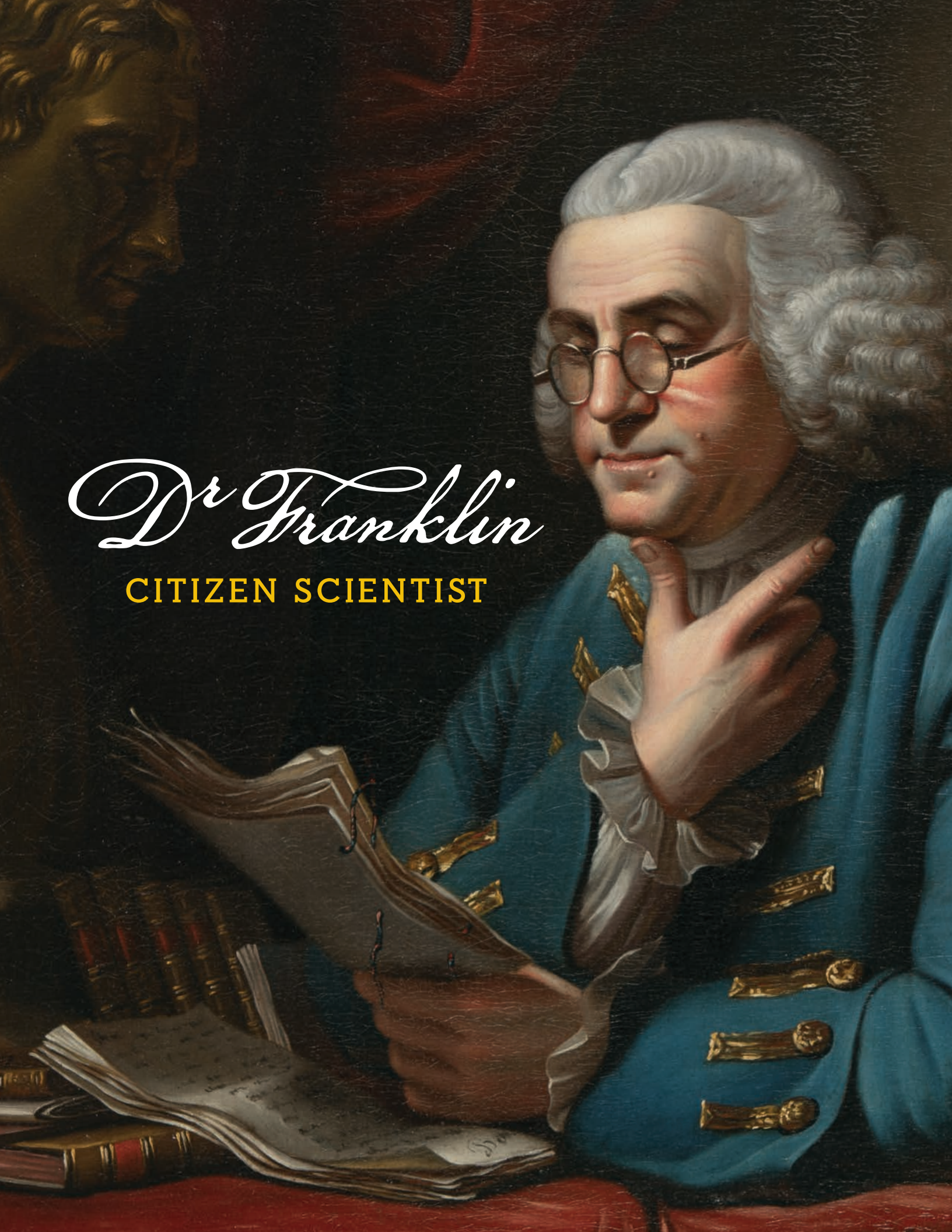
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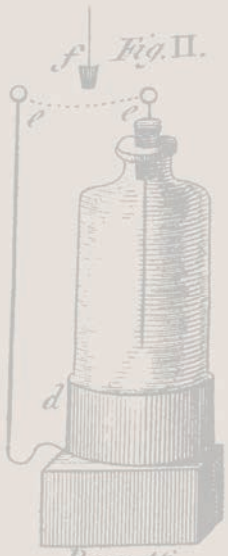

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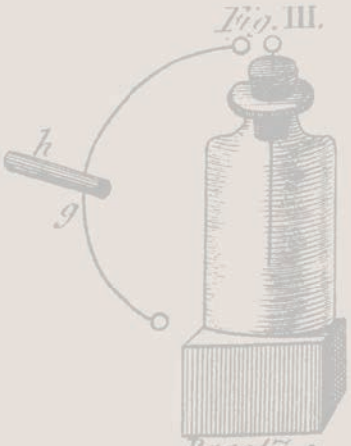

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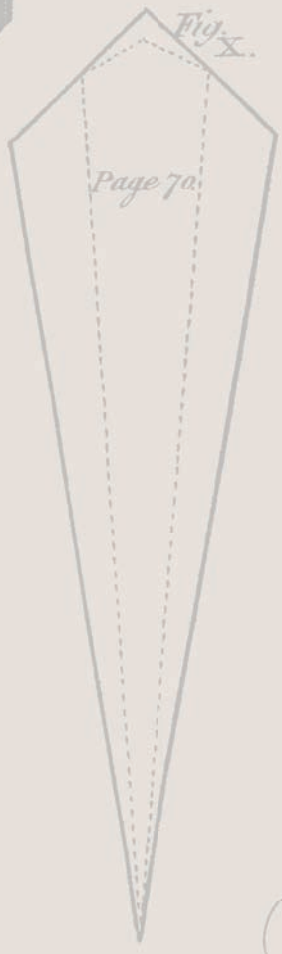

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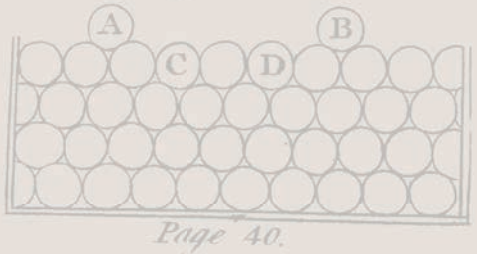

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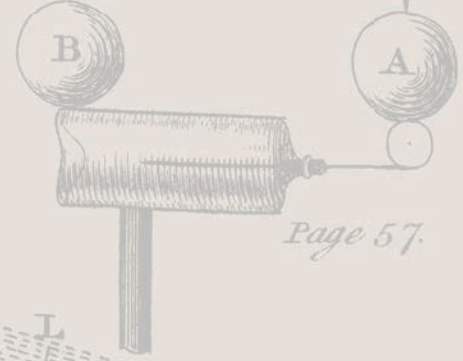

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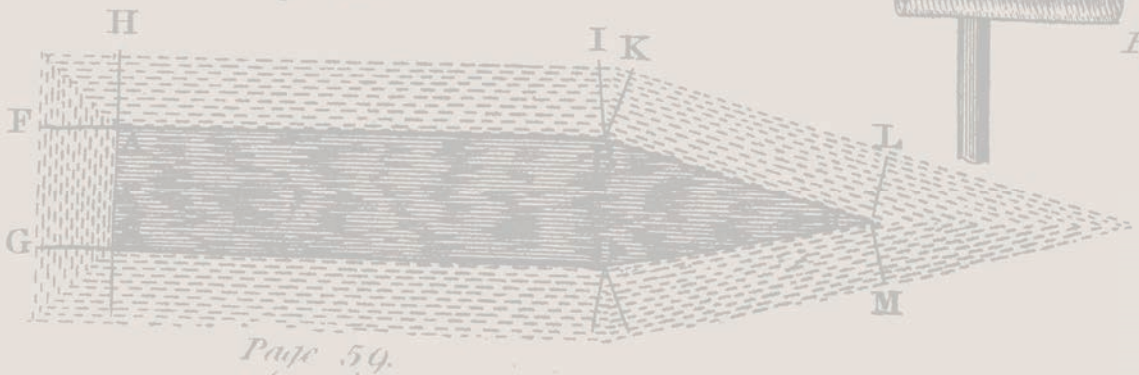

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Dr Franklin

CITIZEN SCIENTIST

Janine Yorimoto Boldt

With contributions by Emily A. Margolis
and Introduction by Patrick Spero

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Introduction

In 1743, Benjamin Franklin and a group of other civically minded individuals got together to form something called the "American Philosophical Society." Philosophy, at the time, had a much different meaning than it does today. To be a philosopher was to be one who systematically inquired into nature, often in ways that we would today consider science. The Society's purpose was thus to "promote useful knowledge" by bringing the greatest thinkers in the British colonies together to share all that they knew and were learning.

Two hundred and seventy-seven years later, the Society continues to serve that mission and steward its legacy. The Society provides over one million dollars a year in grants and fellowships, primarily to young scholars doing cutting-edge work that will produce new knowledge; holds regular gatherings to share the most recent research; publishes scholarship in both print and digital formats; and elects Members based on their distinguished contributions to the advancement of knowledge.

Along the way, the Society also built one of the leading independent research libraries in America. Beginning as a repository that stored the correspondence of its Members, it soon expanded to house collections specializing in early American history, Native American cultures and languages, and the history of science, each area a reflection of the core interests of the Society's early Members. Today, the Library stores over 14 million pages of manuscripts and 300,000 books. Among its most prized possessions are, of course, the papers of its illustrious founder, Benjamin Franklin, and a number of his personal belongings and scientific instruments.

Our exhibition, *Dr. Franklin, Citizen Scientist*, aims to showcase these holdings as a way to explore the world in which the APS was born and in which Franklin thrived. Using that huge cache of his material, the exhibition shows, and the following essay by The Andrew W. Mellon Postdoctoral Curatorial Fellow at the APS Janine Yorimoto Boldt argues, Franklin's age was one of both enlightenment and ignorance.

The title of the exhibition subtly hints at these tensions. *Dr. Franklin, Citizen Scientist* is, in large measure, anachronistic and perhaps even a little misleading.

As far as we know, Benjamin Franklin never referred to himself as a scientist. In Franklin's time, he and those like him who conducted science called themselves natural historians or philosophers or, perhaps, men of science. Those who undertook such pursuits were rarely formally trained, and most either had enough wealth to fund their own experiments or depended on the patronage of grandees.

Franklin, of course, succeeded spectacularly in this world. Eventually, in recognition of his scientific accomplishments, he gained honorary doctorates from both the University of St. Andrews and Oxford. Though Franklin carried the title with pride later in life, the truth was that he never received any formal schooling, while most who carried the designation "doctor" had. Franklin used the title often as he tried to climb higher in the British Empire, knowing that it conferred an elite status that belied his humble beginnings as a soapmaker's son.

Franklin was also a British subject loyal to the Crown for the vast majority of his life, a period during which he conducted his most important scientific experiments. He was a citizen for only the final 14 of his 86 years, and during those years his time was committed more often to public affairs than scientific pursuits. Indeed, the very term *citizen scientist* came much, much later. The phrase was coined sometime in the late 20th century.

Still, the exhibition's title works because the sentiment behind the modern movement resembles the world in which Franklin lived. If citizen science is meant to empower individuals—lacking formal training in a scientific discipline—to participate in scientific experiments that will add to our knowledge, then Franklin's experience was very much like that of a 21st-century citizen scientist. In Franklin's circle, there were farmers who studied weather and experimented with plants and animals, ministers who organized large botanical collections and made contributions to mathematics, artists who contributed to paleontology by excavating fossilized bones, and sailors who collected data that added to knowledge of the ocean and meteorology. It was an expansive moment that was, in some respects, filled with more possibilities for the lay person to participate in science than in the highly specialized world in which we live today.

But, as the exhibition demonstrates through Franklin's life and holdings, it was also a time in which barriers precluded many from accessing scientific knowledge and, in some cases, exploited others in the name of science. Franklin himself owned slaves. While we don't know if they aided him in his scientific experiments, their labor certainly made it easier for Franklin to find the time to conduct his experiments. Franklin and others benefited from Indigenous knowledge as they collected materials in North America and explored territory.

Women, including Franklin's enterprising sister Jane Mecom, rarely had the same opportunities to gain an education or contribute to science as men did. The legacies of these impediments are with us still.

Curator Janine Yorimoto Boldt's essay makes a compelling read that chronicles this world of science filled with possibility that existed in tandem with, and often relied on, these deep and profound inequities. The stunningly photographed catalog that follows captures this complex and timely story in vivid, and sometimes troubling, detail. Though the exhibition was conceived long before the coronavirus pandemic, the events of the past several months revealed that many of the issues surrounding public health, inequality, racial justice, and faith in science that were present in Franklin's day remain present in our own.

This exhibition, occurring in the midst of a global pandemic, was no ordinary one and called on staff in ways unlike any before it. The exhibition's planned opening in April 2020 was postponed, placing unusual burdens on those who were putting the final touches on it. They responded to this incredible challenge with creativity. In a matter of months, they devised a whole slate of new means to promote the work that went into *Dr. Franklin, Citizen Scientist*. Led by Associate Director for Collections and Exhibitions Mary Grace Wahl, the Museum developed an online tour that included special video highlights, this catalog, and other digital galleries and projects meant to invite as many people as possible to experience this exhibition in a virtual world. The acknowledgments included in this volume recognizes those who helped make this exhibition, and all of its supplements, a reality in what are very unusual times.

Patrick Spero
LIBRARIAN
American Philosophical Society
October 26, 2020

Acknowledgments

One of the underlying themes of *Dr. Franklin, Citizen Scientist* is the importance of collaboration. Likewise, this exhibition and catalog were made possible through the collective effort of many people. With gratitude we acknowledge the exceptional scholarship and dedication of the two Mellon Postdoctoral Curatorial Fellows, Janine Yorimoto Boldt, lead curator, and Emily A. Margolis, co-curator. They both deserve high praise for working so diligently and collaboratively to create this engaging exhibition and catalog.

Special thanks are due to Barbara Oberg, Emma Lapsansky-Werner, V. Chapman-Smith, and Carla Mulford for generously consulting with the curators during content development, and providing insight and thoughtful feedback on texts. The exhibition also benefited from discussions with Jessica Linker, Joel Fry of Bartram's Garden, and Susannah Carroll of The Franklin Institute. Lenders to the exhibition included the Library Company of Philadelphia and The Rosenbach Library and Museum. At the Library Company we extend our gratitude to Linda August, Erika Piola, and Sarah Weatherwax and, at The Rosenbach, we wish to thank Jobi Zink, Elizabeth Fuller, and Cathleen Chandler for their assistance. We are grateful to the lenders for graciously working with us through the COVID-19 pandemic.

At the APS we offer thanks to Mary Grace Wahl, Associate Director of Exhibitions and Collections, who oversaw exhibition development and installation, organized the catalog publication, and managed the exhibition team. Her dedication and leadership saw the exhibition team through a challenging year. Thanks to Magdalena Hoot for their commitment and invaluable contributions to exhibition production and installation. Mike Madeja and Alexandra Rospond gave insightful reviews of the content and labels and developed meaningful educational materials. Interns Rosemarie Fettig and Sean Keenan provided research assistance. The APS Conservation Department, Anne Downey, Renée Wolcott, and Anisha Gupta, prepared the objects for display and lent their expertise to the fellows. We also thank our Facilities staff, especially Jeremy Schoenrock for lighting the exhibition and his willingness to help. The Museum Guides, who engage with Museum visitors in the gallery and during programs, also deserve recognition.

We relied on talented contractors during the production of the exhibition and catalog. Barb Barnett deserves praise for her brilliant work handling all the graphic design for both the exhibition and catalog. We are also grateful to art handler Preston Link, mount maker Will Bucher, framer Lucía Torner, and photographer Brent Wahl for their essential help bringing the exhibition and catalog to life.

The exhibition staff could not produce their exhibitions without the knowledge and support of so many other people at the APS. In particular, David Gary, Kyle Roberts, and Brian Carpenter shared their content knowledge and reviewed exhibition texts. Providing essential support and expertise were Valerie-Ann Lutz, Michael Miller, Joseph DiLullo, Bayard Miller, Cynthia Heider, Adrianna Link, Estelle Markel-Joyet, Melanie Rinehart, Paul Sutherland, Tracey deJong, Susan Laquer, Megan Hosie, Julie Fisher, Bethany Farrell, David O. McCullough, and Brenna Holland. Alison Swety Beninato copyedited the exhibition and catalog texts, and Jessica Frankenfield managed publicity. Linda Jacobs managed the grants that made the exhibition and catalog possible. Finally, thank you to Bob Hauser, Executive Officer, for his unfailing support.

The *Dr. Franklin, Citizen Scientist* exhibition has been made possible by the support of The Andrew W. Mellon Foundation, Pennsylvania Historical & Museum Commission, Philadelphia Cultural Fund, APS Members and Friends, and donations by visitors to the APS Museum.

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Dr. Franklin

CITIZEN SCIENTIST

Janine Yorimoto Boldt

When Benjamin Franklin died in 1790, he was arguably the most recognizable American in the world. The story of his rise from being the youngest son of an immigrant soap- and candlemaker to becoming a famous American citizen, diplomat, and natural philosopher became a prototype for the American dream and has been told countless times. The exhibition *Dr. Franklin, Citizen Scientist* highlights and enlarges that familiar story, using Franklin's life and works to shed light on the production, circulation, application, and accessibility of what 18th-century Atlantic world intellectuals viewed as "useful knowledge." Through Franklin's life and works, we can better understand the processes through which "useful knowledge" was recognized as science and who was acknowledged as a scientific authority—as well as how institutions and individuals solidified and perpetuated inequality through science and education. These 18th-century processes, or systems of knowledge production, have long-lasting effects that continue to shape society today.[1]

Citizen science, an anachronistic but useful framework for understanding Franklin's scientific career, can offer some new interpretations of familiar stories. *Citizen science* is a modern term that broadly refers to public participation in scientific research; it is science as practiced by nonprofessionals in collaboration with professional research teams. Free communication and collaborative sharing of results is fundamental to citizen science projects. People of all ages, abilities, and backgrounds volunteer their time and other resources to record and share observations on topics of global importance. Performed at home or in public spaces, citizen science is rarely confined to institutional laboratories. However, citizen scientists share the perspective that evidence-based, carefully documented science can transform society for the better.[2]

In many ways, Franklin espoused the values that characterize citizen science 200 years before the term came into use. Franklin was not a formally trained scientist; he was largely self-educated. Yet he initiated scientific inquiry and collaborated with people of various backgrounds to conduct experiments, share observations, discuss theories about the natural world, and invent useful technologies. He

understood that all peoples were capable of producing useful knowledge and that science could be performed in any available space. Franklin drew upon scientific evidence, data, and statistics to suggest initiatives for the public good. Believing that the power of science could be harnessed to improve society, he widely communicated the results of his findings, deliberately never patented an invention, and encouraged international cooperation. He promoted research and education through his founding and support of a variety of civic institutions and learned societies—and he was willing to change his mind when presented with new evidence.

Franklin's founding of the American Philosophical Society (APS) exemplified his philosophy of citizen science. The APS was founded in concert with his friend, the farmer and self-taught botanist John Bartram. In 1743, Franklin wrote *A Proposal for Promoting Useful Knowledge among the British Plantations in America*, which became the founding document for the APS (no. 88).[3] It stated that "The first Drudgery of Settling new Colonies, which confines the Attention of People to mere Necessaries, is now pretty well over; and there are many in every Province in Circumstances that set them at Ease, and afford Leisure to cultivate the finer Arts, and improve the common Stock of Knowledge." Having achieved economic stability, "Men of Speculation" could start applying themselves to observing the natural world for the "Advantage of some or all of the British Plantations, or to the Benefit of Mankind in general." Of central importance was promoting knowledge and invention for the improvement of society. Original Members of the APS were men from working-class backgrounds who enjoyed learning and self-improvement, including Thomas Hopkinson, a merchant and lawyer; doctors Thomas and Phineas Bond; William Coleman, a carpenter and merchant; Samuel Rhoads, a carpenter; William Parsons, a former shoemaker and tavernkeeper; and Thomas Godfrey, a glazier. Elected Members of the Society met regularly for conversation, to perform experiments, and to read scientific correspondence from throughout the colonies and abroad.[4] Franklin used the term *useful knowledge* to broadly encompass all intellectual pursuits and technologies with practical applications. In the 19th century, the sciences and the humanities divided into the discrete disciplines that we recognize today. In the spirit of Franklin, *Dr. Franklin, Citizen Scientist* uses the inclusive phrase *useful knowledge*, and the modern words *science* and *scientists*, to refer to all scientific endeavors and practitioners.

Yet, despite Franklin's commitment to promoting useful knowledge for the "Benefit of Mankind in general," Franklin benefited from and helped design a system of knowledge production that constructed and reinforced inequality, an inequality that was particularly distinct along gendered and racial lines. The exhibition *Dr. Franklin, Citizen Scientist* asks how people today can learn from Franklin's life,

writings, inventions, and shortcomings in order to build on his mission as a citizen scientist: to advance society through the promotion of useful knowledge. What could society become if "mankind" became the more inclusive "humankind," and "useful knowledge" was equitably accessed, applied, and recognized?

Dr. Franklin, Citizen Scientist explores five thematic areas of Franklin's scientific practice: printing, water and climate, electricity, household science, and the science of human difference. Collectively, these five areas illustrate Franklin's broad interests, revealing his respect for experiential knowledge gained from manual labor, his commitment to freely sharing information, his use of media to shape society, and his prejudices. These five categories also highlight the various spaces where science was performed and the diverse knowledge producers who influenced Franklin. Before examining Franklin's contributions to useful knowledge, an overview of 18th-century scientific practices provides context for Franklin's career.

Eighteenth-century "natural philosophers"—who, in the 21st century, are called "scientists"—were rarely salaried professionals, nor were they "specialists"; instead, they generally studied, and theorized about, a range of topics. The most active natural philosophers were often independently wealthy, possessing the means to study natural philosophy as a leisure pursuit. Less wealthy individuals sought patrons to fund and support their studies. Colonists including Franklin, who wanted to be recognized as natural philosophers, sought patronage from English connections and institutions. The Royal Society of London, a self-electing group of men ("Fellows") interested in natural philosophy, was the most important British institutional patron. Founded in 1660, the Royal Society influenced the shape of the field, acknowledging "worthy" inquiry through reading reports from Fellows and correspondents at regular meetings, awarding prizes for research, and publishing selected tracts in the *Philosophical Transactions of the Royal Society of London*. Franklin modeled the APS after the Royal Society.[5]

The patronage networks that sustained the Western scientific enterprise privileged educated white men who could move freely in society, build connections through their professions, and purchase books and supplies. While white male colonists were often belittled by their European counterparts, they were occasionally elected to the Royal Society and welcomed into correspondence networks where they shared firsthand accounts of North America's flora, fauna, and peoples.[6] The Royal Society and the APS excluded women and peoples of African and Indigenous descent and marginalized their ideas. Yet all three of these groups

engaged in scientific activities. Especially in the colonies, free and enslaved Black and Indigenous peoples collected specimens and shared, or were forced to divulge, information with colonists who then communicated with patrons in England. Their contributions often went uncredited in the resulting letters and publications. Women collected specimens and shared observations on nature but were rarely taken seriously as interpreters of scientific evidence. Individuals and institutions thus obscured the historical contributions to Western science made by women, Black and Indigenous peoples, and other peoples of color.[7]

Peoples of Indigenous and African descent had their own thriving systems of knowledge production. Yet their knowledge was often erased, ignored, or appropriated by European individuals, publications, and archives. One example of the erasure of African knowledge is the story of Onesimus, a man enslaved by the Boston civic and religious leader Cotton Mather. Onesimus introduced Mather to the West African medical practice of inoculation. Working with the white doctor Zabdiel Boylston, Mather promoted inoculation to fight the smallpox epidemic of 1720–1721. Notably, Mather wrote in 1716 to John Woodward, Fellow of the Royal Society, that he learned about inoculation by "Enquiring of my Negro-man *Onesimus*, who is a pretty Intelligent Fellow." In other published accounts, Mather admitted, "I was at first instructed in it, by a Guramantee-Servant of my own," and that he confirmed the method by talking to other enslaved Africans in Boston who had undergone the procedure in Africa. Despite Mather's acknowledgment of Onesimus, he was obscured in other reports. In 1759, Franklin promoted inoculation for public health by sharing survival statistics from Boston (no. 80). He credited Boylston for promoting inoculation without mentioning Onesimus. As Franklin lived in Boston during the initial outbreak, was involved in a public debate about inoculation, and read scientific publications, he was likely aware of Onesimus, or at least the procedure's African origins, yet he did not mention either.[8]

Similarly, Indigenous knowledge was often either unrecognized or barely acknowledged. When Philadelphia naturalist Joseph Breintnall wrote an essay for Franklin's *Poor Richard's Almanack* about the medicinal properties of the rattlesnake herb, he acknowledged that the information came from "Indians" but did not name a specific individual or community (nos. 31 and 32).[9] When the English naturalist Mark Catesby traveled through the southern colonies, he failed to appreciate Indigenous land management practices as critical to the Southeast's ecology. While collecting specimens of the *Robinia hispida* plant, he complained that "the ravaging *Indians*" had burned the land, which made it impossible to collect the specimens he desired (no. 24). What he observed were Indigenous peoples of Carolina, probably the Catawba, engaged in controlled burning. The

practice of controlled burning helped maintain the ecosystem, sustaining plant life through enriching the soil and supporting the animal life that grazed there, including the bison, illustrated in Catesby's volume alongside the plant. Other Indigenous communities also engaged in controlled burning throughout the Americas. Some 21st-century environmental scientists recommend reinstituting such Native American practices to help avoid wildfires, which are exacerbated and more frequent as a result of climate change.[10]

Imperial hierarchies also objectified non-European peoples and relied on unscrupulous collecting practices through the exploitation of enslaved labor and of Black and Indigenous peoples. Europeans frequently considered African and Indigenous peoples and their material culture as scientific specimens. Enslaved Africans were subjected to experimentations, including electrical tests to determine their pain thresholds, and forced inoculation to test the efficacy of the procedure. Black bodies were put on display for public examination as white scientists studied the human body (nos. 73 and 74).[11] Naturalists like Catesby described Indigenous Americans as curiosities, sending reports back to England about Indigenous customs alongside plant descriptions. Objects made by Africans and Indigenous peoples, including pipes, baskets, textiles, and instruments, were collected and displayed alongside natural curiosities. This was the case, for example, with the collections of James Petiver and Sir Hans Sloane (no. 21). These London-based men acquired objects from around the world, relying on colonial correspondents and slave traders to send them objects and information, including Franklin's friend, botanist John Bartram. Their collections became the foundation for the British Museum. These imperial practices continue to inform museum collections and exhibitions, and to shape the public perception of non-European cultures and artifacts as inferior "folkways." As late as the 21st century, objects from non-European cultures are still often found in museums alongside animals, rocks, and plants, or are presented as exotic curiosities.[12]

During most of Franklin's lifetime, white colonists were valued by Europeans for their access to specimens and knowledge of local flora, fauna, and Indigenous peoples; however, few such colonists received respect as natural philosophers. As a result of his experiments and publications about electricity, Franklin arguably became the first American valued by many Europeans for his contributions to scientific theories.[13] David Hume, eminent philosopher of the Scottish Enlightenment, wrote to Franklin in 1762 that "America has sent us many good things, Gold, Silver, Sugar, Tobacco, Indigo &c But you are the first Philosopher" (no. 26).[14] Other colonists likely disagreed that Franklin was the *first* American philosopher, but Hume's letter emphasizes how little respect European intellectuals had for their colonial counterparts. Franklin's electrical theories led

to the Royal Society awarding him its most prestigious award, the Copley Medal, in 1753 (no. 60). He was then elected to the Royal Society in 1756. Franklin was successful because he navigated transatlantic institutions and networks, thus leveraging his position in society as a literate, white man and business owner.

Franklin's career as a printer and shopkeeper in Philadelphia provided the contacts necessary to support his scientific inquiry and become a civil servant. The social connections he fostered also impacted his study of water and climate, electricity, household science, and human difference. Using his printing skills and business networks to elevate himself in society, Franklin joined with peers to socialize, practice science, and improve the city. He was part of a social group that met at Batchelor's Hall (in the modern-day Northern Liberties neighborhood of Philadelphia) in the late 1720s (no. 28). Out of this group emerged the Junto, a mutual improvement society founded by Franklin in 1727 that met regularly to discuss philosophical questions and social issues. The Junto was a forerunner to the American Philosophical Society, which Franklin and Bartram founded in 1743 to promote useful knowledge in the colonies. Many of the men from these societies had also joined Franklin in 1731 as founding members of the Library Company of Philadelphia, the first successful lending library in the colonies. Through these various groups, which were composed of working-class men like himself, Franklin built a network and expanded his influence. As a printer and journalist, he also developed a savvy understanding of various literary genres and became a prolific writer able to impact public policy and popular opinion.[15]

One of Franklin's early inventions was nature printing, developed in collaboration with his friend Joseph Breintnall, member of the Junto and Library Company, and a scrivener and naturalist who collected plant specimens. Breintnall created albums of inked impressions of plants to facilitate the study of nature (no. 30), running inked leaves through a printing press, which preserved images of the botanical structures. He sent copies of impressions to Peter Collinson, a London merchant, botanist, and Fellow of the Royal Society who acted as a patron for many colonial correspondents. When Breintnall wrote about the medicinal properties of the rattlesnake herb for Franklin's 1737 *Poor Richard's Almanack*, he and Franklin developed a new method of printing the leaf to illustrate the essay (nos. 31 and 32). They created a plaster cast of the leaf, then placed the plaster cast into a box and filled it with molten metal. The mold captured the leaf's design and transformed it into a printing block. The resulting block could be placed in the printing press alongside typeface to print the leaf many times over.[16]

FIGURE 1
A NEW AND EXACT CHART OF . . . EUROPE, AFRICA, AMERICA [FRANKLIN-FOLGER CHART OF THE GULF STREAM]
Published by Mount and Page
1768
Library of Congress, Geography and Map Division.

The next step for the innovative Franklin was to realize that nature printing could be used to combat counterfeit paper currency (nos. 33–37). Leaves have unique vein structures, which made their designs difficult to replicate. Franklin expanded the technique by adding fabric to the printing block behind the leaves to introduce more texture to the print. This idea probably came from Breintnall, who made inked impressions of fabric and feathers alongside leaves. Franklin also used other printing methods, including combining multiple typefaces, varied engraving techniques, and colored ink to make counterfeiting currency more difficult.[17] Thus, by helping to solve a public problem, Franklin also acquired a personal benefit; he received government contracts to print money. Franklin's invention, made possible because of his craftsman skill and collaborative network, would become a prototype of "modern" science—now owned and manipulated by a global network of scholars and granting agencies.

