My New Scientist

Science in America: Decline and fall

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The US is the most powerful scientific nation on Earth and yet the status of science in public life has never been so low. Why?

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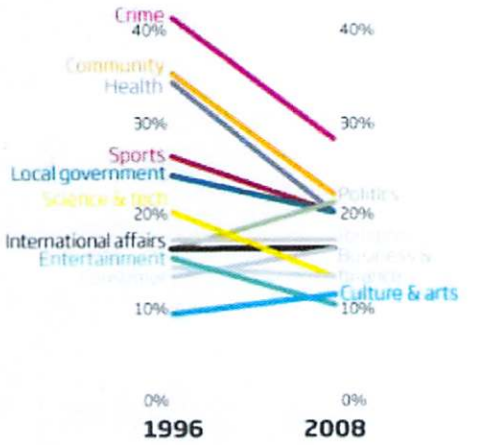
THE big thing we are working on now is the global warming hoax. It's all voodoo, nonsense, hokum, a hoax." So said Michele Bachmann, a candidate for the Republican nomination for president, in 2008. Bachmann also thinks that the human papillomavirus (HPV) vaccine can cause mental retardation and that science classes should include creationism. "What I support is putting all science on the table and then letting students decide. I don't think it's a good idea for government to come down on one side of a scientific issue or another, when there is reasonable doubt on both sides."



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Bachmann's rival, Texas governor Rick Perry, advocates biblically based abstinence-only sex education. He argues that evolution is "a theory that is out there - and it's got some gaps in it". On climate change, Perry says "the science is not settled... just because you have a group of scientists that have stood up and said here is the fact... Galileo got outvoted for a spell".

Former House Speaker Newt Gingrich tells voters that embryonic stem cell research is "killing children in order to have research materials". Rising Republican star Herman Cain claims there is no scientific evidence that homosexuality is anything other than a personal choice.

Republicans diverge from anti-science politics at their peril. When leading candidate Mitt Romney said: "I believe based on what I read that the world is getting warmer... humans contribute to that", conservative radio commentator Rush Limbaugh responded with "Bye bye, nomination". Romney back-pedalled, saying, "I don't know if it's mostly caused by humans."

Former Utah governor Jon Huntsman argued that "the minute that the Republican party becomes the anti-science party, we have a huge problem". Huntsman has since been marginalised by Republican pundits.

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The intellectual rot runs wide. Ninety-six of 100 newly elected Republican members of Congress either deny climate change is real or have signed pledges vowing to oppose its mitigation. This July, San Francisco's board of supervisors, all Democrats, passed an ordinance requiring cellphone shops to warn customers about radiation hazards such as brain cancer, despite no scientific evidence. Elsewhere, elected leaders harass and intimidate scientists they disagree with, inaccurately claim that scientists say carbon dioxide is a carcinogen, pass resolutions stating that Earth has been cooling and instruct teachers to teach their students that astrology controls the weather. Absurd comments are now not only politically acceptable, but passionately applauded. What could be happening?

Over the course of the next 40 years, science is poised to create more knowledge than humans have created in all of recorded history. Even as this overwhelms us, the unanticipated consequences of past advances are boomeranging back - climate change, biodiversity loss, pollution, population, overfishing and many more. We are now 100 per cent dependent on science to find ways to preserve our environment and support our population, but policymakers increasingly reject the answers science offers or pretend the problems don't exist.

Knowledge is power

This is where Thomas Jefferson's assumption about a well-informed public poses a problem. Jefferson believed that it required "no very high degree of education". In today's world, dominated as it is by science, can democracy still prosper?

Judging from Congress, the answer may be no. Less than 2 per cent of its 535 members have professional backgrounds in science. In contrast, there are 222 lawyers, whom one suspects largely avoided science classes in college. Lawyers are trained to win arguments, and as any trial lawyer will tell you, that means using facts selectively for the purposes of winning, not to establish the truth. No wonder ideology and rhetoric have come to dominate policy discussion, often bearing little relationship to factual reality.

