

What a Coin From 1792 Reveals About America's Scientific Enterprise

It's thought that the very first coin ever produced by the United States Mint was made on a screw press in a Philadelphia basement in 1792, in the presence of George Washington and Thomas Jefferson. According to rumor, only ten of these prototype coins were made because the design was discontinued. Each of the remaining coins, called the Birch Cent after its engraver, depict Lady Liberty in profile with the words "LIBERTY, PARENT OF SCIENCE & INDUSTRY."

In 2015, coin dealer Kevin Lipton purchased one of the coins at auction for nearly \$2.6 million. When asked why he paid so much, he replied, "This is our earliest depiction of what we thought of ourselves as a nation."

The Birch Cent is a fascinating reminder of the importance of science among the bold ideas involved in founding the country. Thomas Jefferson himself proposed that advancing science was a continuation of the American Revolution. In 1789, he wrote to Harvard president Joseph Willard about the latest developments in chemistry, steam power, and bridge designs. He admonished Willard to encourage his students to apply themselves: "We have spent the prime of our lives in procuring them the precious blessing of liberty. Let them spend theirs in shewing that it is the great parent of science and of virtue; and that a nation will be great in both always in proportion as it is free."

Today, the Birch Cent is known mainly to coin collectors, but it's an important artifact of how the American scientific enterprise has been shaped, both as a driver of national progress and an expression of liberty. The results are ubiquitous: perhaps you are reading this essay on your phone—itself a product of the dynamic approach to



research, application, and markets that Jefferson intuited. But the messier side of the legacy also remains: those phones are just as likely to be used to contest the authority of science. On social media and cable news, Americans bicker about the efficacy of mRNA vaccines, argue fiercely over global warming and what should be done about it, and fret over whether the country is losing its competitive edge. Some argue that this cacophony is a sign that the United States has lost its way, has stopped "following the science" and is instead simply muddling through a crisis. But these tensions have been part and parcel of life in this nation from the beginning. Such friction should be seen not as a bug in a perfect scientific system, but rather as an intentional feature that brings with it certain distinct advantages.

When the founders embraced science, they were both inspired by and reacting against the role of science in Great Britain. Scientific inquiry in Britain was then overseen by a select group of experts or authorities—all of whom were wealthy aristocrats or nobility—elected by a council of similarly titled and wealthy peers. It was elitist and entirely top-down.

In contrast, America was attempting to establish itself as a society unburdened by the vestiges of aristocracy. However, the aspiration for a truly egalitarian scientific system in the United States, like many of the promises of the Founding Fathers, has never been fully realized. Although the new republic succeeded in rejecting Britain's approach to science, friction between elitist and democratic tendencies remains a defining feature of the American scientific enterprise.

Britain's Royal Society (formerly the Royal Society of London) was established on November 28, 1660, under the

patronage of King Charles II. The intention of the Royal Society was to be a publicly constituted body devoted to the pursuit of scientific thought. Indeed, the society's founding charter stated that its mission would be "to recognise, promote, and support excellence in science and to encourage the development and use of science for the benefit of humanity." Practically, the Royal Society was meant to marry scientific enterprise and power.

With the Royal Society for a model, it is easy to see how a developing country like the United States became deeply invested in the connection between science and national progress. In 1787, the US federal government announced, with strong support from the founders, that Congress would be a consistent patron of the country's scientific enterprise. This would include not only physical and materials science, but also the arts, humanities, and philosophy. Congress therefore would ensure all citizens were able to pursue scientific endeavors via its authority to allocate funding for new science and issue patents and copyrights. However, nowhere in the Constitution was Congress explicitly charged with the responsibility for managing science, so there was no single authority over the scientific enterprise itself. This lack of centralization complimented the egalitarian values that were being explored, not only in science but in the larger democratic enterprise in the United States.

Despite the Founding Fathers' vision for American science, there was nevertheless a strong legacy of influence from the British model. On one hand, scientific interest resided primarily with the upper class. And institutions that resembled the Royal Society in England soon developed—the American Philosophical Society, for example, boasted Benjamin Franklin, John Adams, and later Thomas Jefferson as members. The American Academy of Arts and Sciences, formed in Massachusetts in 1780, also included many elites. In contrast to the British model, however, American members were often skilled in multiple specialties.

Key to the founders' thinking was the awarding of patents to use science to hasten the nation's development. Here, the US government came to resemble—though not necessarily mirror—the European model that preceded it. Significantly, the Patent Act of 1790 awarded patents as a right to the inventor, rather than as a privilege awarded by a monarch. Even more importantly, it established an examination system and a low application fee, and it required that inventors submit both a written description and a diagram or model so that the product could be made by the public after the patent expired. Scholars contend that these changes made the system far more democratic—both by inviting more inventors to file for patents and by rapidly spreading their innovations to the public and markets—than the European systems.

But even as the government was awarding patents, science itself was excluded from congressional authority. Although Congress had the sole authority to review and grant patents,

science itself was not beholden to a centralized, top-down review, allowing for more open, diverse, and abundant streams of scientific inquiry.