Franklin's appreciation for the experiential knowledge of manual laborers blended into his political career, shaping Franklin's musings on such phenomena as water, air circulation, and maritime technology. Inspired by his seafaring brother and cousins in Boston, he had thought to become a sailor himself and maintained a

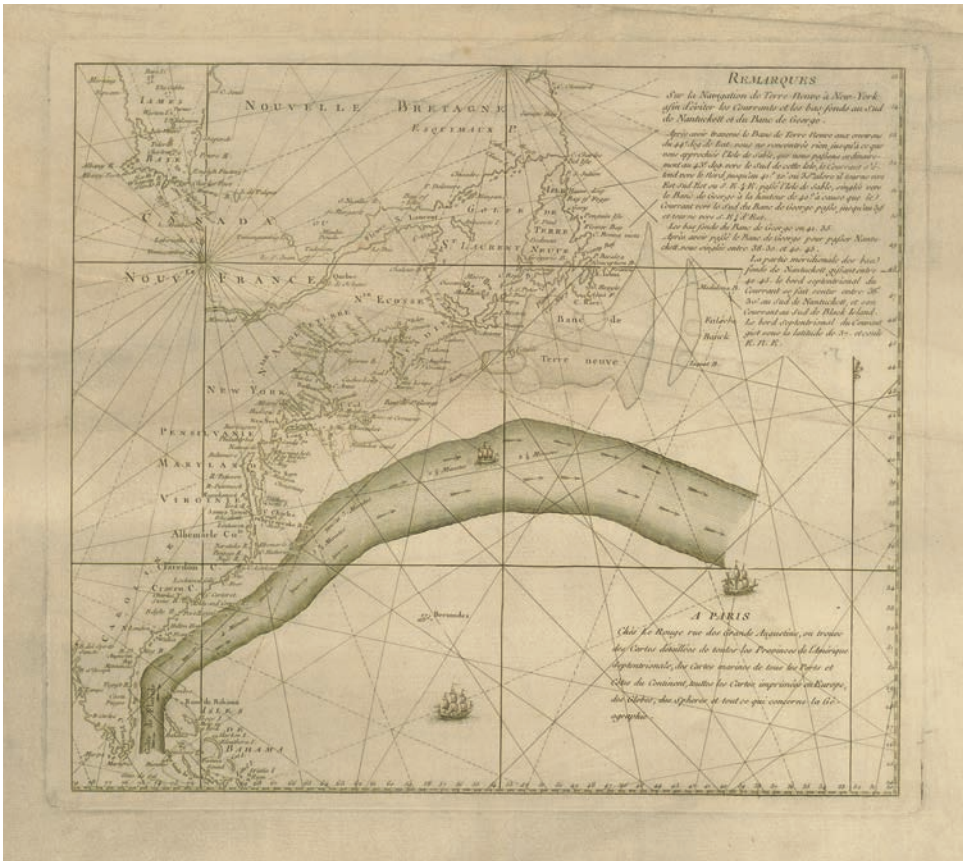


FIGURE 2
REMARQUES SUR LA NAVIGATION DE TERRE-NEUVE À NEW-YORK AFIN D'ÉVITER LES COURRANTS ET LES BAS-FONDS AU SUD DE NANTUCKETT ET DU BANC DE GEORGE
George-Louis le Rouge
ca. 1782
Engraving
APS.

lifelong interest in the ocean.[18] Franklin's greatest contribution to hydrography was the first published chart of the Gulf Stream in 1768, accomplished in his capacity as Postmaster of the colonies (Figure 1). This tale of water, scientific observation, family and peer networking, and manual-labor skill is among the most fascinating of Franklin's event-filled life. The Gulf Stream is a warm water current in the Atlantic that runs in a northeastern circular direction from the Gulf of Mexico. This current results in faster travel times when ships sail from the Americas to England than vice versa. Before Franklin's Gulf Stream chart, officials did not have a clear understanding of the current. Sailors, however, knew the current's location, features, and effects from experience. Timothy Folger, a mariner and Franklin's maternal cousin, assisted Franklin in charting the Gulf Stream. The resulting chart celebrated British dominance over the Atlantic. As Minister to France, Franklin later collaborated with Georges-Louis le Rouge to publish a French chart, which asserted U.S. sovereignty over the Atlantic and expressed an alliance with France through the incorporation of French place names (Figure 2).[19] Once again, Franklin had demonstrated how he could apply science, technical knowledge, and printed works for political gains.

Franklin gave the Gulf Stream its most authoritative account in the second volume of the *Transactions of the American Philosophical Society*, published in 1786 (no. 40). Franklin chose to publish a longer description of the Gulf Stream along with his records on water temperature and observations on the presence of gulf weed, which he observed while crossing the Atlantic. His observations confirmed Folger's earlier notes. Further, the chart engraved by James Poupard in Philadelphia focuses on the United States, representing American dominance of the sea and leaving Europe out of the picture altogether. Along with the chart, Franklin published his "Maritime Observations," a culmination of decades of observations and ideas about the ocean, which included descriptions of technology that could improve boats and living conditions at sea.[20]

Several of Franklin's descriptions in "Maritime Observations" were based on technologies that had been developed by non-Europeans (no. 41). Franklin praised Chinese seafaring technology, and in a poignant passage, he noted the superior expertise of Indigenous peoples from the Americas and the Pacific Islands:

> It is remarkable that the people we consider as savages, have improved the art of sailing- and rowing-boats in several points beyond what we can pretend to. We have no sailing boats equal to the flying proas of the south seas, no rowing or paddling boat equal to that of the Greenlanders for swiftness and safety. The birch canoes of the North-American Indians have also some advantageous properties.[21]

This statement reveals both Franklin's awareness that all peoples produced useful knowledge, and his budding understanding that his contemporaries' hierarchical categorization of human cultures might bear rethinking. This inchoate comprehension of ethnocentrism is similarly reflected in another of Franklin's pamphlets, dated circa 1784. In "Remarks concerning the Savages of North America," he wrote, "Savages we call them, because their manners differ from ours, which we think the Perfection of Civility; they think the same of theirs."[22] While employing the commonly used disparaging language, Franklin interrogates the cultural biases of his European and Anglo-American readers, and points out its ethnocentrism.[23]

Collaboration, transatlantic networks, and the ability to allow new insights to modify his ideas also shaped Franklin's contributions to electrical science. He began experimenting with electricity when Peter Collinson (Figure 3) sent to the Library Company an article from *The Gentleman's Magazine* explaining recent electrical experiments performed in Europe (no. 47). Collinson also sent

FIGURE 3
PETER COLLINSON
J. S. Miller

1770
Engraving
APS.

Someone inserted this portrait of Collinson into a fourth edition of *Experiments and Observations*.

a glass tube for generating static electricity (no. 46). Collaborating with his colleagues, particularly Ebenezer Kinnersley, Thomas Hopkinson, and Philip Syng, Franklin performed experiments around the city of Philadelphia. He theorized about electrical properties and correctly explained why insulated glass jars, called Leyden jars, were able to store electrical charges. He invented the "battery" by connecting a series of Leyden jars and designed experiments that proved that lightning was of the "same nature" as electricity (no. 48). He explained these experiments and observations in letters to Collinson, who became Franklin's greatest patron. Collinson shared Franklin's electrical research with the Royal Society and published Franklin's letters in *Experiments and Observations in Electricity* (London, 1751) (nos. 49 and 50), which was widely read and acclaimed in Europe.[24]

Franklin's sincere commitment and savvy approaches to sharing useful knowledge with the public set him apart from most natural philosophers. In addition to corresponding with prominent scientists and publishing complex theories, Franklin also printed descriptions of his useful inventions in more widely accessible venues. For example, he published directions for affixing lightning rods to houses and public buildings in his *Poor Richard's Almanack* of 1753 (no. 52). Interestingly, the information appeared in a brief notice nestled among court dates, fair dates, and Quaker Meeting times. Franklin, aware that many colonists believed that lightning was a sign from God and that lightning fires were divine interventions, wrote, "It has pleased God in his Goodness to Mankind, at length to discover to them the Means of securing their Habitations and other Buildings from Mischief by Thunder and Lightning."[25] Thus, Franklin framed the success of the lightning rod in religious terms, asserting that God had revealed the technology. Notably, this was Franklin's first published account of the lightning rod, and it was comprehensive enough that readers could theoretically install this protection on their own home. Publishing such a manual in his cheap and widely circulated almanac, as well as its religious framing, is consistent with Franklin's desire to use science to help others.[26]

Franklin's accessible electrical writings and sound scientific theories gave him an international reputation. As a result, he became a popular figure in international politics. In 1757, Franklin was appointed a colonial agent representing Pennsylvania and other colonies in England and became a key figure in imperial politics in the years leading to the American Revolution. Eventually, he became the American Minister Plenipotentiary to France, where he helped convince the French government to support the colonies and helped to negotiate peace with England. Though his work as a civil servant meant he had less time to pursue science, he continued to support research, engage in scientific experiments and observations, and correspond and converse with other scientists, using his official position to foster international cooperation in the pursuit of knowledge. For example, he wrote a passport to support British Captain James Cook's third voyage to the South Pacific, ensuring that Cook would not be harassed en route by American ships (no. 45).[27]

Franklin also encouraged public demonstrations of electricity, which educated broad audiences, even as they reinforced gendered and racialized hierarchies. For example, he worked with Ebenezer Kinnersley to develop a series of lectures and electrical demonstrations that Kinnersley took on tour from Rhode Island to the West Indies in the 1740s and 1750s (no. 59). Kinnersley's performances, similar to those presented throughout Europe, helped bring science to a wide audience. On Kinnersley's tour, while women were welcome as spectators, they were sexualized in experiments. One of Kinnersley's demonstrations resulted in "Spirits kindled by Fire darting from a Lady's Eyes (without a Metaphor)." The display—a manifestation of a woman's purportedly uncontrollable passions, which explode from her eyes in electrical sparks after being charged by an electrical machine—and others like it, supported a broader cultural narrative that claimed that women were erotic and passionate creatures by nature, and therefore inferior to men, who were believed to have better self-discipline. Such performances reinforced the cultural myth that women should be governed by men and that their sexuality should be contained within marriage and motherhood (e.g., no. 58).[28]

Enslaved people were exploited in some of these demonstrations, as both exhibits and test subjects. In Antigua, Kinnersley blew up a "model negroe" using electricity during one of his performances. In Virginia, he reportedly cured an enslaved child of deafness through electrical shock. Other experimenters also tested electric shock therapy on enslaved people. Enslaved people were acceptable test subjects partly because their consent was deemed unnecessary and partly because many white scientists held the racist belief that Black bodies were more tolerant of pain than white bodies. There is no evidence

that Franklin himself performed experiments on enslaved people; however, he read the literature and results of such tests and benefited from the work of these other men, including Kinnersley.[29]

While Franklin encouraged science in public venues, his private residences were also important spaces for scientific practice and invention, and members of his household provided assistance. For example, Franklin installed a lightning rod on his house with a mechanism that allowed him to "catch" electrical charges to be stored in Leyden jars for future experiments. The rod was attached to bells that rang to alert the household when the rod was electrified. In a letter to Collinson, Franklin wrote that he gave "orders in my Family that if the Bells rang when I was from home, they should catch some of the Lightning for me in electrical Vials."[30] Which members of his "Family" participated in this project? It is well-documented that his son William assisted him in electrical experiments, including with the famous kite and key experiment, so undoubtedly, he caught electricity at home.[31] Did Franklin's daughter Sally catch electricity? Did Peter and George, two of the men enslaved by the Franklins? The ambiguity of Franklin's statement obscures the individuals but highlights the casual mindset that valued "science" over the risk of human life.

In a 1758 letter to Deborah Franklin, apparently responding to her request for instructions for silencing the contraption, Franklin, then in London, responded: "If the ringing of the Bells frightens you, tie a Piece of Wire from one Bell to the other, and that will conduct the lightning without ringing or snapping, but silently. Tho' I think it best the Bells should be at Liberty to ring, that you may know when the Wire is electrify'd, and, if you are afraid, may keep at a Distance" (no. 64).[32] This letter reveals not only the disruption that Franklin's experiments and inventions caused for other household members but also reinforces the evidence that Franklin valued scientific inquiry over human comfort and safety. It is often quoted as evidence for Deborah's distaste for Franklin's electrical experiments, her frightened nature, and her ignorance. However, the second part of Franklin's directions clarifies that Deborah's fear of the bells resulted not from ignorance, but rather from an understanding of how electrical conduction could result in painful shock. Franklin explained that the ringing would alert Deborah to stay a safe distance from the wire, reminding her that silencing them would not remove the source of her fear.

Deborah Read Franklin rarely receives more than a passing mention in discussions of Franklin and science; however, she was important to the functioning of his household and, therefore, to his scientific practice (no. 63). During Franklin's absences from Philadelphia, Deborah managed the shop,

printing office, and post office, and facilitated Franklin's epistolary networks. She sent Franklin updates and letters from his Philadelphia colleagues. Her letters and packages included specimens and information that connected Franklin to his Philadelphia network. Moreover, as the Franklin household in Philadelphia was a gathering place where Franklin met with his colleagues to discuss current events and scientific discoveries (no. 65), Deborah played the important role of hostess during these gatherings. Following Deborah's death in 1771 and Franklin's return to Philadelphia in 1785, their daughter Sally Franklin Bache assumed role of hostess, as Franklin lived with the Bache family (Figure 4).[33]

Deborah also had a scientific education of her own. Her mother Sarah White Read, who lived with the Franklins following their marriage, made and sold medicines. The primary evidence for this activity is an advertisement that appeared in the August 19, 1731 issue of Franklin's newspaper *The Pennsylvania Gazette* (Figure 5). According to the advertisement, Read continued "to make and sell her well-known Ointment for the ITCH, with which she has cured abundance of People in and about this City for many Years past." This announcement indicates that Read had a long and revered career in formulating medicines, likely teaching Deborah and soliciting her help. Apparently Read served an essential role as a community healer. Since these medicines were sold in the Franklin shop and made in the Franklin household, Deborah had at least some knowledge of their medical application.[34]

THE Widow READ, removed from the upper End of Highſtreet to the *New Printing-Office* near the Market, continues to make and ſell her well-known Ointment for the ITCH, with which ſhe has cured abundance of People in and about this City for many Years paſt. It is always effectual for that purpoſe, and never fails to perform the Cure ſpeedily. It alſo kills or drives away all Sorts of Lice in once or twice uſing. It has no offenſive Smell, but rather a pleaſant one; and may be uſed without the leaſt Apprehenſion of Danger, even to a ſucking Infant, being perfectly innocent and ſafe. Price 2 *s.* a Gallypot containing an Ounce; which is ſufficient to remove the moſt inveterate Itch, and render the Skin clear and ſmooth.

She alſo continues to make and ſell her excellent *Family Salve* or Ointment, for Burns or Scalds, (Price 1 *s.* an Ounce) and ſeveral other Sorts of Ointments and Salves as uſual.

At the ſame Place may be had *Lockyer's Pills*, at 3 *d.* a Pill.

GOOD WRITING-PARCHMENT Sold by the Printer hereof, very reaſonable.

FIGURE 5
ADVERTISEMENT FROM *THE PENNSYLVANIA GAZETTE*

August 19, 1731
Letterpress
The Library Company of Philadelphia.

Similarly, the influence of Franklin's mother, Abiah Folger Franklin, on his education and interests has not been adequately addressed in existing scholarship. Franklin did not record many personal thoughts about his parents, but he had favorable impressions of his mother's capabilities. Abiah was the well-educated daughter of Peter Folger, who, among other work, served as a schoolteacher to the Christian Wampanoag communities on the island of Martha's Vineyard. Born in

FIGURE 4 (OPPOSITE)
SARAH FRANKLIN BACHE (MRS. RICHARD BACHE)
John Hoppner

1793
Oil on canvas
The Metropolitan Museum of Art, Catharine Lorillard Wolfe Collection, Wolfe Fund, 1901.

Nantucket, she grew up on the island when the English were the minority. She likely inherited an appreciation for education and was responsible for educating her daughters. She also dyed red cloth—possibly for trade with the Wampanoag communities. One of the most intriguing personal documents included in the exhibition is a 1771 letter that Franklin wrote to his sister Jane Franklin Mecom (no. 68). Franklin had been visiting relatives in England and recounted to Mecom the many cloth dyers in the Franklin family. Among the kin he visited was a Sally Franklin, "Great Grandaughter of our Father's Brother John, who was a Dyer at Banbury in Oxfordshire, where our Father learnt that Trade of him." Despite a focus on his father Josiah Franklin's family, Franklin continued, "Having mentioned so many Dyers in our Family, I will now it's in my Mind request of you a full and particular Receipt for Dying Worsted of that beautiful Red, which you learnt of our Mother." He remembered Abiah's red cloth, the recipe for which she shared with her daughter. Franklin respected Abiah's mastery of the domestic science of cloth dyeing. This type of knowledge was sometimes recorded in family recipe books, and other times it was passed down orally. No Folger or Mecom recipe book appears to have survived, but it was common practice for such information to be passed down from mother to daughter.[35]

In the same letter, Franklin immediately followed his request for the red dye recipe by asking Mecom for "a Receipt for making Crown Soap. Let it be very exact in the smallest Particulars. Enclos'd I send you a Receipt for making soft Soap in the Sun." The crown soap recipe was developed by John Franklin, their older brother. It was a hard lye soap that earned its name because it was stamped with a symbol of a crown. The soap was made with bayberry, a North American plant that gave the soap a green color. John shared the recipe with Mecom, who made and sold it to enhance her income. Benjamin and Deborah Franklin sold the crown soap for Mecom in their Philadelphia shop. Franklin requested "little Specimens" of it to distribute as gifts to his friends in France.[36] Mecom obliged Franklin, sending him a detailed, four-page recipe along with directions for molding and cutting it (no. 69). At the bottom of the recipe, Franklin drew small diagrams of the soap mold and cutting instruments as described by Mecom, clearly engaging with her instructions.[37]

Thus, the family approached soapmaking—a complicated process requiring hands-on experience and intuition—as a science, and many letters were exchanged on the topic. Occasionally, the soap Mecom sent to Franklin arrived brittle and crumbly, possibly due to cold weather exposure during shipping. Upon receiving a shipment of brittle soap, Franklin attempted to fix the bars, but failed. He then wrote to Mecom, "Sally has been making an Experiment." He explained her attempts to rehydrate the soap, which "appear to have all the Qualities of

excellent Crown Soap, only in drying they are twisted and warp'd out of Shape . . . you may possibly teach me a better Method."[38] Sally Franklin Bache's design of this experiment is notable for two reasons. First, Sally receives little attention in studies of Franklin's science. His relative lack of interest in her education has been problematically interpreted as evidence of her lack of intelligence. Second, Sally's skills with domestic sciences eclipsed her father's, likely as a result of her greater experience in household sciences. Sally's experiment with crown soap indicates her independence of mind, as well as her participation in Benjamin Franklin's experiment-collaboration network.[39] Mecom repeated Sally's methods and had similar results. She thought the brittle nature of the soap was due to altering the recipe—upon Franklin's request, Mecom had changed the recipe to increase the soap's green color but changing the ratio of ingredients weakened the soap's structure. Mecom decided to return to the original recipe based on her and Sally's results.[40]

Franklin sent their nephew Jonathan Williams to Mecom to learn soapmaking, and in the resulting correspondence among Mecom, Franklin, and Williams they regularly discussed soapmaking in the language of science. Williams described his studies to Franklin stating, "I have gone through the Operation of making the soap and by taking Notes throughout the whole, I have a tolerable Idea of both Theory and Practice, but I will not venture to say I understand it perfectly 'till after I have made some alone."[41] After the debacle with brittle soap, Williams wrote that Mecom found "it best to keep to the Proportions which were fixed by the Inventor after [much] Experience."[42] And as Mecom explained to Franklin, "There is a good deal of Phylosephy in the working of crown soap."[43] It seems that Franklin never truly mastered crown soap, though perhaps his daughter and grandchildren continued to be interested in it. At the top of a second, later recipe for crown soap, also found in Franklin's papers but presumably written after Franklin's death in 1790, is the following statement in Mecom's hand: "My Brother in His Life time tould me it could not be conveyed by Recipt that it sometimes workd so as He could not Ac[coun]t for it Himself but I will Give you the best Information I can" (no. 70).[44] It is possible that Mecom wrote this later recipe for Sally or one of Franklin's grandchildren. Thus, it is clear that the networks of hands-on citizen science included women, though their voices are muted or silenced in subsequent narratives of Franklin's scientific communities.

Franklin is rarely associated with cloth dyeing or soapmaking, yet he was clearly interested in these sciences typically dismissed as the work of women and tradesmen, rather than the work of natural philosophers. He collected information about these trade sciences from relatives and showed them respect and deference for their knowledge. He collected various household

recipes, and the soap recipes survive in his papers. They were preserved amongst correspondence with some of the most famous men of science of his day. Later historians and scientists drew sharper divisions between these scientific practices than Franklin did. We should not dismiss these sciences or their importance to understanding Franklin's approach to science—careful observation, experimentation, collaboration, and respect for useful knowledge of all sorts and from all origins.

While soapmaking and cloth dyeing occurred in his Boston and Philadelphia homes, and those of his relatives, Franklin's residences in London and Passy were also sites of scientific inquiry. Franklin boarded with Margaret Stevenson and her daughter Mary "Polly" Stevenson in their home on Craven Street in London (Figure 6). While living there, Franklin engaged in scientific discussions, welcoming peers to the residence. Franklin also briefly lived with Polly and her husband William Hewson after their marriage. Hewson was a surgeon who performed dissections and observations in the basement of their home. Franklin also served as a teacher and mentor to Polly, as he gifted her with books and engaged her in scientific dialogue (nos. 66 and 67). The two regularly corresponded with each other when Franklin was not in London and eventually, as a widow, Polly moved to Philadelphia with her children to be near Franklin. Franklin's respect for Polly is clear, as he published eight letters that he wrote to her in his fourth and fifth editions of *Experiments and Observations on Electricity*. These letters included discussions of diverse topics including barometers, waterspouts, and insects.[45]

FIGURE 6
36 CRAVEN STREET, LONDON
Photograph
Courtesy of the Benjamin Franklin House.
This is the only surviving residence of Franklin.

One of the letters to Polly that Franklin published was originally written in 1760 and speaks to the limitations that society placed on women. Polly had written to Franklin about a moral lesson she found embedded in a book on insects that Franklin gave her. She wrote that it "taught me to observe there is nothing so trifling but it is necessary and worthy our attention."[46] Franklin responded by agreeing with her and naming various positive functions of insects. However, he then suggested that she not get too distracted with her studies:

> The Knowledge of Nature may be ornamental, and it may be useful, but if to attain an Eminence in that, we neglect the Knowledge and Practice of essential Duties, we deserve Reprehension. For there is no rank in natural knowledge of equal dignity and importance with that of being a good parent, a good child, a good husband, or wife, a good neighbor or friend, a good subject or citizen, that is, in short, a good christian.[47]

Polly was about 20 years old, of marriageable age. Franklin's letter implied that pursuing knowledge for knowledge's sake was an unworthy ambition and that Polly had a duty to become a wife and mother, perhaps in acknowledgment that a young woman could not achieve eminence as a natural philosopher. He reminded her that there was still great honor and dignity in accepting those domestic roles because they contributed to society. Polly apparently understood Franklin's intentions and returned a gentle rebuke of her own, responding, "I have so firm a reliance on your sincerity and regard, that I think, if you imagin'd my pursuit of Knowledge would be detrimental, you would not have given me any encouragement, but have check'd my Curiosity, knowing I should have chearfully submitted to your Judgement."[48] As Polly pointed out, Franklin actively encouraged her education and scientific interests. The statement also reflected Franklin's own priorities during these years: accepting his expanding role of diplomat and public servant and decreasing his attention to experimentation and observations of the natural world.

Franklin's engagement in intellectual discourse with women is further evidenced by his social life in France. While Franklin served as Minister to France, he attended salons—gatherings where men and women discussed intellectual topics—hosted by the musician and composer Anne Louise Boyvin d'Hardancourt Brillon de Jouy in Paris and by Anne-Catherine de Ligniville Helvétius in Auteuil, near Passy. These salons were attended by a number of "statesmen, philosophers, historians, poets, and men of learning of all sorts."[49] Franklin was also friendly with Marie-Anne Paulze Lavoisier and her husband Antoine Lavoisier, a chemist. Madame Lavoisier was a chemist in her own right and regularly worked with her husband in the laboratory and edited his publications. Women in these intellectual circles participated in public life and facilitated Franklin's scientific and political networks in France.[50] Though the exhibition *Dr. Franklin, Citizen Scientist* was unable to include objects highlighting these Frenchwomen and their influence on Franklin's career, they should not be overlooked.

Franklin's residence in Passy was also a site of scientific observation, experimentation, and discussion. In his gardens at Passy (Figure 7), a commission appointed by King Louis XVI performed experiments and inquired into the legitimacy of Franz Anton Mesmer's medical performances. Mesmer claimed healing powers by manipulating a fluid, similar to electricity, in a person's body (no. 57). Franklin and his fellow commissioners determined that any successful treatment by Mesmer was due to the power of suggestion, what doctors call a placebo effect today. It was also from his terrace at Passy that Franklin observed the first piloted hot air balloon flight alongside a number of guests, including John and Sarah Jay, and John Quincy Adams (no. 71).[51]

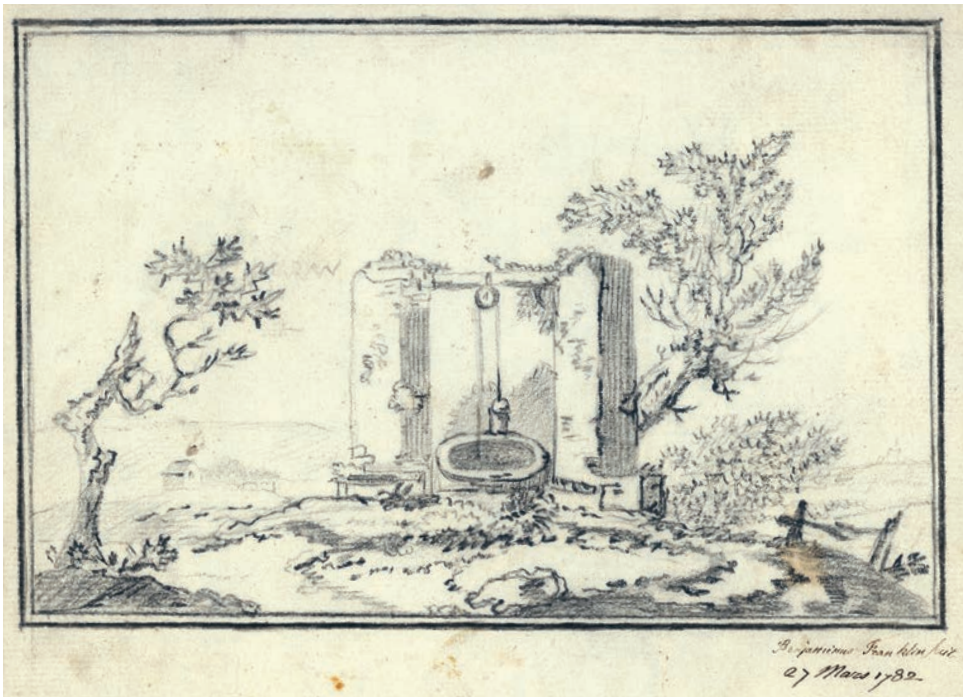


FIGURE 7
SKETCH OF BENJAMIN FRANKLIN'S GARDEN AT PASSY
Benjamin Franklin
March 27, 1782
Ink on paper
APS.

Especially overlooked in studies of Franklin's science are Jemima, Joseph, Peter, King, Othello, George, Bob, and Jack, the woman, men, and children enslaved by the Franklin family. Very little is known about them or the specific work they performed, and the Franklins left few records of them. Jemima, who appears in an account book purchasing sugar, was likely in domestic service, aiding Deborah and Sally. Deborah sent Othello to school, or intended to, before he died at a young age. Peter and King went to London with Benjamin and William. King ran away and was found in the English countryside, where he received an education from an unnamed woman (no. 76).[52] It is not clear whether any of these enslaved people performed any scientific labor. Yet it is likely that at least the

older men assisted Franklin with some of his experiments and observations. They may have "caught" lightning from the house's lightning rod or helped Franklin install the Pennsylvania stove (another of Franklin's inventions) in his home. They may have carried scientific instruments for Franklin and his peers as they traversed Philadelphia performing experiments. Peter and King may have helped Franklin record water temperatures as they crossed the Atlantic. Jemima may have served or cooked for the men who gathered at the Franklin home to discuss and perform experiments. At the very least, their labors enabled the Franklins to live comfortably, allowing Franklin the time to pursue science.

Although Franklin's position on slavery has received increased attention in recent years, his engagement with the science of human difference has undergone less scrutiny. Historians generally agree that Franklin's anti-slavery views developed gradually over time. His commitment to the abolitionist cause is ambiguous and a matter of some debate. It was not until 1772 that he wrote a clear, public anti-slavery statement, and there is no evidence that he freed any of his enslaved people in his lifetime. Franklin appears to have become a vocal supporter of abolition only when it would no longer damage his political career following the American Revolution. He left no personal reflections explaining his changing views on abolition.[53] Franklin also did not write original theories on human origins or the causes of human difference and skin color. However, the monogenesis versus polygenesis debate, the debate over whether all humans were the same species or if there were multiple human origins, was a critical 18th-century discourse, with far-reaching consequences for the development of scientific racism and the justifications for slavery.[54]

An overlooked article published in the 1765 volume of the *Philosophical Transactions of the Royal Society* reveals not only Franklin's engagement in scientific speculation about human origins, characteristics, and capabilities but also Deborah's (no. 73). The article, titled "An Account of the White Negro shown before the Royal Society" and submitted by James Parsons, includes a detailed physical description of an unnamed, enslaved child who had white skin and hair despite being born to Black parents. Today, we know the child had a genetic condition called albinism. In the 18th century, enslaved people with albinism were studied by scientists who wondered how people with light skin could be born to Black parents. Many scientists believed that they were the key to understanding whether all humans were of the same species. Parson's article included the following passage, implicating the Franklins in the study and exploitation of Black bodies:

> The present owner of this boy is Mr. James-Hill-Clark, whom I informed of what had passed between Dr. Franklin and myself . . . he informed me, that while he was in England before, he received a letter from his lady, in which was some of the wool of a white negro child's head, by way of curiosity and when I mentioned it to Mr. Clark, he assured me that this very boy was shewed in Pennsilvania as a great rarity.[55]

This excerpt reveals aspects of the Franklin household's attention to what might be called "racial topics." First, Benjamin Franklin found the topic of human difference worthy of discussion with James Parsons, a physician. Second, Deborah demonstrated her own interest in the discourses about racial difference by choosing to attend the public exhibition of an enslaved child in Philadelphia, to obtain a specimen of the child's hair, and to feel it was worthwhile to send it abroad for Franklin's inspection and investigation.

Such public displays of enslaved people whose appearances challenged contemporary understandings of skin color were common in England, continental Europe, and the colonies. People of African descent with albinism or vitiligo—a condition that affects pigmentation and results in areas of lighter and darker skin—were often studied, exhibited, and subjected to curiosity and titillating public displays, such as the exhibition Deborah attended in Philadelphia. Such inquiry was also supported by institutions like the Royal Society and the APS, which encouraged examining enslaved people at their meetings, and publishing descriptions of "exotic" individuals in their publications alongside theories about what caused such "anomalies."[56]

In 1786, John Morgan, APS Member, doctor, and co-founder of the medical school at the College of Philadelphia, published an "Account of a motley coloured, or pye Negro Girl and Mulatto Boy, exhibited before the Society" in volume two of the *Transactions of the American Philosophical Society* (no. 74). According to Morgan, two enslaved children—Adelaide and Jean Pierre—were examined at a May 1784 meeting of the APS. Though it is unclear if these young children were actually publicly examined at the APS meeting, the account features graphic descriptions of their entire bodies. It is clear that Morgan, one of the volume's editors, wanted readers to believe that the examination occurred, as per the established scientific practices of the day. Morgan's account was widely circulated and republished, and the second volume of the *Transactions* was purchased in large numbers.[57] Thus, the APS proudly enhanced its status by participating in the widespread circulation of the graphic and invasive descriptions of these children's bodies in the name of scientific research and prestige.

