

**James C. Lin**
University of Illinois at Chicago
851 South Morgan Street, M/C 154
Chicago, IL 60607-7053 USA
E-mail: lin@uic.edu

# Pitting Politics Against Science: Conspiracy or Groupthink

***James C. Lin***

University of Illinois at Chicago
851 S. Morgan St. (M/C 154)
Chicago, IL 60607 USA
E-mail: lin@uic.edu

The onset of the coronavirus in early 2020, lasting through the end of the year and beyond, has undoubtedly rendered 2020 an incredible year in many ways. The COVID-19 coronavirus has caused a devastating global pandemic, with rapidly increasing case counts and deaths worldwide. The number of confirmed cases and fatalities exceed 83,113,878 and 1,812,218 globally. In the US, there were 19,821,487 and 343,818 confirmed cases and deaths as of the end of 2020 [1]. It boggles the mind how COVID-19 descended into a conspiracy theory, pitting politics against science, while millions of lives are lost and so many more are suffering from grief and pain, pointlessly. It does not seem to make sense!

Why? Is it because science got wrapped up in politics, or is it politics interfering with science? Perhaps the better or more practical questions are how much politics is to be influenced by scientific findings, or should politics intervene when science upset the established political order to justify governmental action? These questions are not new or groundbreaking.

Nicolaus Copernicus, the 16th century Polish astronomer, set forth the revolutionary view that the Earth revolved around the sun, and proposed a model of the universe that places the sun rather than the Earth at the center of the universe. About a half-century later, Galileo turned his telescope to the heavens. He saw the Milky Way with numerous stars, the pockmarked surface of the moon, and that Jupiter has four moons of its own. Galileo traveled to Rome to meet with church leaders to present his discoveries that lent support to Copernicus' revolutionary view and ready to make the case for heliocentrism: that the Earth moved around the sun.

Instead, Galileo was condemned by the Holy Office of the Inquisition of heresy for having held a believe that the sun is the center of the universe, which was "false" and contrary to the Sacred and Divine Scripture. It was a dangerous idea, and one that cost Galileo his freedom. He was sentenced to imprisonment and followed by confinement for the rest of his life.

One may shrug off these ancient and modern incidents as episodic and proclaim them as absurd! Nothing is new under the sun. Make no mistake, if it has not been found, it is there to be discovered. If it has not happened, it is only a matter of time.

Fast forward to the 21st century: in 2011, the World Health Organization (WHO)'s International Agency for Research on Cancer (IARC) classified exposure to RF radiation as 2B – a possible cancer-causing agent to humans. The IARC had evaluated then-available scientific

studies and concluded that while evidence was incomplete and limited, especially regarding results from animal experiments, epidemiological studies of humans reported that increased risks for gliomas (a type of malignant brain cancer) and acoustic neuromas (or acoustic schwannomas – a non-malignant tumor of auditory nerves on the side of the brain) among heavy or long-term users of cellular mobile telephones were sufficiently strong to support a classification of being a possibly carcinogen in humans for exposure to RF radiation [2, 3].

In 2018, the National Toxicology Program (NTP) of the US National Institute of Environmental Health Science (NIEHS) reported observations of two types of cancers in laboratory rats with life-long exposure to RF radiation used for 2G and 3G wireless cellular mobile telephone operations [4, 5]. This was the largest health-effect study ever undertaken by NIEHS/NTP for any agent. A 12-member peer-review panel of independent scientists, convened by NIEHS/NTP, who evaluated the toxicology and carcinogenesis studies, concluded, among other observations, that there was statistically significant and "clear evidence" that the RF radiation had led to the development of malignant schwannoma in the hearts of male rats.

Shortly after the NTP report, the Cesare Maltoni Cancer Research Center at the Ramazzini Institute in Bologna, Italy, published the results from its comprehensive study on carcinogenicity in rats exposed lifelong to 2G/3G, 1800 MHz RF radiation [6]. The study involved whole-body exposure of male and female rats under plane-wave equivalent or far-zone exposure conditions. A statistically significant increase in the rate of schwannomas in the hearts of male rats was detected for 0.1 W/kg RF exposure. It is critical to note that the recent NTP and Ramazzini RF exposure studies presented similar findings in heart schwannomas and brain gliomas. Two relatively well-conducted RF exposure studies employing the same strain of rats thus showed consistent results in significantly increased cancer risks from mobile-phone exposures.

Recently, a privately constituted group, with self-appointed membership, published a set of guidelines for limiting exposure to RF electromagnetic fields in the 100 kHz to 300 GHz frequency range [7]. The proposed guidelines were based primarily on the tissue-heating potentials of RF radiation to elevate animal body temperatures to greater than 1°C. While recognizing that the two above-mentioned studies used large numbers of animals, best laboratory practice, and exposed animals for the whole of their lives, it preferred to quibble with alleged "chance differences" between treatment conditions and that the measured animal body core temperature changes had reached up to 1°C: apparently implying that a 1°C body core temperature rise is carcinogenic, ignoring the RF exposure. The group then pronounced that when considered either in isolation or within the context of other animal carcinogenicity research these findings do not provide evidence that RF radiation is carcinogenic.

