



Bad Science

It is what it isn't

- ◆ We are currently (2020) in a pandemic that has caused the loss of hundreds of thousands of lives and threatens millions.
- ◆ In much of human history political life has been characterized by beliefs that legitimized witch hunts, slavery, inquisitions and holocausts as methods of solving threatening situations. These beliefs—irrational, romantic, uncompromising—often led to mob action.
- ◆ Many of us see the necessity for real science, involving Double Blind experiments and/or proven techniques of statistical analysis, as a path to rational knowledge of the virus and the pandemic and finding our way out of a crisis.
- ◆ Some fall back on an irrational approach, gloss it over with science-like words, and attempt to benefit themselves in many ways. This approach is bad science, often labelled pseudo-science.

Real Science: The Norms of Scientific Research

- ◆ The first item to consider is the relevance of the subject to be explored. There have been more than 80 years of debate over the 'Science of Umbrellology.'
- ◆ **Facts are, by themselves, meaningless.** In science a fact about viruses, social behaviour or the typical evolution over time of a specific type of cancer cell means nothing in itself. To be of value the fact must fit into a theory that provides us with an understanding of how we can create the conditions for its reappearance. The hope is that all relevant evidence can be reproduced and/or measured given the same conditions. All gathered data, including experimental/environmental conditions, are expected to be scrutinized and circulated for peer review allowing further experiments and/or statistical studies to be conducted to confirm or falsify results.

◆ Bad Science: It is what it isn't

- ◆ Bad science is often used to predict the future by looking at the past. A turkey is fed good things every morning for 100 days. She sees humans as benevolent creatures with 'her best interests at heart.' Until the Wednesday before Thanksgiving. Moral: The past is not a predictor of the future. We know the past. It is limited to what happened and who was there. We cannot see the future which is unlimited. Retrodiction is much easier than prediction. We can understand how the stock market crashed but not if or when it will return to a state of robustness in the future. We can understand why chloroquine reduces malarial symptoms but we cannot predict its effects on other diseases. We can predict its side effects.
- ◆ Beware the false conjuncture. We seek explanations for events and often grasp at other—preceding events—as causes of them. The current debate over the origins of the pandemic is not rooted in science. We can choose among bats, scheming Chinese state functionaries or virus-infected border crossers. We can choose the narrative most satisfying to us but science is not law practice and it doesn't depend on what arguments we make on the basis of the evidence that we choose to present. Nor can we accumulate anecdotes of random happenings and hope to build a science from them.

◇ Other Considerations:

◇ A constant cannot explain a variable. Human nature is not an explanation.

◇ Science is not advanced by out-of-context quotes, usually attributed to Einstein.

◇ Small statistical samples do not produce reliable results.

◇ Bad science claims cannot be verified, or falsified, in the event they are inaccurate, incorrect or irrelevant.

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◆ How to identify a practitioner of Bad Science:

- ◆ Practitioners fail to submit results to peer review prior to publicizing them (called "science by press conference")
- ◆ Practitioners fail to provide adequate information for other researchers to reproduce the claimed results;
- ◆ Practitioners claim a theory predicts something that it does not;
- ◆ Practitioners violate the principle of parsimony, i.e., failing to seek an explanation that requires the fewest possible additional assumptions when multiple viable explanations are possible.
- ◆ Practitioners claim secrecy or proprietary knowledge in response to requests for review of data or methodology;
- ◆ Research claims are constantly changed in response to criticism;
- ◆ Promised new evidence is constantly delayed.