Moreover, the account was included in the second volume of the *Transactions*, which the APS published to bolster its reputation as the center of science in the United States and to honor Franklin, while drawing attention to the institution's relationship to the esteemed statesmen and scientist. The second volume, the first one published after the American Revolution, is indicative of the new nation's ongoing fascination with Black bodies. The publication also honored Franklin, the APS founder and President at the time, who contributed four essays to it, including "Maritime Observations." Eleven of the other essays expanded on Franklin's earlier research and covered topics of particular interest to him, including waterspouts, electric eels, and smoking chimneys. Three of the four illustrations in the volume accompanied Franklin's tracts. As Joyce Chaplin has observed, the volume was essentially an ode to Franklin's scientific career.[58] Morgan's inclusion of the account of Adelaide and Jean Pierre supported the volume's intention to show off the "best of" American science and honor the APS's founder. The inclusion of a study about human bodies, one that relied on the exploitation of enslaved, two-year-old children forcibly removed from their families, was considered necessary to establish the APS as a serious institution.

Franklin's writings on other topics reveal how he absorbed the contemporary scientific discourse about human nature, as well as how his views evolved over time. Originally drafted in 1751, Franklin published a text in 1755 about population growth and immigration to the British North American colonies called *Observations concerning the Increase of Mankind* (no. 78). The essay, which argued that the rapid growth of the British-American population could be advantageous to the British economy, was a response to recent regulations that aimed to protect the English economy by curbing manufacturing in the colonies. Relying on dominant theories about human difference and the association of negative traits with darker complexions, Franklin's treatise consisted of 24 clauses. Two are of particular concern. Clause 12 disputed an English argument that the cheap labor provided by enslaved people would unfairly position colonists to compete with British factories. Franklin argued that slavery was not cheap labor, since enslavers had to purchase enslaved people at high costs and then continue to incur expenses for clothing, food, and maintenance. Further, he argued that enslaved people worked only halfheartedly, as they had no incentive to work hard. Enslavers also had to bear the "Expence of a Driver to keep [the enslaved person] at Work, and his Pilfering from Time to Time, almost every Slave being *by Nature* a Thief."[59] This passage concluding that slavery was, in the long run, a bad investment, relied on Franklin's apparent assumption that an inclination to theft was inherent in people of African descent. Finally, in clause 24, Franklin drew upon the prevailing practice of categorizing a peoples' origin and value by complexion, on a spectrum from "purely white" to Black. Complexions correlated with national or ethnic

identities. He wrote that people from Africa were "black or tawny" while Asians and Indigenous Americans were "tawny." Most Europeans were "swarthy," except for Anglo-Saxons who were "purely white." He continued,

> And while we are, as I may call it, *Scouring* our Planet, by clearing America of Woods, and so making this Side of our Globe reflect a brighter Light to the Eyes of Inhabitants in Mars or Venus, why should we in the Sight of Superior Beings, darken its People? why increase the Sons of Africa, by Planting them in America, where we have so fair an Opportunity, by excluding all Blacks and Tawneys, of increasing the lovely White and Red? But perhaps I am partial to the Complexion of my Country, for such Kind of Partiality is natural to Mankind.[60]

Thus, describing his preference for Europeans as a "natural" prejudice, Franklin proposed increasing the number of people of European descent in the Americas through immigration, and excluding or replacing Africans and Indigenous Americans.[61]

In 1760, Franklin revised *Observations concerning the Increase of Mankind* for another publication, eliminating clause 24 altogether (no. 79). He also amended clause 12, so that the passage read, "almost every Slave being from the Nature of Slavery a Thief."[62] This subtle revision, which blamed the condition of slavery for turning enslaved people into thieves, reversed the earlier implication that criminality was inherent in people of African descent. These changes remained in place when it was reprinted in 1761 and again by Franklin in the fourth edition of *Experiments and Observations on Electricity* (1769). These revisions are indicative of Franklin's changing ideas regarding slavery and human difference during the 1750s.[63]

A series of letters discussing the Bray School for African American children in Philadelphia sheds further light on Franklin's evolving ideas around this period (nos. 75–77). While residing in London, Franklin was approached by members of the Associates of Dr. Bray, a philanthropic Christian organization interested in founding schools for African American children. They solicited Franklin's help finding a location and schoolmaster in Philadelphia. Franklin, intrigued by the venture, corresponded with John Waring, Secretary of the Associates, warning Waring that few people educated enslaved children, "partly from a Prejudice that Reading and Knowledge in a Slave are both useless and dangerous; and partly from an Unwillingness in the Masters and Mistresses of common Schools to take black Scholars, lest the Parents of the white Children should be disgusted."

Nevertheless, Franklin approached the school as an experiment, writing that if the children could be instilled with "good Principles" perhaps the school would "be found useful" and survive.[64] Deborah Franklin was recruited to report back on the school. Deborah wrote to Franklin on August 9, 1759 that she was impressed with the students at the school and determined to enroll Othello, a child who was enslaved in the Franklins' household.[65]

When Franklin returned to Philadelphia, he visited the school and "examined" the children on their reading skills and catechism and observed their behavior. Then he wrote to Waring:

> I was on the whole much pleas'd, and from what I then saw, have conceiv'd a higher Opinion of the natural Capacities of the black Race, than I had ever before entertained. Their Apprehension seems as quick, their Memory as strong, and their Docility in every Respect equal to that of white Children. You will wonder perhaps that I should ever doubt it, and I will not undertake to justify all my Prejudices, nor to account for them.[66]

Notably, Franklin admits to his prejudices. But Franklin, who changed his mind about the abilities of Black children he observed in a school context, seems resigned to neither understanding nor ridding himself of "all my Prejudices." Rather, he viewed the school as an experiment in learning and the children as specimens to be observed and tested to gauge whether their education was successful. Though the letter is a powerful statement about Franklin's willingness to confront his biases and admit that his preconceived notions were wrong, it also reveals that he approached these children of color largely in terms of scientific experimentation. Indeed, it would be many years before Franklin publicly spoke out against slavery.[67]

The involvement with the Bray School of Philadelphia was just one example of Franklin using his privileged position and resources to promote public good and educate others. He also spearheaded the Library Company of Philadelphia and the APS, two organizations that continue to promote useful knowledge. Franklin and his colleagues were involved with the founding of other institutions, including the Pennsylvania Hospital, the College, Academy, and Charity School of Philadelphia, which became the University of Pennsylvania (no. 81), and the first medical school in the British North American colonies (nos. 83–86). These institutions helped bring formal education and scientific study to the United States, training the next generation of scientists. Franklin also joined other organizations that promoted public good, including the Society for Alleviating

the Miseries of Public Prisons in 1787 (no. 87), which not only promoted prison reform but also drew upon medical expertise to promote the benefits of exercise and fresh air to reform prisoners. And eventually, Franklin lent his weight to the Pennsylvania Abolition Society, becoming its president in 1787. Yet in Franklin's lifetime, these organizations engaged in exclusionary practices. Higher education was restricted to white men and the leadership of these organizations was white and male. Even the Bray School and the Pennsylvania Abolition Society were dependent on white philanthropists rather than directed by African American leaders.[68]

In his last will, Franklin signaled his awareness of his fortuitous rise to wealth and privilege: "having myself been bred to a manual art, printing, in my native town, and afterwards assisted . . . I wish to be useful even after my death, if possible, in forming and advancing other young men."[69] Franklin acknowledged that his career was only possible because he benefited from the assistance of others who had wealth and influence. Franklin sought to offer help to other working-class men in the form of scholarship money. He also left bequests to the cities of Philadelphia and Boston for civic improvement and to a number of civic and educational institutions. Franklin's promotion of useful knowledge thus continued beyond his lifetime. Today, the organizations founded and supported by Franklin are increasingly inclusive and have contributed to the development of sciences, arts, and culture in the United States, as Franklin hoped they would.

On a day that many U.S. Americans associate with celebrations of independence and equality, Franklin began an exchange with his sister that turned into a reflection on inequality. In a letter dated July 4, 1786, Franklin told Jane Franklin Mecom that she should not apologize for her self-described "bad Spelling" because she always spelled phonetically. Franklin assured her that was perfectly sensible. He told her a story about an educated man and woman who could not figure out that "yf" was a phonetic spelling for "wife." According to Franklin, "yf" was "a much better as well as shorter Method of Spelling Wife, than by Doubleyou, i, ef, e, which in reality Spells, Doubleyifey."[70] To prove this point, he noted that the couple's chambermaid, Betty, immediately recognized that "yf" was pronounced "wife."

On July 21, 1786, Mecom responded to Franklin's letter, remarking that "sometimes the Betys has the Brightest understandings" (no. 92). Bettys, i.e., undereducated, working-class women, could indeed be society's brightest. Perhaps

Mecom saw Betty as a kindred spirit. At the very least, it seems Betty's story encouraged Mecom to reflect on the relationship among intelligence, education, and status. She briefly summarized the moral philosopher Richard Price:

> Dr. Price thinks Thousands of Boyles, Clarks and Newtons have Probably been lost to the world, and lived and died in Ignora[ns] and meanness, mearly for want of being Placed in favourable Situations, and Injoying Proper Advantages, very few we know is Able to beat thro all Impedements and Arive to any Grat Degre of Superiority in Understanding.[71]

Specifically, Mecom wondered how many potential Sir Robert Boyles, Samuel Clarkes, and Sir Isaac Newtons had been "lost to the world" because they were not born into privileged circumstances. Then Mecom continued, adding her own reflection by stating, as "we know" few people are able to "beat thro all Impedements" to education or self-improvement. In the 21st century lexicon, such unequal opportunities and rewards are referred to as "structural inequality."

"We know." Those two powerful words show Mecom's self-awareness of her situation in life and gently remind Franklin of his origins. Franklin and Mecom were born into the same working-class family. Mecom was not formally educated, and throughout her life she remained self-conscious about her spelling and her lack of education. She married young, at age 15, and her husband never adequately supported the family. She worked hard to financially support herself, her many children, and other relatives. In her old age, her brother paid for her housing. Franklin himself had to leave school at age 10 and seemed destined for a life as a working-class man, like his father, his brothers, and other relatives. Nevertheless, he managed to beat through any impediments to join the elite ranks of Boyles, Clarkes, and Newtons. Hardworking, smart, stubborn, and more than a bit lucky, Franklin also enjoyed some advantage: as a white man, he was able to move through society with more freedom than any woman or person of color. That fact alone gave him an advantaged access to the patronage and institutions that promoted science.[72]

How many great minds have been lost to the world because they were born into disadvantageous circumstances? What about the Janes and Bettys of the world—or Franklin's other sisters, Elizabeth, Hannah, Anne, Mary, Sarah, and Lydia? Or Deborah, frequently remembered as Franklin's abandoned and beleaguered wife? What about Jemima, Peter, King, Othello, George, Bob, and Jack, and other enslaved people who labored in Franklin's households and contributed in undocumented ways to Franklin's success? History remembers the Benjamin

Franklins of the world because they have long had the power to record and preserve their stories. They had access to education and networks that recognized their work as useful knowledge, rather than as insignificant menial labor. As a society, we would do well to remember, like Franklin, that all peoples can produce useful knowledge and contribute to improving society.

NOTES

I want to give a special acknowledgment to Emily A. Margolis who provided feedback on early drafts of this essay and whose research and insights were invaluable to the development of *Dr. Franklin, Citizen Scientist*. Many of the ideas presented in this essay were developed in close collaboration.

1 Benjamin Franklin has been the subject of numerous biographies, monographs, collected essays, articles, and exhibitions. Biographical sources consulted for *Dr. Franklin, Citizen Scientist* include: I. Bernard Cohen, *Benjamin Franklin's Science* (Cambridge: Harvard University Press, 1990); J. A. Leo Lemay, *The Life of Benjamin Franklin*, 3 vols. (Philadelphia: University of Pennsylvania Press, 2005–2008); Joyce E. Chaplin, *The First Scientific American: Benjamin Franklin and the Pursuit of Genius* (New York: Basic Books, 2006); Edmund S. Morgan, *Benjamin Franklin* (New Haven: Yale University Press, 2003); and E. Philip Krider, "Benjamin Franklin's Science," in *Benjamin Franklin: In Search of a Better World*, ed. Page Talbott (New Haven: Yale University Press, 2005), 163–97. This project is also indebted to the many editors of *The Papers of Benjamin Franklin*, 43 vols. (New Haven: Yale University Press, 1954–2019); of a projected 47 volumes, 43 have been published. Throughout this essay, I refer to *The Papers of Benjamin Franklin Digital Edition* by the Packard Humanities Institute and sponsored by the American Philosophical Society and Yale University, which includes as yet unpublished materials and is available at franklinpapers.org. Unless otherwise noted, the Franklin papers I refer to in the APS collection come from the APS's extensive Benjamin Franklin Papers Collection. These can also be found in *The Papers of Benjamin Franklin*.

2 The definition of *citizen science* was informed by Rajul Pandya, Kenne A. Dibner, and the National Academies of Sciences, Engineering, and Medicine (U.S.), eds., *Learning through Citizen Science: Enhancing Opportunities by Design*, Consensus Study Report (Washington, DC: The National Academies Press, 2018).

3 For all "nos." mentioned in parentheses throughout text, see the "Illustrated Checklist" that follows the essay.

4 Benjamin Franklin, *A Proposal for Promoting Useful Knowledge among the British Plantations in America*, 1768 ed. (Philadelphia, 1743), APS. For a recent history of the early APS, see Gary B. Nash, "When We Were Young: The American Philosophical Society in the 18th Century," *Proceedings of the American Philosophical Society* 163, no. 1 (March 2019): 10–50. See also Whitfield J. Bell, Jr., *Patriot-Improvers: Biographical Sketches of Members of the American Philosophical Society*, vol. 1, *1743–1768* (Philadelphia: American Philosophical Society, 1997).

5 Londa Schiebinger, "Scientific Exchange in the Eighteenth-Century Atlantic World," in *Soundings in Atlantic History: Latent Structures and Intellectual Currents, 1500–1830*, ed. Bernard Bailyn and Patricia L. Denault (Cambridge: Harvard University Press, 2009), 294–328; and Susan Scott Parrish, *American Curiosity: Cultures of Natural History in the Colonial British Atlantic World* (Chapel Hill: Published for the Omohundro Institute of Early American History and Culture by the University of North Carolina Press, 2006), 64–76, 103–28. For more on the relationship between intellectual developments in the British North American colonies and Early Republic and abroad, see Caroline Winterer, *American Enlightenments: Pursuing Happiness in the Age of Reason* (New Haven: Yale University Press, 2016).

6 Winterer, *American Enlightenments*, esp. 18–72; and Parrish, *American Curiosity*.

7 Parrish, *American Curiosity*, 174–306; Kathleen S. Murphy, "Translating the Vernacular: Indigenous and African Knowledge in the Eighteenth-Century British Atlantic," *Atlantic Studies* 8, no. 1 (March 2011): 29–48; Londa Schiebinger, "Agnotology and Exotic Abortifacients: The Cultural Production of Ignorance in the Eighteenth-Century Atlantic World," *Proceedings of the American Philosophical Society* 149, no. 3 (September 2005): 316–43; and Londa Schiebinger, *Secret Cures of Slaves: People, Plants, and Medicine in the Eighteenth-Century Atlantic World* (Stanford: Stanford University Press, 2017).

8 *Guramantee* was Mather's spelling for *Coromantee*, a term used to describe Akan and Twi speakers from modern-day Ghana on the Gold Coast of Africa. It is likely that Onesimus came from this region. Cotton Mather to John Woodward, 12 July 1716, in George L. Kittredge, "Some Lost Works of Cotton Mather," *Proceedings of the Massachusetts Historical Society* 45 (1911–1912): 422; Cotton Mather, *The Angel of Bethesda by Cotton Mather*, ed. Gordon W. Jones (Barre, MA: American Antiquarian Society and Barre Publishers, 1972), 107; [Cotton Mather], *An Account of the Method and Success of Inoculating the Small-Pox, in Boston in New-England* (London: Printed for J. Peele, 1722); [Benjamin Franklin], Preface to William Heberden, *Some Account of the Success of Inoculation for the Small-Pox in England and America. Together with Plain Instructions, By Which Any Person May Be Enabled to Perform the Operation, and Conduct the Patient through the Distemper* (London: Printed by W. Strahan, 1759), 5; Stanley Finger, *Doctor Franklin's Medicine* (Philadelphia: University of Pennsylvania Press, 2006), 49–65; and Margot Minardi, "The Boston Inoculation Controversy of 1721–1722: An Incident in the History of Race," *The William and Mary Quarterly* 61, no. 1 (2004): 47–76.

9 [Joseph Breintnall], "Rattlesnake Herb," in *Poor Richard, 1737* (Philadelphia: Printed and sold by B. Franklin, 1737); and Martha Robinson, "New Worlds, New Medicines: Indian Remedies and English Medicine in Early America," *Early American Studies* 3, no. 1 (Spring 2005): 94–110.

10 Mark Catesby, *The Natural History of Carolina, Florida, and the Bahama Islands*, rev. ed. (London: Printed for Benjamin White, 1771), 2:120. On the return to Traditional Ecological Knowledge, see Deborah McGregor, "Coming Full Circle: Indigenous Knowledge, Environment, and Our Future," *American Indian Quarterly* 28, no. 3–4 (2004): 385–410; and Will Harling and Bill Tripp, "Western Klamath Restoration Partnership: A Plan for Restoring Fire Adapted Landscapes" (Klamath National Forest, June 30, 2014).

11 James Delbourgo, *A Most Amazing Scene of Wonders: Electricity and Enlightenment in Early America* (Cambridge: Harvard University Press, 2006), 126, 183–89; and Andrew S. Curran, *The Anatomy of Blackness: Science and Slavery in an Age of Enlightenment* (Baltimore: Johns Hopkins University Press, 2012).

12 Kathleen S. Murphy, "Collecting Slave Traders: James Petiver, Natural History, and the British Slave Trade," *The William and Mary Quarterly* 70, no. 4 (2013): 637–70; James Delbourgo, *Collecting the World: Hans Sloane and the Origins of the British Museum* (Cambridge: The Belknap Press of Harvard University Press, 2017); and O. R. Impey and Arthur MacGregor, eds., *The Origins of Museums: The Cabinet of Curiosities in Sixteenth and Seventeenth-Century Europe* (Oxford: Oxford University, 1985).

13 Parrish, *American Curiosity*; and Chaplin, *First Scientific American*.

14 David Hume to Benjamin Franklin (BF), 10 May 1762, APS.

15 Lemay, *Life of Benjamin Franklin*, 1:334–56; James N. Green and Peter Stallybrass, *Benjamin Franklin: Writer and Printer* (New Castle, DE: Oak Knoll Press, 2006); and Jessica C. Roney, *Governed by a Spirit of Opposition: The Origins of American Political Practice in Colonial Philadelphia* (Baltimore: Johns Hopkins University Press, 2014), 69–79.

16 Special thanks to Jessica Linker for sharing her research on Franklin and Breintnall's nature printing, which informed this and the following paragraph. See also Jennifer L. Roberts, "The Veins of Pennsylvania: Benjamin Franklin's Nature-Print Currency," *Grey Room* 69 (2018): 50–79. Joseph Breintnall's two albums of nature prints are in the collection of the Library Company of Philadelphia, accession nos. P.2011.7.1 and P.2011.7.2.

17 Special thanks to Anisha Gupta for sharing her insights on print and paper technology.

18 Chaplin, *First Scientific American*, 14–16; and Nick Bunker, *Young Benjamin Franklin: The Birth of Ingenuity* (New York: Alfred A. Knopf, 2018).

19 Ellen R. Cohn, "Benjamin Franklin, Georges-Louis le Rouge and the Franklin/Folger Chart of the Gulf Stream," *Imago Mundi* 52, no. 1 (January 2000): 124–42; and Chaplin, *First Scientific American*, 196–200, 289–92.

20 Chaplin, *First Scientific American*, 316–25.

21 Benjamin Franklin, "A Letter from Dr. Benjamin Franklin, to Mr. Alphonsus Le Roy, Member of Several Academies, at Paris. Containing Sundry Maritime Observations," *Transactions of the American Philosophical Society* 2 (1786): 306.

22 Benjamin Franklin, *Remarks Concerning the Savages of North America* (Passy, 1784).

23 Carla Mulford, *Benjamin Franklin and the Ends of Empire* (New York: Oxford University Press, 2015), 311–13.

24 Chaplin, *First Scientific American*, esp. 103–39; Michael Brian Schiffer, *Draw the Lightning Down: Benjamin Franklin and Electrical Technology in the Age of Enlightenment* (Berkeley: University of California Press, 2003), esp. 47–51, 160–69; Delbourgo, *Most Amazing Scene*, 30–74; and Krider, "Benjamin Franklin's Science."

25 Benjamin Franklin, "How to Secure Houses, &c. from Lightning," in *Poor Richard Improved* (Philadelphia: Printed and Sold by B. Franklin and D. Hall, 1753).

26 Schiffer, *Draw the Lightning Down*, 189–90; Delbourgo, *Most Amazing Scene*, 68–74; and Chaplin, *First Scientific American*, 59–63.

27 Benjamin Franklin, "To All Captains and Commanders . . ." March 10, 1779, APS. Cook died in February 1779 before he could benefit from Franklin's largesse. For biographies that specifically discuss Franklin's use of science to become a statesman, see Chaplin, *First Scientific American*; and Morgan, *Benjamin Franklin*. Morgan argues that Franklin saw his service as a statesman as his most important contribution to the country.

28 Ebenezer Kinnersley, "Notice is hereby given . . ." (Newport, 1752), broadside, The Rosenbach; and Ebenezer Kinnersley, *A Course of Experiments, in that Curious and Entertaining Branch of Natural Philosophy Called Electricity* (Philadelphia: A. Armbruster, 1764). For more on Kinnersley, see J. A. Leo Lemay, *Ebenezer Kinnersley: Franklin's Friend* (Philadelphia: University of Pennsylvania Press, 1964); Schiffer, *Draw the Lightning Down*, 83–89; and Delbourgo, *Most Amazing Scene*, 96–105. For women's participation in electrical demonstrations, see Schiffer, *Draw the Lightning Down*, 80–88; and Delbourgo, *Most Amazing Scene*, 109–18.

29 Delbourgo, *Most Amazing Scene*, 126; and Schiebinger, *Secret Cures of Slaves*, 12, 117.

30 BF to Peter Collinson, September 1753, *Papers of Benjamin Franklin*. In the 18th century, the term *family* often encompassed all members of the household, free or enslaved.

31 Joseph Priestley, *The History & Present State of Electricity* (London: Printed for J. Dodsley in Pall-Mall, J. Johnson and B. Davenport in Pater-noster Row, and T. Cadell in the Strand, 1767), 180. William Franklin also sent his father observations on electrical matters when Franklin was away from Philadelphia. See, for example, William Franklin to BF, 12 July 1753, APS.

32 BF to Deborah Franklin, 10 June 1758, APS; and Chaplin, *First Scientific American*, 138.

33 For recent scholarship on Deborah and Sally Franklin, see Jennifer Reed Fry, "'Extraordinary Freedom and Great Humility': A Reinterpretation of Deborah Franklin," *The Pennsylvania Magazine of History and Biography* 127, no. 2 (April 2003): 167–96; Vivian Bruce Conger, "'There Is Graite Odds between A Mans Being At Home And A Broad': Deborah Read Franklin and the Eighteenth-Century Home," *Gender and History* 21, no. 3 (November 2009): 392–607; and Carla J. Mulford, "Benjamin Franklin and Women: Or, Franklin's Women," *Pennsylvania History* 87, no. 3 (Summer 2020): 454–93. For their lives during the American Revolution, see Vivian Bruce Conger, "Reading Early American Women's Political Lives: The Revolutionary Performances of Deborah Read Franklin and Sally Franklin Bache," *Early American Studies* 16, no. 2 (2018): 317–52. See also Susan E. Klepp, "Benjamin Franklin and Women," in *A Companion to Benjamin Franklin*, ed. David Waldstreicher (Malden, MA: Wiley-Blackwell, 2011), 221–33. The APS Digital Franklin Project is uncovering more information about Deborah Franklin's shopkeeping through the transcription, digitization, and analysis of the Franklin account books. Special thanks to Bethany Farrell and Cynthia Heider for sharing information about the Franklin ledger books, especially the Deborah-related materials.

34 Fry, "Extraordinary Freedom and Great Humility," 173; Finger, *Doctor Franklin's Medicine*, 23–26; Susan Hanket Brandt, "Marketing Medicine: Apothecary Elizabeth Weed's Economic Independence during the American Revolution," in *Women in the American Revolution: Gender, Politics, and the Domestic World*, ed. Barbara B. Oberg (Charlottesville: University of Virginia Press, 2019), 61–65.

35 BF to Jane Franklin Mecom, 17 July 1771, APS. It is unknown if Mecom ever sent her brother the red dye recipe. Special thanks to Julie Fisher for sharing her research on the Folger family, particularly Abiah Folger Franklin. See Julie Fisher, "Up Biblium, the 2nd Edition," *APS Blog*, June 21, 2019, https://www.amphilsoc.org/blog/biblum-2nd-edition; and Julie Fisher, "Peter Folger and Up Biblium," *APS Blog*, December 11, 2018, https://www.amphilsoc.org/blog/peter-folger-and-biblum. See also Jill Lepore, *Book of Ages: The Life and Opinions of Jane Franklin* (New York: Alfred A. Knopf, 2013), 11–19; and Carla Mulford, "Benjamin Franklin, Traditions of Liberalism, and Women's Learning in Eighteenth-Century Philadelphia," in *"The Good Education of Youth": Worlds of Learning in the Age of Franklin*, ed. John Pollack (Philadelphia: University of Pennsylvania Press, 2009), 110–11. For more on Franklin's father, see Nian-Sheng Huang, "Franklin's Father Josiah: Life of a Colonial Boston Tallow Chandler, 1657–1745," *Transactions of the American Philosophical Society* 90, no. 3 (2000): i–155.

36 BF to Jane Franklin Mecom, 17 July 1771, APS; and BF to Jane Franklin Mecom, 25 October 1779, APS.

37 Jane Franklin Mecom, "Receipt for Crown Soap," 1771–1786, APS. Franklin requested the recipe more than once between 1771 and 1786. John Franklin's wife, Elizabeth, also made and sold crown soap in Boston. Lepore, *Book of Ages*, 97–98, 157, 210; and Mulford, "Benjamin Franklin and Women," 460–62.

38 BF to Jane Franklin Mecom, 8 April 1786, *Papers of Benjamin Franklin*.

39 For example, Gordon Wood called Sally "less lively and intelligent" than Polly Stevenson, to whose education Franklin paid attention. See Gordon S. Wood, *The Americanization of Benjamin Franklin* (New York: Penguin Press, 2004), 132. For more on how Sally has been treated in the historiography of Franklin, see Klepp, "Benjamin Franklin and Women."

40 Jane Franklin Mecom to BF, 29 May 1786, *Papers of Benjamin Franklin*.

41 Jonathan Williams, Jr. to BF, 26 December 1785, APS.

42 Jonathan Williams, Jr. to BF, 25 April 1786, APS. See also "Jonathan will be glad to assist you (for the Instruction's sake)," BF to Jane Franklin Mecom, 27 October 1785, *Papers of Benjamin Franklin*.

43 Jane Franklin Mecom to BF, 29 May 1786, *Papers of Benjamin Franklin*.

44 Jane Franklin Mecom, "Receipt for Crown Soap," [1786–1794], Franklin-Bache Papers, APS.

45 Mulford, "Benjamin Franklin, Traditions of Liberalism," 114; Chaplin, *First Scientific American*, 171–72; and Whitfield J. Bell, "'All Clear Sunshine': New Letters of Franklin and Mary Stevenson Hewson," *Proceedings of the American Philosophical Society* 100, no. 6 (1956): 521–36.

46 Polly Stevenson to BF, 6 June 1760, James S. and Frances M. Bradford Collection, APS.

47 BF to Polly Stevenson, 11 June 1760. *Papers of Benjamin Franklin*. Also in Benjamin Franklin, *Experiments and Observations on Electricity Made in Philadelphia in America*, 4th ed. (London, 1769), 448.

48 Polly Stevenson to BF, 23 June 1760, James S. and Frances M. Bradford Collection, APS.

49 BF to Madame Helvétius, [October 1778?], *Papers of Benjamin Franklin*.

50 Claude-Anne Lopez, *Mon Cher Papa: Franklin and the Ladies of Paris* (New Haven: Yale University Press, 1990); Bruce Gustafson, "The Music of Madame Brillon: A Unified Manuscript Collection from Benjamin Franklin's Circle," *Notes* 43, no. 3 (March 1987): 522–43; Dorothy Medlin, "Benjamin Franklin's Bagatelles for Madame Helvétius: Some Biographical and Stylistic Considerations," *Early American Literature* 15, no. 1 (March 1980): 42–58; A. Owen Aldridge, "Feeling or Fooling in Benjamin Franklin's 'The Elysian Fields,'" *Early American Literature* 39, no. 1 (March 2004): 121–28; Cassandra T. Eagle and Jennifer Sloan, "Marie Anne Paulze Lavoisier: The Mother of Modern Chemistry," *The Chemical Educator* 3, no. 5 (October 1998): 1–18; Susan M. Stabile, "Salons and Power in the Era of the Revolution: From Literary Coteries to Epistolary Enlightenment," in *Benjamin Franklin and Women*, ed. Larry E. Tise (University Park: Pennsylvania State University Press, 2000), 129–48; and Carla Mulford, "Franklin, Women, and American Cultural Myths," in Tise, *Benjamin Franklin and Women*, 103–28.

51 *Rapport des commissaires chargés par le Roi de l'examen du magnétisme animal* (Paris: Imprimerie royale, 1784); Chaplin, *First Scientific American*, 293–302; and Robert Darnton, *Mesmerism and the End of the Enlightenment in France* (Cambridge: Harvard University Press, 1968).

52 May 12 and June 9, 1759, Account book of Mary Langdale Coates, 1748–1770, Library Company of Philadelphia; Gary B. Nash, "Franklin and Slavery," *Proceedings of the American Philosophical Society* 150, no. 4 (2006): 618–35; Kevin J. Hayes, "New Light on Peter and King, the Two Slaves Benjamin Franklin Brought to England," *Notes and Queries* 60, no. 2 (June 1, 2013): 205–209; David Waldstreicher, *Runaway America: Benjamin Franklin, Slavery, and the American Revolution* (New York: Hill and Wang, 2004); and Mulford, "Benjamin Franklin and Women," 482–84.

53 See, for example, Emma J. Lapsansky-Werner, "At the End, an Abolitionist?" in Talbott, *Benjamin Franklin*, 273–97; Waldstreicher, *Runaway America*, esp. 230–239; and Nash, "Franklin and Slavery." The enslaved members of the Franklin household either died enslaved or disappeared from the archival record. Bob was still enslaved by Richard and Sally Franklin Bache when Franklin died, though Franklin's will left funds to Richard Bache with the stipulation that "in consideration thereof, he would immediately after my decease manumit and set free his negro man Bob." See Benjamin Franklin, Will and Codicil, July 17, 1788, APS.

