumer. You're not supposed to ask. Don't think. Buy.

Paid product endorsements, especially by real or purported experts, constitute a steady rainfall of deception. They betray contempt for the intelligence of their customers. They introduce an insidious corruption of popular attitudes about scientific objectivity. Today there are even commercials in which real scientists, some of considerable distinction, shill for corporations. They teach that scientists too will lie for money. As Tom Paine warned, inuring us to lies lays the groundwork for many other evils.

I have in front of me as I write the program of one of the annual Whole Life Expos, New Age expositions held in San Francisco. Typically, tens of thousands of people attend. Highly questionable experts tout highly questionable products. Here are some of the presentations: "How Trapped Blood Proteins Produce Pain and Suffering." "Crystals, Are They Talismans or Stones?" (I have an opinion myself.) It continues: "As a crystal focuses sound and light waves for radio and television"—this is a vapid misunderstanding of how radio and television work—"so may it amplify spiritual vibrations for the attuned human." Or here's one "Return of the Goddess, a Presentational Ritual." Another: "Synchronicity, the Recognition Experience." That one is given by "Brother Charles."

Or, on the next page, “You, Saint-Germain, and Healing Through the Violet Flame.” It goes on and on, with plenty of ads about “opportunities”—running the short gamut from the dubious to the spurious—that are available at the Whole Life Expo.

Distraught cancer victims make pilgrimages to the Philippines, where “psychic surgeons,” having palmed bits of chicken liver or goat heart, pretend to reach into the patient’s innards and withdraw the diseased tissue, which is then triumphantly displayed. Leaders of Western democracies regularly consult astrologers and mystics before making decisions of state. Under public pressure for results, police with an unsolved murder or a missing body on their hands consult ESP “experts” (who never guess better than expected by common sense, but the police, the ESPers say, keep calling). A clairvoyance gap with adversary nations is announced, and the Central Intelligence Agency, under Congressional prodding, spends tax money to find out whether submarines in the ocean depths can be located by thinking hard at them. A “psychic”—using pendulums over maps and dowsing rods in airplanes—purports to find new mineral deposits; an Australian mining company pays him top dollar up front, none of it returnable in the event of failure, and a share in the exploitation of ores in the event of success. Nothing is discovered. Statues of Jesus or murals of Mary are spotted with moisture, and thousands of kind-hearted people convince themselves that they have witnessed a miracle.

These are all cases of proved or presumptive baloney. A deception arises, sometimes innocently but collaboratively, sometimes with cynical premeditation. Usually the victim is caught up in a powerful emotion—wonder, fear, greed, grief. Credulous acceptance of baloney can cost you money; that’s what P. T. Barnum meant when he said, “There’s a sucker born every minute.” But it can be much more dangerous than that, and when governments and societies lose the capacity for critical thinking, the results can be catastrophic—however sympathetic we may be to those who have bought the baloney.

In science we may start with experimental results, data, observations, measurements, “facts.” We invent, if we can, a rich array of possible explanations and systematically confront each explanation with the facts. In the course of their training, scientists are equipped with a baloney detection kit. The kit is brought out as a matter of course whenever new ideas are offered for consideration. If the new idea survives examination by the tools in our kit, we grant it warm, although tentative, acceptance. If you’re so inclined, if you don’t want to buy baloney even when it’s reassuring to do so, there are precautions that can be taken; there’s a tried-and-true, consumer-tested method.

What’s in the kit? Tools for skeptical thinking.

What skeptical thinking boils down to is the means to construct, and to understand, a reasoned argument and—especially important—to recognize a fallacious or fraudulent argument. The question is not whether we *like* the conclusion that emerges out of a train of reasoning, but whether the conclusion *follows* from the premise or starting point and whether that premise is true.

