

Cause and Effect

Fallacy Number Five

<p>POST HOC ERGO PROPTER HOC</p>

CHANTECLER, the cock in Rostand's famous play, observed that after he crowed the sun came up. Therefore, he reasoned, his crowing caused the sun to rise. This illustrates perfectly what logicians call the *post hoc* fallacy. When one event precedes another event in time, the first is assumed to be the cause of the second.

Malaria was for centuries a baffling plague. It was observed that persons who went out at night often developed the malady. So, on the best *post hoc* reasoning, night air was assumed to be the cause of malaria, and elaborate precautions were taken to shut it out of sleeping quarters. Some scientists, however, were skeptical of this theory. A long series of experiments eventually proved that malaria was caused by the bite of the *anopheles* mosquito. Night air entered the picture only because mosquitoes prefer to attack in the dark.

As I write, two *post hoc* arguments are much in the news: the first, cigarette-smoking causes lung cancer; the second, test explosions of atomic bombs cause hurricanes and floods. Let us examine them.

More men are smoking cigarettes, and more men are de-

veloping lung cancer. Some careful statistical studies show a correlation. But many doctors are skeptical, saying that one or more other causes, such as polluted air, fumes, “smog,” may contribute to the effect. We do not yet have enough facts to know whether this widely publicized reasoning is a fallacy or not. The logical thing to do in the circumstances is to defer our conclusions until the facts are in.¹

Various sections of the globe, such as the northeast coast of the United States, have suffered from unaccustomed hurricanes and floods in recent years. The U.S. Armed Services meanwhile have been exploding atomic and hydrogen bombs, for experimental purposes, in Nevada and the Pacific. Therefore, the reasoning runs, the explosions cause the hurricanes by disturbing higher air currents. Most atomic scientists deny any connection. Furthermore, the worst New England hurricanes to date, those of 1938 and 1944, arrived before any atomic bombs had been exploded. Newsweek in July, 1954, ran the following story:

Red propagandists aren't missing any bets. Soviet and satellite radio broadcasts are blaming Europe's current floods on American H-bomb tests, which, they say, disturbed the atmosphere and caused heavy rains.

Now that the Russians themselves are exploding H-bombs, their enemies can return the compliment whenever the weather gets out of hand. My guess is that we have here a genuine *post hoc* fallacy; the test explosions have not yet upset the weather, except locally, whatever they might do to it in an all-out atomic war.

TO FILL AN EXPLANATORY VACUUM

The full Latin name for the fallacy is *Post hoc, ergo propter hoc*, which translates: “After this, therefore because of this.”

¹ Facts are still coming in and increasingly seem to indicate a causal connection.

It is responsible for a large amount of misunderstanding and conflict. It operates on all levels, from the cucumbers which you are sure caused a stomach-ache, to the H-bombs which some people are sure cause hurricanes half a world away.

What is the cause of a given effect? Often it is obvious, as when a fall on the ice results in a sprained wrist. But often it is not at all obvious, as in the case of malaria. Many events result from not one cause but from a whole process. The stomach-ache may be due to cucumbers, plus too many martinis, plus an acrimonious argument at dinner, plus worry about a possible layoff at the office. Scientists, as mentioned earlier, increasingly think in terms of process, rather than simple cause and effect.

Post hoc reasoning helps us fill an explanatory vacuum. We do not like uncertainty, and if we can't find a reason for a given occurrence we feel baffled and unhappy. Any reason, even a flimsy one, seems better than no reason at all. John Dewey once explored this idea in *The Quest for Certainty*.

Frost comes. Leaves turn. Therefore frost turns the leaves. Few happenings in nature are more solidly accepted. But for certain years in southern Connecticut, I have observed glorious displays of autumn foliage *before* the first frost. Scientists say that frost has little to do with the process, which they attribute to chemical changes as sap recedes in the tree. Indeed a strict disciple of *post hoc* should reason, in the years when the leaves turn first, that autumn foliage induces frost.

IN THE JURY ROOM

Courts today are crowded with accident cases, and *post hoc* hovers over most of them. The jury must decide whether or not the current indispositions and misfortunes of the plaintiff are due to a prior accident. If they are, what is their dollar value? Medical testimony is often flatly contradictory, one expert arguing a *post hoc*, the other denying it. The jury has

to battle its way through logic good and bad, trying to come to a just verdict; it has to imitate in a crude way what a scientist does in an exact way.

Here are two cases considered recently by a Connecticut jury on which my wife happened to serve. A girl receives a head injury in a motor accident. Subsequently she gets a job as a receptionist for a doctor, but does not hold it long. She sues the insurance company for damages, claiming that the accident prevents her from keeping her mind on her work. She thinks she is damaged about thirty thousand dollars' worth. Was the accident the cause of her incompetence? The jury is inclined to think the accident contributed, but not to the tune of thirty thousand dollars.

