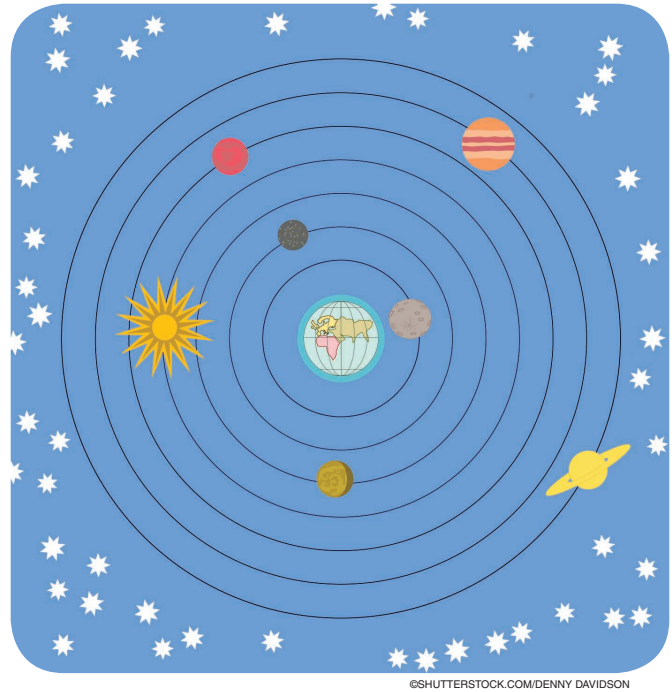
Health Matters

Science, Politics, and Groupthink

■ **James C. Lin**

The onset of the COVID-19 coronavirus in early 2020, lasting through the end of the year and beyond, has undoubtedly rendered 2020 incredible in many ways. COVID-19 has caused a devastating global pandemic with rapidly increasing case counts and deaths. Globally, the numbers of confirmed cases and fatalities exceed 83,113,878 and 1,812,218, respectively. In the United States, there were 19,821,487 confirmed cases and 343,818 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 have been lost and so many more have pointlessly suffered from grief and pain. It does not seem to make sense.



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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 should be influenced by scientific findings and whether politics should intervene when science upsets the established political order enough to justify governmental action. These questions are not new or groundbreaking.

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

Instead, Galileo was condemned by the Holy Office of the Inquisition as heretical for holding the belief that the sun is the center of the universe, which was considered false and contrary to the Sacred and Divine Scripture. It was a

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dangerous idea, and one that cost Galileo his freedom. He was sentenced to imprisonment, 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: to paraphrase *Ecclesiastes* 1, "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 will only be a matter of time."

Fast forward to the 21st century, when, in 2011, the World Health Organization'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 the then-available scientific studies and, although evidence was incomplete and limited (especially regarding results from animal experiments), concluded that the epidemiological studies of humans reported increased health risks for long-term users of cellular mobile telephones. These risks included gliomas (a type of malignant brain cancer) and acoustic neuromas (or acoustic schwannomas—a nonmalignant tumor of the auditory nerves on the side of the brain). This evidence was sufficiently strong to support a classification of exposure to RF radiation possibly being carcinogenic for humans [2], [3].

In 2018, the National Toxicology Program (NTP) of the U.S. National Institute of Environmental Health Science (NIEHS) reported observations of two types of cancers in laboratory rats that were exposed, for their entire lives, to RF radiation used for 2G and 3G wireless cellular mobile telephone operations [4], [5]. This is the largest health-effect study ever undertaken by the NIEHS/NTP for any agent. A 12-member peer review panel of independent scientists convened by NIEHS/NTP evaluated the toxicology and carcinogenesis studies and 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 heart 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 with lifelong exposure to 2G/3G 1,800-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 about heart schwannomas and brain gliomas. Thus, two relatively well-conducted RF exposure studies, employing the same strain of rats, showed consistent results of 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 and 300-GHz frequency range [7]. The proposed guidelines were primarily based on the tissue-heating potentials of RF radiation to elevate animal body temperatures to greater than 1° C. While recognizing that the two aforementioned studies used large numbers of animals, best laboratory practice, and animals exposed for the entirety of their lives, the private group preferred to quibble with alleged "chance differences" between treatment conditions and the fact that the measured animal body core temperature changes reached 1° C, 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 noted that, even though many epidemiological studies of RF radiation associated with mobile phone use and cancer risk had been performed, studies on brain tumors, acoustic neuroma, meningioma, and parotid gland tumors had 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, precluded these results from being considered for setting exposure guidelines. The simultaneous penchant to dismiss and criticize positive results and the fondness for and eager acceptance of negative findings are palpable and concerning.

In contrast, the 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 this: How can there be such divergent evaluations and conclusions of the same scientific studies? Humans are not always rational or as transparent as advertised, and 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. Here are a couple of cases in point.

Most people would readily say that the brilliant, celebrated Albert Einstein was a Nobel Laureate, having received the prize in physics. When asked about the subject of his research or scholarship, the default answer is "the theory of relativity" or "his observation of energy and mass being interchangeable (i.e., $E = mc^2$)." The response would rarely be 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]. There lies the rub or paradox.

Among the many theories that Einstein had reported in the previous

17 years, his 1905 paper on photoelectric effect was a relatively minor contribution at the time, and it was the theory least accepted by 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 award him the prize had become an embarrassment. So the selection was 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 recognized the two Laureates' pioneering contributions, which led to the application of magnetic resonance imaging (MRI) in medical diagnostics and research. The discovery was a breakthrough in radiology, based on noninvasive and nonionizing radiation. MRI has significantly improved the diagnosis of numerous diseases and reduced risk and discomfort for patients. The announcement also led many to notice the absence of Raymond Damadian for his share of the Nobel Prize [11], [12].

Published records show that Damadian conceived of noninvasive magnetic resonance scanning, discovered tissue proton relaxation and density differences that are crucial to MRI, and achieved the first human whole-body images. Lauterbur devised methods to reconstruct 2D images a year later. Mansfield developed a faster pulse-sequence technique that differed from Lauterbur's reconstruction method a 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 of them?

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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 managed neither to either confront nor 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 commented, "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 the willing being politically correct.

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

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 lifetimes, the jury is still out. When confronted with such divergent assessments of science, the ALARA—as low as reasonably achievable—practice and principle should be followed for RF health and safety.

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