Among the tools:

- Wherever possible there must be independent confirmation of the “facts.”
- Encourage substantive debate on the evidence by knowledgeable proponents of all points of view.
- Arguments from authority carry little weight—“authorities” have made mistakes in the past. They will do so again in the future. Perhaps a better way to say it is that in science there are no authorities; at most, there are experts.
- Spin more than one hypothesis. If there’s something to be explained, think of all the different ways in which it could be explained. Then think of tests by which you might systematically disprove each of the alternatives. What survives, the hypothesis that resists disproof in this Darwinian selection among “multiple working hypotheses,” has a much better chance of being the right answer than if you had simply run with the first idea that caught your fancy.\*
- Try not to get overly attached to a hypothesis just because it’s yours. It’s only a way station in the pursuit of knowledge. Ask yourself why you like the idea. Compare it fairly with the alternatives. See if you can find reasons for rejecting it. If you don’t, others will.

\* This is a problem that affects jury trials. Retrospective studies show that some jurors make up their minds very early—perhaps during opening arguments—and then retain the evidence that seems to support their initial impressions and reject the contrary evidence. The method of alternative working hypotheses is not running in their heads.

- Quantify. If whatever it is you're explaining has some measure, some numerical quantity attached to it, you'll be much better able to discriminate among competing hypotheses. What is vague and qualitative is open to many explanations. Of course there are truths to be sought in the many qualitative issues we are obliged to confront, but finding *them* is more challenging.
- If there's a chain of argument, *every* link in the chain must work (including the premise)—not just most of them.
- Occam's Razor. This convenient rule-of-thumb urges us when faced with two hypotheses that explain the data *equally well* to choose the simpler.
- Always ask whether the hypothesis can be, at least in principle, falsified. Propositions that are untestable, unfalsifiable, are not worth much. Consider the grand idea that our Universe and everything in it is just an elementary particle—an electron, say—in a much bigger Cosmos. But if we can never acquire information from outside our Universe, is not the idea incapable of disproof? You must be able to check assertions out. Inveterate skeptics must be given the chance to follow your reasoning, to duplicate your experiments and see if they get the same result.

The reliance on carefully designed and controlled experiments is key, as I tried to stress earlier. We will not learn much from mere contemplation. It is tempting to rest content with the first candidate explanation we can think of. One is much better than none. But what happens if we can invent several? How do we decide among them? We don't. We let experiment do it. Francis Bacon provided the classic reason:

Argumentation cannot suffice for the discovery of new work, since the subtlety of Nature is greater many times than the subtlety of argument.

Control experiments are essential. If, for example, a new medicine is alleged to cure a disease 20 percent of the time, we must make sure that a control population, taking a dummy sugar pill which as far as the subjects know might be the new drug, does not also experience spontaneous remission of the disease 20 percent of the time.

Variables must be separated. Suppose you're seasick, and given both an acupressure bracelet and 50 milligrams of meclizine. You find the unpleasantness vanishes. What did it—the bracelet or the pill? You can tell only if you take the one without the other, next time you're seasick. Now imagine that you're not so dedicated to science as to be willing to be seasick. Then you won't separate the variables. You'll take both remedies again. You've achieved the desired practical result; further knowledge, you might say, is not worth the discomfort of attaining it.

Often the experiment must be done “double-blind,” so that those hoping for a certain finding are not in the potentially compromising position of evaluating the results. In testing a new medicine, for example, you might want the physicians who determine which patients' symptoms are relieved not to know which patients have been given the new drug. The knowledge might influence their decision, even if only unconsciously. Instead the list of those who experienced remission of symptoms can be compared with the list of those who got the new drug, each independently ascertained. Then you can determine what correlation exists. Or in conducting a police lineup or photo identification, the officer in charge should not know who the prime suspect is, so as not consciously or unconsciously to influence the witness.



In addition to teaching us what to do when evaluating a claim to knowledge, any good baloney detection kit must also teach us what not to do. It helps us recognize the most common and perilous fallacies of logic and rhetoric. Many good examples can be found in religion and politics, because their practitioners are so often obliged to justify two contradictory propositions. Among these fallacies are:

- *ad hominem*—Latin for “to the man,” attacking the arguer and not the argument (e.g., *The Reverend Dr. Smith is a known Biblical fundamentalist, so her objections to evolution need not be taken seriously*);
- argument from authority (e.g., *President Richard Nixon should be re-elected because he has a secret plan to end the war in Southeast Asia*—but because it was secret, there was no way for the electorate to evaluate it on its merits; the argument amounted to trusting him because he was President: a mistake, as it turned out);

\* A more cynical formulation by the Roman historian Polybius: Since the masses of the people are inconstant, full of unruly desires, passionate, and reckless of consequences, they must be filled with fears to keep them in order. The ancients did well, therefore, to invent gods, and the belief in punishment after death.