54 Curran, *Anatomy of Blackness*; Ibram X. Kendi, *Stamped from the Beginning: The Definitive History of Racist Ideas in America* (New York: Nation Books, 2016), esp. 15–134; and Katy L. Chiles, *Transformable Race: Surprising Metamorphoses in the Literature of Early America* (New York: Oxford University Press, 2014), 65–89.

55 James Parsons, "An Account of the White Negro Shewn before the Royal Society," *Philosophical Transactions of the Royal Society of London* 55 (1765): 46. The exhibition would have occurred between 1757 and 1762 when Franklin lived in London, and the hair apparently accompanied one of Deborah's missing letters from these years.

56 Curran, *Anatomy of Blackness*, 90–107; Ilona Katzew, "White or Black? Albinism and Spotted Blacks in the Eighteenth-Century Atlantic World," in *Envisioning Others: Race, Color, and the Visual in Iberia and Latin America*, ed. Pamela A. Patton (Boston: Brill, 2016).

57 John Morgan, "Some Account of a Motley Coloured, or Pye Negro Girl and Mulatto Boy, Exhibited before the Society in the Month of May, 1784 for Their Examination, by Dr. John Morgan, from the History Given of Them by Their Owner Mons. Le Vallois, Dentist of the King of France at Guadaloupe in the West Indies," *Transactions of the American Philosophical Society* 2 (1786): 392–95. The APS Minutes for May 5, 1786 mentions, "Two papers one giving an account and description of a living snake in the eye of a living horse the other describing two spotted Negroe children were presented by Dr. Morgan and read." According to the Minutes, a paper on the subject was read by Morgan. It is unclear from this notation if the children were physically present at the meeting when the paper was read aloud, though it is possible. See American Philosophical Society, Minutes, 1774–1787, APS Archives. The reason for the discrepancy is unclear. Morgan's account was re-printed in other publications, including *The Annual Register* (London: Printed for J. Dodsley, 1787): 53–55; *American Museum* 3 (Philadelphia, 1788): 37–39; and *The New Lady's Magazine* (London, September 1790): 443–45. For more on this meeting and publication, see Chiles, *Transformable Race*, 83, 179–80, 290–91, fn. 80; on the APS's discussions and publications on the subject of human difference, see ibid., 68–73, 76–77, 83–85, 192–93.

58 Chaplin, *First Scientific American*, 316–17; and Chiles, *Transformable Race*, 83.

59 Benjamin Franklin, *Observations Concerning the Increase of Mankind, Peopling of Countries, &c.* (Boston: S. Kneeland, 1755), 6. This pamphlet was as an addendum to [William Clarke], *Observations On the Late and Present Conduct of the French, with Regard to Their Encroachments upon the British Colonies in North America.*

60 Franklin, *Observations Concerning the Increase of Mankind*, 14–15.

61 Mulford, *Benjamin Franklin and the Ends of Empire*, 150–66. For more on how contemporary discourse regarding human differences affected Franklin's other writings, see also Chiles, *Transformable Race*, 65–89.

62 Benjamin Franklin, *Observations Concerning the Increase of Mankind, Peopling of Countries, &c.* (Boston: B. Mecom, 1760), 54. This was published as an addendum to *The Interest of Great Britain considered with regard to Her Colonies and the Acquisitions of Canada and Guadaloupe.*

63 Mulford, *Benjamin Franklin and the Ends of Empire*, 166; and Lapsansky-Werner, "At the End, an Abolitionist?"

64 BF to John Waring, 3 January 1758, APS. John C. Van Horne, "The Education of African Americans in Benjamin Franklin's Philadelphia," in Pollack, *"The Good Education of Youth,"* 72–99.

65 Extract of a Letter from Mrs. Franklin in Philadelphia, to B.F. in London, dated Aug. 9. 1759, *Papers of Benjamin Franklin*; Van Horne, "Education of African Americans"; and Pollack, *"The Good Education of Youth,"* 242–43.

66 BF to John Waring, 17 December 1763, APS.

67 Lapsansky-Werner, "At the End, an Abolitionist?"; Van Horne, "Education of African Americans," 86–87; Waldstreicher, *Runaway America*; and Nash, "Franklin and Slavery."

68 Pollack, *"Good Education of Youth"*; Simon P. Newman, "Benjamin Franklin and the Leather-Apron Men: The Politics of Class in Eighteenth-Century Philadelphia," *Journal of American Studies* 43, no. 2 (August 2009): 161–75; Roney, *Governed by a Spirit of Opposition*, 69–79, 91–103; and Paul Kahan, *Eastern State Penitentiary: A History* (Charleston, SC: History Press, 2008), 16. For recent histories of the early APS, see Linda Greenhouse, "Dinner with Ben Franklin: The Origins of the American Philosophical Society," *Proceedings of the American Philosophical Society* 163, no. 1 (March 2019): 1–9; and Nash, "When We Were Young."

69 Franklin, Will and Codicil.

70 BF to Jane Franklin Mecom, 4 July 1786, *Papers of Benjamin Franklin*.

71 Jane Franklin Mecom to BF, 21 July 1786, Franklin-Bache Papers, APS. See also Lepore, *Book of Ages*, 212–13, 216–18.

72 For more on Jane Franklin Mecom and her relationship with her brother, see Lepore, *Book of Ages*.

A Benjamin Franklin Timeline

1706
Born to Josiah and Abiah Folger Franklin in Boston

1718
Apprenticed to brother James, a printer

1723
Ran away to Philadelphia

1724
Traveled to London and worked in a print shop

1728–1748
Operated a print shop in Philadelphia

1730
Entered into common-law marriage with Deborah Read

1743
Founded the American Philosophical Society with Philadelphia botanist John Bartram

1751
Achieved international fame with the London publication of his *Experiments and Observations on Electricity*

1751–1764
Elected member of the Pennsylvania Assembly

1757–1762
Represented the colony of Pennsylvania in London

1759
Received an honorary doctorate from the University of St. Andrews and referred to hereafter as Dr. Franklin

1764–1775
Represented Pennsylvania in London, again

1768
The American Philosophical Society merged with the American Society for Promoting Useful Knowledge to become the American Philosophical Society Held at Philadelphia for Promoting Useful Knowledge (APS), and Franklin was elected President

1774
Deborah Read Franklin died on December 19

1776
Helped write the Declaration of Independence

1777–1785
Served as Minister to France for the United States and lived in Passy, near Paris

1787
Served as Member of the U.S. Constitutional Convention in Philadelphia

1790
Died on April 17 in Philadelphia

Illustrated Checklist

"FOR THERE IS NO RANK IN NATURAL KNOWLEDGE OF EQUAL DIGNITY AND IMPORTANCE WITH THAT OF BEING A GOOD PARENT, A GOOD CHILD, A GOOD HUSBAND, OR WIFE, A GOOD NEIGHBOUR OR FRIEND, A GOOD SUBJECT OR CITIZEN"

—B. Franklin, 1760

BENJAMIN FRANKLIN (1706–1790) dedicated himself to research, invention, and sharing knowledge for the "benefit of mankind in general." Franklin believed that all people could and should engage with science, and that science could transform society for the better. For these reasons, Franklin was America's first citizen scientist.

Franklin's working-class origins and self-education distinguished him from other elite scientists, known in the 18th century as natural philosophers. He recognized that science could take many forms and that all people could produce useful knowledge, including the soapmakers and sailors in his family. The knowledge and labor of diverse people enabled his success.

As a citizen scientist, Franklin created institutions that used science to benefit and educate others. However, he participated in a system of knowledge production that often reinforced and produced inequality. The American Philosophical Society (APS), an institution founded by Franklin in 1743 for promoting useful knowledge, invites you to reflect on Franklin's legacy as a citizen scientist.

HOW CAN YOU CONTINUE AND IMPROVE FRANKLIN'S MISSION?

Known first as a scientist and later as a statesman, Franklin came to represent the self-made American. Images of the celebrated citizen scientist were shared all over the world as his fame grew. The objects shown here include only a small selection of 18th-century representations and relics of Franklin. As he wrote to his daughter Sally, the medallions as well as "the pictures, busts, and prints, (of which copies upon copies are spread every where) have made your father's face as well known as that of the moon."

1
PORTRAIT OF BENJAMIN FRANKLIN
Isidoro Bianchi

Paris, c. 1780s
Electrical printing on silk
Franklin-Bache Papers, APS.

2
BENJAMIN FRANKLIN'S TOOTH, PRESERVED AS RELIC

1790
Tooth, gold, and paper
APS, 2011.2. Gift of Jean Starr and Allen Pergrin, 2011.

3
MINIATURE PORTRAIT OF BENJAMIN FRANKLIN
Unknown artist, after Mason Chamberlin

After 1762
Watercolor on ivory
APS, 58.P.78.

4
AU GENIE DE FRANKLIN
Marguerite Gérard after Jean-Honoré Fragonard

Paris, 1778
Etching
APS.

5
BAS-RELIEF PORTRAIT OF BENJAMIN FRANKLIN
James Tassie, after Isaac Gosset

London, after 1774
Blue jasperware
APS, 2009.5. Gift at the bequest of B. Franklin Kahn, 2008.

6
PROFILE SKETCH OF BENJAMIN FRANKLIN
Benjamin Franklin Bache

Philadelphia, unknown date
Ink on paper
Franklin-Bache Papers, APS.

7
BUST OF BENJAMIN FRANKLIN
Unknown artist

After 1777
Marble
APS, 2009.1. Gift at the bequest of B. Franklin Kahn, 2008.

8
PORTRAIT MEDALLION
Jean-Baptiste Nini

Paris, 1777
Terra-cotta
APS, 01.C.36. Gift at the bequest of Francis Sergeant Childs, 1989.

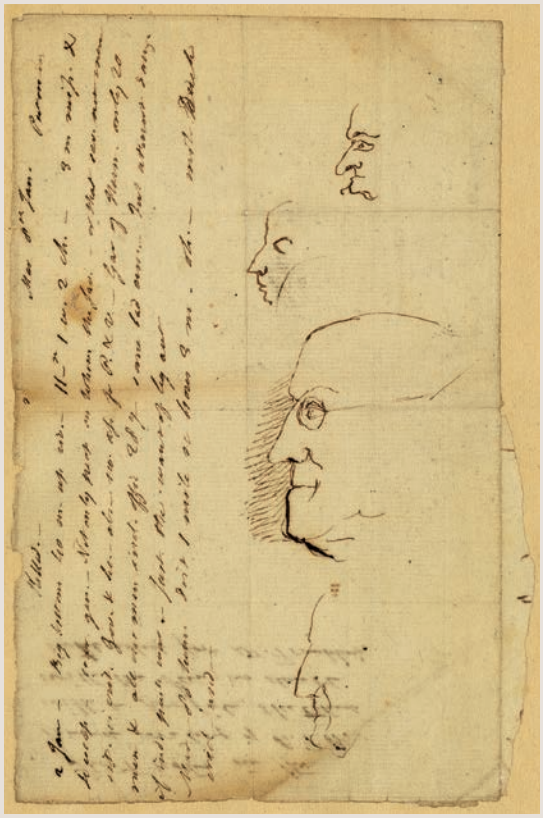
9
BAS-RELIEF PORTRAIT OF BENJAMIN FRANKLIN
Isaac Gosset

London, 1766
Beeswax
APS, 60.S.1. Gift of Frances Margaret Bradford, 1960.

1


2


5


6

3


ERIPUIT COELO FULMEN SCEPTRUMQUE TIRANNIS
Au GENIE DE FRANKLIN

4

7


B. FRANKLIN. AMERICAIN

8

9

This painting of Philadelphia's favorite citizen was one of two copies made of a 1766 original, which was publicly exhibited in London. The first copy hung in Franklin's Philadelphia home. This one was gifted to the APS. Franklin appears as the ideal natural philosopher working in his study, watched over by a bust of his role model, the English scientist Sir Isaac Newton. The artist celebrates Franklin's intelligence and practical skills by illuminating both his head and hands in equally bright light. Franklin's fine clothing, wig, and pose mark him as a privileged gentleman, worlds away from the modest circumstances of his youth.

10
PORTRAIT OF DR. FRANKLIN
Charles Willson Peale, after David Martin
Philadelphia, 1772
Oil on canvas
APS, 58.P.1. Gift of Charles Willson Peale, 1785.

Transatlantic Currents of Knowledge

In the 18th century, London was the scientific center of the British Empire. Colonists who desired to be taken seriously as scientists sought the recognition of London's elite individuals and institutions. They sent letters describing their environment along with specimens—objects of scientific interest such as plants and animals—to contacts in England. Colonists imported books and scientific instruments to support their investigations. However, Europeans valued colonial North America more for its natural resources than for the talents of the people who lived there. The trade of enslaved Africans directly and indirectly sustained this network of scientific exchange.

Franklin participated in this transatlantic exchange of knowledge with great success. From Philadelphia, he built a network with connections on both sides of the Atlantic Ocean. As the first American-born colonist to receive international praise for his research, Franklin ensured recognition for American science.

FIGURE 8
EAST PROSPECT OF THE CITY OF PHILADELPHIA
George Heap
1761
Colored engraving
APS.

Reading was an important part of Franklin's self-education and scientific practice. These books from his library reveal some of his interests. Franklin read everything from French scientific journals, to Latin texts on water, to popular English almanacs.

(LEFT TO RIGHT)

11
HISTOIRE NATURELLE, VOL. 5
Georges-Louis Leclerc, Comte de Buffon

Paris, 1778
Bound volume
APS. Gift of Georges-Louis Leclerc, Comte de Buffon.

12
OPTICKS
Sir Isaac Newton

London, 1721
Bound volume
APS.

13
THE PHILOSOPHY OF EARTHQUAKES
William Stukeley

London, 1756
Bound volume
APS.

14
SELECTION OF ALMANACKS FOR THE YEAR 1706
Compiled by Benjamin Franklin

London, c. 1760
Bound volume
APS.

15
PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY OF LONDON
Royal Society of London

London, 1753
Bound volume
APS.

16
HYDRODYNAMICA
Daniel Bernoulli

Strasbourg, 1738
Bound volume
APS. Gift of John G. Biddle, 1817.

17
HISTOIRE DE L'ACADÉMIE ROYALE DES SCIENCES
Académie Royale des Sciences

Paris, 1728
Bound volume
APS. Gift of Benjamin Franklin.

18
A COURSE OF EXPERIMENTAL PHILOSOPHY, VOL. 1
J. T. Desaguliers

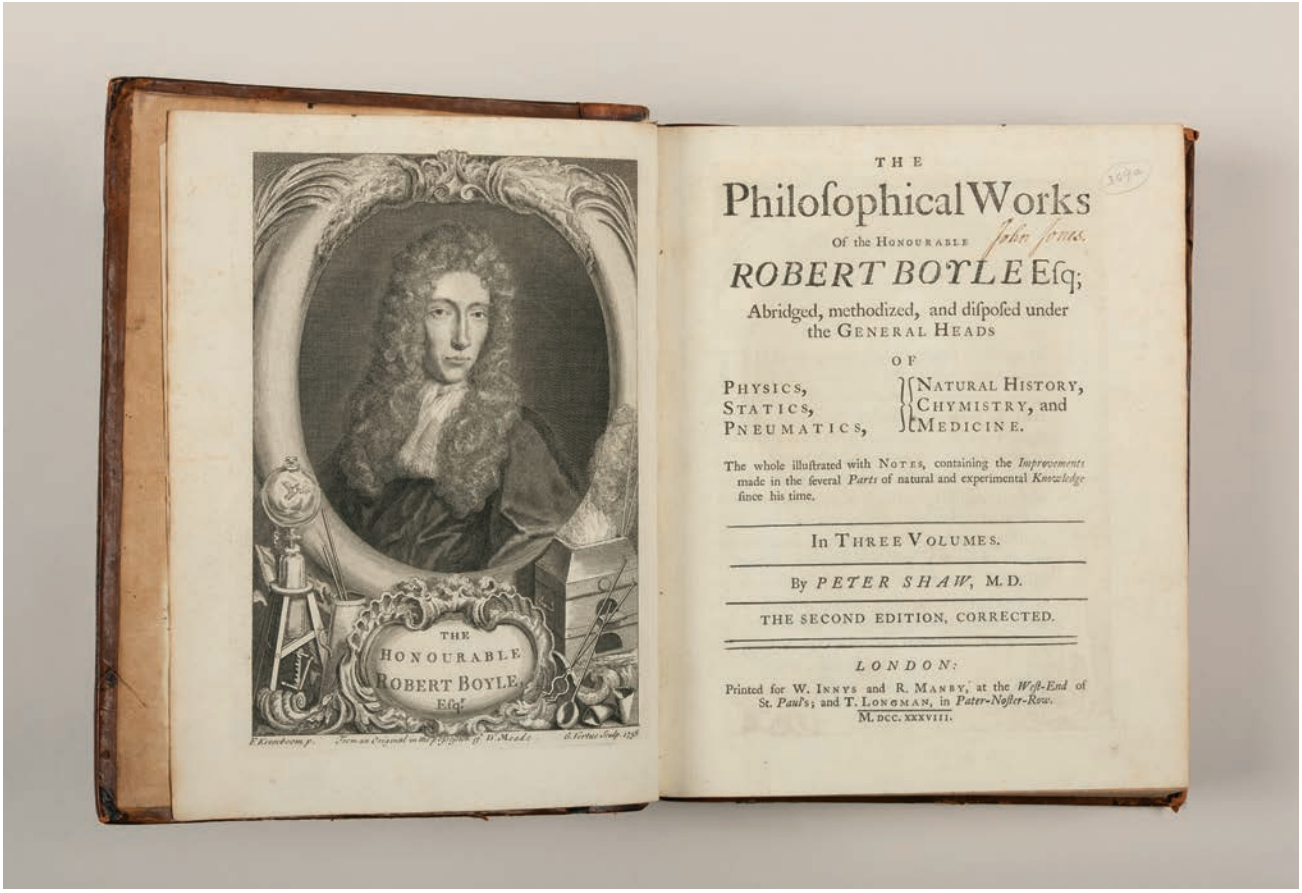
London, 1744
Bound volume
APS.

19
MAGNALIA CHRISTI AMERICANA; OR, THE ECCLESIASTICAL HISTORY OF NEW-ENGLAND
Cotton Mather

London, 1702
Bound volume
APS.

"FROM A CHILD I WAS FOND OF READING, AND ALL THE LITTLE MONEY THAT CAME INTO MY HANDS WAS EVER LAID OUT IN BOOKS."

—B. Franklin



This was Franklin's personal copy of Robert Boyle's writings. Boyle founded the Royal Society of London, the British Empire's premier scientific institution. Franklin sought recognition from the Society and followed the natural philosopher's example by studying many topics, including those listed on this title page.

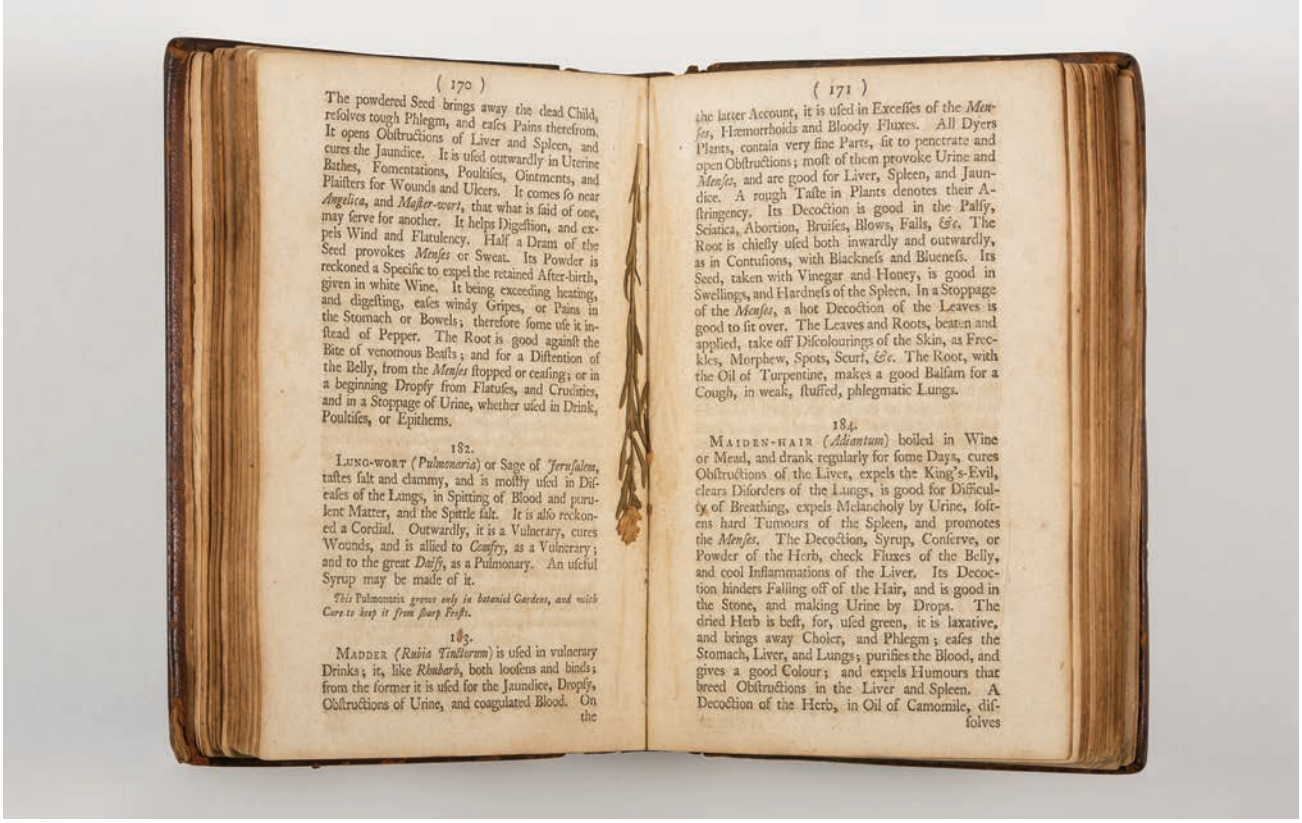
20
THE PHILOSOPHICAL WORKS, VOL. 1
Robert Boyle, compiled by Peter Shaw
London, 1738
Bound volume
APS.

PATRONIZING SCIENCE

Young Franklin sought patrons to support his early scientific work. Patrons enabled scientists to conduct and publish their research by providing money, supplies, and access to scientific networks. Institutions such as the Royal Society of London and the French Royal Academy of Sciences were patrons for the advancement of knowledge. Wealthy individuals acted for personal glory, as they would be celebrated in resulting publications. This system favored educated, white men who could work within business and political networks to meet sponsors. Those who lacked connections due to their social status, including most women, men of the working classes, enslaved people, and Indigenous peoples, produced useful knowledge without support or recognition.

21
PETIVER'S WORKS
James Petiver
London, 1695–1714
Bound volume of multiple texts
APS. Gift of Colonel Robert Carr, 1851.

This book illustrates how European scientists understood Indigenous-made objects as natural specimens. A Carolina pipe made by the Westo people appears among insects and plants. John Bartram, Franklin's colleague, received this book from Sir Hans Sloane, founder of the British Museum.



(170)

The powdered Seed brings away the dead Child, reſolves tough Phlegm, and eaſes Pains therefrom. It opens Obſtructions of Liver and Spleen, and cures the Jaundice. It is uſed outwardly in Uterine Bathes, Fomentations, Poultiſes, Ointments, and Plaiſters for Wounds and Ulcers. It comes ſo near *Angelica*, and *Maſter-wort*, that what is ſaid of one, may ſerve for another. It helps Digeſtion, and expels Wind and Flatulency. Half a Dram of the Seed provokes *Menſes* or Sweat. Its Powder is reckoned a Specific to expel the retained After-birth, given in white Wine. It being exceeding heating, and digeſting, eaſes windy Gripes, or Pains in the Stomach or Bowels; therefore ſome uſe it inſtead of Pepper. The Root is good againſt the Bite of venomous Beaſts; and for a Diſtention of the Belly, from the *Menſes* ſtopped or ceaſing; or in a beginning Dropſy from Flatuſes, and Crudities, and in a Stoppage of Urine, whether uſed in Drink, Poultiſes, or Epithems.

182.

Lung-wort (*Pulmonaria*) or Sage of *Jeruſalem*, taſtes ſalt and clammy, and is moſtly uſed in Diſeaſes of the Lungs, in Spitting of Blood and purulent Matter, and the Spittle ſalt. It is alſo reckoned a Cordial. Outwardly, it is a Vulnerary, cures Wounds, and is allied to *Comfry*, as a Vulnerary; and to the great *Daiſy*, as a Pulmonary. An uſeful Syrup may be made of it.

This Pulmonaria *grows only in botanick Gardens, and with Care to keep it from ſharp Froſts.*

183.

Madder (*Rubia Tinctorum*) is uſed in vulnerary Drinks; it, like *Rhubarb*, both looſens and binds; from the former it is uſed for the Jaundice, Dropſy, Obſtructions of Urine, and coagulated Blood. On the

(171)

the latter Account, it is uſed in Exceſſes of the *Menſes*, Hæmorrhoids and Bloody Fluxes. All Dyers Plants, contain very fine Parts, fit to penetrate and open Obſtructions; moſt of them provoke Urine and *Menſes*, and are good for Liver, Spleen, and Jaundice. A rough Taſte in Plants denotes their Aſtringency. Its Decoction is good in the Palſy, Sciatica, Abortion, Bruiſes, Blows, Falls, &c. The Root is chiefly uſed both inwardly and outwardly, as in Contuſions, with Blackneſs and Blueneſs. Its Seed, taken with Vinegar and Honey, is good in Swellings, and Hardneſs of the Spleen. In a Stoppage of the *Menſes*, a hot Decoction of the Leaves is good to ſit over. The Leaves and Roots, beaten and applied, take off Diſcolourings of the Skin, as Freckles, Morphew, Spots, Scurf, &c. The Root, with the Oil of Turpentine, makes a good Balſam for a Cough, in weak, ſtuffed, phlegmatic Lungs.

184.

Maiden-hair (*Adiantum*) boiled in Wine or Mead, and drank regularly for ſome Days, cures Obſtructions of the Liver, expels the King's-Evil, clears Diſorders of the Lungs, is good for Difficulty of Breathing, expels Melancholy by Urine, ſoftens hard Tumours of the Spleen, and promotes the *Menſes*. The Decoction, Syrup, Conſerve, or Powder of the Herb, check Fluxes of the Belly, and cool Inflammations of the Liver. Its Decoction hinders Falling off of the Hair, and is good in the Stone, and making Urine by Drops. The dried Herb is beſt, for, uſed green, it is laxative, and brings away Choler, and Phlegm; eaſes the Stomach, Liver, and Lungs; purifies the Blood, and gives a good Colour; and expels Humours that breed Obſtructions in the Liver and Spleen. A Decoction of the Herb, in Oil of Camomile, diſſolves

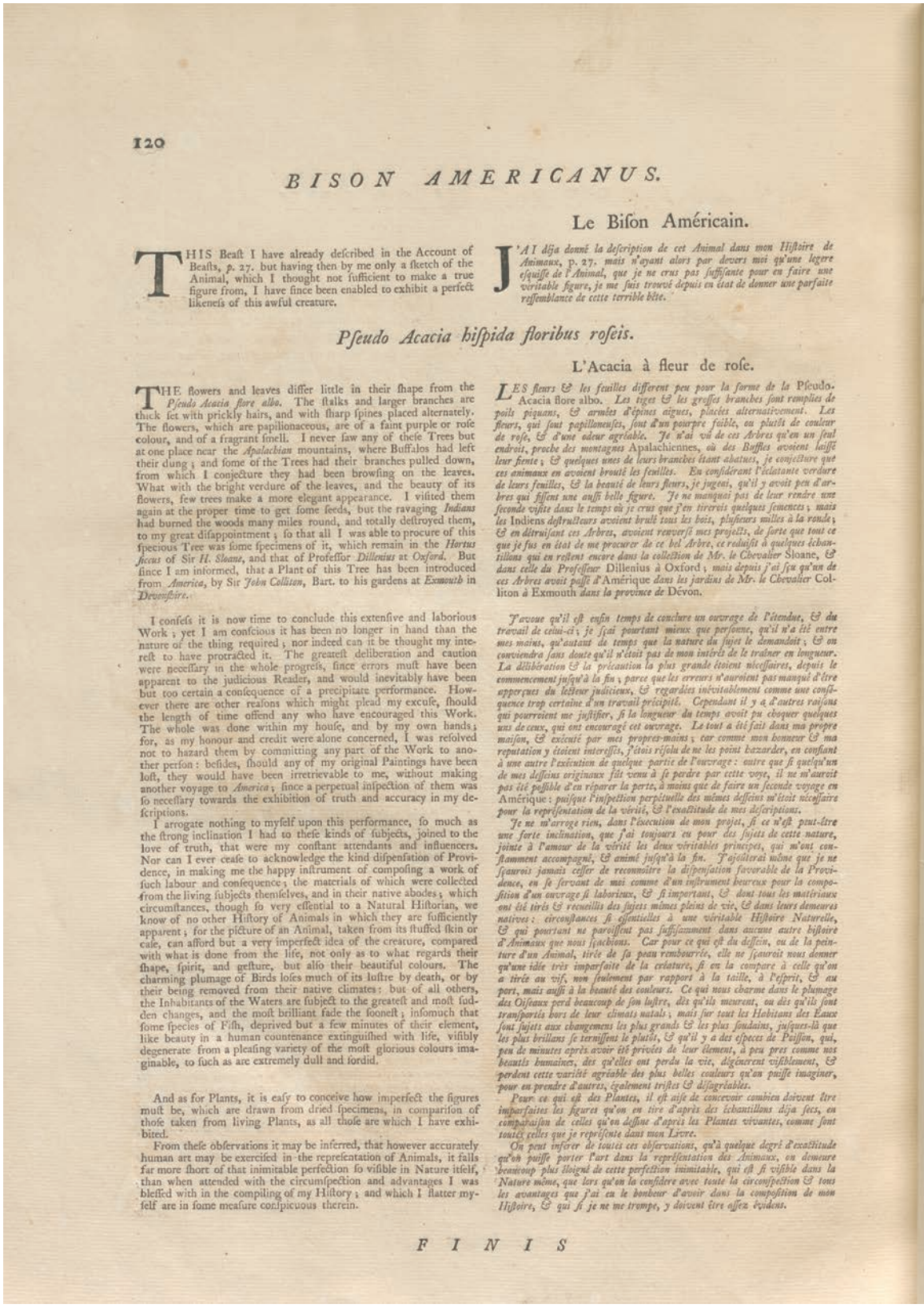
22 (ABOVE)
MEDICINA BRITANNICA
Thomas Short (author),
John Bartram (commentator),
Benjamin Franklin (printer)
Philadelphia, 1751
Bound volume
APS.

The original edition of this household manual advised on the medicinal uses of England's plants. Philadelphia botanist John Bartram adapted this book for colonial readers. He added italicized notes on finding English plants in North America and described local substitutions. The owner of this volume preserved a plant specimen between the pages.