Furthermore, the group had noted that even though many epidemiological studies of RF radiation associated with mobile-phone use and cancer risk have been performed, studies on brain tumors, acoustic neuroma, meningioma, and parotid gland tumors have not provided evidence of an increased cancer risk. It suggested that although somewhat elevated odds ratios were observed, inconsistencies and limitations including recall or selection bias preclude these results from being considered for setting exposure guidelines. The penchant to dismiss and criticize positive results, and fondness for and eager acceptance of negative findings at the same time, are palpable and concerning.

In contrast, IARC's evaluation of the same epidemiological studies ended up officially classifying RF radiation as possibly carcinogenic to humans [2, 3].

An understandable question that comes to mind is how can there be such divergent evaluations and conclusions of the same scientific studies? Humans are not always rational or as transparent as advertised. Scientists are not impervious to conflicts of interest and can be driven by egocentric motivations. Humans frequently make choices and decisions that defy clear logic.

Science has never been devoid of politics, believe it or not: a couple of cases in point.

Most people would readily say that the brilliant, celebrated Albert Einstein was a Nobel Laureate for having received the prize in Physics. When asked about for what subject of research or scholarship he received the prize, the default answer is for the Theory of Relativity, or for his observation that energy and mass are interchangeable (i.e., $E = mc^2$ . Rarely would mention be made otherwise. In fact, Einstein received his Nobel Prize in 1922 "for his services to theoretical physics, and especially for his discovery of the law of the photoelectric effect." Today, no knowledgeable physicist would dispute that Einstein deserved the Nobel Prize for his discovery of the photoelectric effect [9]. Therein lies the rub or paradox!

Among the many theories that Einstein had reported in the previous 17 years, his 1905 paper on the photoelectric effect was a relatively minor contribution at the time, and it was the least accepted by the contemporary theoretical physicists. During the selection process in 1921, the Nobel Committee for Physics decided that none of that year's nominations met the criteria as outlined in the will of Alfred Nobel. However, Einstein was so renowned by that time that their failure to have awarded him the Prize had become an embarrassment. The selection was thus a political decision by the Nobel Committee, most notably revealed by the insertion of "for his services to theoretical physics" as a telltale in the award citation. Regardless, the Nobel Committee exhibited courage and made amends for a major error.

The Nobel Prize in Physiology or Medicine for 2003 was awarded jointly to Paul Lauterbur and Peter Mansfield [10] "for their discoveries concerning magnetic resonance imaging." The award made recognition of the two Laureates' pioneering contributions, which led to the applications of magnetic resonance imaging (MRI) in medical diagnostics and research. The discovery was a breakthrough in radiology, which was based on noninvasive and non-ionizing radiation. MRI has significantly improved the diagnosis of numerous diseases, along with reduced risk and discomfort for patients. The announcement also led many to notice the absence of Raymond Damadian for a share of the Nobel Prize [11, 12].

Published records show that Damadian had conceived of noninvasive magnetic-resonance scanning, discovered tissue proton relaxation and density differences that are crucial to MRI, and had achieved the first human whole-body images. Lauterbur devised methods to reconstruct two-dimensional images a year later. Mansfield had developed a faster pulse-sequence technique that differed from Lauterbur's reconstruction method another couple of years later. It appears unequivocal that all three scientists made important contributions in launching medical MRI. Why, then, was the Nobel Prize awarded to two scientists?

There was apparent disciplinary allegiance, or groupthink, within the magnetic-resonance research community. Science got wrapped up in politics and interfered to label the earlier contributions as insignificant or less consequential. Unfortunately, this time, the Nobel Committee did not manage to either confront or mitigate a needless dispute.

Biases *can* impair *rational* judgment and lead to poor decisions. Emotions *can* keep humans from *being rational* and prevent us from arriving at obvious conclusions. At times, humans systematically make choices and decisions that defy clear logic. Regrettably, the herd mentality or groupthink is as rampant today as ever.

Some years ago, I had commented that "science has become partisan. And the corollary, if science becomes partisan, is it science or politics, or would it be political science?" [8]. Perhaps, it is simply a matter of being politically correct of the willing!

When decisions are not arrived at by prudently balancing the facts or are made via impaired *rational* judgment this could lead to poor decisions through biases. Sometimes, the poor decisions may impact only a small number of individuals as a result. However, in cases like the COVD-19 coronavirus pandemic, millions of people may suffer the unjust and needless consequences.

The cellular mobile communication and associated wireless technologies have proven beyond any debate their direct benefit to humans. However, as for the verdict on the health and safety of billions of people who are exposed to unnecessary levels of RF radiation over extended lengths of time or even over their lifetime, the jury is still out! The ALARA – as low as reasonably achievable – practice and principle should be followed for RF health and safety when confronted with such divergent assessments of science.

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[Editor's note: the above contribution was written at the end of December 2020.]