- argument from adverse consequences (e.g., *A God meting out punishment and reward must exist, because if He didn't, society would be much more lawless and dangerous—perhaps even ungovernable.*\* Or: *The defendant in a widely publicized murder trial must be found guilty; otherwise, it will be an encouragement for other men to murder their wives*);
- appeal to ignorance—the claim that whatever has not been proved false must be true, and vice versa (e.g., *There is no compelling evidence that UFOs are not visiting the Earth; therefore UFOs exist—and there is intelligent life elsewhere in the Universe.* Or: *There may be seventy kazillion other worlds, but not one is known to have the moral advancement of the Earth, so we're still central to the Universe.*) This impatience with ambiguity can be criticized in the phrase: absence of evidence is not evidence of absence.
- special pleading, often to rescue a proposition in deep rhetorical trouble (e.g., *How can a merciful God condemn future generations to torment because, against orders, one woman induced one man to eat an apple? Special plead: you don't understand the subtle Doctrine of Free Will.* Or: *How can there be an equally godlike Father, Son, and Holy Ghost in the same Person? Special plead: You don't understand the Divine Mystery of the Trinity.* Or: *How could God permit the followers of Judaism, Christianity, and Islam—each in their own way enjoined to heroic measures of loving kindness and compassion—to have perpetrated so much cruelty for so long? Special plead: You don't understand Free Will again. And anyway, God moves in mysterious ways.*)
- begging the question, also called assuming the answer (e.g., *We must institute the death penalty to discourage violent crime.* But does the violent crime rate in fact fall when the death penalty is imposed? Or: *The stock market fell yesterday because of a technical adjustment and profit-taking by investors—but is there any independent evidence for the causal role of “adjustment” and profit-taking; have we learned anything at all from this purported explanation?*);
- observational selection, also called the enumeration of favorable circumstances, or as the philosopher Francis Bacon described it, counting the hits and forgetting the misses\* (e.g., *A state boasts of the Presidents it has produced, but is silent on its serial killers*);
- statistics of small numbers—a close relative of observational selection (e.g., *“They say 1 out of every 5 people is Chinese. How is this possible? I know hundreds of people, and none of them is Chinese. Yours truly.”* Or: *“I’ve thrown three sevens in a row. Tonight I can’t lose.”*);
- misunderstanding of the nature of statistics (e.g., President Dwight Eisenhower expressing astonishment and alarm on discovering that fully half of all Americans have below average intelligence);
- inconsistency (e.g., *Prudently plan for the worst of which a potential military adversary is capable, but thriftily ignore scientific projections on environmental dangers because they’re not “proved.”* Or: *Attribute the declining life expectancy in the former Soviet Union to the failures of communism many years ago, but never attribute the high infant mortality rate in the United States (now highest of the major industrial nations) to the failures of capitalism.* Or: *Consider it reasonable for the Universe to continue to exist forever into the future, but judge absurd the possibility that it has infinite duration into the past*);
- non sequitur—Latin for “It doesn’t follow” (e.g., *Our nation will prevail because God is great.* But nearly every nation pretends this to be true; the German formulation was “*Gott mit uns*”). Often those falling into the *non sequitur* fallacy have simply failed to recognize alternative possibilities;
- *post hoc, ergo propter hoc*—Latin for “It happened after, so it was caused by” (e.g., Jaime Cardinal Sin, Archbishop of Manila: *“I know of... a 26-year-old who looks 60 because she takes [contraceptive] pills.”* Or: *Before women got the vote, there were no nuclear weapons*);

\* My favorite example is this story, told about the Italian physicist Enrico Fermi, newly arrived on American shores, enlisted in the Manhattan nuclear weapons Project, and brought face-to-face in the midst of World War II with U.S. flag officers.