23 (RIGHT)
FRANKLINIA ALATAMAHA
William Bartram
Philadelphia, after 1777
Hand-colored engraving
Violetta Delafield-Benjamin Smith Barton Collection, APS.

Botanist William Bartram named this North American flowering shrub in honor of Franklin, the Bartram family's friend and patron. Bartram was the first scientist of European descent to describe the plant, which he grew in his family's Philadelphia garden.

24
THE NATURAL HISTORY OF CAROLINA, FLORIDA, AND THE BAHAMA ISLANDS, VOL. 2
Mark Catesby
London, 1771
Bound volume
APS.



120

BISON AMERICANUS.

Le Biſon Américain.

THIS Beaſt I have already deſcribed in the Account of Beaſts, *p.* 27. but having then by me only a ſketch of the Animal, which I thought not ſufficient to make a true figure from, I have ſince been enabled to exhibit a perfect likeneſs of this awful creature.

J'AI déja donné la déſcription de cet Animal dans mon Hiſtoire de Animaux, p. 27. mais n'ayant alors par devers moi qu'une legere eſquiſſe de l'Animal, que je ne crus pas ſuffiſante pour en faire une véritable figure, je me ſuis trouvé depuis en état de donner une parfaite reſſemblance de cette terrible bête.

Pſeudo Acacia hiſpida floribus roſeis.

L'Acacia à fleur de roſe.

THE flowers and leaves differ little in their ſhape from the *Pſeudo Acacia flore albo.* The ſtalks and larger branches are thick ſet with prickly hairs, and with ſharp ſpines placed alternately. The flowers, which are papilionaceous, are of a faint purple or roſe colour, and of a fragrant ſmell. I never ſaw any of theſe Trees but at one place near the *Apalachian* mountains, where Buffalos had left their dung; and ſome of the Trees had their branches pulled down, from which I conjecture they had been browſing on the leaves. What with the bright verdure of the leaves, and the beauty of its flowers, few trees make a more elegant appearance. I viſited them again at the proper time to get ſome ſeeds, but the ravaging *Indians* had burned the woods many miles round, and totally deſtroyed them, to my great diſappointment; ſo that all I was able to procure of this ſpecious Tree was ſome ſpecimens of it, which remain in the *Hortus ſiccus* of Sir *H. Sloane*, and that of Profeſſor *Dillenius* at *Oxford*. But ſince I am informed, that a Plant of this Tree has been introduced from *America*, by Sir *John Colliton*, Bart. to his gardens at *Exmouth* in *Devonſhire*.

LES fleurs & les feuilles different peu pour la forme de la Pſeudo-Acacia flore albo. *Les tiges & les groſſes branches ſont remplies de poils piquans, & armées d'épines aigues, placées alternativement. Les fleurs, qui ſont papilloneuſes, ſont d'un pourpre foible, ou plutôt de couleur de roſe, & d'une odeur agréable. Je n'ai vû de ces Arbres qu'en un ſeul endroit, proche des montagnes* Apalachiennes, *où des Buffles avoient laiſſé leur fiente; & quelques unes de leurs branches étant abatues, je conjecture que ces animaux en avoient brouté les feuilles. En conſidérant l'éclatante verdure de leurs feuilles, & la beauté de leurs fleurs, je jugeai, qu'il y avoit peu d'arbres qui fiſſent une auſſi belle figure. Je ne manquai pas de leur rendre une ſeconde viſite dans le temps où je crus que j'en tirerois quelques ſemences; mais les* Indiens *deſtructeurs avoient brulé tous les bois, pluſieurs milles à la ronde; & en détruiſant ces Arbres, avoient renverſé mes projets, de ſorte que tout ce que je fus en état de me procurer de ce bel Arbre, ce réduiſit à quelques échantillons qui en reſtent encore dans la collection de Mr. le Chevalier* Sloane, *& dans celle du Profeſſeur* Dillenius *à* Oxford; *mais depuis j'ai ſçu qu'un de ces Arbres avoit paſſé d'*Amérique *dans les jardins de Mr. le Chevalier* Colliton *à* Exmouth *dans la province de* Dévon.

I confeſs it is now time to conclude this extenſive and laborious Work; yet I am conſcious it has been no longer in hand than the nature of the thing required; nor indeed can it be thought my intereſt to have protracted it. The greateſt deliberation and caution were neceſſary in the whole progreſs, ſince errors muſt have been apparent to the judicious Reader, and would inevitably have been but too certain a conſequence of a precipitate performance. However there are other reaſons which might plead my excuſe, ſhould the length of time offend any who have encouraged this Work. The whole was done within my houſe, and by my own hands; for, as my honour and credit were alone concerned, I was reſolved not to hazard them by committing any part of the Work to another perſon: beſides, ſhould any of my original Paintings have been loſt, they would have been irretrievable to me, without making another voyage to *America*; ſince a perpetual inſpection of them was ſo neceſſary towards the exhibition of truth and accuracy in my deſcriptions.

J'avoue qu'il eſt enfin temps de conclure un ouvrage de l'étendue, & du travail de celui-ci; je ſçai pourtant mieux que perſonne, qu'il n'a été entre mes mains, qu'autant de temps que la nature du ſujet le demandoit; & on conviendra ſans doute qu'il n'étoit pas de mon intérêt de le traîner en longueur. La délibération & la précaution la plus grande étoient néceſſaires, depuis le commencement juſqu'à la fin; parce que les erreurs n'auroient pas manqué d'être apperçues du lecteur judicieux, & regardées inévitablement comme une conſéquence trop certaine d'un travail précipité. Cependant il y a d'autres raiſons qui pourroient me juſtifier, ſi la longueur du temps avoit pu choquer quelques uns de ceux, qui ont encouragé cet ouvrage. Le tout a été fait dans ma propre maiſon, & exécuté par mes propres-mains; car comme mon honneur & ma reputation y étoient intereſſés, j'étois réſolu de ne les point hazarder, en confiant à une autre l'exécution de quelque partie de l'ouvrage: outre que ſi quelqu'un de mes deſſeins originaux fût venu à ſe perdre par cette voye, il ne m'auroit pas été poſſible d'en réparer la perte, à moins que de faire un ſecond voyage en Amérique: *puiſque l'inſpection perpétuelle des mêmes deſſeins m'étoit néceſſaire pour la repréſentation de la vérité, & l'exactitude de mes déſcriptions.*

I arrogate nothing to myſelf upon this performance, ſo much as the ſtrong inclination I had to theſe kinds of ſubjects, joined to the love of truth, that were my conſtant attendants and influencers. Nor can I ever ceaſe to acknowledge the kind diſpenſation of Providence, in making me the happy inſtrument of compoſing a work of ſuch labour and conſequence; the materials of which were collected from the living ſubjects themſelves, and in their native abodes; which circumſtances, though ſo very eſſential to a Natural Hiſtorian, we know of no other Hiſtory of Animals in which they are ſufficiently apparent; for the picture of an Animal, taken from its ſtuffed ſkin or caſe, can afford but a very imperfect idea of the creature, compared with what is done from the life, not only as to what regards their ſhape, ſpirit, and geſture, but alſo their beautiful colours. The charming plumage of Birds loſes much of its luſtre by death, or by their being removed from their native climates: but of all others, the Inhabitants of the Waters are ſubject to the greateſt and moſt ſudden changes, and the moſt brilliant fade the ſooneſt; inſomuch that ſome ſpecies of Fiſh, deprived but a few minutes of their element, like beauty in a human countenance extinguiſhed with life, viſibly degenerate from a pleaſing variety of the moſt glorious colours imaginable, to ſuch as are extremely dull and ſordid.

Je ne m'arroge rien, dans l'éxecution de mon projet, ſi ce n'eſt peut-être une forte inclination, que j'ai toujours eu pour des ſujets de cette nature, jointe à l'amour de la vérité les deux véritables principes, qui m'ont conſtamment accompagné, & animé juſqu'à la fin. J'ajouterai même que je ne ſçaurois jamais ceſſer de reconnoître la diſpenſation favorable de la Providence, en ſe ſervant de moi comme d'un inſtrument heureux pour la compoſition d'un ouvrage ſi laborieux, & ſi important, & dont tous les matériaux ont été tirés & recueillis des ſujets mêmes pleins de vie, & dans leurs demeures natives: circonſtances ſi eſſentielles à une véritable Hiſtoire Naturelle, & qui pourtant ne paroiſſent pas ſuffiſamment dans aucune autre hiſtoire d'Animaux que nous ſçachions. Car pour ce qui eſt du deſſein, ou de la peinture d'un Animal, tirée de ſa peau rembourrée, elle ne ſçauroit nous donner qu'une idée très imparfaite de la créature, ſi on la compare à celle qu'on a tirée au vif, non ſeulement par rapport à la taille, à l'eſprit, & au port, mais auſſi à la beauté des couleurs. Ce qui nous charme dans le plumage des Oiſeaux perd beaucoup de ſon luſtre, dès qu'ils meurent, ou dès qu'ils ſont tranſportés hors de leur climats natals; mais ſur tout les Habitans des Eaux ſont ſujets aux changemens les plus grands & les plus ſoudains, juſques-là que les plus brillans ſe ternifſent le plutôt, & qu'il y a des eſpeces de Poiſſon, qui, peu de minutes après avoir été privées de leur élement, à peu près comme nos beautés humaines, dès qu'elles ont perdu la vie, dégénerent viſiblement, & perdent cette variété agréable des plus belles couleurs qu'on puiſſe imaginer, pour en prendre d'autres, également triſtes & déſagréables.

And as for Plants, it is eaſy to conceive how imperfect the figures muſt be, which are drawn from dried ſpecimens, in compariſon of thoſe taken from living Plants, as all thoſe are which I have exhibited.

Pour ce qui eſt des Plantes, il eſt aiſe de concevoir combien doivent être imparfaites les figures qu'on en tire d'après des échantillons déja ſecs, en comparaiſon de celles qu'on deſſine d'après les Plantes vivantes, comme ſont toutes celles que je repréſente dans mon Livre.

From theſe obſervations it may be inferred, that however accurately human art may be exerciſed in the repreſentation of Animals, it falls far more ſhort of that inimitable perfection ſo viſible in Nature itſelf, than when attended with the circumſpection and advantages I was bleſſed with in the compiling of my Hiſtory; and which I flatter myſelf are in ſome meaſure conſpicuous therein.

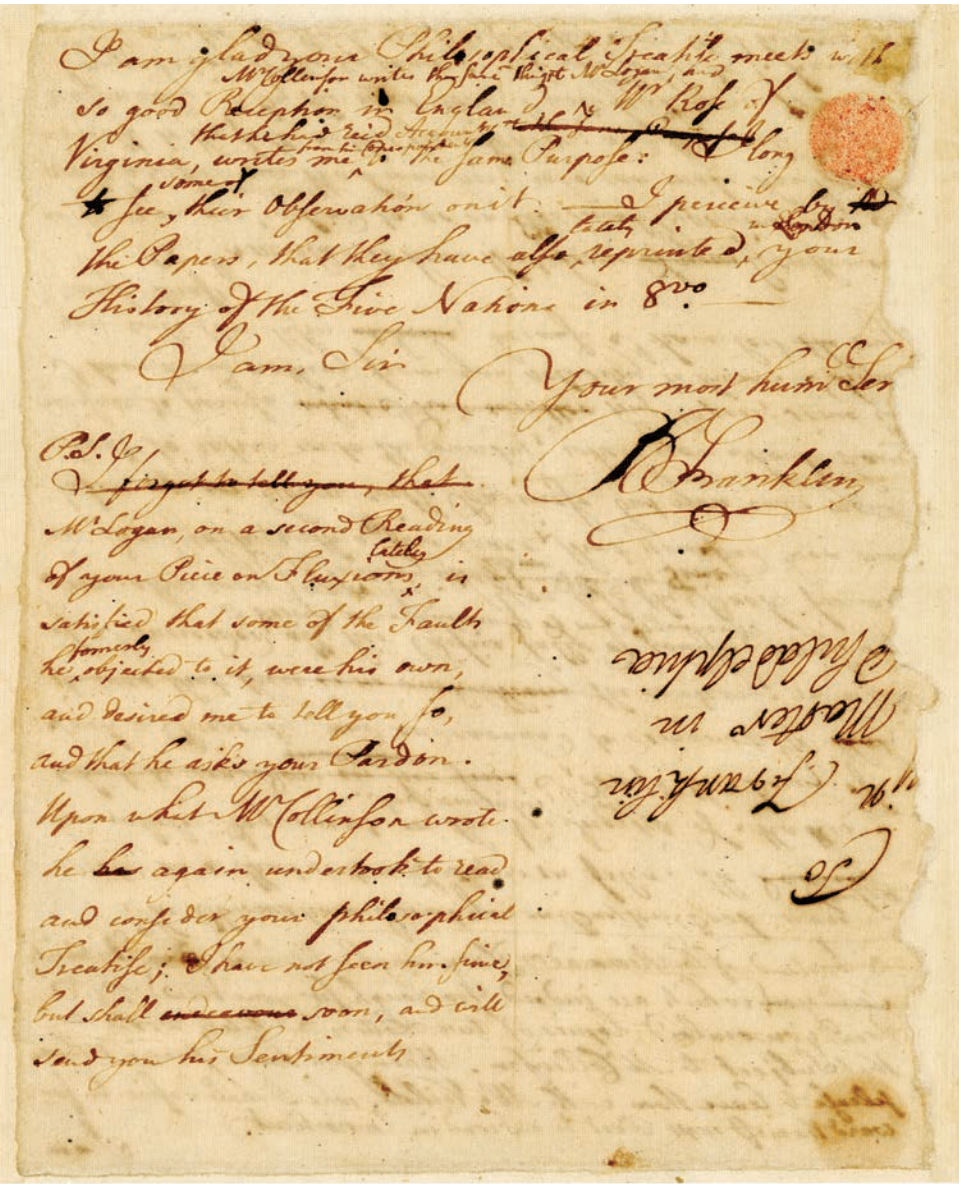
On peut inférer de toutes ces obſervations, qu'à quelque degré d'exactitude qu'on puiſſe porter l'art dans la repréſentation des Animaux, on demeure beaucoup plus éloigné de cette perfection inimitable, qui eſt ſi viſible dans la Nature même, que lors qu'on la conſidere avec toute la circonſpection & tous les avantages que j'ai eu le bonheur d'avoir dans la compoſition de mon Hiſtoire, & qui ſi je ne me trompe, y doivent être aſſez évidents.

F I N I S

Supported by English and colonial patrons, British naturalist Mark Catesby traveled to North America to study nature. European scientists were interested in indigenous species like bison, which Catesby illustrated here. Franklin purchased a copy of this book for his Philadelphia colleagues.

In the text, Catesby complained that "*Indians* had burned the woods," which prevented him from collecting the plant illustrated with the bison. What Catesby described as a "great disappointment" was an Indigenous land management practice that helped maintain Carolina's ecosystem.

Today, as climate change and settlement patterns threaten plant and animal populations and produce more frequent and destructive wildfires, some environmental scientists advocate for a return to the traditional ecological practice of controlled burning. Indigenous peoples have always produced useful knowledge, though European and U.S. authorities often failed to recognize their scientific contributions.



25
DRAFT OF A LETTER TO CADWALLADER COLDEN
Benjamin Franklin

Philadelphia, August 6, 1747
Ink on paper
Benjamin Franklin Papers,
APS. Gift of Charles
Pemberton and Mary Fox, 1840.

In this letter to the New York naturalist Cadwallader Colden, Franklin mentions that their mutual patron, Peter Collinson, was sharing their scientific writings in London. Letters such as this sustained 18th-century scientific communities.

26 (OPPOSITE)
LETTER TO BENJAMIN FRANKLIN
David Hume

Edinburgh, May 10, 1762
Ink on paper
Benjamin Franklin Papers,
APS. Gift of Charles
Pemberton and Mary Fox, 1840.

Franklin's successful electrical experiments and visit to Britain helped change perceptions of North America's potential. As Scottish philosopher David Hume wrote to Franklin, "America has sent us many good things, Gold, Silver, Sugar, Tobacco, Indigo &c. But you are the first Philosopher."

it proper to convey to you these two Ideas of so ingenious a Man, that you might adopt them, if they appear to you well founded.

I have sent off your Letter to Lord Mareschal, who will consider himself as much beholden to you. His Lordship is at present very much employ'd in settling the Controversy about the Eternity of Hell-Torments, which has set the little Republic of Neuf-chatel in Combustion. I have ventured to recommend to his Lordship the abridging these Torments as much as possible, and have used the Freedom to employ your Name, as well as my own, in this Request. I have told him, that, as we have taken so much Pains to preserve him & his Subjects from the Fires of Heaven, they cannot do less than to guard us from the Fires of Hell. My Lord told me, when in England, that the King of Prussia could not at first be brought to regard this Theological Controversy as a Matter of any Moment, but soon found, from the Confusions, to which it gave rise, that these were not Matters to be slighted. But surely never was a Synod of Divines more ridiculous, than to be worrying one another, under the Arbitration of the K. of Prussia & Lord Mareschal, who will make an Object of Derision of every thing, that appears to these holy Men so deserving of Zeal, Passion, and Animosity.

I am very sorry, that you intend soon to leave our Hemisphere. America has sent us many good things, Gold, Silver, Sugar, Tobacco, Indigo &c: But you are the first Philosopher, and indeed the first Great Man of Letters, for whom we are beholden to her: It is our own Fault, that we have not kept him: Whereas it

Useful Knowledge in the Making

As a citizen scientist, Franklin was committed to being useful to others and freely shared his inventions and ideas. He addressed some of society's most pressing issues, from maritime navigation and counterfeit currency, to smallpox epidemics and destructive electrical storms. Franklin approached scientific challenges by drawing on both his theoretical knowledge and practical experiences. He turned any available space into a laboratory, including homes, workshops, and ships. Careful observation and controlled experimentation characterized Franklin's scientific practice.

Remembered as a singular genius, Franklin recognized that all people could produce useful knowledge and worked closely with family, friends, and enslaved members of his household. Operating within a society that privileged knowledge produced by elite white men, many of Franklin's collaborators and sources went uncredited.

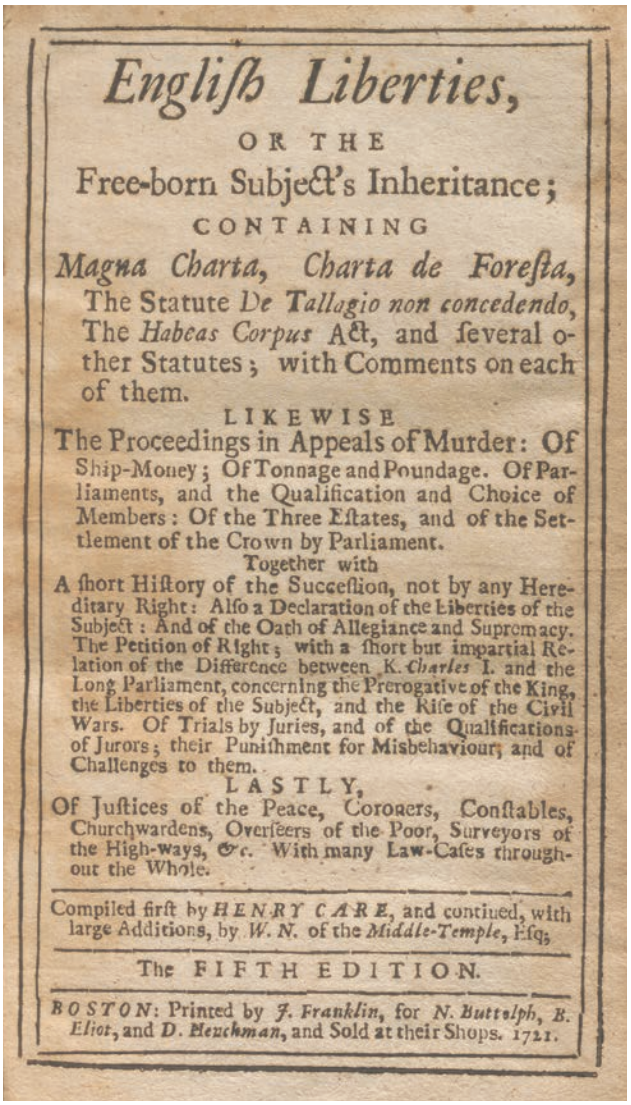
FIGURE 9
BENJAMIN FRANKLIN DRAWING ELECTRICITY FROM THE SKY
After Benjamin West
Unknown date
Lithograph
APS.

"AS WE ENJOY GREAT ADVANTAGES FROM THE INVENTIONS OF OTHERS, WE SHOULD BE GLAD OF AN OPPORTUNITY TO SERVE OTHERS BY ANY INVENTION OF OURS, AND THIS WE SHOULD DO FREELY AND GENEROUSLY"

—B. Franklin

SCIENTIFIC TYPE

At age 12, Benjamin Franklin became an apprentice to his brother, James, from whom he learned the printing trade. His time working in a print shop gave Franklin a lifelong appreciation for the knowledge of tradespeople. The printed texts he worked with exposed him to new worlds and ideas. In 1728 he established a print shop in Philadelphia, through which he made influential connections. Mastering and later experimenting with print technology, Franklin recognized the power of words and images to share knowledge with many audiences. Retiring as a printer in 1748, the citizen scientist nevertheless continued to use print to shape society.



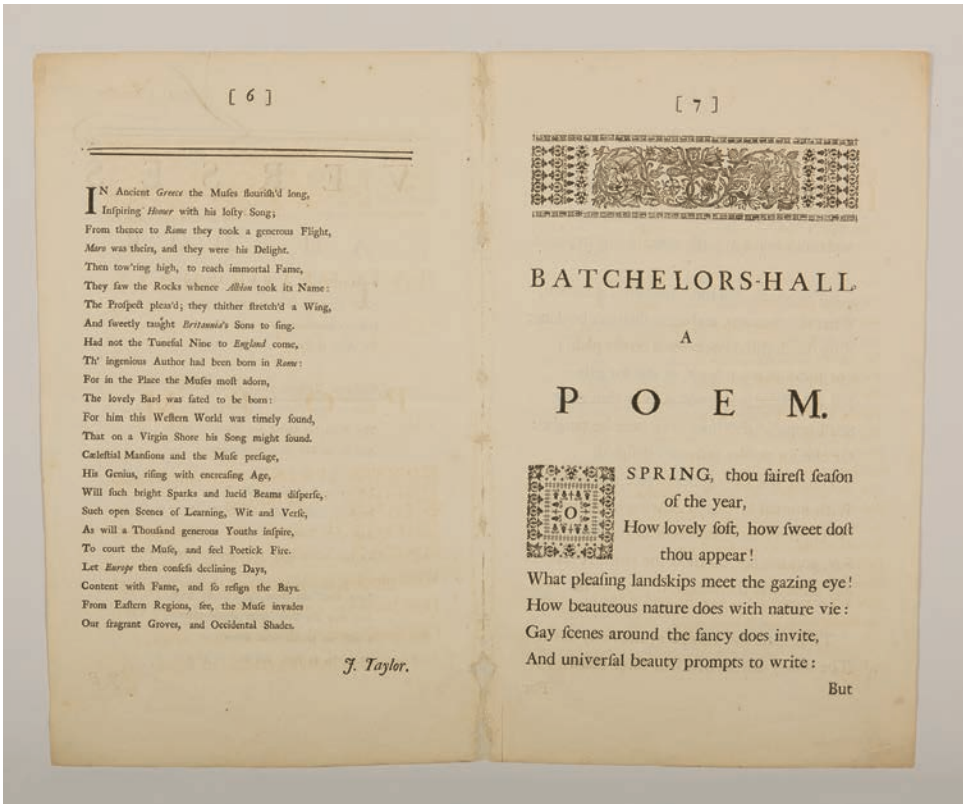
Engliſh Liberties,
OR THE
Free-born Subject's Inheritance;
CONTAINING
Magna Charta, Charta de Foreſta, The Statute *De Tallagio non concedendo,* The *Habeas Corpus* Act, and ſeveral other Statutes; with Comments on each of them.
LIKEWISE
The Proceedings in Appeals of Murder: Of Ship-Money; Of Tonnage and Poundage. Of Parliaments, and the Qualification and Choice of Members: Of the Three Eſtates, and of the Settlement of the Crown by Parliament.
Together with
A ſhort Hiſtory of the Succeſſion, not by any Hereditary Right: Alſo a Declaration of the Liberties of the Subject: And of the Oath of Allegiance and Supremacy. The Petition of Right; with a ſhort but impartial Relation of the Difference between K. *Charles* I. and the Long Parliament, concerning the Prerogative of the King, the Liberties of the Subject, and the Riſe of the Civil Wars. Of Trials by Juries, and of the Qualifications of Jurors; their Puniſhment for Misbehaviour; and of Challenges to them.
LASTLY,
Of Juſtices of the Peace, Coroners, Conſtables, Churchwardens, Overſeers of the Poor, Surveyors of the High-ways, &c. With many Law-Caſes throughout the Whole.
Compiled firſt by *HENRY CARE*, and continued, with large Additions, by *W. N.* of the *Middle-Temple*, Eſq;
The FIFTH EDITION.
BOSTON: Printed by *J. Franklin*, for *N. Buttolph*, *B. Eliot*, and *D. Henchman*, and Sold at their Shops. 1721.

27
ENGLISH LIBERTIES
Henry Care (author),
James Franklin (printer)
Boston, 1721
Bound volume
APS.

Fifteen-year-old Benjamin Franklin likely performed the manual labor of printing this book in his brother's Boston print shop. Franklin's apprenticeship gave him access to books on various subjects, including politics and science.

28
"BATCHELORS-HALL"
George Webb (author),
Benjamin Franklin (printer)
Philadelphia, 1731
Letterpress
APS.

George Webb and Franklin were part of a men's club that socialized at Batchelors Hall, north of Philadelphia. Franklin privately printed this poem for its members. He designed the publication to highlight his superior skills and build his local network early in his career.



[6]

IN Ancient *Greece* the Muſes flouriſh'd long,
Inſpiring *Homer* with his lofty Song;
From thence to *Rome* they took a generous Flight,
Maro was theirs, and they were his Delight.
Then tow'ring high, to reach immortal Fame,
They ſaw the Rocks whence *Albion* took its Name:
The Proſpect pleas'd; they thither ſtretch'd a Wing,
And ſweetly taught *Britannia's* Sons to ſing.
Had not the Tuneful Nine to *England* come,
Th' ingenious Author had been born in *Rome*:
For in the Place the Muſes moſt adorn,
The lovely Bard was fated to be born:
For him this Weſtern World was timely found,
That on a Virgin Shore his Song might ſound.
Cæleſtial Manſions and the Muſe preſage,
His Genius, riſing with encreaſing Age,
Will ſuch bright Sparks and lucid Beams diſperſe,
Such open Scenes of Learning, Wit and Verſe,
As will a Thouſand generous Youths inſpire,
To court the Muſe, and feel Poetick Fire.
Let *Europe* then confeſs declining Days,
Content with Fame, and ſo reſign the Bays.
From Eaſtern Regions, ſee, the Muſe invades
Our fragrant Groves, and Occidental Shades.

J. Taylor.

[7]

BATCHELORS-HALL

A

POEM.

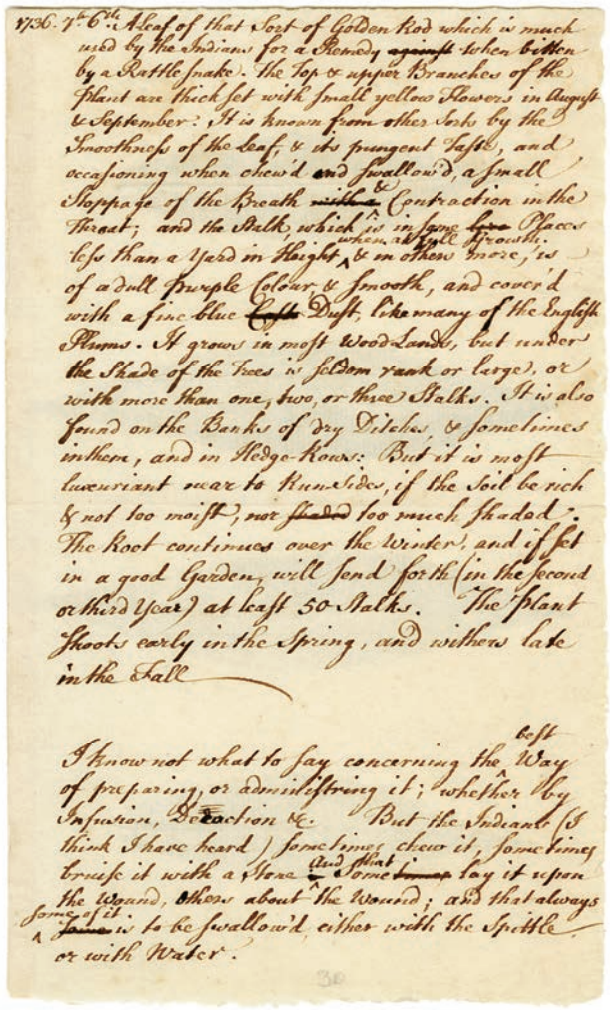
SPRING, thou faireſt ſeaſon of the year,
How lovely ſoft, how ſweet doſt thou appear!
What pleaſing landskips meet the gazing eye!
How beauteous nature does with nature vie:
Gay ſcenes around the fancy does invite,
And univerſal beauty prompts to write:
But

29
STENCIL SET
Jean Gabriel Bery
Paris, c. 1781–1782
Walnut and brass
APS, 58.48.

Franklin maintained a lifelong interest in print technology and font design. He ordered this stencil set while living in France in the 1780s. The nearly 400 stencils include alphabets in nine distinct fonts, a nameplate, and decorative elements.

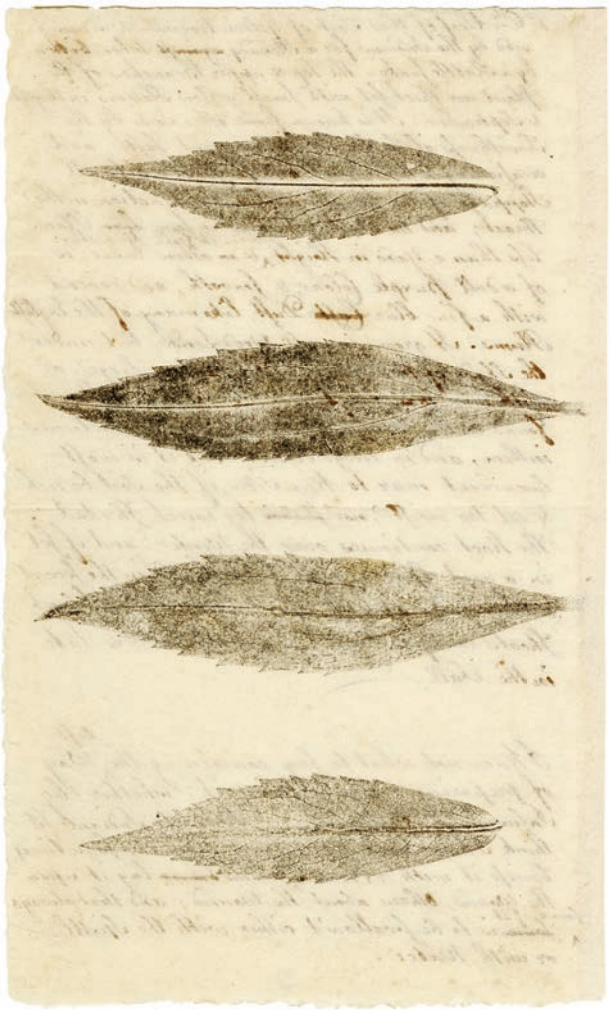
30 (OPPOSITE)
PRINT OF LEAVES, FEATHER, AND FABRIC
Joseph Breintnall
Philadelphia, 1731–1744
Ink impression on paper
The Library Company of Philadelphia.