A real estate broker is injured by furniture falling on him in a house he is showing to a client. He sues the owner. He says he hasn't been well since the accident. Among other symptoms, he becomes very tired in the afternoon. The lawyer for the defense inquires how old the broker is, and remarks, with appropriate legal sarcasm, "I get tired in the afternoon too, and nothing has fallen on me except my age."

Serving on a jury, says my wife, gives excellent practice in avoiding the pitfalls of *post hoc* reasoning.

MEDICAL MATTERS

Natives of the New Hebrides in the South Pacific hold the unshakable conviction that lice keep a person healthy. They observe that practically all healthy natives have lice, while sick people often do not, ergo lice must be the cause of good health. The real explanation, however, is quite different. When a person falls sick in that tropical climate he usually runs a fever. Lice do not like it that hot and they leave.²

I was brought up to believe that wet feet produced colds,

² Darrell Huff, *How to Lie with Statistics*.

and was taught to take elaborate precautions against them. This reasoning was a *post hoc*, but not a pure one. Wet feet do not produce colds but may contribute to them indirectly by lowering the body's resistance. A person who keeps his blood circulating by exercise, says³ a lumberman, can have wet feet for days and not develop a cold. Here again a *process* is involved, not a simple cause and effect.

At a convention in San Francisco in the spring of 1955, someone reported from the platform that he had recently seen President Eisenhower, who did not look in the best of health. Instantly a delegate jumped up on the floor and cried: "Washington drinks fluoridated water; that's the trouble with Ike!" The fact that a million or so other Washingtonians were feeling reasonably well did not count.⁴

BLACK CATS

A woman sees a black cat and later in the day loses her pocketbook. The cat, she says, caused the loss. Most of us average some kind of misfortune every day of our lives, with a greater misfortune perhaps once a week. To reason that the sight of a black cat, or passing under a ladder, or spilling salt, causes these routine misfortunes is pure *post hoc*.

People continue to believe that if milk is left around in open pans, a clap of thunder will sour it. What actually happens is that thunderstorms usually come on hot days, and heat encourages the bacteria which cause milk to sour. Lightning and thunder have nothing to do with it.

Another celestial matter in which uncounted Americans still believe, if the ads are any indication, is astrology. You were born under such and such a sign, therefore all important experiences throughout your life can be laid to the position of the stars at your birth. It apparently pleases many people to

³ William Tell thinks this is a typo, and that the word the author in-

believe that the orbs of heaven watch over their fortunes. But no scientific connection has ever been established; indeed no operation to prove it could conceivably be set up. What *can* happen, of course, is that a student of astrology may firmly believe that he is lucky or unlucky, according to the chart. Such belief may, to a degree impossible to determine, influence his behavior.

A strong team of Japanese mountain-climbers was given permission by the native government to climb Manaslu, one of the great peaks of the Himalayas. In 1954 the team arrived in the village of Sama. More than four hundred porters, laden with food and equipment, escorted them. The villagers attacked the party with sticks and stones so violently that the porters dropped their loads and fled. Why the violence? A nice case of *post hoc*. The villagers explained that “heathen Japanese,” scouting for a climb the year before, had desecrated their holy mountain. The gods had therefore loosed a great avalanche, which destroyed a lamasery and killed three priests. It was admitted that the avalanche came six months after the visit of the exploring party, but no villager doubted the connection.

Sometimes we try to influence future events by *post hoc* reasoning, and a favorite subject among country-dwellers is the weather. We joke about it of course, but are we not half serious? “The garden,” I say, “is drying up. I’ve done everything to make it rain — left out the tennis rackets, washed the car, planned a picnic for Saturday with no cover anywhere near the beach — everything. And not a drop!”

More grim were the *post hocs* of the ancient Aztecs. In their experience rain had followed the season of sacrificial rites, and they believed that sacrificing a human being with due ceremony would make rain come again, and turn the

tended is “say.”

⁴ The Reporter, June 30, 1955.

milpas green. Practically all sacrifices of men or animals down the ages bear horrible testimony to the fallacy.

A good deal of modern advertising bears similar testimony, but more fanciful than horrible. Copy often takes the form:

SHE IS ENGAGED! Picture of beautiful lady with dreamy expression.

SHE USES BLOTTO'S FACE POWDER. Picture of package.

THEREFORE, it is implied, if YOU use Blotto's face powder, YOU TOO will become engaged.

Thus *post hoc* substantially aids copywriters dedicated to capitalizing on human longing. We do so want to be engaged, or to have lovely teeth, or be the life of the party, or a man of distinction.

