



# Data vs. Derision: The Ethics of Language in Scientific Publication. The Younger Dryas Impact Hypothesis as a Case Study

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## Abstract

Throughout the history of science, novel ideas that diverge from mainstream thought have often been met with condemnation, derision, and ad hominem attacks. These reactions have sometimes led to the premature rejection of such ideas, only for them to be later revived and even accepted as the prevailing paradigm. While robust debate is essential in science, the use of derogatory language is unethical, for it discourages research on existing hypotheses, deters funders, corrupts the scientific record, and delays or prevents the advancement of science. In this article, I discuss the case of unethical language repeatedly used against proponents of the hypothesis that an extraterrestrial impact event triggered the Younger Dryas cool period.

**Keywords** Younger Dryas Impact Hypothesis · Publication Ethics · Abusive Language · Ad Hominem Arguments · Pseudoscience

## Introduction

Truzzi (1987) revived an older term, pseudoskepticism, to refer to “negative hypotheses”: assertions that some theory or claim is false without the asserter assuming the burden of providing falsifying evidence. True skepticism, he argued, “properly refers to doubt rather than denial—nonbelief rather than belief.” He noted that critics who adopt a negative rather than an agnostic stance, yet still call themselves “skeptics,” are actually pseudoskeptics, gaining a false advantage by usurping that label. Any scientist is likely to know of examples where doubt about a hypothesis becomes transformed into a confident assertion of its falsity.

Cabbolet (2016) observes that “pseudoskepticism is not aimed at finding out the truth, but at discrediting someone’s research.” He describes several “tell-tale” signs of pseudo-

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skepticism, including ad hominem attacks, where a critic focuses on alleged personal failings of an author rather than addressing the argument in question. Scientific societies and journals generally proscribe ad hominem attacks for reasons that Sagan (1995) explained: “Science requires an almost complete openness to all ideas. Ad hominem arguments—arguments about the personality of somebody who disagrees with you—are irrelevant....” Ad hominem accusations are not harmless: they “may have the same degree of impact as attacks on the empirical basis of the science claims (Barnes et al., 2018).” Brown et al. (2018) recommend that “individuals engaging in ad hominem attacks in scientific discourse should be subject to censure.”

Another sign of pseudoskepticism, according to Cabbolet (2016), is the description of a targeted work as despicable, using “belittling phrases and strong pejoratives,” giving the criticism “a vitriolic or even libelous tone.” A third indicator is the use of non-specific comments: vague, all-encompassing accusations addressed at a hypothesis as a whole, without sufficiently backing them up in the body of the criticism. A fourth indicator is suppression (Martin, 2010). Proper skepticism challenges only the evidence and arguments. Pseudoskepticism, on the other hand, crosses the line by seeking to suppress dissenting voices. A fifth is known as “raising the goalposts”: the practice of changing the criteria or standards for evaluating success or proving a point after the original criteria have been met.

## The Younger Dryas

The articles I review concern the Younger Dryas (YD) episode, a period of cooling that began about 12,850 years ago (Powell, 2022; Sweatman, 2021). Until then, the Northern Hemisphere had been warming when suddenly, within only a year or two, the temperature of central Greenland fell by 9–14 °C. Some 1,200 years later, “in less than a few decades, and possibly in less than a few years,” temperatures abruptly rose by 5–10 °C (Powell, 2022). To make the YD even more unusual, as it began, many of the charismatic large animals of the Western Hemisphere, including the horse, mammoth, and giant sloth, went extinct. Moreover, the distinctive artifacts of the Clovis Paleoindians have never been found above the YD boundary layer, suggesting that the event might have eliminated their culture. The cause of the YD eluded scientists, with one remarking in 1990: “The origin of the Younger Dryas is likely to remain an enigma for some time to come, perhaps forever” (Berger, 1990).

By the time this century began, however, most scientists had come to accept the explanation that freshwater from the melting continental ice sheets had produced a cap of cool, low-salinity surface water sitting atop the North Atlantic and Arctic oceans, blocking oceanic circulation and cooling the adjacent continents. Regarding the associated megafaunal extinctions, the most popular ideas were “overkill,” which suggests a human cause, and “overchill,” which instead suggests that the YD climate change itself was responsible. However, both these ideas have their own problems, and neither became dominant.

Then, in 2007 came the hypothesis that the YD was caused by the impact of “one or more large, low-density objects ... most likely a comet” (Firestone et al., 2007). This hypothesis retained the idea that changes in oceanic circulation had led to YD cooling but posited a cosmic event as the trigger. The authors based it on the finding of recognized meteorite impact markers in YD boundary layer deposits, including extraterrestrial microspherules, wildfire indicators, and glass-like carbon containing nanodiamonds. The aftereffects of the impact

might help explain the demise of the megafauna and the disappearance of Clovis artifacts, thus giving it the advantage that one cause might explain all three effects.

