

Occam's Razor

Elie A. Shneour

FOR THE UNINITIATED—and alas, our educational system ensures that they are the vast majority—science seems arcane and unapproachable. With a modicum of intellectual effort, however, almost everyone can partake of its elements, and this makes science potentially the most equalitarian of human endeavors. Had that been recognized, at least following World War II, there would be no need for a CSICOP today, when even high government officials, industrial leaders, publishers, and editors exhibit embarrassing illiteracy in this dominant engine of modern civilization.

Science is an intellectual tool rather than a body of facts. It is the most powerful tool ever devised by the mind of man for the control of his destiny. By contrast, most religions require uncritical beliefs, resignation to earthly fate in silence, and above all that no questions be asked. In return, the believer is assured that all his travail will one day come to an end, to be followed by an afterlife of punishment or reward, determined by his conduct on earth: eternal damnation for the wicked and an idyllic heaven for the just.

Science offers no such powerful reassurances. It can only provide for some insight into the physical world during man's earthly journey, and perhaps some control over his immediate fate. And in the absence of an intellectual handle, science can afford no relief about questions of the existence of an ethical deity or of an afterlife. It ought to be self-evident that ethical principles, empirically arrived at over millennia, must prevail whether a deity exists or not. Would murder be any more acceptable without the Ten Commandments? This transition from hope for an afterlife to hope for this one represents perhaps the most traumatic modern change in the expectations of mankind. It is science that is pushing away the veil of ignorance and superstition to ease that painful transition.

No wonder, then, that the intellectual power of science is frightening to so

Elie A. Shneour is director of the Biosystems Research Institute, La Jolla, California. He is a CSICOP scientific consultant.

many. No wonder that for this reason educational systems worldwide have resisted it and continue to resist it although this is rarely if ever admitted and is instead excused on all kinds of irrelevant grounds. But many people who develop even a cursory acquaintance with what passes for science are awed, if not discouraged or angered, by the pretensions of elitism and condescension exhibited by too many of its more articulate and visible practitioners.

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That need not be so. There is a fundamental tenet of science that has its greatest and most beneficial immediate impact in the routine matters of human existence. This particular intellectual tool of science is called Occam's Razor. Like many verities, it was first articulated a long time ago, in the Middle Ages, although it appears in different forms in older and more recent texts, i.e., by theologian Durand de Saint-Pourçain in the thirteenth century, and later by Galileo in the defense of his planetary hypothesis.

William of Ockham was an influential Catholic philosopher of the fourteenth century who caused the church a great deal of trouble, was excommunicated, and probably died in the Great Plague of 1349. Ockham is associated with his famous intellectual razor by the enunciation of this principle: *Non sunt multiplicanda entia praeter necessitatem*, which roughly translated means that things must not be multiplied beyond necessity and can also be rendered as "one should not make mountains out of molehills." It affirms that parsimony in thought is usually closest to the truth or that the simplest explanation for an observation is most likely to be the correct one.

The honest and simple application of this principle to paranormal claims would quickly consign most of them to oblivion. It would free their purveyors from frustrating emotional burdens and the waste of resources to accommodate more fruitful pursuits. Thus far, UFO sightings, the Bermuda Triangle, dowsing, biorhythms, astrology, the Loch Ness monster, psi phenomena, and the like have not been able to withstand the scrutiny of Occam's Razor in separating fact from fiction. The following particularly trenchant example is adapted from T. H. Jukes (*Nature*, 285: 130, 1980).

According to the Creation Research Society's Statement of Belief, which must be subscribed to by all its members, the Bible is the written word of God and is scientifically true in all the original autographs. All living things, including man, were created *de novo* by God during Creation week. The Flood, and Noah's part in it, described in Genesis, was a historical event,

worldwide in its extent and effect. The Creation Research Society dismisses all alternatives to this scenario, pointing in particular to the biblical precisions of exact measurements, including the dimensions of the Ark and the duration of the Flood.

The spokesmen of that organization, some of them holders of recognized advanced academic degrees in scientific disciplines, assert that isotopic dating is in error, that Darwinian evolution is in contravention of the Second Law of Thermodynamics, and that the interpretation of the fossil record by modern paleontology is a fallacy. According to them, the only credible explanation for Creation is found in the Bible.

