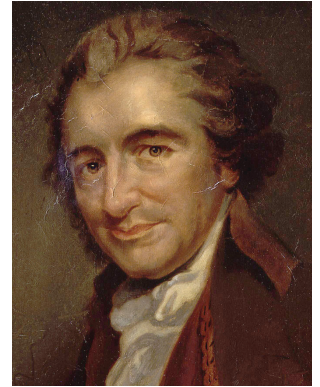

The Beacon

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THOMAS PAINE NATIONAL HISTORICAL ASSOCIATION

New Rochelle, New York



Thomas Paine's Iron Bridge Design Spans the Start of the Industrial Revolution

By Adrian Tawfik

Thomas Paine in *Common Sense* wrote, "We have it in our power to begin the world over again." He meant it in his words, in his politics, and in his life. Paine believed in Enlightenment ideals about science. Fascinated by new technologies, Paine tried his hand at designing bridges. He'd change the world by connecting it together.

After his 1774 arrival in Philadelphia, Paine spent time with Benjamin Franklin and scientifically-minded friends. John Morton's 2014 article "Thomas Paine & Sunderland Bridge," in England's *Northeast Lore*, says Paine "studied mechanical philosophy, electricity, mineralogy, and the use of iron in bridge building." After the American Revolution, Paine devoted considerable energy to innovative bridge designs, which improved on existing designs.

Paine wanted to build bridges in the United States. His first attempt at bridge design was a never-built 300-foot wooden arch bridge across the Harlem River from Manhattan to the Bronx.

When he lived in Bordentown, NJ, Paine in 1786 made three small models of iron bridges, which Paine later described in his 1803 "memoir" to Congress, "On the Construction of Iron Bridges."

"I took the last mentioned one [model] with me to France in 1787 and presented it to the Academy of Sciences at Paris for their opinion of it," Paine wrote. "I presented it as a model for a bridge of a single arch of four hundred feet span over the river Schuylkill at

Philadelphia." The Academy adopted his design principle, but only for 100-foot spans. That same year, he sent a model to Sir Joseph Banks, president of the Royal Society in England, "and soon after went there myself."

Paine's bridge design was being compared to The Iron Bridge in England. The first



The Sunderland Iron Bridge was based on Paine's design.