## **Impacts, Mega-Tsunami, and Other Extraordinary Claims (2008)**

The first response to Firestone et al. (2007) came from Pinter and Ishman (2008), who argued—without evidence—that the alleged impact markers were terrestrial. The authors criticized Firestone et al. for not having settled on the nature of the impactor, despite the fact that Firestone et al., as quoted above, had proposed a comet strike. Pinter and Ishman described the hypothesis as “a Frankenstein monster, incompatible with any single impactor or any known impact event.” This unethical tactic treated as despicable a hypothesis introduced in a prestigious journal, the *Proceedings of the National Academy of Sciences*, by two dozen respected authors. It would have been good practice for Pinter and Ishman, writing so soon after the original publication, to call for further study of the Younger Dryas Impact Hypothesis (YDIH). Instead, they concluded with a series of ad hominem attacks seemingly aimed at shutting down further research.

Both the 12.9-ka impact and the Holocene megatsunami [an unrelated hypothesis] appear to be spectacular explanations on long fishing expeditions for shreds of support. Both stories have played out primarily in the popular press, highlighting how successful impact events can be in attracting attention. The desire for such attention is understandable in an environment where science and scientific funding are increasingly competitive. The National Science Foundation now emphasizes ‘transformative’ research, and few events are as transformative as an impact. In an era when evolution, geologic deep time, and global warming are under assault, this type of ‘science by press release’ and spectacular stories to explain unspectacular evidence consume the finite commodity of scientific credibility.

This statement implied that Firestone et al. (2007) first invented the hypothesis and then sought evidence to support it; that the evidence was unconvincing; that the hypothesis was first announced in a press release; that the authors had chosen the topic because funding was available; and that merely entertaining the YDIH reduces scientific credibility in the eyes of the public. None of these claims is true.

## **The Younger Dryas Impact Hypothesis: A Requiem (2011)**

Pinter et al. (2011) escalated to more strongly dismissive language. By this time, evidence that many would regard as stemming from an extraterrestrial impact had been replicated at a number of YD boundary sites. The abstract of their article ended:

Throughout the arc of this hypothesis, recognized and expected impact markers were not found, leading to proposed YD impactors and impact processes that were novel, self-contradictory, rapidly changing, and sometimes defying the laws of physics. The

YD impact hypothesis provides a cautionary tale for researchers, the scientific community, the press, and the broader public.

Pinter et al. did not explain exactly how the hypothesis is self-contradictory nor how it violates the laws of physics. Moreover, novel hypotheses that change as new evidence comes to light should be welcomed, not condemned. The last sentence, like the quotation above from Pinter and Ishman (2008), seems intended to warn scientists against researching the YDIH and can therefore be considered an attempt at suppression.

In their last paragraph, Pinter et al. (2011) escalate to even more abusive language:

Many scientists are unaware of the surprising number of hypotheses that have gone badly astray, often after widespread initial interest and support [15–17]. Characteristics of these wayward hypotheses include claims that are spectacular, data that are subjective or at the limit of precise measurement, and criticisms met with ad hoc excuses and/or shifts in the original claims (after [15]). We suggest that much can be gained by stepping back and looking at the broader lessons for the earth sciences, impact science, archeology, and other affected fields.

Citations [15–17] in Pinter et al. (2011) refer to three books on pseudoscience titled, respectively, *Pathological Science*; *The Undergrowth of Science: Delusion, Self-Deception, and Human Frailty*; and *Voodoo Science: The Road from Foolishness to Fraud* (Gratzer, 2001; Langmuir & Hall, 1989; Park, 2002). These books use as examples of pseudoscience UFOs, cold fusion, perpetual energy and motion, extrasensory perception, eugenics, the “Jewish Physics” of the Nazis, homeopathy, the works of Deepak Chopra, animal magnetism, and more. It could not have been more clear that Pinter et al. (2011) were labeling the YDIH as pseudoscience, without coming right out and saying so. Opponents would do that in the next article we review.

## **Comprehensive Refutation of the Younger Dryas Impact Hypothesis (2023)**

Holliday et al. (2023) announced in an article of nearly 100,000 words their “comprehensive refutation” of the YDIH. The abstract concluded: “Evidence and arguments purported to support the YDIH involve flawed methodologies, inappropriate assumptions, questionable conclusions, misstatements of fact, misleading information, unsupported claims, irreproducible observations, logical fallacies, and *selected omission of contrary information*” (Italics added). By this time, however, dozens of articles from scores of authors had appeared in peer-reviewed journals describing evidence from four continents for an extraterrestrial event at the YD boundary.

The body of Holliday et al. (2023) contains the sentence: “Claiming evidence where none exists and providing misleading citations may be accidental, but when conducted repeatedly, it becomes negligent and undermines scientific advancement as well as the credibility of science itself.” The U.S. National Science Foundation (2002) says that research misconduct is “fabrication, falsification, or plagiarism,” defining fabrication as “making up data or results and recording or reporting them,” while falsification includes “changing or

omitting data or results such that the research is not accurately represented in the research record.” The charge by Holliday et al. (2023) of “selected omission of contrary information” could be construed as an accusation of falsification, while “claiming evidence where none exists” and “irreproducible observations” could be construed as an accusation of fabrication. Together, these statements amount to an accusation of research misconduct by YDIH proponents, the most serious charge in science. However, Holliday et al. (2023) provide no evidence whatsoever to support their claim. If Holliday et al. (2023) do have evidence to back up this allegation of scientific misconduct, they should report it in proper academic and governmental venues.

