Pioneer Science and the Great Plagues

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classical swine fever), and the worry was that the location could release these agents into agricultural areas. The Department of Homeland Security paused to do a study and used the National Academy of Sciences to investigate the site location. Completed in June 2012, the National Academy of Sciences report supported Kansas. A ground-breaking ceremony was held on May 27, 2015, with Kansas senator Pat Roberts, Governor Sam Brownback, Agriculture Secretary Tom Vilsack, and Homeland Security’s Jeh Johnson. Construction was to begin on campus with the date for transfer of Plum Island operations to Kansas set for 2023. Control of the new laboratory was transferred from the Department of Homeland Security to the Agricultural Research Service in 2019.

40. ANTI-SCIENCE SCAMS AND KEYS TO PROGRESS

Since 2000, commercial, academic, and religious anti-science scams have accompanied the rise in the public’s distrust of science. Expansive commercial ventures in animal and human health developed that provided scams for the unwary financier. After retirement from the Veterinary Medical Research Institute, Professor William Switzer, known internationally for research in respiratory diseases of pigs, entered into an arrangement with an entrepreneur to create Mitogenetics LLC, which billed itself as a research and development company focused on biomedical technology “to preserve a healthy lifestyle.” Switzer was listed as the company’s founder, company director, and chief science officer, but offices were in Sioux Falls, South Dakota, with a businesswoman listed as CEO and president.

According to its website, “Mitogenetics has found therapeutic solutions for mitochondrial and cellular changes used in diseases like type 2 diabetes, obesity, heart disease, hypertension, Alzheimer’s disease, and Parkinson’s disease—to name a few that have been linked to mitochondrial dysfunction.” But it was not true. There were no solutions, nor was there evidence that there might be—there were no laboratories, no research, and no science. A few other scientists located elsewhere were listed, but there were no authentic original scientific publications or any other evidence of innovative science done by Mitogenetics. When the investors’ money was gone, Mitogenetics came back for more—but it was too late.
Professor Switzer had been bamboozled into lending his name to a business front that was, at best, a scam to make money for personal gain; at worst, a shell company for other devious activities. The current listing under Buzzfile is that Mitogenetics “primarily operates in the automobile insurance business with $340,000 annual revenue.” Turns out, Switzer was following a modern flimflam artist whose modus operandi was *fake it 'til you make it*. But Mitogenetics was minor league—small potatoes in the world of medical scamming.

Elizabeth Holmes zoomed to fame as the youngest female billionaire after dropping out of Stanford at age nineteen to found the company she named Theranos. A “darling of Silicon Valley,” she claimed to have created an easy way to test blood just by pricking your finger. She added retired politicos to her board, including George Shultz and Henry Kissinger. Holmes cast a hypnotic spell: her investors included Rupert Murdoch and Betsy DeVos, as well as Steven Mnuchin, big investment banker and secretary of the U. S. Treasury. But her processes were fake and her equipment resembled that in a high school science laboratory. She wasn’t selling software but vaporware. When exposed by *Wall Street Journal* reporter John Carreyrou, her company collapsed. Turns out, she was defrauding investors of just under $1 billion on nonexistent technology. Her science directors, having been cheerleaders, not overseers, quietly resigned.  

Inappropriate behavior by veterinarians in the federal government can be especially disappointing. Lester Mills Crawford, a veterinary school graduate of Auburn University in 1963 with a PhD degree in pharmacology from the University of Georgia, was appointed commissioner of the Food and Drug Administration by President George W. Bush. Crawford had worked in the Bush election campaign of 2004 and was a member of the National Republican Senatorial Committee and a heavy contributor to Bush’s presidential election. A highly trained scientist of great ability, he rapidly worked his way upward in the federal mid-level administrative chain; he had been director of the FDA’s Center for Veterinary Medicine, administrator for the Food Safety and Inspection Service at the U. S. Department of Agriculture, and director of the Center for Food and Nutrition Policy. Approved by the Senate Committee on Health, Education, Labor, and Pensions, Crawford was confirmed two weeks later and began as commissioner of the FDA in July 2005. The next spring, Crawford’s lawyer announced that he was being investigated by a grand jury over accusations of financial improprieties and false statements to Congress. On October 16, 2006, he was charged by the Department of Justice and the next day suddenly
resigned as FDA commissioner. He pleaded guilty to conflict of interest and false reporting of information about stocks he owned in food, beverage, and medical device companies he was in charge of regulating. He was sentenced to three years of probation and fined $90,000.