Science became a national hobby and even an identity, accessible to everyday Americans who were coming to see personal improvement as a route to national progress. "Lecture halls, museums, taverns, and private parlors made scientific information accessible to the curious of every age and gender," writes historian Susan Branson. Women wrote in their diaries about studying chemistry; readers anxious for information on stars, tides, and science made an almanac written by Black surveyor and mathematician Benjamin Banneker a bestseller in the 1790s. Fascination with newly unearthed mammoth bones kicked off a fad for natural history and the production of "mammoth" objects—including a 1,200-pound cheese.

The shape of today's scientific enterprise in the United States grew out of this mixture of profoundly democratizing forces and elitist aspirations. There was always the potential for the fledgling nation to fall into a scientific model more akin to the British—and it very nearly did. Historian Hunter Dupree has written that when Thomas Jefferson was vice president, he was keen to use professional societies like the American Philosophical Society (APS) to introduce scientific "schemes" to elude the oversight or influence of Congress. What came next was a series of recommendations from the APS to Congress to direct the allocation of congressional funding. For example, the APS recommended that Congress research and establish what would eventually become the National Weather Service. Had the capital of the United States stayed in Philadelphia (the home of the APS), this unofficial channel of scientific direction from one professional society into congressional influence would likely have continued to grow and become more formally codified. Instead, the alliance between the federal government and science remained strong but diversified in execution and membership. Distribution of patents, colleges, and later, research universities, private enterprises, and professional memberships all became part of a system of science that allowed for more participation and less authoritarian oversight.

Still, tensions between democratization and elitism played out in important institutions. For example, in 1863, during the height of the Civil War, Congress passed an act establishing the formation of the National Academy of Sciences (NAS) to "investigate, examine, experiment, and report upon any subject of science or art" whenever called upon by any department of the government. The academy was thus independent from the government, positioned to consult and advise on—rather than control or fund—the workings of science.

At the same time, NAS could have taken an elitist path. The first president, engineer Alexander Dallas Bache, was

himself a member of the Royal Society. He was also part of a group of Massachusetts scientists who jokingly called themselves the “Scientific Lazzaroni,” in reference to the street people of Naples, and long advocated for the creation of a scientific institution to guide public action. Despite the influence Bache and the Lazzaroni had in its design, NAS never centralized control of science the way European academies did. Instead, by providing advice to the nation, the academy became an important part of a far more open process of shaping the research agenda.

Even when elite scientists called for more direct government support of science after World War II, they preserved the uncoordinated, “messy” system of research. Shortly before his death in 1945, President Roosevelt asked Vannevar Bush, a Massachusetts Institute of Technology professor who had supervised the development of wartime science, to outline a proposal on how the United States should and could maintain its commitment to the scientific and technological enterprise. With his seminal report, *Science*,

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the Endless Frontier, Bush, perhaps unknowingly, returned to Jefferson’s ideas about science and national progress, becoming the primary architect of the US national science system that still operates today.

In this model, the government continued to fund research, much as it had during the war effort, but it gave scientists, not the government, near full control of the science and technology their laboratories worked on. Later, the National Science Foundation, operating under the assumption that “essential, new knowledge can be obtained only through basic scientific research,” as Bush’s report professed, institutionalized the role of scientists as principle decisionmakers and worked to harness the power of the decentralized system for national benefit. Bush himself firmly believed that “good science” would always prevail in an unrestricted, open environment.

Over the past eight decades, the federal government has continued to invest in science in ways that are both egalitarian and accepting of pockets of scientific elitism, including admission-based scientific societies, admission-based research institutions, and privately funded research. The hybrid structure of the US scientific enterprise persists

and evolves, creating an extraordinarily dynamic mix of innovation and markets as well as a population always willing to try new things—from ChatGPT to Impossible Burgers to space tourism. It’s not a coincidence that scientific findings are often front-page news; Americans have embraced the relationship between the scientific enterprise and national power in a deeply personal way.

However, the conflicts in this agglomerated system are ever-present. When looking at contemporary scientific challenges such as global health emergencies and climate change, some observers have called for centralized management of the scientific enterprise. Appeals to simply “listen to the scientists” or “trust science” are often a direct response to dissatisfaction with policy decisions or the perceived pace of innovation in response to increasingly complex problems. More and more frequently, these petitions for a more technocratic approach are couched in the argument that the US scientific enterprise isn’t efficient and cannot compete against China’s authoritarian model.

Today, the 1792 Birch Cent remains an important reminder that the spontaneity and chaos in today’s scientific enterprise was one of the design aspirations of the founders. Its messiness is not a bug; this riotous disorganization is a deliberate feature. The decision to create an American approach to science that is diverse and democratic is not a failure or the result of hapless indirection; it is a system that was designed to be varied and contested.

In reflection, the enduring ethos of American science can be traced to its very inception. The Birch Cent, albeit now a relic, encapsulates the spirit of a nation that was poised to prioritize liberty, innovation, and the pursuit of knowledge. The United States’ unique model of scientific enterprise continues to influence its trajectory in a world of rapid technological advancements and pressing global challenges. The frustrations expressed by contemporary Americans about the processes and outcomes of scientific endeavors mirror the complexities and debates that the system was designed to accommodate.

As the country navigates the present and future complexities of scientific discovery and application, it is crucial to remember that vigorous debate and diverse and sometimes irreconcilable perspectives within our system are not indicative of dysfunction but rather of the dynamic interplay of values that have shaped American thought since its foundation. Designed to be messy, diverse, and contentious, democracy and science are two sides of the same coin.

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