In several places, Holliday et al. (2023) use the term “pseudoscience” in relation to the YDIH, titling one section, “More pseudoscience (fringe) evidence and conjecture.” Elsewhere they write, “The YDIH evolved directly from pseudoscience,” and “Although the [Firestone et al., 2007] paper did not contain all the pseudoscience of its predecessors...” Another section is titled, “Pseudoarchaeological Divined Date of the Impact Event.” Accusations of pseudoscience should not appear in a peer-reviewed article without solid and clear evidence to back them up.

Holliday et al. (2023) also make repeated ad hominem attacks on proponents of the YDIH. For example, Sect. 15 of their article, titled “Unparalleled promotion of the YDIH outside of scientific literature,” is largely ad hominem, comprising remarks aimed at individual, named proponents of the YDIH rather than at the hypothesis itself. Examples from this section include:

The principal YDIH authors created and ran websites to promote the YDIH and other fringe science outside the constraint of peer review, raise money, and engage in personal attacks on skeptics.

Sweatman, in preparing his review of the YDIH, which has the appearance of being independent, interacted with webmasters of one of these sites and used their resources.

Powell fails to disclose his self-published book *Deadly Voyager* (Powell, 2020), which promotes the YDIH.

Popular press books have been written to promote the YDIH by scientists/academics. However, disclosure of conflict of interest (either potential or the appearance of) is lacking in YDIH publications in the scientific literature.

Scientists are often advised to build support for their work and for science itself through a range of media channels, including blogs and books. However, Holliday et al. (2023) take aim at those trying to explain the YDIH to the lay public. These ad hominem attacks appear to be another form of suppression intended to discourage further attempts to explain science to the general public.

Other examples of ad hominem attacks and derisory language include:

The book [Cycle of Cosmic Catastrophes] is based on fanciful speculation and demonstrates a remarkable lack of understanding of the archaeological and stratigraphic data discussed ... and was described by Morrison (2010) as “pseudoscience.”

Authors common to YDIH-proponent papers ... appear confused and lacking in credibility.

Powell (2022, p. 14) concludes, “The simplest explanation is again that Firestone et al. sampled the YDB at Topper while Surovell et al. did not.” The condescending argument about procedural errors is an after-the-fact explanation of inconvenient data. Most of this alleged evidence disappeared from the current YDIH literature with no comment, but its highly speculative nature certainly reflects on the credibility of the authors that were involved.

In an example of raising the goalposts, in their conclusions Holliday et al. (2023) write, “We await a full summary discussion that offers a coherent hypothesis and deals with the many contradictions that have been fully outlined since 2008.” But Wolbach et al. (2018) provided a coherent summary and the key impact evidence has been replicated repeatedly.

## Conclusions

The language used by YDIH opponents, especially Holliday et al. (2023), crosses the line into pseudoskepticism. I have provided examples of the expected signals of pseudoskepticism in their articles, including ad hominem arguments, strong pejoratives, vague and unsubstantiated accusations of scientific misconduct, attempted suppression, and raising the goalposts.

Many have blamed the failure to uphold publishing standards in this and other examples as due to the process of peer review itself (Smith, 2006). Yet most studies have found, to paraphrase Winston Churchill, that “Peer review is the worst system for evaluating scientific publications, except for all those other systems that have been tried from time to time.” At the very least, we should expect editors and peer reviewers to uphold the professed ethics policies of the journal in question. Holliday et al. (2023) appeared in *Earth-Science Reviews*, published by Elsevier, as did Pinter et al. (2011), whose statement on publishing ethics reads:

It is important to lay down standards of expected ethical behaviour by all parties involved in the act of publishing ... This includes ... treating each other with respect and dignity and without discrimination, harassment, bullying or retaliation. (Elsevier Policy, n.d.).

How could such failures to follow ethics policy be avoided? Increased training in the ethics of science communication at the post-graduate level would surely help. Perhaps editors could also be asked to confirm in writing that an article under consideration meets the journal’s ethical standards.

Finally, is it reasonable to proclaim that a hypothesis which remains an active subject of research has been refuted? To do so discourages research, dissuades funders, and may mislead readers as to the true state of an area of science. Moreover, we might ask: when can we be sure that a hypothesis has been refuted and should be forgotten? Popper argued that a scientific theory can never be proven because future observations could contradict it. Conversely, many great theories, including continental drift, meteorite impact cratering, and anthropogenic global warming, were said to have been disproven, only to have new evidence rejuvenate them and even elevate them to the status of ruling paradigm.

Despite the derogatory language directed at the YDIH, and claims of its refutation, scientists have continued to investigate the hypothesis. After Holliday et al. (2023) appeared, peer-reviewed articles have reported new impact evidence from four YD boundary sites, including, for the first time, the presence of quartz shocked and shattered by extreme pressures (Moore et al., 2023, 2024). As French and Koeberl (2010) write, “Only the presence of diagnostic shock-metamorphic effects...is generally accepted as unambiguous evidence for an impact origin.”

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