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Google Funds Cold Fusion Research; Results Still Negative

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The venerable science publication *Nature* revealed in May 2019 that the Internet technology company Google funded research in cold fusion to the tune of about $10 million. A group of scientists from reputable institutions—MIT, Lawrence Berkeley National Lab, the University of British Columbia, the Canadian Institute for Advanced Research, and the University of Maryland—worked for several years to establish experimental protocols and measurement techniques in an effort to "re-evaluate cold fusion to a high standard of scientific rigour." Their conclusion so far? No cold fusion (still).

Although the term "cold fusion" was coined in the 1950s, the concept made headlines in March 1989. Two electrochemists at the University of Utah, Stanley Pons and Martin Fleishmann, announced in a press conference that they had achieved nuclear fusion of deuterium absorbed by palladium electrodes in an electrochemical cell, rather than the extreme conditions of temperature and pressure usually required (hence the use of the adjective "cold"). The announcement caused a worldwide wave of attempts to reproduce and characterize the phenomenon. Despite the claims of repetition and production of excess heat (the main apparent product of the cold fusion), results were scattered, irreproducible, and mostly negative. Most physical scientists who have studied the work accept that cold fusion does not exist in any reasonable sense, although a small group of devotees continue to pursue experiments in this area.

The current team admits "…we have found no evidence of anomalous effects claimed by proponents of cold fusion that cannot otherwise be explained prosaically." But in the very next

sentence, they hedge: "However, our work illuminates the difficulties of producing the conditions under which cold fusion is hypothesized to exist. This result leaves open the possibility that the debunking of cold fusion in 1989 was perhaps premature because the relevant physical and material conditions had not (and indeed have not yet) been credibly realized and thoroughly investigated." They further argue that there may be "… good technical reasons why proponents of cold fusion have struggled to detect anomalous effects reliably and reproducibly." The "Perspective" paper (defined as a "technical opinion piece" by the journal editors) published in *Nature* then discusses issues involving the absorption of hydrogen isotopes by palladium as well as the challenges in constructing reliable calorimetric techniques for measuring energy into and out of an electrochemical cell. But then they concede "…none of the 420 samples we evaluated provided evidence of excess heat; the COPs [coefficients of performance; a measure of the ratio of energy out to energy into the calorimeter] measured in our experiments were consistently unity…" That is, no excess energy production.

Nowhere in the paper do the authors indicate that they are aware of the event that essentially started the cold fusion affair at Utah: An electrochemical cell, operating unattended overnight in a basement lab, exploded during the night with such force that the concrete floor of the lab was damaged. Pons and Fleischmann could think of no other source of so much energy except a nuclear reaction. (Really??? Not a short circuit in the cell? Not an explosion of built-up hydrogen gas? No, it must have been a nuclear reaction…) That incident led them to try other cells with the explicit goal of detecting nuclear processes. This ultimately led to an announcement of new science by press conference, which led to a paper published in an electrochemical journal that was of such dubious use that experts in nuclear science immediately

called it out. But because of the claim of easy, cheap, and copious energy, scientists and engineers around the world worked to replicate and understand it. Their efforts produced inconsistent results at best, and negative results at worst. After several scientific and government conferences on the topic, most scientists and engineers accept the evidence that cold fusion, as claimed by Pons and Fleischmann and their supporters, does not occur and is an example of pathological science.

Why would Google fund a project in an area that most credible scientists argue is clearly unsupported by evidence? The reality is that for Google, $10 million is pocket change, and they can certainly stand to spend that much in research that has very low odds of success. Perhaps they are balancing that against the possibility that some useful knowledge may come out of the research. Indeed, an editorial in that issue of *Nature* touts just that: The research discovered new issues in metal hydrides and calorimetry that justify the work, both the article and the editorial claim.

Should funding for claims like this continue? One could argue that studies of metal hydrides and extreme-condition calorimetry are important in their own right, independent of their application to cold fusion. Funding agencies are certainly within their right to fund projects that fit their scope of interest; the John Templeton Foundation is one example. At the same time, significant support for work that has been clearly debunked gives credence to fringe science. What's next? Research support for studying the flat earth, autism-causing vaccines, and intelligent design? ("After all, yesterday's fringe ideas are today's science facts!") Perhaps funding agencies should be using Carl Sagan's baloney detection kit. Given the dearth of funding for scientific research

that has a demonstrably better outlook for success, perhaps funders should be more, ah, skeptical in where they provide support.

David W. Ball is a professor of chemistry at Cleveland State University. He published a 30-year retrospective of cold fusion in a recent issue of Skeptical Inquirer.