What happened? To understand the troubled relationship between US science and politics we have to understand the nation's history.

Contrary to recent claims, the US was not founded as a Christian nation. The early settlers were Puritans seeking freedom from authoritarian Christianity. To be a Puritan was to study both the Bible and the book of nature in order to discern God's laws, a process called "natural philosophy", which today we call "science". In 1663, 62 per cent of the members of the Royal Society were Puritans, including Isaac Newton.

The writings of Newton, Francis Bacon, John Locke and David Hume deeply influenced Jefferson as he drafted the Declaration of Independence. Newton teased out the difference between belief and knowledge. Bacon laid out how we could build knowledge using inductive reasoning. Locke defined how knowledge is different from and superior to "but faith or opinion". Hume defined freedom as the ability to choose to do something or not.

Jefferson incorporated these ideas in America's founding document and they laid the philosophical and legal foundations of the US. If every human had the potential to build knowledge about reality and truth using science, no king or pope could claim a greater authority than an ordinary citizen. All men were created equal. This justified a secular government that respected and tolerated religion, but did not base its authority on religion - instead basing it on liberty, reason and science.

This thinking served the US very well for some 200 years. But then things began to go wrong.

It would be too easy to point the finger solely at the religious right. In reality there were many forces at work, from both ends of the political spectrum and from within science as well as

without.

A good starting point is the second world war, which transformed science from an exploration of nature into a weapon. Radar and the atomic bomb had big impacts on the outcome, as did sonar, synthetic rubber and other innovations.

In 1945, Vannevar Bush, who had coordinated these efforts as director of the Office of Scientific Research and Development, gave President Harry Truman a document titled "Science, the Endless Frontier". In it, he made the argument for permanent government funding of research.

If anything, Bush made the argument too well. Relieved of the burden of selling the value of their research to philanthropists, scientists turned inward and in many ways withdrew from civic engagement. University tenure programmes were developed that rewarded research and publication but not public outreach. Scientists who did reach out to the public were often viewed poorly by their peers. Politics became something that could taint one's objectivity.

Science is politics

But to view science as apolitical is a fundamental error. Science is *always* political because the new knowledge it creates requires refining our morals and ethics and challenges vested interests. Withdrawing from the conversation cedes these discussions to opponents, which is exactly what happened.

As scientists were retreating into their labs, America was reflecting on the dark side of knowledge. The atom bomb profoundly affected public consciousness as moral ambiguity combined with the threat of nuclear annihilation. The effects of chemical pollution began to be felt. Disasters ranging from toxic waste to dangerous medical devices shattered public confidence. A deep distrust of both government and science set in among baby boomers.

Meanwhile, religion was organising. Struggling to attract new members, fundamentalist churches found a rallying call in the increasing moral complexities of science. Using television, the voice of Protestantism grew evangelical, angry, anti-science and intensely political.

Even as these criticisms mounted, science was enjoying increased funding and prestige in universities, supplanting the humanities. The humanities pushed back. Postmodernism emerged, drawing on cultural anthropology and relativity to argue that there was no such thing as objective truth. Science was simply the cultural expression of western white men and had no greater claim to the truth than the "truths" of women and minorities. This fit well with the politics of civil rights and also conveniently placed the humanities back on top. In pop culture it became a secular religious movement that preached creating your own reality - the New Age.

Many positive things came out of postmodernism but the idea that there is no objective truth is just plain wrong. And yet a generation of Americans was taught this incorrect idea. As they became leaders in politics, industry and the media this thinking affected their regard for truth and science. Without objective truth, all arguments become rhetorical. We are either paralysed in endless debate or we must resort to brute authority. This is the abyss the US now faces.

The situation was worsened in 1987 when the Federal Communications Commission set aside the fairness doctrine. Until that time, broadcasters who use the public airwaves were required to present controversial subjects, and to present them fairly. Once the doctrine was set aside, a new breed of radio and television newscaster took over. Rush Limbaugh and others earned massive ratings by voicing outraged opinions on political matters. At the same time, cable TV and the internet were coming online, providing innumerable alternative news platforms.