Here and there, the legitimacy of scientific medical research has been discredited by scams that preyed on science for profit or by professors who cooperated with these scams—modern bogeymen who finagle for professional advantage but foul their own nests. Plagiarism, the appropriation of another person’s ideas, results, or words without giving appropriate credit, is the most common form of research misconduct in academia. It often appears among scientists as citation plagiarism—also called “citation amnesia” or “bibliography negligence”—the negligent or willful failure to appropriately credit others and prior discoveries so as to give the impression of priority.

Data dredging or cherry-picking—looking for and giving inappropriate emphasis to findings that seem most interesting—is a wily falsification scheme used in nutritional and agricultural studies, where large sets of data are required. Brian Wansink, once one of the nation’s most respected food researchers, was forced to resign from Cornell University when most of his published papers were retracted by the Journal of the American Medical Association. His downfall began when he reported that the calorie count in Joy of Cooking had gone up 44 percent since the first edition in 1936 and that the change was related to the obesity epidemic; the publisher asked statisticians to review the studies. Turns out, Wansink had used data dredging, or p-hacking, the process of running exhaustive analysis on data sets to tease out subtle signals that might otherwise be unremarkable. His studies were riddled with errors, data inconsistencies, and evidence of fraud. Gregarious and narcissistic, Wansink had never learned the rules of proof and integrity. He had been born in Iowa and had extraordinary academic credentials: an MS from Drake University in journalism and a PhD from Stanford in marketing, as well as faculty stints in economics at Dartmouth, Illinois in Champaign, and the Wharton School at Pennsylvania. But he was a journalist and marketer, not a scientist.

The most serious examples of academic scamming arise from the fabrication and falsification of results—such as making up or “dry labbing” results and reporting them—a form of research misconduct in which scientists manipulate research processes or change or omit data so that the research is not accurate. In 2009, the Department of Biomedical Sciences in the College of
Veterinary Medicine at Iowa State recruited Michael Cho and his team of HIV/AIDS research scientists from Case Western Reserve University in Cleveland. Dong-Pyou Han, a Korean member of the team, reported that he had detected antibodies in rabbits given an experimental HIV vaccine—the first ever evidence that an HIV vaccine might work.

Others could not confirm his work, and the funding agency, the National Institutes of Health, insisted that other labs pursue the issue using Han’s reagents and serum to detect the antibodies. In early 2013, scientists at Harvard University, trying to validate Han’s work, found the antibodies in Han’s sera; they also found something else—human proteins. Following through, they discovered that human antibodies had been added surreptitiously to the rabbit serum specimens. The rabbits had not responded to the HIV vaccine; human anti-HIV antibodies had been added to the rabbit serum to make it appear as if they had. Iowa State University and the NIH investigated immediately.

Han confessed to his misdeeds, resigned, and left town. Unfortunately for him, Iowa’s Senator Grassley, the Senate watchdog over medical science misdeeds—unhappy with the NIH’s light punishment—was not about to let Han get off scot-free and, pursuing the issue, forced a criminal investigation. In 2014, Han was arrested, tried, found guilty, and sentenced to five years in prison and ordered to return $7.2 million to the NIH. A spokesman for NIH was quoted in the New York Daily News as having called it the “worst case of research fraud he’d seen in two decades at the agency.” In the end, administrators had failed, their academic greed trumping a careful decision that a medical school HIV hotshot was an inappropriate choice for a cramped veterinary school. Clueless about cutting-edge science, naive about misconduct, and lackadaisical in leadership, the professors in charge had been dazzled by the $19 million in federal funding for the project, but no one was attending to details.