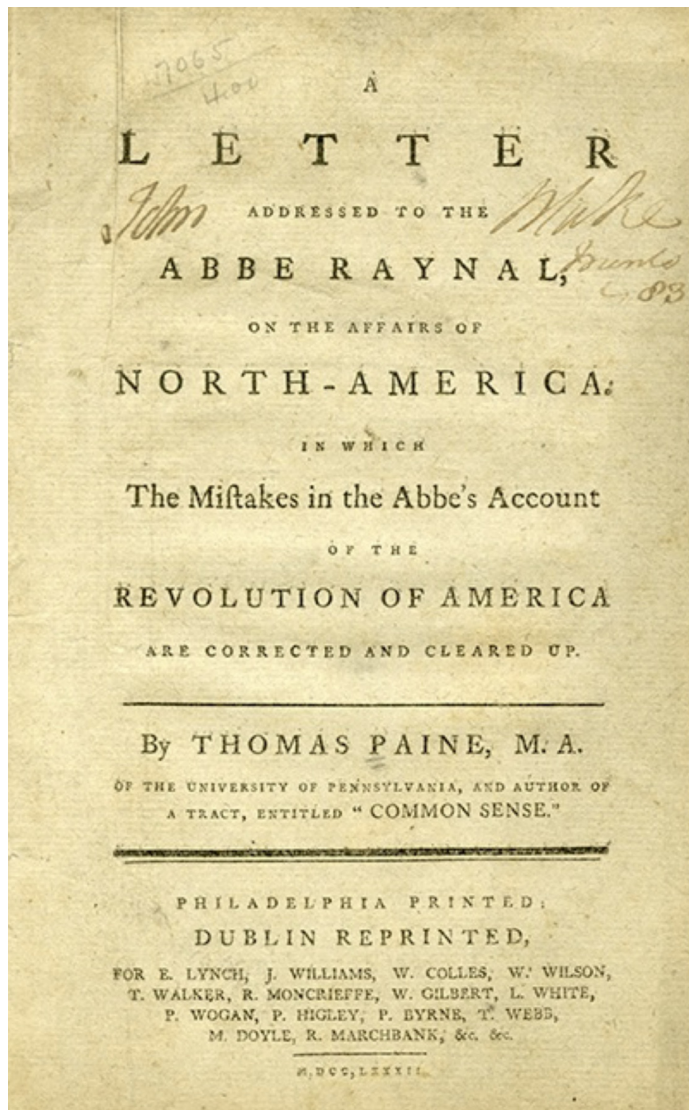
Continued on pg. 2

By Thomas Paine

A Letter to Abbé Raynal

Thus, as I have already observed, the condition of the world being materially changed by the influence of science and commerce, it is put into a fitness not only to admit of, but to desire, an extension of civilization. The principal and almost only remaining enemy, it now has to encounter, is prejudice; for it is evidently the interest of mankind to agree and make the best of life. The world has undergone its divisions of empire, the several boundaries of which are

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*Guillaume Thomas François Raynal, abbé de Raynal, wrote an account of the French Revolution for *Mercure de France*. When Thomas Paine in London read an English translation, he wrote a public response to correct Reynal's misinformation on the American Revolution. Paine's published his 80-page pamphlet in 1782. A short excerpt is reprinted here.*

Abbé Raynal — Continued from Pg. 1

known and settled. The idea of conquering countries, like the Greeks and Romans, does not now exist; and experience has exploded the notion of going to war for the sake of profit. In short, the objects for war are exceedingly diminished, and there is now left scarcely anything to quarrel about, but what arises from that demon of society, prejudice, and the consequent sullenness and untractableness of the temper.

There is something exceedingly curious in the constitution and operation of prejudice. It has the singular ability of accommodating

There is something exceedingly curious in the constitution and operation of prejudice.

itself to all the possible varieties of the human mind. Some passions and vices are but thinly scattered among mankind, and find only here and there a fitness of reception. But prejudice,

like the spider, makes every place its home. It has neither taste nor choice of situation, and all that it requires is room. Everywhere, except in fire or water, a spider will live.

So, let the mind be as naked as the walls of an empty and forsaken tenement, gloomy as a dungeon, or ornamented with the richest abilities of thinking, let it be hot, cold, dark or light, lonely or inhabited, still prejudice, if undisturbed, will fill it with cobwebs, and live, like the spider, where there seems nothing to live on. If the one prepares her food by poisoning it to her palate and her use, the other does the same; and as several of our passions are strongly characterized by the animal world, prejudice may be denominated the spider of the mind. ▲

Iron Bridge — Continued from Pg. 1

and the only large bridge made of cast iron, The Iron Bridge was built in Shropshire County by Abraham Darby III, owner of massive West Midlands ironworks. The Iron Bridge opened in 1781, reported Eric Delony in his 2000 *Invention & Technology Magazine* article, "Tom Paine's Bridge." Darby's Iron Bridge set the standard by which any iron bridge would be judged.

After years studying iron bridge design and seeking funds to build one, Paine decided to build a large-scale model as a proof of concept. Patrick Sweeney in 2017 writes in "Tom Paine's Bridge" for *Republican Socialists UK*, that funds couldn't be raised in America, so Paine returned to England in late 1787 to construct it.

Paine began building what became the "London Model." He described it to Congress as more than 100

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The Sunderland Bridge, above (from an engraving in Richardson's Table Book), used Thomas Paine's design as well as many of the cast-iron components first produced for Paine's "London Model" bridge. Paine went uncredited for his contributions.

Iron Bridge — Continued from Pg. 2

feet long. The model bridge was built away from heavy traffic in a flat field "at a road junction at the edge of Paddington, north west of London."