In support of his botanical studies, Philadelphia naturalist Joseph Breintnall recorded the physical characteristics of leaves using printed impressions. He also experimented with printing feathers and fabric. Breintnall later expanded the applications of this technology with his friend Franklin.



1736. 7br 6th. A leaf of that Sort of Golden Rod which is much used by the Indians for a Remedy against when bitten by a Rattle Snake. The Top & upper Branches of the Plant are thick set with small yellow Flowers in August & September: It is known from other Sorts by the Smoothness of the Leaf, & its pungent Taste, and occasioning when chew'd and swallow'd, a small Stoppage of the Breath with & Contraction in the Throat; and the Stalk which is in some Places less than a Yard in Height when at full Growth, & in others more, is of a dull Purple Colour & smooth, and cover'd with a fine blue Dust, like many of the English Plums. It grows in most Wood-Lands, but under the Shade of the Trees is seldom rank or large, or with more than one, two, or three Stalks. It is also found on the Banks of dry Ditches, & sometimes in them, and in Hedge-Rows: But it is most luxuriant near to Rivulets, if the Soil be rich & not too moist, nor too much shaded. The Root continues over the Winter, and if set in a good Garden, will send forth (in the second or third Year) at least 50 Stalks. The Plant shoots early in the Spring, and withers late in the Fall.

I know not what to say concerning the best Way of preparing, or administring it; whether by Infusion, Decoction &c. But the Indians (I think I have heard) sometimes chew it, sometimes bruise it with a Stone and sometimes lay it upon the Wound, others about the Wound; and that always some of it is to be swallow'd, either with the Spittle or with Water.



31
RATTLESNAKE HERB
Joseph Breintnall

Philadelphia, June 7, 1736
Ink impression on paper
Du Simitiere Collection,
The Library Company of
Philadelphia.

Breintnall wrote an essay on the medicinal uses of the rattlesnake herb, and illustrated the plant on the back using his nature print method. He acknowledged that the information came from Indigenous peoples, though he did not credit specific sources.

RATTLE-SNAKE HERB.

THE *Indians* long made a Secret of the Herb they uſed in curing the Bite of that venemous Reptile a *RATTLE-SNAKE*: but ſince ſome curious Perſons among the *Engliſh* have fully diſcover'd and are now well acquainted with it, I hope it will be an acceptable Service to theſe Parts of the World, if I make it more publick by the following Deſcription, with the Figure of a Leaf of it.

THE Top and Branches of the Plant are thick ſet with ſmall yellow Flowers in *Auguſt* & *September*. It is a Species of *Golden-Rod*, known from the other Sorts by the ſmoothneſs of the Leaf, and its pungent Taſte, and occaſioning when chewed & ſwallow'd, a ſmall Stoppage of the Breath, and Contraction in the Throat; and the Stalk, which is in ſome Places leſs than a yard in height when at full Growth, in others more, is of a dull purple colour, and ſmooth, and cover'd with a fine blue Duſt, like that on many of the Engliſh Plums. It grows in moſt Wood-Lands, but under the Shade of Trees is ſeldom rank or large, or with more than one, two or three Stalks. It is alſo found on the Banks of dry Ditches, & ſometimes in them, & in Hedge-Rows: But it is moſt luxuriant near to Run Sides, if the Soil be rich, and not too moiſt, nor too much ſhaded. The Root continues over the Winter, and if ſet in a good Garden, will ſend forth (in the 2d or 3d Year) at leaſt 50 Stalks. The Plant ſhoots early in the Spring & withers late in the Fall.

The *Indians* uſe it variouſly; ſometimes they bruiſe it between Stones, ſometimes chew it and ſpit in the Patient's Mouth, ſome lay it to the Wound, others about the Wound, ſometimes they boil it and give the Water to drink, waſhing the Wound with it likewiſe: but always ſome of it is to be ſwallowed, either with the Spittle or with Water.

The Leaf figur'd in the Margin is one of the largeſt; for the moſt part they are not near ſo big though the Shape be the ſame.

Planets Motions for the 1, 8, 15, and 22 Days in each Month, 1737.

Mon.	Days	Sun's Place	♄	♃	♂	♀	☿	Mon.	Sun's Place	♄	♃	♂	♀	☿
January	1	22 41	6	21	1	27	23	July	20 ♋ 8	20	23	18	14	D.
	8	29 49	5	23	5	♓	17		26 48	21	23	20	17	8
	15	6 ♒ 56	5	24	8	14	17		3 ♌ 28	22	23	27	21	14
	22	14 3	5	26	12	25	29		10 10	23	22	♍	26	24
February	1	24 11	5	29	17	♈	♓	August	19 15	23	22	7	♎	♌
	8	1 ♓ 15	5	♓	21	13	R		26 30	24	21	12	10	27
	15	8 17	6	2	25	2	7		3 ♍ 14	25	20	16	17	♍
	22	15 18	6	3	29	29	1		10 0	25	19	21	24	23
March	1	22 17	6	5	♊	♆	D	September	19 44	26	18	27	♌	♎
	8	29 14	7	7	8	14	♓		26 34	26	17	♎	13	19
	15	6 ♈ 9	7	8	12	22	8		3 ♎ 26	26	16	6	20	28
	22	13 3	8	10	16	25	17		10 20	26	15	11	28	♍
April	1	22 51	9	12	22	♊	♈	October	19 15	26	14	17	♍	R.
	8	29 41	10	13	26	14	3		26 13	26	14	22	17	11
	15	6 ♉ 29	10	15	♋	19	14		3 ♍ 13	26	14	26	26	3
	22	13 15	11	16	5	24	♉		10 14	26	13	♍	♑	♎
May	1	21 55	13	18	10	28	♊	November	20 18	25	13	♎	16	♍
	8	28 39	13	19	14	♋	13		27 23	25	14	12	25	10
	15	5 ♊ 21	14	20	19	♊	26		4 ♐ 29	24	14	17	♍	21
	22	12 3	15	21	23	27	♋		11 36	24	14	22	12	♐
June	1	21 35	16	22	29	21	14	December	20 47	23	15	28	23	15
	8	28 15	17	22	♌	17	R		27 55	22	16	♐	♐	26
	15	4 ♋ 54	18	23	8	14	14		5 ♑ 4	22	17	8	11	♑
	22	11 34	19	23	12	13	10		12 13	21	18	13	10	13

32

"RATTLE-SNAKE HERB," POOR RICHARD'S ALMANACK, 1737

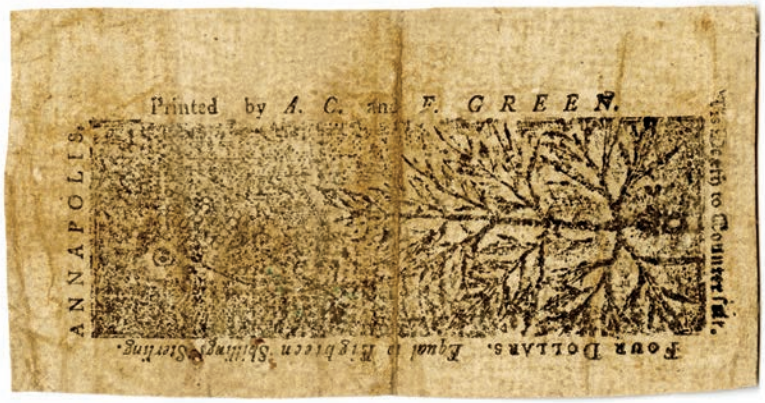
Joseph Breintnall and Benjamin Franklin

Philadelphia, 1736

Bound volume

APS.

Franklin edited and published Breintnall's essay in *Poor Richard's Almanack*, an inexpensive annual collection of useful knowledge. To help readers identify the rattlesnake herb, they invented a new printing technology. They illustrated the essay by adapting Breintnall's nature print method to mass print leaves.



Franklin realized his and Breintnall's nature-printing invention could be useful against counterfeiting because the unique patterns of leaves and fabrics were not easily reproduced. Franklin started printing currency using this technology in 1739 for the colonial government. Franklin's associates continued the practice after his retirement from printing.

33–34 (TOP)
PENNSYLVANIA CURRENCY
Benjamin Franklin and David Hall

Philadelphia, 1759 and 1764
Stereotype and letterpress
Duane Family Collection, APS. Gift of Morris Duane, 1957–1980.

35 (CENTER)
FOUR DOLLARS, MARYLAND
Anne Catherine Green and Frederick Green

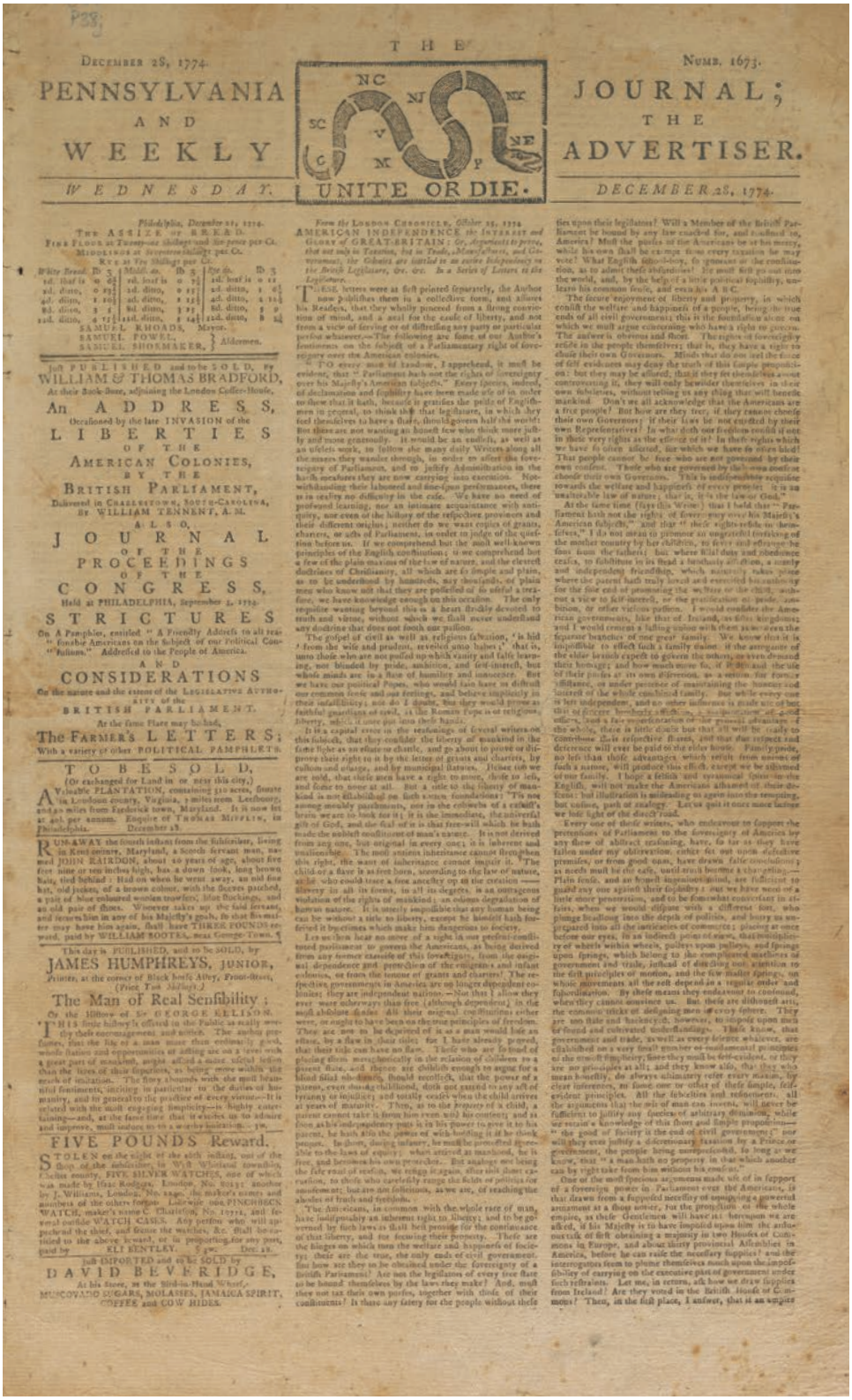
Annapolis, April 10, 1774
Stereotype and letterpress
Samuel Breck Collection, APS. Gift of Samuel Breck, 1856.

36 (BOTTOM LEFT)
EIGHTY DOLLARS, U.S.
David Hall and William Sellers

Philadelphia, January 14, 1779
Stereotype and letterpress
Samuel Breck Collection, APS. Gift of Samuel Breck, 1856.

37 (BOTTOM RIGHT)
COUNTERFEIT EIGHTY DOLLARS, U.S.
Unknown maker

After January 14, 1779
Engraving and letterpress
Samuel Breck Collection, APS. Gift of Samuel Breck, 1856.



THE

DECEMBER 28, 1774. NUMB. 1673.

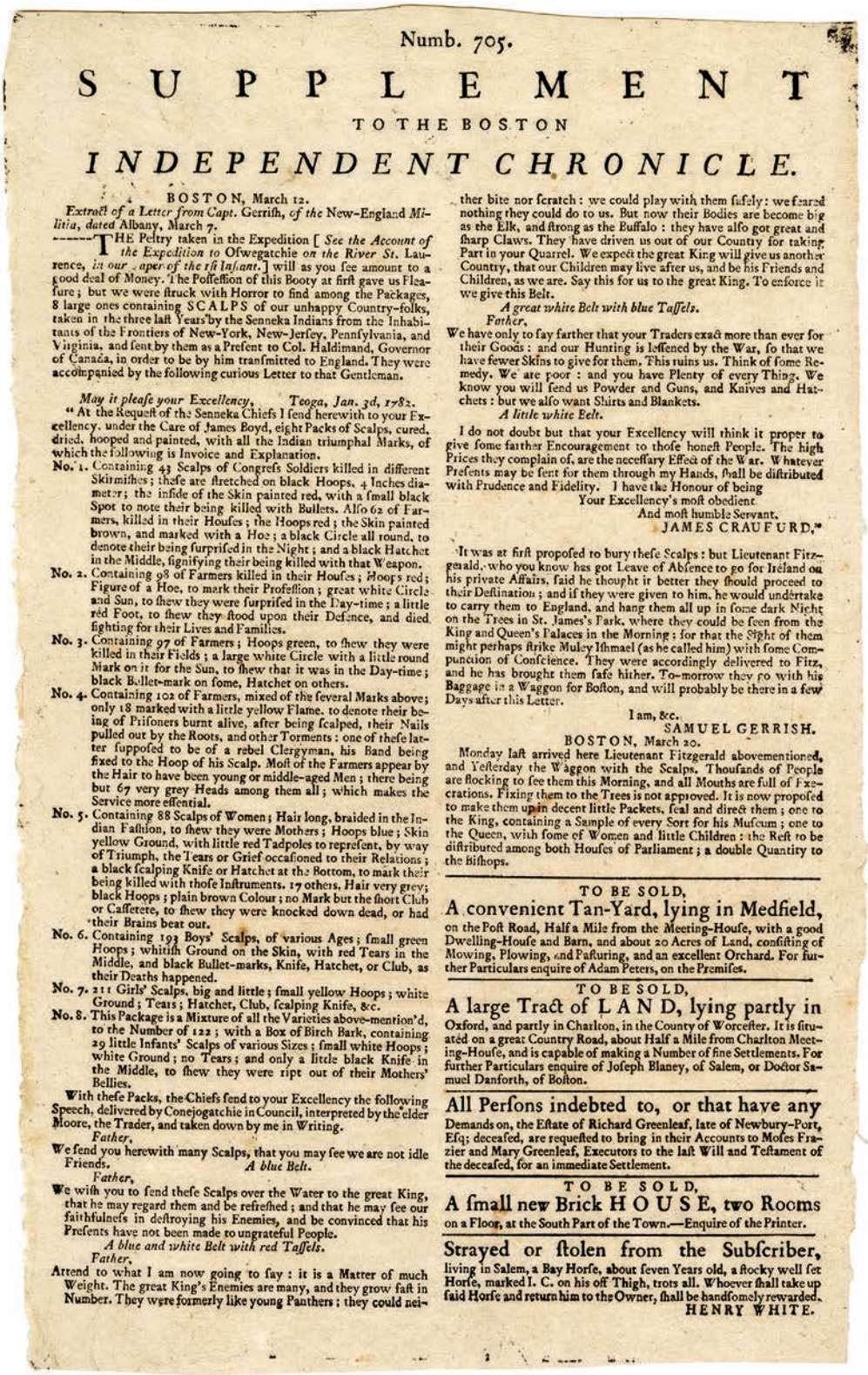
PENNSYLVANIA AND WEEKLY JOURNAL; THE ADVERTISER.

WEDNESDAY. UNITE OR DIE. DECEMBER 28, 1774.

38
PENNSYLVANIA JOURNAL
William and Thomas Bradford
Philadelphia,
December 28, 1774
Letterpress
APS.

Franklin understood the power of images. In 1754, he designed a political cartoon using the image of the North American rattlesnake. It rallied British colonists against the French. Other printers repurposed the famous image in 1774 to unite colonists against the British.

FIGURE 10
"JOIN, OR DIE," THE PENNSYLVANIA GAZETTE,
Benjamin Franklin
May 9, 1754
Library of Congress.
This is Franklin's original cartoon.



Numb. 705.

SUPPLEMENT

TO THE BOSTON

INDEPENDENT CHRONICLE.

BOSTON, March 12.

Extract of a Letter from Capt. Gerrish, *of the* New-England *Militia, dated* Albany, March 7.

"THE Peltry taken in the Expedition [*See the Account of the Expedition to* Oswegatchie *on the River St.* Laurence, *in our Paper of the 1st Inſtant.*] will as you ſee amount to a good deal of Money. The Poſſeſſion of this Booty at firſt gave us Pleaſure; but we were ſtruck with Horror to find among the Packages, 8 large ones containing SCALPS of our unhappy Country-folks, taken in the three laſt Years by the Senneka Indians from the Inhabitants of the Frontiers of New-York, New-Jerſey, Pennſylvania, and Virginia, and ſent by them as a Preſent to Col. Haldimand, Governor of Canada, in order to be by him tranſmitted to England. They were accompanied by the following curious Letter to that Gentleman.

May it pleaſe your Excellency, *Teoga, Jan. 3d, 1782.*

"At the Requeſt of the Senneka Chiefs I ſend herewith to your Excellency, under the Care of James Boyd, eight Packs of Scalps, cured, dried, hooped and painted, with all the Indian triumphal Marks, of which the following is Invoice and Explanation.

No. 1. Containing 43 Scalps of Congreſs Soldiers killed in different Skirmiſhes; theſe are ſtretched on black Hoops, 4 Inches diameter; the inſide of the Skin painted red, with a ſmall black Spot to note their being killed with Bullets. Alſo 62 of Farmers, killed in their Houſes; the Hoops red; the Skin painted brown, and marked with a Hoe; a black Circle all round, to denote their being ſurpriſed in the Night; and a black Hatchet in the Middle, ſignifying their being killed with that Weapon.

No. 2. Containing 98 of Farmers killed in their Houſes; Hoops red; Figure of a Hoe, to mark their Profeſſion; great white Circle and Sun, to ſhew they were ſurpriſed in the Day-time; a little red Foot, to ſhew they ſtood upon their Defence, and died fighting for their Lives and Families.

No. 3. Containing 97 of Farmers; Hoops green, to ſhew they were killed in their Fields; a large white Circle with a little round Mark on it for the Sun, to ſhew that it was in the Day-time; black Bullet-mark on ſome, Hatchet on others.

No. 4. Containing 102 of Farmers, mixed of the ſeveral Marks above; only 18 marked with a little yellow Flame, to denote their being of Priſoners burnt alive, after being ſcalped, their Nails pulled out by the Roots, and other Torments: one of theſe latter ſuppoſed to be of a rebel Clergyman, his Band being fixed to the Hoop of his Scalp. Moſt of the Farmers appear by the Hair to have been young or middle-aged Men; there being but 67 very grey Heads among them all; which makes the Service more eſſential.

No. 5. Containing 88 Scalps of Women; Hair long, braided in the Indian Faſhion, to ſhew they were Mothers; Hoops blue; Skin yellow Ground, with little red Tadpoles to repreſent, by way of Triumph, the Tears or Grief occaſioned to their Relations; a black ſcalping Knife or Hatchet at the Bottom, to mark their being killed with thoſe Inſtruments. 17 others. Hair very grey; black Hoops; plain brown Colour; no Mark but the ſhort Club or Caſſeterete, to ſhew they were knocked down dead, or had their Brains beat out.

No. 6. Containing 193 Boys' Scalps, of various Ages; ſmall green Hoops; whitiſh Ground on the Skin, with red Tears in the Middle, and black Bullet-marks, Knife, Hatchet, or Club, as their Deaths happened.

No. 7. 211 Girls' Scalps, big and little; ſmall yellow Hoops; white Ground; Tears; Hatchet, Club, ſcalping Knife, &c.

No. 8. This Package is a Mixture of all the Varieties above-mention'd, to the Number of 122; with a Box of Birch Bark, containing 29 little Infants' Scalps of various Sizes; ſmall white Hoops; white Ground; no Tears; and only a little black Knife in the Middle, to ſhew they were ript out of their Mothers' Bellies.

With theſe Packs, the Chiefs ſend to your Excellency the following Speech, delivered by Conejogatchie in Council, interpreted by the elder Moore, the Trader, and taken down by me in Writing.

Father,

We ſend you herewith many Scalps, that you may ſee we are not idle Friends. *A blue Belt.*

Father,

We wiſh you to ſend theſe Scalps over the Water to the great King, that he may regard them and be refreſhed; and that he may ſee our faithfulneſs in deſtroying his Enemies, and be convinced that his Preſents have not been made to ungrateful People.

A blue and white Belt with red Taſſels.

Father,

Attend to what I am now going to ſay: it is a Matter of much Weight. The great King's Enemies are many, and they grow faſt in Number. They were formerly like young Panthers; they could neither bite nor ſcratch: we could play with them ſafely: we feared nothing they could do to us. But now their Bodies are become big as the Elk, and ſtrong as the Buffalo: they have alſo got great and ſharp Claws. They have driven us out of our Country for taking Part in your Quarrel. We expect the great King will give us another Country, that our Children may live after us, and be his Friends and Children, as we are. Say this for us to the great King. To enforce it we give this Belt.

A great white Belt with blue Taſſels.

Father,

We have only to ſay farther that your Traders exact more than ever for their Goods: and our Hunting is leſſened by the War, ſo that we have fewer Skins to give for them. This ruins us. Think of ſome Remedy. We are poor: and you have Plenty of every Thing. We know you will ſend us Powder and Guns, and Knives and Hatchets: but we alſo want Shirts and Blankets.

A little white Belt.

I do not doubt but that your Excellency will think it proper to give ſome farther Encouragement to thoſe honeſt People. The high Prices they complain of, are the neceſſary Effect of the War. Whatever Preſents may be ſent for them through my Hands, ſhall be diſtributed with Prudence and Fidelity. I have the Honour of being

Your Excellency's moſt obedient

And moſt humble Servant.

JAMES CRAUFURD."

It was at firſt propoſed to bury theſe Scalps: but Lieutenant Fitzgerald, who you know has got Leave of Abſence to go for Ireland on his private Affairs, ſaid he thought it better they ſhould proceed to their Deſtination; and if they were given to him, he would undertake to carry them to England, and hang them all up in ſome dark Night on the Trees in St. James's Park, where they could be ſeen from the King and Queen's Palaces in the Morning: for that the Sight of them might perhaps ſtrike Mulcy Iſhmael (as he called him) with ſome Compunction of Conſcience. They were accordingly delivered to Fitz, and he has brought them ſafe hither. To-morrow they go with his Baggage in a Waggon for Boſton, and will probably be there in a few Days after this Letter.

I am, &c.

SAMUEL GERRISH.

BOSTON, March 20.

Monday laſt arrived here Lieutenant Fitzgerald abovementioned, and Yeſterday the Waggon with the Scalps. Thouſands of People are flocking to ſee them this Morning, and all Mouths are full of Execrations. Fixing them to the Trees is not approved. It is now propoſed to make them up in decent little Packets, ſeal and direct them; one to the King, containing a Sample of every Sort for his Muſeum; one to the Queen, with ſome of Women and little Children: the Reſt to be diſtributed among both Houſes of Parliament; a double Quantity to the Biſhops.

39
SUPPLEMENT TO THE BOSTON INDEPENDENT CHRONICLE
Benjamin Franklin
Passy, [March 12, 1782]
Letterpress
APS.

Knowing the power of print to shape public opinion, Franklin anonymously published this hoax newspaper in France and circulated it to the British press. He hoped the fictitious article about the British and their Seneca allies, in which he exploited racist stereotypes of Indigenous peoples, would influence the peace negotiations in favor of the United States following the American Revolution.

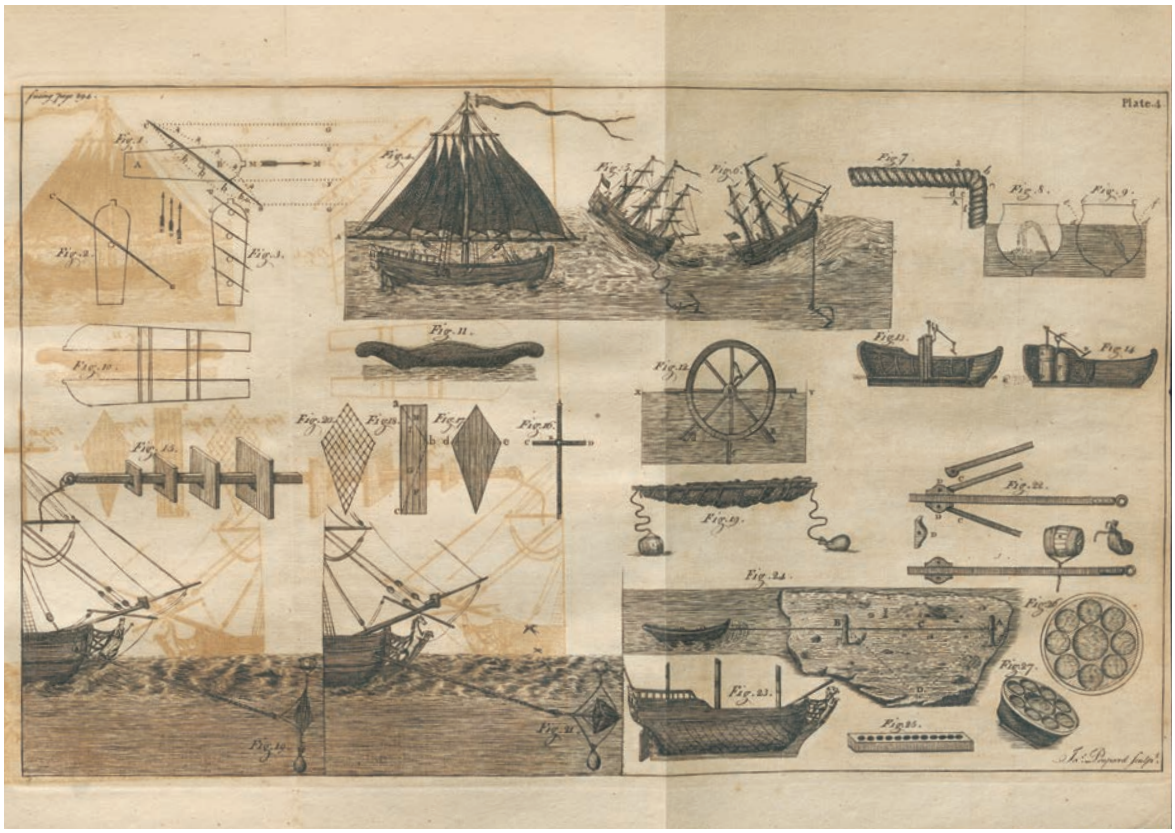
Careful readers picked up on clues that this paper was a hoax created by Franklin. He used fonts made especially for his press in France, which were distinct from those used by the real *Independent Chronicle*. Some readers recognized his satirical voice from his other writings. Today, as in the 18th century, media literacy skills are essential for people to evaluate a news source and acknowledge biases.

BETWEEN THE SEA AND SKY

Growing up near Boston Harbor with seafaring relatives, Franklin showed interest in the sea from his youth. Crossing the Atlantic as a political official, Franklin used his time at sea to study the ocean. As a citizen scientist, he desired to improve the speed and safety of sea travel, knowing that maritime science had political and economic consequences. Through his experiments and observations, Franklin came to appreciate the relationship between water and air, leading him to speculate on climate. His publications on these topics late in his life reveal that his passion for the sea never wavered.

40
CHART OF THE GULF STREAM
Benjamin Franklin and Timothy Folger, APS
Philadelphia, 1786
Engraving from bound volume
APS.

Timothy Folger and his cousin, Franklin, were the first to chart the Gulf Stream in 1768. Understood by sailors like Folger but unfamiliar to officials, this warm current impacted transatlantic travel. The first American chart appeared in the *Transactions of the American Philosophical Society*.