Application of Occam's Razor to the biblical account of the Flood yields the following analysis: Genesis 6-8 give the volume of the three-story Ark as 43,000 cubic meters (1 cubit = 0.46 cubic meter). The Noah team that built the huge Ark and gathered all the balky terrestrial animals (some of them dangerous), together with their monumental and varied food supply for one year, numbered a total of eight persons.

The Bible is silent about the way such a minuscule group of people, with no clearly defined rational means, no pertinent experience, and a critically limited period of time before the Flood was to start, managed the feat. To state that "God provided the means" is not an acceptable explanation in a scientific context. The "materials and methods" must be explicitly described *in extenso* and be credible by at least commonsense criteria before they can be accepted as legitimate science.

Another problem with a literal acceptance of the biblical Ark is that an exquisitely delicate ecological balance exists between living species; many are obligate predators or parasites on the others. There are no explanations of how that balance was retained aboard the Ark. The Ark's insectary would have had to include well above a million species. The aviary, 25,000 or so species of birds. The bulk of the remaining space would have had to accommodate about 15,000 pairs of mammals, 6,000 pairs of reptiles, 2,500 species of amphibians, to say nothing of providing very finicky cultured environments for tens of thousands of microorganisms, some with associated viruses, to have been assembled, catalogued, and kept alive without so much as a microscope. And, if the Bible is the written word of God, how is it that these microorganisms, ubiquitous and essential residents of the planet, are not even mentioned.

Then there is the botanical problem. Nothing in the Genesis story of Noah's Ark is mentioned about plants, although it is self-evident that the Ark had to carry them all, both for food and to replenish the Earth after the flood. But if the account of the Flood is accurate, it rained literally torrents of water. The skies must have been heavily overcast to carry so much moisture, reducing photosynthesis, the foundation of life on earth, to almost nothing. To absorb the residual sunshine and survive, all green plants would have had to remain well separated from one another on deck, assuming that the heavy and continuous downpour did not destroy them and wash them

overboard, along with their retaining soil.

How could all these plants find enough open space on the Ark and still leave room for all the animals? If the total volume of the Ark is equitably divided among all the animal species that populated it, and making no allowance at all for plants, there is less than one cubic meter available for each pair of vertebrates and their food supply for the entire voyage. And what was to be done about the obviously massive waste-disposal problem such a cargo would generate?

By now the reader is conscious of the enormous discrepancies that must be accounted for if the biblical account of the Flood is to be accepted literally. There are many more than I can note here, but a final one deserves mention. It deals with the hydrology of the Flood. In Genesis it is stated that “. . . all the high hills that were under the whole Heaven were covered. . . .” Since Mount Ararat is 17,011 feet high, a very conservative estimate of the maximum depth of the water on the surface of the earth at the end of the Flood would be 10,000 feet. And 15,000 feet would not be an unreasonable figure. Taking the smaller of these two estimates to calculate the volume of precipitation generated in the Flood, we arrive at a figure of *393 million cubic miles* of water, which is 40 percent greater than the total amount of water present on the earth. .

There is another way of applying Occam's Razor to these figures: According to the Bible, it rained for 40 days and 40 nights, or for 960 hours. To reach 10,000 feet, it must have rained at a rate of $4\frac{1}{3}$ feet of water an hour, a precipitation that would have devastated the ability of any vessel to remain afloat, let alone the survival of its passengers. But assuming that the Ark was able to weather that immense deluge—it took more than 167 days for the water to come down to normal levels—what happened to all that water? It could not find space in the interior of the planet in such a short time without generating awesome Krakatoa-like eruptions. If, on the other hand, it just dissipated into outer space, by a sort of cataclysmic “boiling away,” which no living things could reasonably have survived, why and how did it stop just in time to leave rivers, lakes, and oceans behind?

Unless these and related questions can be answered rationally by creationists, or until they stop insisting that theirs is a legitimate scientific subject, only derision and ridicule can be their lot as presumed scientists. Science rests on a bedrock of slowly and painstakingly gathered consistent evidence, born out of careful observation and repeated testing of hypotheses to eliminate inherent human biases. Only when a hypothesis has been shown to fit the observed facts does it become possible to apply rules of formal logic to it and derive consequences with predictive value. Any rational human being is welcome to join the cause of science. There are no statements of belief to execute for membership, only the demonstrable application of reason. •