So-and-so is a great general, he was told. What is the definition of a great general? Fermi characteristically asked. I guess it's a general who's won many consecutive battles. How many? After some back and forth, they settled on five. What fraction of American generals are great? After some more back and forth, they settled on a few percent.

But imagine, Fermi rejoined, that there is no such thing as a great general, that all armies are equally matched, and that winning a battle is purely a matter of chance. Then the chance of winning one battle is one out of two, or 1/2, two battles 1/4, three 1/8, four 1/16, and five consecutive battles 1/32—which is about 3 percent. You would expect a few percent of American generals to win five consecutive battles—purely by chance. Now, has any of them won ten consecutive battles...?

- excluded middle, or false dichotomy—considering only the two extremes in a continuum of intermediate possibilities (e.g., “*Sure, take his side; my husband’s perfect; I’m always wrong.*” Or: “*Either you love your country or you hate it.*” Or: “*If you’re not part of the solution, you’re part of the problem*”);
- short-term vs. long-term—a subset of the excluded middle, but so important I’ve pulled it out for special attention (e.g., “*We can’t afford programs to feed malnourished children and educate pre-school kids. We need to urgently deal with crime on the streets.*” Or: “*Why explore space or pursue fundamental science when we have so huge a budget deficit?*”);
- slippery slope, related to excluded middle (e.g., “*If we allow abortion in the first weeks of pregnancy, it will be impossible to prevent the killing of a full-term infant.*” Or, conversely: “*If the state prohibits abortion even in the ninth month, it will soon be telling us what to do with our bodies around the time of conception*”);
- confusion of correlation and causation (e.g., “*A survey shows that more college graduates are homosexual than those with lesser education; therefore education makes people gay.*” Or: “*Andean earthquakes are correlated with closest approaches of the planet Uranus; therefore—*despite the absence of any such correlation for the nearer, more massive planet Jupiter—the latter causes the former\*”);
- straw man—caricaturing a position to make it easier to attack (e.g., “*Scientists suppose that living things simply fell together by chance—*a formulation that willfully ignores the central Darwinian insight that Nature ratchets up by saving what works and discarding what doesn’t. Or—this is also a short-term/long-term fallacy—“*environmentalists care more for snail darters and spotted owls than they do for people*”);
- suppressed evidence, or half-truths (e.g., “*An amazingly accurate and widely quoted “prophecy” of the assassination attempt on President Reagan is shown on television;* but—an important detail—was it recorded before or after the event? Or: “*These government abuses demand revolution, even if you can’t make an omelette without breaking some eggs.*” Yes, but is this likely to be a revolution in which far more people are killed than under the previous regime? What does the experience of other revolutions suggest? Are all revolutions against oppressive regimes desirable and in the interests of the people?);
- weasel words (e.g., “The separation of powers of the U.S. Constitution specifies that the United States may not conduct a war without a declaration by Congress. On the other hand, Presidents are given control of foreign policy and the conduct of wars, which are potentially powerful tools for getting themselves re-elected. Presidents of either political party may therefore be tempted to arrange wars while waving the flag and calling the wars something else—“police actions,” “armed incursions,” “protective reaction strikes,” “pacification,” “safeguarding American interests,” and a wide variety of “operations,” such as “Operation Just Cause.” Euphemisms for war are one of a broad class of reinventions of language for political purposes. Talleyrand said, “An important art of politicians is to find new names for institutions which under old names have become odious to the public”).

Knowing the existence of such logical and rhetorical fallacies rounds out our toolkit. Like all tools, the baloney detection kit can be misused, applied out of context, or even employed as a rote alternative to thinking. But applied judiciously, it can make all the difference in the world—not least in evaluating our own arguments before we present them to others.