41 (ABOVE)
"MARITIME OBSERVATIONS"
Benjamin Franklin, APS

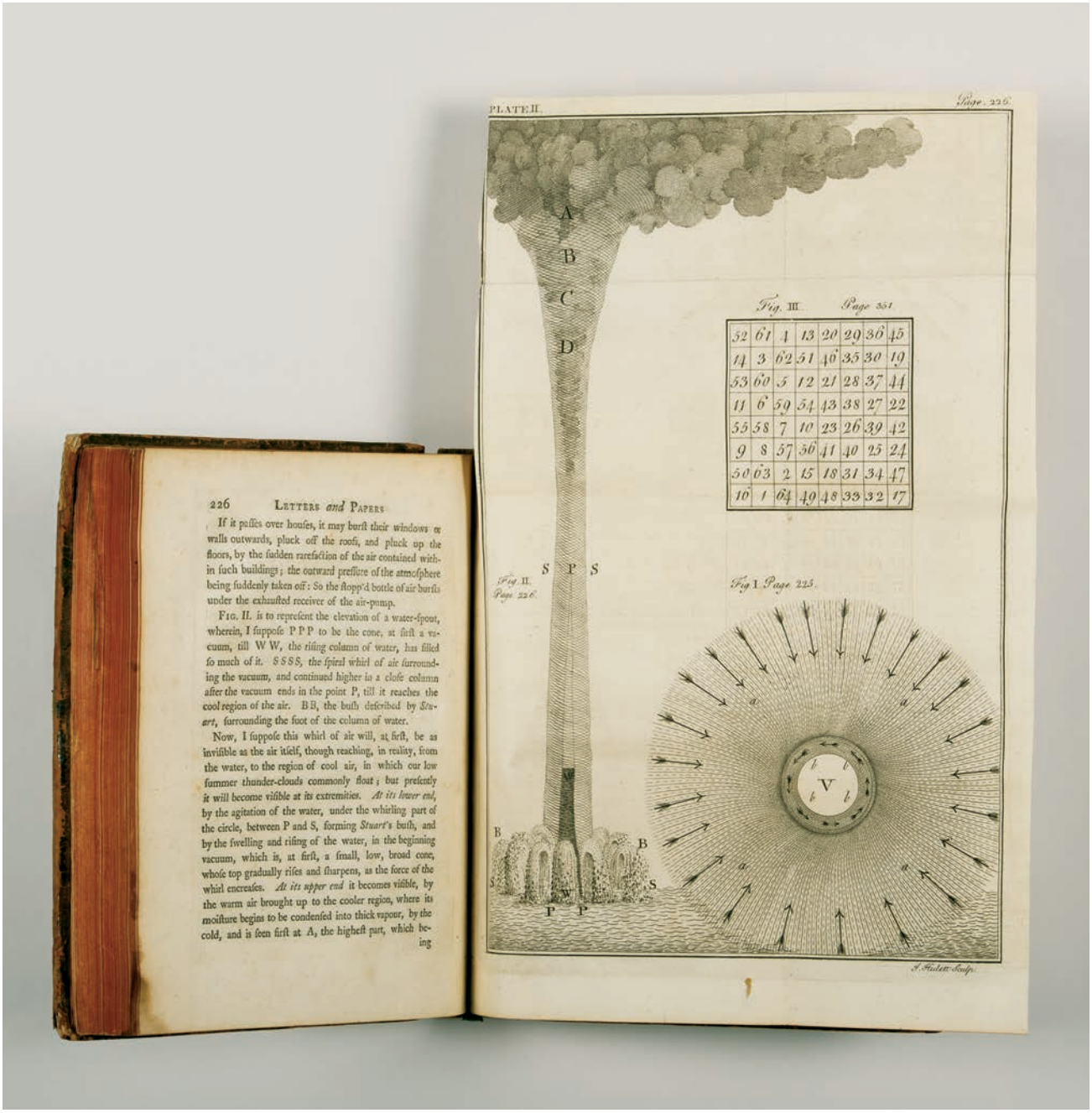
Philadelphia, 1786
Bound volume
APS.

In the *Transactions*, Franklin described inventions and improvements to boating practices, illustrated here. He based some of his designs on technologies developed by Pacific Islanders and Native Americans, who he nevertheless called "savages."

42 (LEFT)
CANE WITH OIL RESERVOIR
Unknown maker

Probably 18th century
Bamboo, staghorn or bone, and metal
APS, 2009.24. Gift of H. H. Harjes, 1915.

Using a similar cane, Franklin publicly demonstrated oil's ability to still waves. He poured oil, hidden in the cane's handle, onto bodies of water. Franklin read about this phenomenon as a child, observed it at sea, and confirmed it repeatedly through experiment.



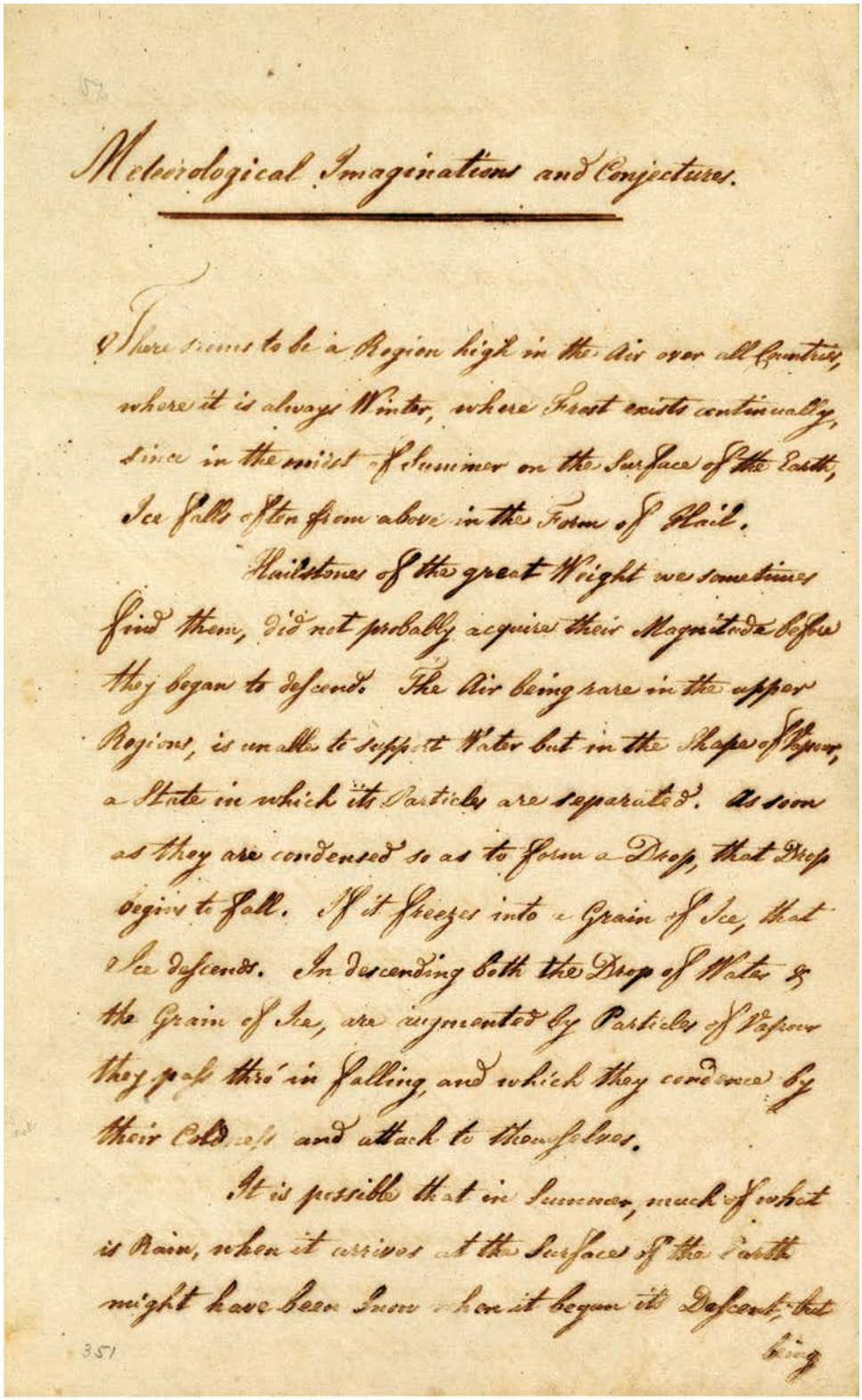
43
WATERSPOUT, EXPERIMENTS AND OBSERVATIONS ON ELECTRICITY, 4TH ED.
Benjamin Franklin
London, 1769
Bound volume
APS. Gift of the Metropolitan Museum of Art.

Franklin and his colleagues debated the cause of waterspouts. He correctly theorized that water is pulled upward into a swirling tower, illustrated here. Others incorrectly believed that waterspouts pulled water downward from the sky.

44
METEOROLOGICAL IMAGINATIONS AND CONJECTURES
Benjamin Franklin
Passy, c. 1784
Ink on paper
Archives, APS.

Following a particularly cold summer and "severe" winter in 1783, Franklin wrote this theory about climate. Franklin was one of many 18th-century scientists who theorized about the relationship between air, water, and global climate.

Franklin advocated for international cooperation to study weather and water temperatures around the earth to help people "take such measures as are possible and practicable to secure themselves" from the "mischiefs" of weather. His concern for global air circulation is shared by climate scientists today.



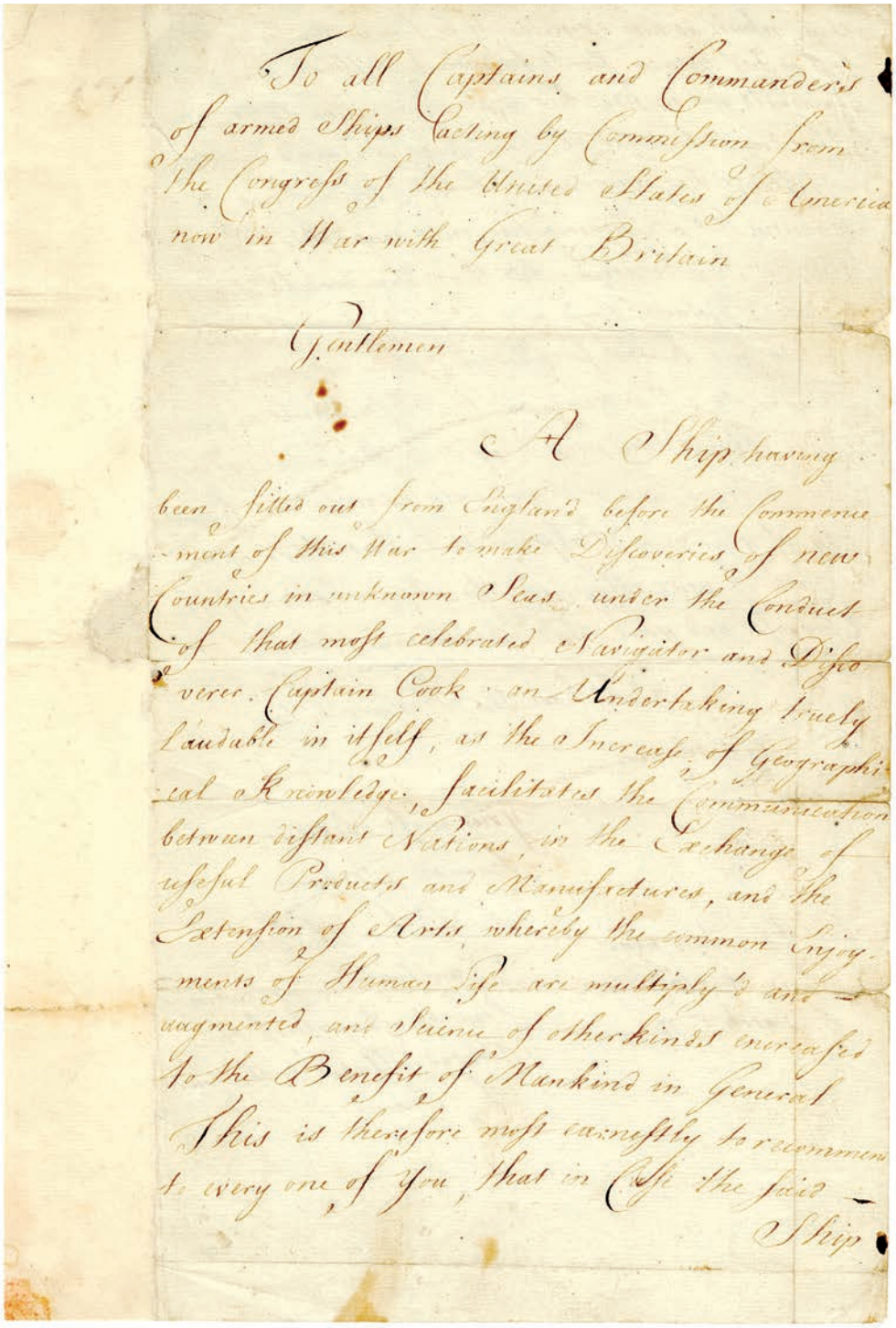
Meteorological Imaginations and Conjectures.

There seems to be a Region high in the Air over all Countries, where it is always Winter, where Frost exists continually, since in the midst of Summer on the Surface of the Earth, Ice falls often from above in the Form of Hail.

Hailstones of the great Weight we sometimes find them, did not probably acquire their Magnitude before they began to descend. The Air being rare in the upper Regions, is unable to support Water but in the Shape of Ice, a State in which its Particles are separated. As soon as they are condensed so as to form a Drop, that Drop begins to fall. If it freezes into a Grain of Ice, that Ice descends. In descending both the Drop of Water & the Grain of Ice, are augmented by Particles of Vapour they pass thro' in falling, and which they condense by their Cold as and attach to themselves.

It is possible that in Summer, much of what is Rain, when it arrives at the Surface of the Earth might have been Snow when it began its Descent, but

351



To all Captains and Commanders
of armed Ships acting by Commission from
the Congress of the United States of America
now in War with Great Britain

Gentlemen

A Ship having
been fitted out from England before the Commence-
ment of this War to make Discoveries of new
Countries in unknown Seas under the Conduct
of that most celebrated Navigator and Disco-
verer Captain Cook an Undertaking truely
Laudable in itself, as the Increase of Geographi-
cal Knowledge, facilitates the Communication
between distant Nations, in the Exchange of
useful Products and Manufactures, and the
Extension of Arts, whereby the common Enjoy-
ments of Human Life are multiply'd and
augmented, and Science of other kinds encreased
to the Benefit of Mankind in General
This is therefore most earnestly to recommen
to every one of You, that in Case the said
Ship

45
PASSPORT FOR CAPTAIN JAMES COOK
Benjamin Franklin
Passy, March 10, 1779
Ink on paper
Benjamin Franklin Miscellaneous Collection, APS.

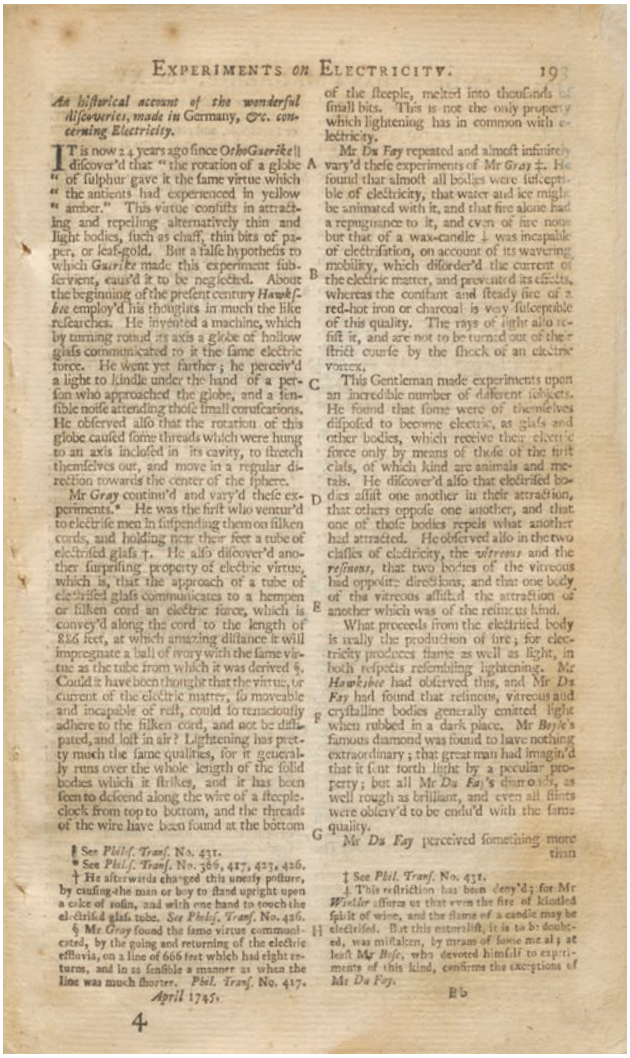
Franklin believed war should not interrupt science, as new knowledge improved "the common Enjoyments of human life." During the American Revolution, Franklin wrote this passport for the English explorer James Cook, granting him protection from American ships during his scientific voyage.

EXPERIENCING ELECTRICITY

Franklin's interest in electricity began in 1745 when the Library Company of Philadelphia received electrical equipment and descriptions of experiments from its London patron, Peter Collinson. The Library Company, founded in 1731 by Franklin and his fellow tradesmen to increase access to knowledge, gave Franklin the space and tools to perform his first electrical experiments. So began an obsession with a topic that had already taken Europe by storm. Franklin developed new theories and inventions, working around the city and out of his home. The international publication of his electrical writings made him a celebrity and led to important political appointments.

46
GLASS TUBE FOR ELECTRICAL EXPERIMENTS
Wistarburgh Glass House
Salem County, New Jersey, c.1746
Glass
APS, 58.38.

Eighteenth-century electrical researchers, called "electricians," generated static electricity by rubbing glass tubes with various materials. They used the charged tube to study the electrical properties of attraction and repulsion.



EXPERIMENTS *on* ELECTRICITY. 193

An hiſtorical account of the wonderful diſcoveries, made in Germany, *&c. concerning Electricity.*

IT is now 24 years ago ſince *Otho Guerike* ‖ diſcover'd that "the rotation of a globe "of ſulphur gave it the ſame virtue which "the antients had experienced in yellow "amber." This virtue conſiſts in attracting and repelling alternatively thin and light bodies, ſuch as chaff, thin bits of paper, or leaf-gold. But a falſe hypotheſis to which *Guerike* made this experiment ſubſervient, caus'd it to be neglected. About the beginning of the preſent century *Hawkſbee* employ'd his thoughts in much the like reſearches. He invented a machine, which by turning round its axis a globe of hollow glaſs communicated to it the ſame electric force. He went yet farther; he perceiv'd a light to kindle under the hand of a perſon who approached the globe, and a ſenſible noiſe attending thoſe ſmall coruſcations. He obſerved alſo that the rotation of this globe cauſed ſome threads which were hung to an axis incloſed in its cavity, to ſtretch themſelves out, and move in a regular direction towards the center of the ſphere.

Mr *Gray* continu'd and vary'd theſe experiments.* He was the firſt who ventur'd to electriſe men in ſuſpending them on ſilken cords, and holding near their feet a tube of electriſed glaſs †. He alſo diſcover'd another ſurpriſing property of electric virtue, which is, that the approach of a tube of electriſed glaſs communicates to a hempen or ſilken cord an electric force, which is convey'd along the cord to the length of 886 feet, at which amazing diſtance it will impregnate a ball of ivory with the ſame virtue as the tube from which it was derived §. Could it have been thought that the virtue, or current of the electric matter, ſo moveable and incapable of reſt, could ſo tenaciouſly adhere to the ſilken cord, and not be diſſipated, and loſt in air? Lightening has pretty much the ſame qualities, for it generally runs over the whole length of the ſolid bodies which it ſtrikes, and it has been ſeen to deſcend along the wire of a ſteeple-clock from top to bottom, and the threads of the wire have been found at the bottom of the ſteeple, melted into thouſands of ſmall bits. This is not the only property which lightening has in common with electricity.

Mr *Du Fay* repeated and almoſt infinitely vary'd theſe experiments of Mr *Gray* ‡. He found that almoſt all bodies were ſuſceptible of electricity, that water and ice might be animated with it, and that fire alone had a repugnance to it, and even of fire none but that of a wax-candle ‖ was incapable of electriſation, on account of its wavering mobility, which diſorder'd the current of the electric matter, and prevented its effects, whereas the conſtant and ſteady fire of a red-hot iron or charcoal is very ſuſceptible of this quality. The rays of light alſo reſiſt it, and are not to be turned out of their ſtrict courſe by the ſhock of an electric vortex.

This Gentleman made experiments upon an incredible number of different ſubjects. He found that ſome were of themſelves diſpoſed to become electric, as glaſs and other bodies, which receive their electric force only by means of thoſe of the firſt claſs, of which kind are animals and metals. He diſcover'd alſo that electriſed bodies aſſiſt one another in their attraction, that others oppoſe one another, and that one of thoſe bodies repels what another had attracted. He obſerved alſo in the two claſſes of electricity, the *vitreous* and the *reſinous*, that two bodies of the vitreous had oppoſite directions; and that one body of the vitreous aſſiſted the attraction of another which was of the reſinous kind.

What proceeds from the electriſed body is really the production of fire; for electricity produces flame as well as light, in both reſpects reſembling lightening. Mr *Hawkſbee* had obſerved this, and Mr *Du Fay* had found that reſinous, vitreous and cryſtalline bodies generally emitted light when rubbed in a dark place. Mr *Boyle*'s famous diamond was found to have nothing extraordinary; that great man had imagin'd that it ſent forth light by a peculiar property; but all Mr *Du Fay*'s diamonds, as well rough as brilliant, and even all flints were obſerv'd to be endu'd with the ſame quality.

Mr *Du Fay* perceived ſomething more than

‖ See *Philſ. Tranſ.* No. 431.
* See *Philſ. Tranſ.* No. 386, 417, 423, 426.
† He afterwards changed this uneaſy poſture, by cauſing the man or boy to ſtand upright upon a cake of roſin, and with one hand to touch the electriſed glaſs tube. *See Philſ. Tranſ.* No. 426.
§ Mr *Gray* found the ſame virtue communicated, by the going and returning of the electric effluvia, on a line of 666 feet which had eight returns, and in as ſenſible a manner as when the line was much ſhorter. *Phil. Tranſ.* No. 417. *April* 1745.
‡ See *Phil. Tranſ.* No. 431.
‖ This reſtriction has been deny'd; for Mr *Wheler* aſſures us that even the fire of kindled ſpirit of wine, and the flame of a candle may be electriſed. But this miſtake, it is to be doubted, was occaſioned by means of ſome metal; at leaſt Mr *Boſe*, who devoted himſelf to experiments of this kind, confirms the exceptions of Mr *Du Fay*.

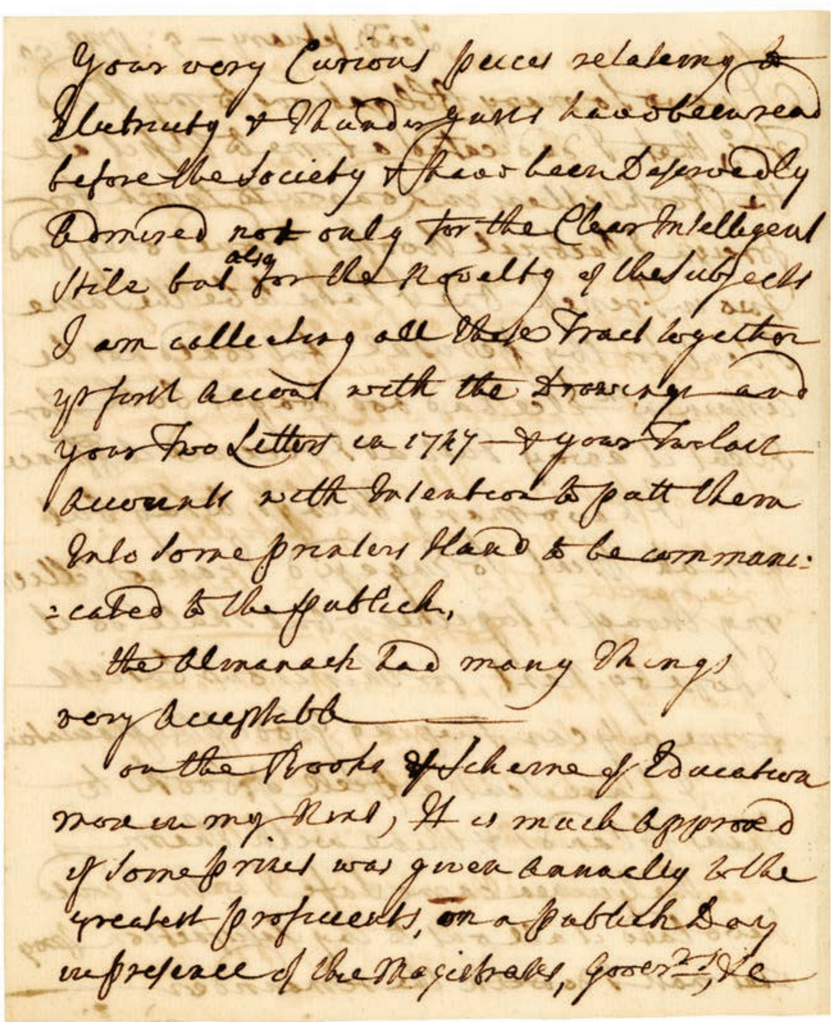
4

47
"EXPERIMENTS ON ELECTRICITY"
Albrecht von Haller (author), Edward Cave (publisher)
London, March 1745
Bound volume
APS.

Gentleman's Magazine published this article summarizing important European electrical experiments. English scientist Peter Collinson sent a copy of it, along with a glass tube, to the Library Company of Philadelphia in 1745. These gifts sparked Franklin's interest in electricity.

48
BATTERY OF LEYDEN JARS
Unknown maker
After 1746
Glass, metal, and wood
APS, 58.36. Gift of Joseph Hopkinson, 1836.

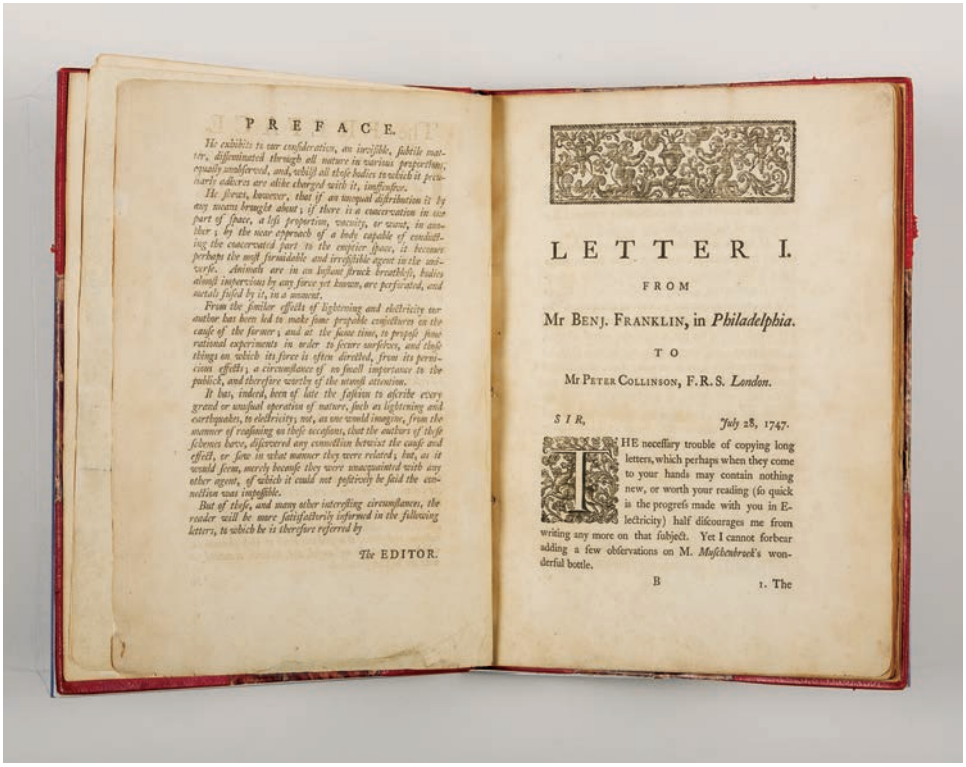
Electricians stored static electricity in metal-coated glass containers called Leyden jars. Franklin was first to correctly theorize how they worked. He invented a method of connecting multiple jars into a "battery." It discharged the jars together, allowing for more powerful applications of electricity.



Your very Curious pieces relateing to
Electricity & Thundergusts have been read
before the Society & have been Deservedly
Admired not only for the Clear Intelligent
Stile but also for the Novelty of the subjects
I am collecting all these Tracts together
wth first accot with the Drawings and
your Two Letters in 1747 & your last
accounts with Intention to putt them
Into some printers Hand to be communi:
:cated to the publick,
the Almanack had many things
very acceptable
on the Books & Scheme of Education
more in my Next, It is much approved
if some prizes was given annually to the
greatest proficients, on a publick Day
in presence of the Magistrates, Goverr &c

49
LETTER TO BENJAMIN FRANKLIN
Peter Collinson
London, February 5, 1750
Ink on paper
Benjamin Franklin Papers, APS. Gift of Charles Pemberton and Mary Fox, 1840.

Franklin communicated his experiments and observations on electricity in a series of letters to Peter Collinson, a merchant, botanist, and patron to many colonial scientists. Impressed with Franklin's work, Collinson told him in this letter of plans to publish the correspondence in London.



PREFACE.

He exhibits to our conſideration, an inviſible, fubtile matter, diſſeminated through all nature in various proportions; equally unobſerved, and, whilſt all thoſe bodies to which it peculiarly adheres are alike charged with it, inoffenſive.

He fhews, however, that if an unequal diſtribution it by any means brought about; if there is a concentration in one part of ſpace, a leſs proportion, vacuity, or want, in another; by the near approach of a body capable of conducting the concentrated part to the emptier ſpace, it becomes perhaps the moſt formidable and irreſiſtible agent in the univerſe. Animals are in an inſtant ſtruck breathleſs, bodies almoſt impervious by any force yet known, are perforated, and metals fuſed by it, in a moment.

From the ſimilar effects of lightening and electricity our author has been led to make ſome probable conjectures on the cauſe of the former; and at the ſame time, to propoſe ſome rational experiments in order to ſecure ourſelves, and thoſe things on which its force is often directed, from its pernicious effects; a circumſtance of no ſmall importance to the publick, and therefore worthy of the moſt attention.

It has, indeed, been of late the faſhion to aſcribe every grand or unuſual operation of nature, ſuch as lightening and earthquakes, to electricity; not, as one would imagine, from the manner of reaſoning on thoſe occaſions, that the authors of thoſe ſchemes have, diſcovered any connection between the cauſe and effect, or ſeen in what manner they were related; but, as it would ſeem, merely becauſe they were unacquainted with any other agent, of which it could not poſitively be ſaid the connection was impoſſible.

But of theſe, and many other intereſting circumſtances, the reader will be more ſatisfactorily informed in the following letters, to which he is therefore referred by

The EDITOR.

LETTER I.

FROM

Mr BENJ. FRANKLIN, in *Philadelphia.*

TO

Mr PETER COLLINSON, F.R.S. *London.*

SIR, *July* 28, 1747.

THE neceſſary trouble of copying long letters, which perhaps when they come to your hands may contain nothing new, or worth your reading (ſo quick is the progreſs made with you in Electricity) half diſcourages me from writing any more on that ſubject. Yet I cannot forbear adding a few obſervations on M. *Muſchenbroek's* wonderful bottle.

B 1. The

50
EXPERIMENTS AND OBSERVATIONS ON ELECTRICITY, 1ST ED.
Benjamin Franklin (author), Peter Collinson (editor)

London, 1751
Bound volume
APS.

This book established Franklin's reputation as an important electrician. It included Franklin's letters to Collinson describing new electrical experiments in a way that invited others to repeat them. When they replicated Franklin's results, Europeans were forced to take colonial scientists seriously.

51
EXPERIMENTS AND OBSERVATIONS ON ELECTRICITY, 5TH ED.
Benjamin Franklin (author and editor)

London, 1774
Bound volume
APS. Gift of the Metropolitan Museum of Art.

High demand for Franklin's *Experiments and Observations* led to five English editions and translations in French, German, Italian, and Latin in his lifetime. Franklin added writings to the fourth and fifth English editions reflecting his other scientific interests.

EXTRACT

OF

LETTER I.