A lesson on the impact of anti-science threats comes from the perpetual turmoil in the Middle East, an intriguing paradox in cultures. In the dark ages of medieval Europe, Arabic scholars held on to the possibilities of truth, rationality, and tolerance while these were being destroyed in Europe. In the tenth century, an Arab philosopher and optics physicist, Ibn al-Haytham—he had discovered that vision occurred in the brain, not the eye—proposed that the scientific method must “search for truth, not support of opinions” and that science must function through observation, measurement, creative
experiment, and conclusion. In the next three hundred years, others in the Muslim world emphasized the importance of subjecting contrarian views to the test of evidence and rational analysis.\textsuperscript{30} Ibn al-Awam, an Andalusian Arab in Seville, wrote *Kitab al-Filaha* (*Book of Agriculture*), with four chapters on livestock, including diseases of horses and cattle.\textsuperscript{31} But then, slowly, the Arabic world entered its own dark ages.

By the 1980s, Egypt had been one of the most heavily endowed recipients of American aide for agriculture and veterinary medicine from the Agricultural Research Service. Operating through the Food and Agriculture Organization of the United Nations in Rome, Americans had helped Egypt build a useful system of universities. Veterinarians, young and old, were intelligent and well-educated. Their universities in Cairo and Asyut published Egyptian veterinary journals, and they owned a great heritage. Yet, somewhere along the line, the great ancient libraries of Alexandria and Baghdad had disappeared, and with them their heritage of tolerance and rational thought.

These bright young veterinary scientists in Egypt were not being productive in the Western sense, and their system seemed hampered by zealots in their Muslim culture. Scientific productivity is strikingly low in many Arab Gulf states, despite the investment of enormous sums of money. This low output of scientific papers and patents is perpetually linked to failures of acceptance of the central core of universal values that any modern society must possess: the search for truth, rational thought, creativity, and analysis of contrary views. The Muslim world of over a billion people is, in many countries, flush with cash yet perpetually retarded in the search for stable and permanent economic growth by its social intolerance, lack of science values, and failure to use rational, evidence-based decision-making processes.

In 2008, Ismail Serageldin, director of the Library of Alexandria in Egypt, in a remarkable treatise on Muslim science, wrote: “Throughout the Muslim world, we are witnessing an increasingly intolerant social milieu that is driven by self-appointed guardians of religious correctness, who inject their narrow interpretation of religion into all public debates. Rejecting rationality or evidentiary approaches, they increasingly force dissenting voices into silence and conformity with what they consider acceptable behavior.”\textsuperscript{32}

Muslim zealots are paralleled in the U.S. by battles of religious zealots over creationism and evolution. Supporting religious scamming, a disturbing editorial by a member of the *Des Moines Register*’s Reader Advisory Board appeared
on January 7, 2006. Covered by the headline “Evolution Disciples Dodge Facts, Implications of Intelligent Design,” the writer had turned truth on its head, suggesting that facts belong to creationists and faith to science, telling us about scientists whose “faith in evolution prevents them from admitting there is very little evidence to support its grand claims . . .” From there, he proceeded to a series of illogical and downright silly conclusions. Equally disturbing at the same time was a discussion with students on the Iowa State University campus by Robert Vander Plaats, a candidate for lieutenant governor of Iowa. He was proposing that intelligent design, a revisionist version of creationism, be taught in the public schools “alongside of the theory of evolution.”

Intelligent design was a loosely veiled façade whose goal was the teaching of science based on biblical values. The objectives were to falsify science and manipulate public opinion in order to lead the political process to control what science is taught. The creationist curse seemed to disappear, but perhaps it was once again transferred to anti-vaccination activism. Although they will not survive, these anti-science scams require vigilance. Serageldin writes: “The future can be bright, but it requires a commitment to fight for the values of science and to reject obscurantism, fanaticism, and xenophobia.”