The model was constructed from cast iron. Paine told Congress his main innovation was the bridge arch shape, following the top circumference or arc of a circle. The arch "segment was a circle of four-hundred and ten feet diameter; and until this was done no experiment on a circle of such extensive diameter had ever been made in architecture."

Paine's design improved on the 1781 Iron Bridge, writes Sweeney, by offering flexibility to be as big or small, wide or narrow, high or low, "as required by the geography of the location." The arch height and shape was not predetermined as a semicircle, then the standard design practice.

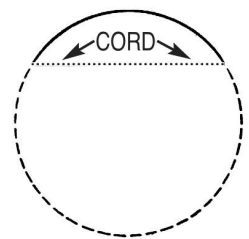
Sweeney says Paine's solution was "based on his observation of a spider's web, a form derived directly from nature.

'Nothing in the world is as fine as my bridge.'

He was keen on the fundamental structures of nature being the basis for our own human efforts at construction."

In essence, Paine wrote, his bridge design was...

"taking a small section across a circle, called in geometry a cord. The bridge could be based on that cord. The starting point is to draw a large imaginary circle, then draw a cord across a section of the circle that matches the width of the river or gap one wishes to bridge. [The] key point is that the size of the circle can be infinitely varied according to the width of the gap being bridged."



Cast iron components for the London Model were manufactured by Thomas Walker at his foundry, then transported by ship to London, says Sweeney.

Paine won a 1788 British patent for his completed London Model. His application stated, "Nothing in the world is as fine as my bridge, except a woman."

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About Thomas Paine

Excerpt: *The Life of Thomas Paine*, by Gilbert Vale

From The Life of Thomas Paine by Gilbert Vale. Vale's 1897 biography ranks for historical reliability with William James Linton's. Both were researched in the mid-1800s when eyewitnesses to Paine's life were still available for interviews.

Thus we arrive at the conclusion of the second period of Mr. Paine's life. At this time [1787], he enjoyed the highest popularity, and, as we have seen, the friendship of the most enlightened patriots of the age.

Mr. Paine was as much esteemed in his private life as in his public. He was a welcome visitor to the tables of the most distinguished citizens [in Paris and London]: his manners and habits were those of a gentleman, which rendered him agreeable, not only to the master of the family, but to the mistress also. He was full of anecdote, extremely social, and always mixed good nature with his reflections.



Thomas Paine the gentleman.
(Painting in TPNHA collection)

At a later period, in prospect of a dinner-party, Horne Tooke remarked, that "he would venture to say that the best thing would be said by Mr. Paine."

Indeed, his conversational powers were as distinguished as his tact for writing. An old lady, now a boardinghouse-keeper in Cedar street, remembers, when a girl, visiting Mr. Paine just after the war, when he took possession of his house and farm at New Rochelle [1784], and gave a village-fete on the occasion; she then only knew him as "Common Sense," and supposed that was his name.

On that day he had something to say to everybody, and young as she was, she received a portion of his attention; while he sat in the shade and assisted in the labor of the feast, by cutting or breaking sugar to be used in some agreeable liquids by his guests.

Mr. Paine was then, if not handsome, a fine, agreeable looking man. ▲

Editor's Note: For 2023 readability, paragraph breaks were inserted above in Vale's original single paragraph. Long paragraphs were routine well into the 20th century. — jf