SUNSPOTS AND STATISTICS

In 1875 the noted economist Jevons advanced the theory that the business cycle was caused by sunspots. This had a little more to it than Chantecler's theory, but not much more. Even today, one economist seriously argues that the path of the planet Venus, interrupting solar radiation, affects weather and crops and causes eight-year cycles. Economists who value their reputation are pretty shy of sunspots. The ups and downs of business, they say, have many causes, especially the alternation of over-optimism and over-pessimism among businessmen, depending in turn on the behavior of consumers.

After damn lies, in the old saying, come statistics. The trouble in considering statistical *post hocs* is not so much with the figures as with the conclusions drawn from them. In our expanding economy, records of production, sales, and the like, keep moving up year after year. The fallacy creeps in when one upward-moving curve is said to be the *cause* of another. In England, imports of bananas rose regularly for years, and so did cases of tuberculosis. The figures were unimpeachable,

but the conclusion, widely heralded, that eating bananas caused TB was plain crazy. Figures show juvenile crime increasing in the U.S., and also sales of comic books. Now there *may* be a connection, but all we have to date is a rough clue.

Unless statistics like these are handled with asbestos gloves⁵ they will kindle *post hoc*s in all directions. Huff cites another exhibit concerning cigarettes. Reliable figures demonstrate, he says, that college students who smoke them receive lower average grades than those who do not. The anti-nicotine reformers seize on these figures to “prove” that cigarettes lower scholarship. The figures could equally well “prove” the reverse, that low marks drive students not to drink, but to tobacco. The most probable reason, however, says Huff, is that the sociable type likes to smoke and does not want to be known as a grind — C-minus is good enough for him. There are several plausible explanations for the correlation between the two figures; we are not entitled to select the one that suits our case.

The number of college students per thousand of U.S. population is rising. So is the number of inmates in mental hospitals, so is the incidence of heart disease, output of false teeth, salaries of California schoolteachers, production of electric washing machines, left-handed batmen struck out, and what have you. Take the first two curves above: college students and mental cases, both advancing. This “proves,” does it not, that going to college is likely to unbalance the mind?

A fairly close statistical correlation can be worked out between the price of rum in Havana and the salaries of ministers in Massachusetts. Both are affected by the secular inflation of the last hundred years. There is no possible connection otherwise, but an embittered atheist might attempt to prove that Massachusetts ministers are using their increased salaries to buy more rum, or that the rum trade supports the ministry!

⁵ William Tell’s note: the use of this term here suggests that, as of the time this book was written, asbestos was not known to be dangerous.

Deductions from statistics can fall into various classes of logical fallacies. Here we use examples to illustrate *post hoc* reasoning. In Chapter 12 we will select other statistical examples to illustrate the fallacy of *ad verecundiam*, appeal to authority. The latter includes reverence for figures as such, the curious notion, widely held especially in the U.S., that a string of decimal places can't be wrong.

IN SUMMARY

Post hoc logic is all around us, and will trip the wisest unless he is on guard. It is especially likely to trip us in three kinds of situations:

1. Something happens, and presently something else happens, with considerable regularity. It looks as if the first causes the second, but actually it does not. A cockcrow does not make the sun come up.

2. In an even more common form, event A *may* affect B, but in a minor way, as part of a process which includes other causes. Cucumbers may be one small item in a complicated process which brings on a pain in the stomach.

3. Events A and B move together in a time scale, but which is cart and which is horse? Or, as in the case of Havana rum and Massachusetts clergymen, are both due to a larger general cause? Or is there any connection at all?

Any parallel movement of two events, to be sure, can give us a *clue*. But as readers of detective stories well know, for one correct clue there are a dozen false ones. A hunch may be all right to start with; scientific discovery often begins with a hunch. But science and sound logic cannot stop there; they must go on collecting facts and weighing them until real proof can be demonstrated.

Here is a public official who seems to have done just this. New York City's Police Commissioner, Stephen P. Kennedy,

Or, at least, Chase did not know it to be dangerous.

surveys automobile fatalities for the first forty days of 1956.⁶ Look, he says, they are 20 percent less than for the first forty days of 1955. Furthermore, he says, in 1956 we used police cars without special markings, but in 1955 they could be recognized as official cars. The stage is thus set for a ringing *post hoc*, and the newspaper headline does not disappoint us. *Because* police cars cruised amid the traffic unmarked, they apprehended more wild drivers and so kept fatalities down. Q.E.D.

But Commissioner Kennedy is apparently a student of logical fallacies. He declined to draw any conclusion from the seemingly related facts, holding that “the success of the new techniques cannot be judged in so short a time.” What a paragon for all of us to follow!

⁶ *New York Times*, February 13, 1956.