Over the past decade the internet and social media have changed the rules of how grifters play the game. They speed people to like-minded combatants, giving them an impression of stronger validation than really exists. “What people find on the web ‘creates a whole new permission structure, a sense of social affirmation for what was once unthinkable,’” writes Frank Bruni of the New York Times. He continues, quoting from a New Yorker article that deconstructs the 2016 election: “The capacity to disseminate misinformation, to will conspiracy theories, to paint the opposition in wildly negative light without any rebuttal—that has accelerated.”

Suspicion becomes certainty. It is the era of the confidence game. Google, Facebook, and Twitter have served to elevate the abilities of the con artist—one can sign on to enter a behavior modification loop, which is the con. At any rate, that is what virtual reality expert Jaron Lanier says in his book Ten Arguments for Deleting Your Social Media Accounts Right Now.

Nationwide, college professors were shocked by a 2017 Pew Survey. Asked if colleges were having a positive or negative effect on America, 58 percent of Republicans and conservative-leaning independents said negative—up from just 37 percent two years previously. Even worse, a Gallup poll found that only 44 percent of all Americans had a “great deal” or “quite a lot” of confidence
in the country’s colleges and universities, while 56 percent had only “some” or “very little.” In past decades, one encountered academic bashing—references to “half of what you learn in college is wrong,” “those who can, do; those who can’t, teach,” and all the old standby references to ivory towers. But these surveys revealed something far more ominous.

In the late 2010s, we moved into a politically divisive era that took us backward in culture. Too high a percentage of the population was persuaded that razzmatazz, bullying, bigotry, and even lying were lesser evils that could supersede logic, law, and common sense in the pursuit of political goals. Lying was viewed simply as a marketing tool to move the public into an anti-science stance. The position of science advisor to the president was abandoned, and the National Academy of Sciences, originated by Abraham Lincoln to provide critical scientific information for national leaders, was not used effectively.

In the name of efficiency, new schools of veterinary medicine have appeared that replace microscopes with digitized photographs and virtual reality programs that have no serious connection to how science is done. Some fear that the century-old tradition of the educated veterinarian understanding, speaking, and doing science may be over. The problem is that the virtual in virtual reality is a lie. It uses marvelous technology to teach in seconds by pressing a button what professors of past generations took days to teach using microscopes, real specimens, multilayered diagrams, unretouched photographs, and contact with laborious anatomical dissections and clinical analysis of living animals. Those methods were often inefficient, time-wasting, and boring, especially in the hands of a tired and aging professor. Yet the danger in the digital approach is that, for many students, a connection to reality is virtually lost. Limiting education to the dazzle of virtual reality has led in some institutions to the concept that students do not need experiences offered by diagnostic laboratories, research centers using cutting-edge technology, and veterinary hospitals controlled by professional educators.

The keys to avoiding all this intellectual vandalism that poisons science and education lie in who we elect to lead our government, what regulations are begun to prevent internet misdemeanors, and how effectively we teach science to our offspring—keeping leadership rigorously embedded in long-term realities and not diluted in the name of cost savings or religious bigotry, or to please helicopter parents or student audiences.
Science education has to be an integral part of the nation’s economic creativity and inventiveness, an economic engine for biotechnology in food safety, livestock animal health, and animal modeling for the life sciences. It provides the high-quality, authoritative research data that is required for national policy decisions. To fail opens society to agenda-driven misinformation by zany cults and even careless political leaders. In every generation science somewhere does fail, sometimes in devious ways. The dangers that arise from all this are deferred and vastly underrated.

The truth is, despite the defects in our system, we are educating a new generation of problem solvers that understands both the seemingly unlimited capacity of computers as well as the weaknesses in digital communication. For these inquisitive students the study of science is fulfilling, and they understand its power for good. In the few years allotted for college, problem solving is perfected as the graduate’s most powerful tool. In most veterinary schools, students do learn to apply discretionary judgment in making fine distinctions among alternative possibilities and to draw valid conclusions from a unique set of observations. In the end, they will combine objectivity and rational thought to determine the best path to a successful clinical outcome. They understand that great plagues will continue and that to survive, we must be tethered to science. The arc of history vacillates but always bends to truth.