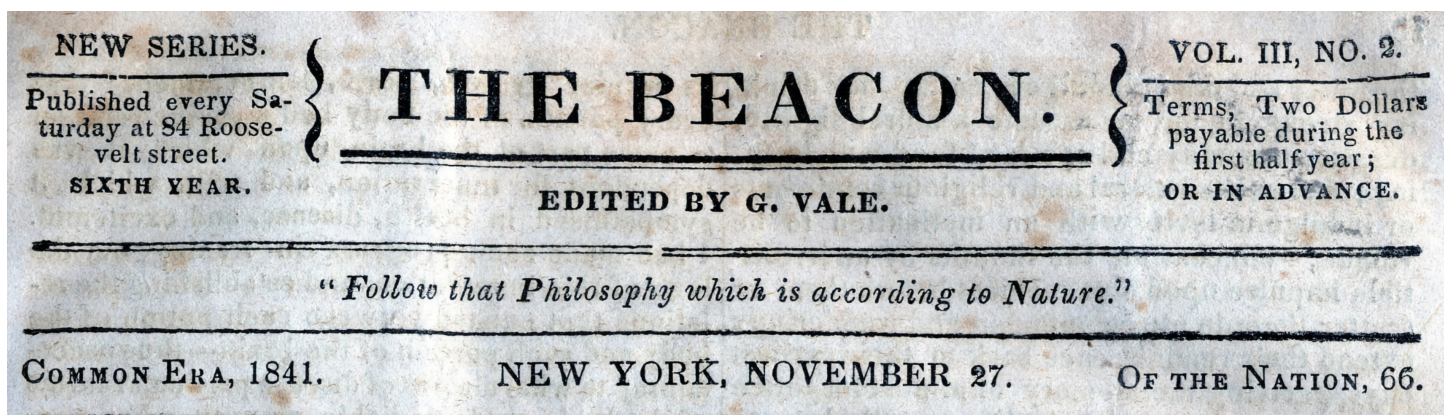
Gilbert Vale and The Beacon

The Beacon, a freethought journal by Gilbert Vale (1788-1866) was a pivotal, influential social and political publication in the mid-19th century, publishing 587 issues from 1836 to 1851.

In the mid-19th century, *The Beacon* helped to forge a movement against the age's undemocratic, religious, anti-labor, anti-women cultural and political forces. *The Beacon* prepared society for the Progressive Era.

The Beacon further played a central role in restoring the reputation and legacy of Thomas Paine.

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Vale published several series of The Beacon, each restarting at Volume 1. The 1841 edition above is from the series starting in 1839.

Meet the TPNHA Board

My discovery and love of Thomas Paine

by Frances Chiu

An incorrigible Europhile for much of my youth, I was not terribly interested in Thomas Paine. The fact that Ronald Reagan was an admirer of Paine didn't help either: Paine must be a conservative, right? But then I realized that to understand William Blake's revolutionary sentiment, I had to read *Rights of Man*, Paine's defense of the French Revolution.



Frances Chiu, TPNHA Board

As I turned the pages of *Rights*, I was pleasantly surprised. Wait, was he actually what we'd consider a liberal rather than a conservative? Paine challenged hereditary rule and privilege! He proposed welfare — along with progressive taxation, a prototype of Social Security, while sanctioning unions. I was blown away by his prescience, seeing that his words could as easily apply to 1993 as 1792:

When, in countries that are called civilized, we see age going to the workhouse and youth to the gallows, something must be wrong in the system of government. It would seem, by the exterior appearance of such countries, that all was happiness; but there lies hidden from the eye of common observation, a mass of wretchedness, that has scarcely any other chance, than to expire in poverty or infamy.

Also appealing to me about Paine was his modern, accessible prose, so different from his 18th-century peers. He presents the most visionary ideas in the least pretentious language — for instance, this passage defending the rights of man:

Though I mean not to touch upon any sectarian principle of religion, yet it may be worth observing, that the genealogy of Christ is traced to Adam. Why then not trace the rights of man to the creation of man? I will answer the question. Because there have been upstart governments, thrusting themselves between, and presumptuously working to unmake man.

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Vale — Continued from Pg. 4

A weekly print publication for its first 10 years, *The Beacon* voiced ideas from Paine and others from The Enlightenment, contributing freethinking to public conversations, as did the transcendentalists. *The Beacon* then published quarterly before going monthly for two years, closing as a bi-weekly called *Sunday Beacon*.