News shows now had to compete with entertainment, and so became more emotional and

opinionated. A generation of journalists with a postmodern education decided that "objective" reporting was simply getting varying views of the story, but not taking a position on which represented reality. "It's not our role," explained White House correspondent David Gregory when asked why he didn't push George W. Bush on his lack of a rationale for going into Iraq. This problem, called "false balance" now pits, for example, climate scientists against deniers. This gives undue exposure to extreme views - a situation that has been compounded by the elimination of most science and investigative reporters from cash-strapped newsrooms.

Finally, there is the influence of vested interests. Between January 2009 and June 2010, for example, the energy industry spent half a billion dollars fighting climate change legislation. They spent an estimated $73 million more on anti-clean energy ads from January through October 2010. Much of the effort was to cast doubt on the findings of climate science or impugn scientists' reputations and motives. It worked, largely because the news media allowed it to.

These factors have combined to create an assault on science that is unprecedented in American history. Cut loose from objective truth, America's public dialogue has become one of warring opinions and policy paralysis. Progress is made by brute authority, over the laws, despite the data, and against the will of opponents - the very situation Locke and Jefferson were hoping to avoid.

Anti-science ideology has taken hold before, differently, but history may provide some lessons. The fundamental elements were similar when the Soviet Union elevated the ideology of Lysenkoism ahead of the warnings of geneticists, whom Trofim Lysenko called "caste priests of ivory tower bourgeois pseudoscience", not unlike Sarah Palin's characterisations of global warming as "doomsday scare tactics pushed by an environmental priesthood". Soviet agriculture was set back 40 years.

The political right in Weimar Germany called Einstein's theory of relativity a "hoax" and said he was in it for the money - much as climate deniers argue today.

During the Nuremberg trials, Hitler's Minister for Armaments, Albert Speer, recounted the use of new technology to deliver a uniform ideological message, much like today's political echo chambers: "Through technical devices like the radio and the loudspeaker, 80 million people were deprived of independent thought." In other words, "Dittoheads".

In his Great Leap Forward, Mao set forth a plan to transform China into a modern society in 15 years. Scientists who advised against his ideas were harassed or jailed. Mao's policies led to the greatest famine in human history and the deaths of over 40 million people.

The US is obviously nowhere near any of these situations, but is reaching a crisis point uniquely its own. With every step away from reason and into ideology, the country moves toward a state of tyranny in which public policy comes to be based not on knowledge, but on the most loudly voiced opinions.

The solutions are as multi-faceted as the problem. Above all, scientists must reengage in the national civic dialogue (see opposite) and reasonable politicians should challenge opponents to science-themed policy debates.

I am involved in two projects that aim to make this happen. One is the American Science Pledge, which calls on candidates to pledge to defend science and base public policy decisions on data.

The other is ScienceDebate2012.com, a grassroots campaign for a presidential debate on science, technology, health, medicine and the environment. In 2008 we persuaded Barack Obama and John McCain to join such a debate; Science Debate 2008 was the largest political initiative in the history of American science. Scientists would do well to support such efforts at even greater

levels today. As Alexis de Tocqueville observed, "in every democracy, the people get the government they deserve".

The right stuff

The Republicans used to be the party of science. Abraham Lincoln created the National Academy of Sciences in 1863; William McKinley won two presidential elections, in 1896 and 1900, over the anti-evolution Democrat William Jennings Bryan. McKinley supported the creation of the forerunner to today's National Institute of Standards and Technology. Bryan's campaigns against evolution led to in the 1925 Scopes Monkey Trial, and drove more scientists toward the Republican party. In 1923, an exasperated Republican, Nobel physicist and California Institute of Technology president Robert A. Millikan, wrote that creationists were "men whose decisions have been formed, as are all decisions in the jungle, by instinct, by impulse, by inherited loves and hates, instead of by reason. Such people... are a menace to democracy and to civilization."

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