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The American tobacco industry grosses some \$50 billion per year. There is a statistical correlation between smoking and cancer, the tobacco industry admits, but not, they say, a causal relation. A logical fallacy, they imply, is being committed. What might this mean? Maybe people with hereditary propensities for cancer also have hereditary propensities to take addictive drugs - so cancer and smoking might be correlated, but the cancer would not be caused by the smoking. Increasingly farfetched connections of this sort can be contrived. This is exactly one of the reasons science insists on control experiments.

\* Children who watch violent TV programs tend to be more violent when they grow up. But did the TV cause the violence, or do violent children preferentially enjoy watching violent programs? Very likely both are true. Commercial defenders of TV violence argue that anyone can distinguish between television and reality. But Saturday morning children’s programs now average 25 acts of violence per hour. At the very least this desensitizes young children to aggression and random cruelty. And if impressionable adults can have false memories implanted in their brains, what are we implanting in our children when we expose them to some 100,000 acts of violence before they graduate from elementary school?

Suppose you paint the backs of large numbers of mice with cigarette tar, and also follow the health of large numbers of nearly identical mice that have not been painted. If the former get cancer and the latter do not, you can be pretty sure that the correlation is causal. Inhale tobacco smoke, and the chance of getting cancer goes up; don't inhale, and the rate stays at the background level. Likewise for emphysema, bronchitis, and cardiovascular diseases.

When the first work was published in the scientific literature in 1953 showing that the substances in cigarette smoke when painted on the backs of rodents produce malignancies, the response of the six major tobacco companies was to initiate a public relations campaign to impugn the research, sponsored by the Sloan Kettering Foundation. This is similar to what the Du Pont Corporation did when the first research was published in 1974 showing that their Freon product attacks the protective ozone layer. There are many other examples.

You might think that before they denounce unwelcome research findings, major corporations would devote their considerable resources to checking out the safety of the products they propose to manufacture. And if they missed something, if independent scientists suggest a hazard, why would the companies protest? Would they rather kill people than lose profits? If, in an uncertain world, an error must be made, shouldn't it be biasing toward protecting customers and the public?

A 1971 internal report of the Brown and Williamson tobacco Corporation lists as a corporate objective "to set aside in the minds of millions the false conviction that cigarette smoking causes lung cancer and other diseases; a conviction based on fanatical assumptions, fallacious rumors, unsupported claims and the unscientific statements and conjectures of publicity-seeking opportunists." They complain of

the incredible, unprecedented and nefarious attack against the cigarette, constituting the greatest libel and slander ever perpetrated against any product in the history of free enterprise; a criminal libel of such major proportions and implications that one wonders how such a crusade of calumny can be reconciled under the Constitution can be so flouted and violated [sic].

This rhetoric is only slightly more inflamed than what the tobacco industry has from time to time uttered for public consumption.

There are many brands of cigarettes that advertise low "tar" (ten milligrams or less per cigarette). Why is this a virtue? Because it is the refractory tars in which the polycyclic aromatic hydrocarbons and some other carcinogens are concentrated. Aren't the low-tar ads a tacit admission by the tobacco companies that cigarettes indeed cause cancer?

Healthy Buildings International is a for-profit organization, recipient of millions of dollars over the years from the tobacco industry. It performs research on second-hand smoke, and testifies for the tobacco companies. In 1994, three of its technicians complained that senior executives had faked data on inhalable cigarette particles in the air. In every case, the invented or "corrected" data made tobacco smoke seem safer than the technicians' measurements had indicated. Do corporate research departments or outside research contractors ever find a product to be more dangerous than the tobacco corporation has publicly declared? If they do, is their employment continued?

Tobacco is addictive; by many criteria more so than heroin and cocaine. There was a reason people would, as the 1940s ad put it, "walk a mile for a Camel." More people have died of tobacco than in all of World War II. According to the World Health Organization, smoking kills three million people every year worldwide. This will rise to ten million annual deaths by 2020—in part because of a massive advertising campaign to portray smoking as advanced and fashionable to young women in the developing world. Part of the success of the tobacco industry in purveying this brew of addictive poisons can be attributed to widespread unfamiliarity with baloney detection, critical thinking, and the scientific method. Gullibility kills.