In our era, 170 years after the last Vale edition, the Thomas Paine National Historical Association in 2021 relaunched *The Beacon* as its official member publication. Entering our third year as a bi-monthly, counting Vale's 14 volumes, this edition is Vol. 17, No 1.

Gilbert Vale, "Citizen of the World," made another crucial contributions to the Paine legacy — his vision for the Paine farmland in New Rochelle, a former Tory farm that New York State gifted to Paine in 1784.

At the farm entrance, Vale in 1839 erected the Paine Monument, the nation's first monument for any



Founder of the Republic. The monument stands at North Avenue and Paine Avenue (once the main farm road). It's 30 feet north of Paine's long-empty gravesite, now under widened North Ave.

An 1850 report says Vale, "legally holds title in the Paine farm but that the management of the farm is in the hands of the subscribers and that the cemetery is now being laid out." Also, "subscribers to the Paine farm are now an incorporated body." The three planned projects were a cemetery, industrial school and college, plus a rural retreat. None of the projects were realized, because Vale's health began to weaken, and the following year he retired. ▲

— Gary Berton

Frances Chiu — Continued from Pg. 2

Although the subject of my doctoral dissertation changed once I entered Oxford, I continued to study Paine. I admired him more when I read *Age of Reason* and articles from the *Pennsylvania Magazine*.

In 2004, I gained a more complete picture of Paine as a man from reading John Keane's biography of him. I fell almost head over heels in love with him.

I was impressed that he donated all of his proceeds from *Common Sense* to the Continental Army. I was impressed that he walked from Trenton to Philadelphia one late December night to publish his first *American Crisis* paper. I was impressed that Paine didn't just hang out with the wealthiest and most prominent men, but also appreciated the company of ordinary men. I was even more impressed by all his efforts to end slavery in America and his unusually appreciative views of Native Americans (or "Indians" as they were called).

When I reached the end of the biography, I wept for him. How sad it was that Americans had forgotten his selfless efforts to win American independence and build the new country. How profoundly sad it was that only a mere handful of Americans — six people, including two Black youths — attended his funeral, given the tens of thousands who attended the public funerals of Benjamin Franklin and Thomas Jefferson.

I became determined to remind other Americans of Paine's contributions. I figured I would never get a chance to write academically about Paine since my PhD was in English literature, not history or political science, so I decided to teach the first class in the U.S. devoted to Paine and his contemporaries at The New School —

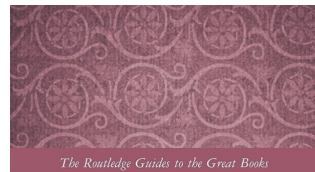
"The Age of Paine: Religion, Revolution, and Radicalism" Three years later, shortly before Christmas, I organized there a symposium on Paine for the bicentenary of his death. I recall feeling astonished at the overflow crowd. Who would have imagined such a large turnout amid last-minute holiday shopping?

Then the unimaginable happened: I was invited to submit a book proposal to Routledge on Paine's *Rights of Man*, the very work that first made me a "Paineite." I didn't think it would ever happen because the majority of my publications had focused on the history of the Gothic novel.

In writing a Routledge guide, I rediscovered why I admired Paine the way I do. In the wake of the financial crash of 2008, expansion of the George W. Bush's wars from two to seven, the crackdowns on freedom of the press and the right to protest, I realized Paine's ideas within *Rights of Man* were quite possibly even more relevant today than when first published in 1792.

Beyond Adams, Jefferson and Hamilton, Thomas Paine is the "founding father" we need to heed more than ever in these times that try our souls! ▲

Frances A. Chiu, PhD is an Associate Professor, School For Public Engagement, The New School, NYC. She serves on the board of the TPNHA.



THE ROUTLEDGE GUIDEBOOK TO PAINE'S RIGHTS OF MAN

Frances A. Chiu



Frances Chiu's book



The Thomas Paine National Historical Association congratulates our sister publication on their 150th Anniversary!

The Truth Seeker has been the world's foundational source of freethought information continuously since 1873, longer than TPNHA has existed. The Truth Seeker was the main force behind our formation in 1884.



Bridges in the 18th and 9th centuries required enough clearance over navigable rivers to allow for safe passage of masted ships carrying goods, like this bridge under construction in England (exact location unknown).



Iron Bridge — Continued from Pg. 2

Paine lacked the needed funds to build a full-scale bridge. His attention turned to the French Revolution and then his new book, *Rights of Man*.

Meanwhile, says Sweeney, the London Model sat rusting in a field and had to be dismantled. Thomas Walker, who built the model, paid off debts by sending the iron north to construct his new bridge across the River Wear in Sunderland, a city in County Durham on the North Sea. Many of Paine's cast components, likely support voussoirs, were used directly in the bridge. The rest of the iron was smelted and recast.

Walker constructed the Sunderland Bridge with Rowland Burdon, a local Member of Parliament. The bridge opened in 1796 as Britain's second cast-iron bridge. Walker and Burdon took full credit for the Sunderland Bridge, but Paine is the one who really invented its design and technology.

Burdon took out his own patent in 1795, reports English historian John Morton in his *Northeast Lore* article, Durham's other Member of Parliament, Ralph Milbanke, pleaded with Burdon to give Paine "compensation for the advantages the public may have derived from his ingenious model, from which certainly the outline of the bridge at Sunderland was taken."

The Sunderland Bridge at 236 feet was twice as long as The Iron Bridge, becoming the world's longest single-span bridge at 72 meters, writes Leonardo F. Troyano in *Bridge Engineering: A Global Perspective*.

Paine's important role in the Industrial Revolution has been widely ignored.

Paine never saw the Sunderland bridge in his lifetime, Troyano says, and he "did not get any credit for it," but its appearance clearly was that of Paine's design.

Morton quotes a Mr. Phipps, C.E., who wrote a report to 19th century architect Robert Stephenson:

We must not deny to Paine the credit of conceiving the construction of iron bridges of far larger span than had been made before his time, or of the important examples, both as models and large constructions, which he caused to be made and publicly exhibited.

Paine explicitly decided not to patent his bridge design in America, says Morton, but "he took care to put the country in possession of the means and of the right of making use of the construction freely."

Paine wrote to Congress in 1803, "I have to request that this memoir may be put on the journals of Congress, as evidence hereafter that this new method of constructing bridges originated in America."

Paine's bridge is a metaphor for his life. With no formal education or training as an engineer, he joined a small number of people who contributed advances in technology to begin the Industrial Revolution. Like his political achievements were buried. Paine's important role in the industrial revolution has been lost.

It's time for that to change. ▲

Adrian Tawfik in 2011 launched the pro-democracy website, DemocracyChronicles.org. Currently living in New York, Adrian is a TPNHA board member.



THE THOMAS PAINE NATIONAL HISTORICAL ASSOCIATION

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About TPNHA

The Mission of the Thomas Paine National Historical Association is to educate the world about the life, legacy and works of Thomas Paine.

TPNHA was founded in 1884 to correct the record on Thomas Paine, to refute negative propaganda and slanders perpetrated against him by most historians in the 19th century. We've since become the most reliable and accurate source of information about Paine worldwide. We assist scholars, authors, journalists, readers and anyone interested in Paine's life and work.

TPNHA is managing the international effort to complete the collected works of Thomas Paine, which may double the corpus of known writings.

We operate the 100-year-old Paine Memorial Museum in New Rochelle, NY, where we hold educational programs. As a 501c(3) educational non-profit, we are grateful for member support sustaining our efforts.

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THOMAS PAINE NATIONAL HISTORICAL ASSOCIATION
New Rochelle, New York



***The Beacon* is a bi-monthly publication for members of the Thomas Paine National Historical Association**

The Beacon from the TPNHA extends the legacy of Gilbert Vale's influential *The Beacon* in the mid-19th century, both restoring the legacy of Thomas Paine.

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