FROM

BENJ. FRANKLIN, *Eſq;* at *Philadelphia,*

TO

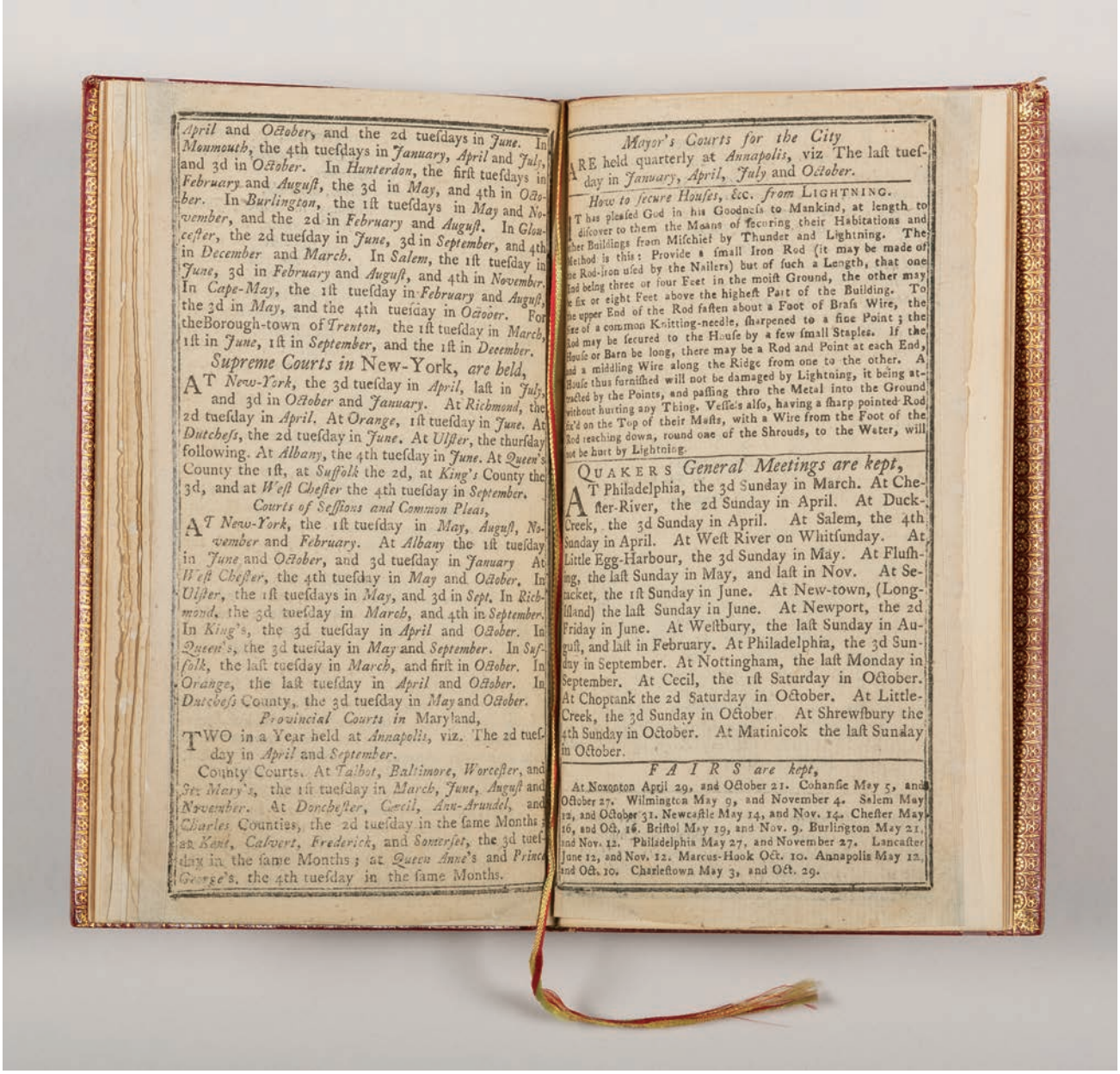
PETER COLLINSON, Eſq; F. R. S. *London.*

SIR, *Philadelphia, March* 28, 1747.

YOUR kind preſent of an electric tube, with directions for uſing it, has put ſeveral of us * on making electrical experiments, in which we have obſerved ſome particular phænomena that we look upon to be new. I ſhall therefore communicate them to you in my next, though poſſibly they may not be new to you, as among the numbers daily employed in thoſe experi-

* i. e. *of the Library-Company,* an inſtitution of the Author's, founded 1731. To which company the preſent was made.

B ments



April and October, and the 2d tuesdays in June. In Monmouth, the 4th tuesdays in January, April and July, and 3d in October. In Hunterdon, the first tuesdays in February and August, the 3d in May, and 4th in October. In Burlington, the 1st tuesdays in May and November, and the 2d in February and August. In Gloucester, the 2d tuesday in June, 3d in September, and 4th in December and March. In Salem, the 1st tuesday in June, 3d in February and August, and 4th in November. In Cape-May, the 1st tuesday in February and August, the 3d in May, and the 4th tuesday in October. For the Borough-town of Trenton, the 1st tuesday in March, 1st in June, 1st in September, and the 1st in December.

Supreme Courts in New-York, *are held,*

AT New-York, the 3d tuesday in April, last in July, and 3d in October and January. At Richmond, the 2d tuesday in April. At Orange, 1st tuesday in June. At Dutchess, the 2d tuesday in June. At Ulster, the thursday following. At Albany, the 4th tuesday in June. At Queen's County the 1st, at Suffolk the 2d, at King's County the 3d, and at West Chester the 4th tuesday in September.

Courts of Sessions and Common Pleas,

AT New-York, the 1st tuesday in May, August, November and February. At Albany the 1st tuesday in June and October, and 3d tuesday in January At West Chester, the 4th tuesday in May and October. In Ulster, the 1st tuesdays in May, and 3d in Sept. In Richmond, the 3d tuesday in March, and 4th in September. In King's, the 3d tuesday in April and October. In Queen's, the 3d tuesday in May and September. In Suffolk, the last tuesday in March, and first in October. In Orange, the last tuesday in April and October. In Dutchess County, the 3d tuesday in May and October.

Provincial Courts in Maryland,

TWO in a Year held at Annapolis, viz. The 2d tuesday in April and September.

County Courts. At Talbot, Baltimore, Worcester, and St. Mary's, the 1st tuesday in March, June, August and November. At Dorchester, Cecil, Ann-Arundel, and Charles Counties, the 2d tuesday in the same Months; at Kent, Calvert, Frederick, and Somerset, the 3d tuesday in the same Months; at Queen Anne's and Prince George's, the 4th tuesday in the same Months.

Mayor's Courts for the City

ARE held quarterly at Annapolis, viz The last tuesday in January, April, July and October.

How to secure Houses, &c. from LIGHTNING.

IT has pleased God in his Goodness to Mankind, at length to discover to them the Means of securing their Habitations and other Buildings from Mischief by Thunder and Lightning. The Method is this: Provide a small Iron Rod (it may be made of one Rod-iron used by the Nailers) but of such a Length, that one End being three or four Feet in the moist Ground, the other may be six or eight Feet above the highest Part of the Building. To the upper End of the Rod fasten about a Foot of Brass Wire, the Size of a common Knitting-needle, sharpened to a fine Point; the Rod may be secured to the House by a few small Staples. If the House or Barn be long, there may be a Rod and Point at each End, and a middling Wire along the Ridge from one to the other. A House thus furnished will not be damaged by Lightning, it being attracted by the Points, and passing thro the Metal into the Ground without hurting any Thing. Vessels also, having a sharp pointed Rod fix'd on the Top of their Masts, with a Wire from the Foot of the Rod reaching down, round one of the Shrouds, to the Water, will not be hurt by Lightning.

QUAKERS *General Meetings are kept,*

AT Philadelphia, the 3d Sunday in March. At Chester-River, the 2d Sunday in April. At Duck-Creek, the 3d Sunday in April. At Salem, the 4th Sunday in April. At West River on Whitsunday. At Little Egg-Harbour, the 3d Sunday in May. At Flushing, the last Sunday in May, and last in Nov. At Sea-cacket, the 1st Sunday in June. At New-town, (Long-Island) the last Sunday in June. At Newport, the 2d Friday in June. At Westbury, the last Sunday in August, and last in February. At Philadelphia, the 3d Sunday in September. At Nottingham, the last Monday in September. At Cecil, the 1st Saturday in October. At Choptank the 2d Saturday in October. At Little-Creek, the 3d Sunday in October At Shrewsbury the 4th Sunday in October. At Matinicok the last Sunday in October.

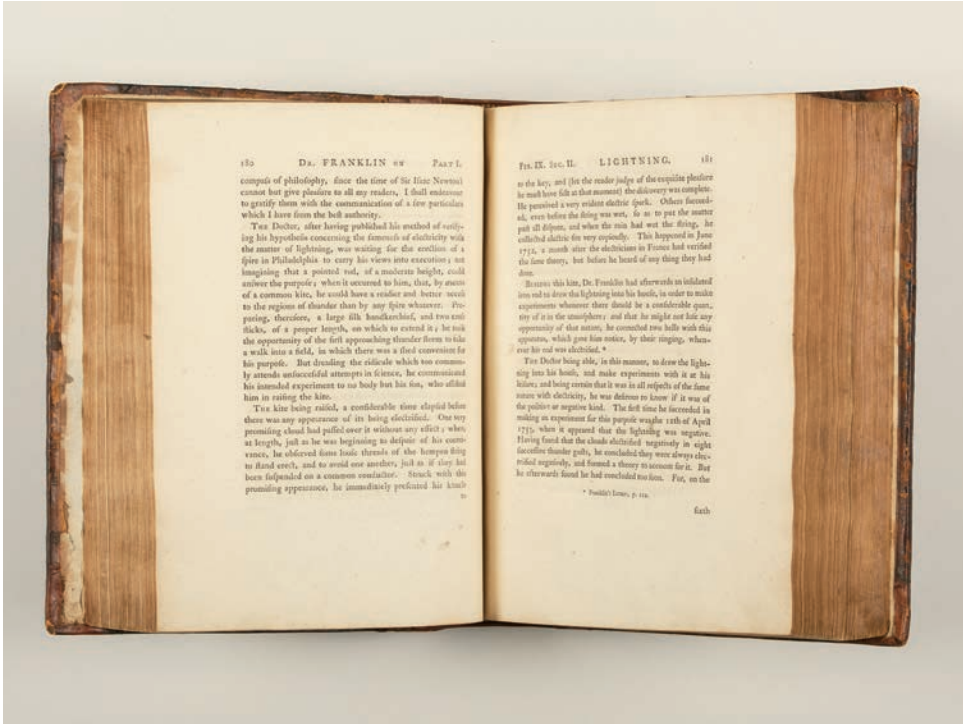
FAIRS are kept,

At Noxonton April 29, and October 21. Cohansie May 5, and October 27. Wilmington May 9, and November 4. Salem May 12, and October 31. Newcastle May 14, and Nov. 14. Chester May 16, and Oct. 16. Bristol May 19, and Nov. 9. Burlington May 21, and Nov. 12. Philadelphia May 27, and November 27. Lancaster June 12, and Nov. 12. Marcus-Hook Oct. 10. Annapolis May 12, and Oct. 10. Charlestown May 3, and Oct. 29.

52
"HOW TO SECURE HOUSES, &C. FROM LIGHTNING," POOR RICHARD'S ALMANACK, 1753
Benjamin Franklin
Philadelphia, 1752
Bound volume
APS.

Franklin invented the lightning rod to protect buildings from fires caused by lightning strikes. The rod redirected the bolt's charge into the ground. He described this useful invention here to benefit the broadest audience possible.

FIGURE 11
TOP PORTION OF LIGHTNING ROD
c. 1756
The Franklin Institute, Philadelphia, PA.
Photo: Peter Harholdt.



180 DR. FRANKLIN ON PART I.

compass of philosophy, since the time of Sir Isaac Newton) cannot but give pleasure to all my readers, I shall endeavour to gratify them with the communication of a few particulars which I have from the best authority.

THE Doctor, after having published his method of verifying his hypothesis concerning the semenels of electricity with the matter of lightning, was waiting for the erection of a spire in Philadelphia to carry his views into execution; not imagining that a pointed rod, of a moderate height, could answer the purpose; when it occurred to him, that, by means of a common kite, he could have a readier and better access to the regions of thunder than by any spire whatever. Proposing, therefore, a large silk handkerchief, and two small sticks, of a proper length, on which to extend it; he took the opportunity of the first approaching thunder storm to take a walk into a field, in which there was a shed convenient for his purpose. But dreading the ridicule which too commonly attends unsuccessful attempts in science, he communicated his intended experiment to no body but his son, who assisted him in raising the kite.

THE kite being raised, a considerable time elapsed before there was any appearance of its being electrified. One very promising cloud had passed over it without any effect; when, at length, just as he was beginning to despair of his contrivance, he observed some loose threads of the hempen string to stand erect, and to avoid one another, just as if they had been suspended on a common conductor. Struck with this promising appearance, he immediately prefented his knuck-

PT. II. SEC. II. LIGHTNING. 181

to the key, and [let the reader judge of the exquisite pleasure he muft have felt at that moment] the difcovery was complete. He perceived a very evident electric fpark. Others fucceeded, even before the ftring was wet, fo as to put the matter paft all difpute, and when the rain had wet the ftring, he collected electric fire very copioufly. This happened in June 1752, a month after the electricians in France had verified the fame theory, but before he heard of any thing they had done.

BEFORE this kite, Dr. Franklin had afterwards an infulated iron rod to draw the lightning into his houfe, in order to make experiments whenever there fhould be a confiderable quantity of it in the atmofphere: and that he might not lofe any opportunity of that nature, he contrived two bells with this apparatus, which gave him notice, by their ringing, whenever his rod was electrified. *

THE Doctor being able, in this manner, to draw the lightning into his houfe, and make experiments with it at his leifure; and being certain that it was in all refpects of the fame nature with electricity, he was defirous to know if it was of the pofitive or negative kind. The firft time he fucceeded in making an experiment for this purpofe was the 12th of April 1753, when it appeared that the lightning was negative. Having found that the clouds electrified negatively in eight fucceffive thunder gufts, he concluded they were always electrified negatively, and formed a theory to account for it. But he afterwards found he had concluded too faft. For, on the

* Priefley's Letters, p. 102.

faith

53
HISTORY & PRESENT STATE OF ELECTRICITY
Joseph Priestley
London, 1767
Bound volume
APS.

Franklin encouraged the chemist Joseph Priestley to write this history of electrical research. It included the first complete description of Franklin's famous 1752 kite and key experiment, which confirmed the ancient theory that lightning and electricity are "of the same nature."

54
ESSAI SUR L'ELECTRICITÉ
Abbé Jean-Antoine Nollet
Paris, 1746
Bound volume
APS.

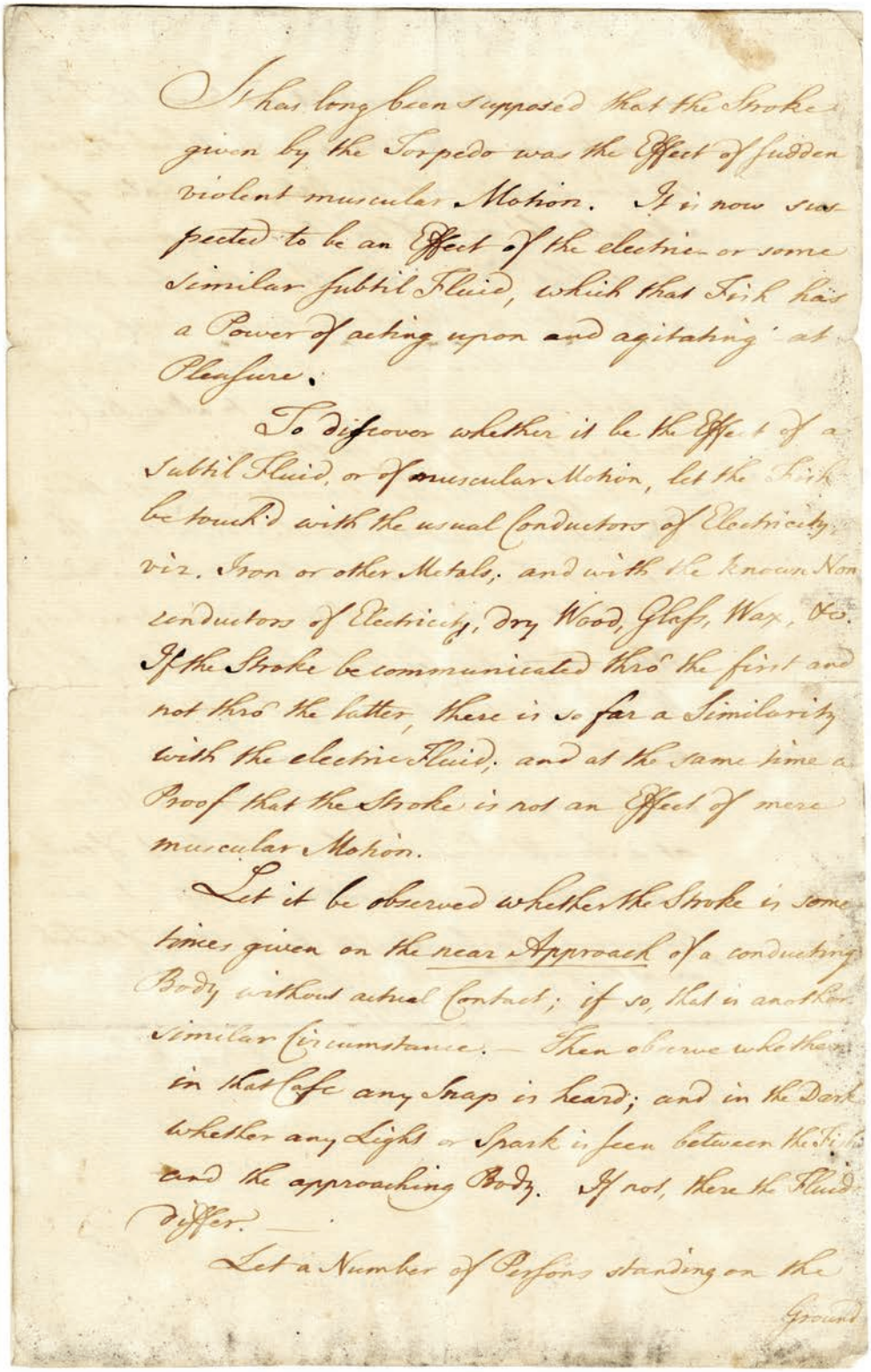
French scientist Abbé Nollet wrote about electricity in this book. Franklin's theories later challenged Nollet's work, leading to a rivalry. Franklin never answered Nollet's criticisms directly, allowing friends to defend him.

ESSAI
SUR
L'ELECTRICITÉ
DES CORPS.

Par M. l'Abbé NOLLET, de l'Académie Royale des Sciences, & de la Société Royale de Londres.

A PARIS,
Chez les Freres GUERIN, rue S. Jacques, vis-à-vis les Mathurins, à S. Thomas d'Aquin.

M. DCC. XLVI.
Avec Approbation & Privilege du Roy.



It has long been supposed that the Stroke given by the Torpedo was the Effect of sudden violent muscular Motion. It is now suspected to be an Effect of the electric or some similar subtil Fluid, which that Fish has a Power of acting upon and agitating at Pleasure.

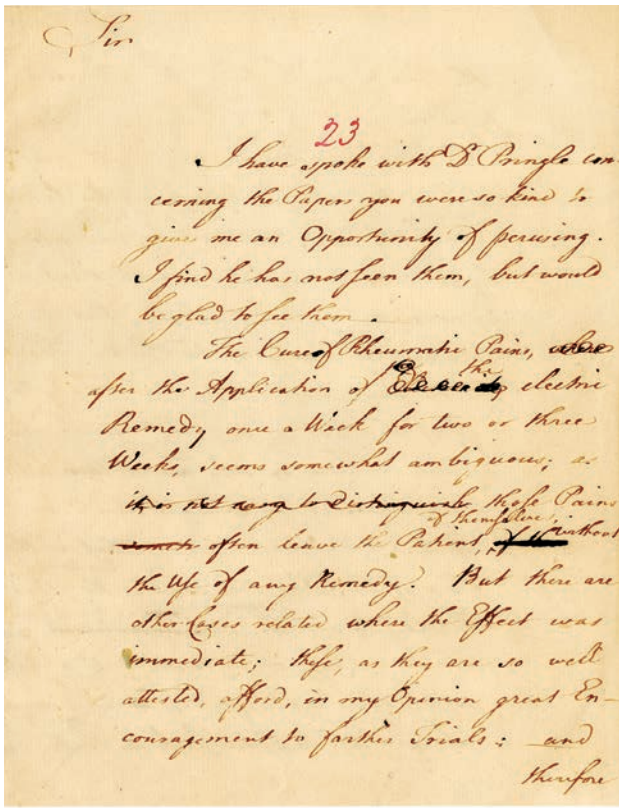
To discover whether it be the Effect of a subtil Fluid, or of muscular Motion, let the Fish be touch'd with the usual Conductors of Electricity, viz. Iron or other Metals, and with the known Non conductors of Electricity, dry Wood, Glass, Wax, &c. If the Stroke be communicated thro' the first and not thro' the latter, there is so far a Similarity with the electric Fluid, and at the same time a Proof that the Stroke is not an Effect of mere muscular Motion.

Let it be observed whether the Stroke is sometimes given on the near Approach of a conducting Body without actual Contact; if so, that is another similar Circumstance. — Then observe whether in that Case any Snap is heard; and in the Dark whether any Light or Spark is seen between the Fish and the approaching Body. If not, there the Fluids differ. —

Let a Number of Persons standing on the Ground

55
PROPOSED ELECTRICAL EXPERIMENTS ON THE TORPEDO FISH
Benjamin Franklin
London, August 12, 1772
Ink on paper
Benjamin Franklin Miscellaneous Collection, APS.

Torpedo fish confused scientists with their ability to numb people with a shock. Franklin devised experiments, described here, to determine whether the animals had electrical properties. Shockingly, they do, as Franklin's colleagues later proved.



Sir

23

I have spoke with D. Pringle concerning the Paper you were so kind to give me an Opportunity of perusing. I find he has not seen them, but would be glad to see them.

The Cure of Rheumatic Pains, after the Application of the electric Remedy one a Week for two or three Weeks, seems somewhat ambiguous; as those Pains often leave the Patient, without the Use of any Remedy. But there are other Cases related when the Effect was immediate; these, as they are so well attested, afford, in my Opinion great Encouragement to farther Trials: and therefore

56
LETTER ON THE CURE OF RHEUMATISM
Benjamin Franklin

London, c. 1773
Ink on paper
Benjamin Franklin Papers,
APS. Gift of Charles
Pemberton and Mary Fox, 1840.

After electrifying their own bodies—accidentally or intentionally—during experimentation, Franklin and others wondered about medical applications of electricity. In this draft of a letter, Franklin questioned an unidentified electrician on his attempt to cure rheumatism, a type of arthritis.

57
L'ANTIMAGNÉTISME
Jean-Jacques Paulet

Paris, 1784
Bound volume
APS.

Franz Mesmer, criticized in this book, claimed healing powers through manipulation of a bodily magnetic fluid, similar to electricity. The exaggerated illustration, shown here, mocked Mesmer's medical performances. King Louis XVI of France requested that Franklin investigate Mesmer. Franklin concluded that the power of suggestion was responsible for Mesmer's results.

L'ANTIMAGNÉTISME

OU

ORIGINE, PROGRÈS, DÉCADENCE,

RENOUVELLEMENT ET RÉFUTATION

DU MAGNÉTISME ANIMAL.

Sed quanto ille magis formas se vertet in omnes,
Tanto, nate, magis contende tenacia vincla,
Donec talis erit, mutato corpore, qualem
Videris, incepto. . . . . .
VIRGIL. *Georgic. lib. IV.*

A LONDRES.

1784.

58
L'EXPÉRIENCE SUR L'ELECTRICITÉ
Mme. Veuve Turgis after Charles-Amédée-Philippe Van Loo

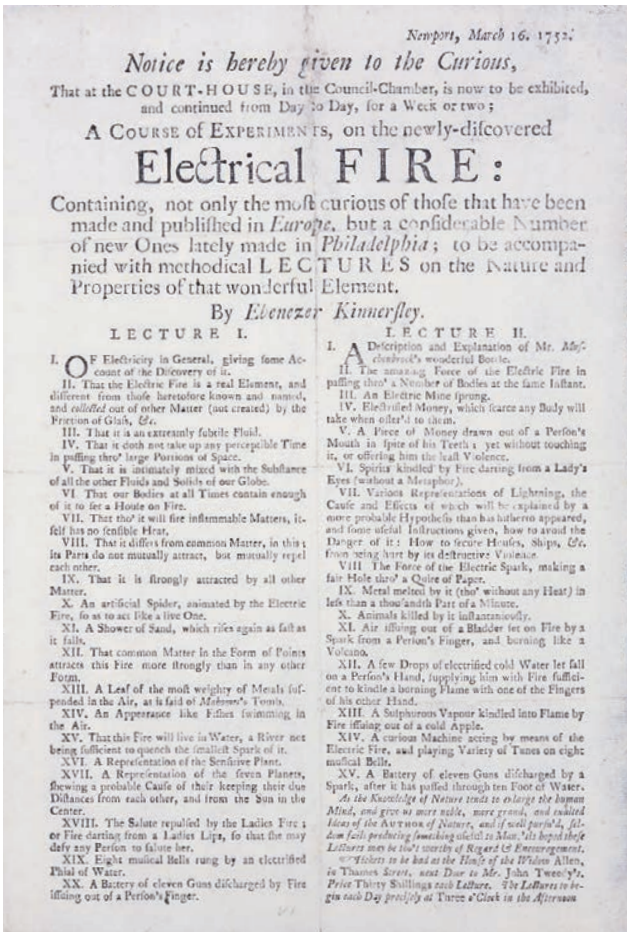
Paris, After 1777
Hand-colored engraving
APS.

In this public spectacle, a man electrifies a woman. She holds a rod that will painfully shock the Black youth for the entertainment of the elite audience. Such scientific practices reinforced unequal social relationships based on gender, race, and class.

59
ADVERTISEMENT FOR PUBLIC ELECTRICAL DEMONSTRATIONS
Ebenezer Kinnersley (author), Ann and James Franklin (printers)

Newport, March 6, 1752
Letterpress
A752n, The Rosenbach, Philadelphia.

Electricians demonstrated the science of electricity for public entertainment and education, as well as profit. Ebenezer Kinnersley toured the colonies performing experiments designed with his friend and collaborator, Franklin. Audiences from Boston to the West Indies saw the experiments advertised here.



Newport, March 16. 1752.

Notice is hereby given to the Curious,

That at the COURT-HOUSE, in the Council-Chamber, is now to be exhibited, and continued from Day to Day, for a Week or two;

A COURSE of EXPERIMENTS, on the newly-discovered

Electrical FIRE:

Containing, not only the most curious of those that have been made and published in *Europe*, but a considerable Number of new Ones lately made in *Philadelphia*; to be accompanied with methodical LECTURES on the Nature and Properties of that wonderful Element.

By *Ebenezer Kinnersley.*

LECTURE I.

I. OF Electricity in General, giving some Account of the Discovery of it.

II. That the Electric Fire is a real Element, and different from those heretofore known and named, and collected out of other Matter (but created) by the Friction of Glass, &c.

III. That it is an extreamly subtile Fluid.

IV. That it doth not take up any perceptible Time in passing thro' large Portions of Space.

V. That it is intimately mixed with the Substance of all the other Fluids and Solids of our Globe.

VI. That our Bodies at all Times contain enough of it to set a House on Fire.

VII. That tho' it will fire inflammable Matters, itself has no sensible Heat.

VIII. That it differs from common Matter, in this; its Parts do not mutually attract, but mutually repel each other.

IX. That it is strongly attracted by all other Matter.

X. An artificial Spider, animated by the Electric Fire, so as to act like a live One.

XI. A Shower of Sand, which rises again as fast as it falls.

XII. That common Matter in the Form of Points attracts this Fire more strongly than in any other Form.

XIII. A Leaf of the most weighty of Metals suspended in the Air, as is said of *Mahomet's* Tomb.

XIV. An Appearance like Fishes swimming in the Air.

XV. That this Fire will live in Water, a River not being sufficient to quench the smallest Spark of it.

XVI. A Representation of the Sensitive Plant.

XVII. A Representation of the seven Planets, shewing a probable Cause of their keeping their due Distances from each other, and from the Sun in the Center.

XVIII. The Salute repulsed by the Ladies Fire; or Fire darting from a Ladies Lips, so that she may defy any Person to salute her.

XIX. Eight musical Bells rung by an electrified Phial of Water.

XX. A Battery of eleven Guns discharged by Fire issuing out of a Person's Finger.

LECTURE II.

I. A Description and Explanation of Mr. *Musschenbrook's* wonderful Bottle.

II. The amazing Force of the Electric Fire in passing thro' a Number of Bodies at the same Instant.

III. An Electric Mine sprung.

IV. Electrified Money, which scarce any Body will take when offer'd to them.

V. A Piece of Money drawn out of a Person's Mouth in Spite of his Teeth; yet without touching it, or offering him the least Violence.

VI. Spirits kindled by Fire darting from a Lady's Eyes (without a Metaphor).

VII. Various Representations of Lightning, the Cause and Effects of which will be explained by a more probable Hypothesis than has hitherto appeared, and some useful Instructions given, how to avoid the Danger of it: How to secure Houses, Ships, &c. from being hurt by its destructive Violence.

VIII. The Force of the Electric Spark, making a fair Hole thro' a Quire of Paper.

IX. Metal melted by it (tho' without any Heat) in less than a thousandth Part of a Minute.

X. Animals killed by it instantaneously.

XI. Air issuing out of a Bladder set on Fire by a Spark from a Person's Finger, and burning like a Volcano.

XII. A few Drops of electrified cold Water let fall on a Person's Hand, supplying him with Fire sufficient to kindle a burning Flame with one of the Fingers of his other Hand.

XIII. A Sulphurous Vapour kindled into Flame by Fire issuing out of a cold Apple.

XIV. A curious Machine acting by means of the Electric Fire, and playing Variety of Tunes on eight musical Bells.

XV. A Battery of eleven Guns discharged by a Spark, after it has passed through ten Foot of Water.

As the Knowledge of Nature tends to enlarge the human Mind, and give us more noble, more grand, and exalted Ideas of the AUTHOR *of Nature, and if well pursued, seldom fails producing something useful to Man: 'tis hoped these Lectures may be thot worthy of Regard & Encouragement.*

☞ *Tickets to be had at the House of the Widow* Allen, *in* Thames *Street, next Door to Mr.* John Tweedy's. *Price* Thirty Shillings *each Lecture. The Lectures to begin each Day precisely at* Three *o'Clock in the Afternoon*

FIGURE 12
REPRODUCTION OF FRANKLIN'S BELLS
Courtesy of The Franklin Institute.

"I erected an iron rod to draw the lightning down into my house, in order to make some experiments on it, with two bells to give notice when the rod should be electrify'd."

– B. Franklin to Peter Collinson, September 1753

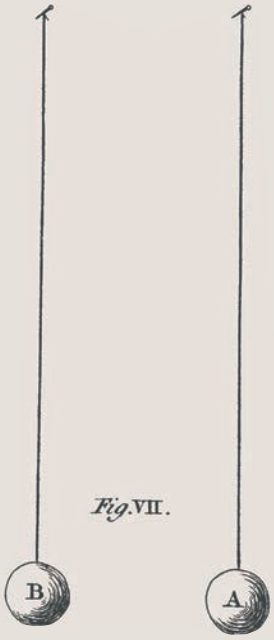


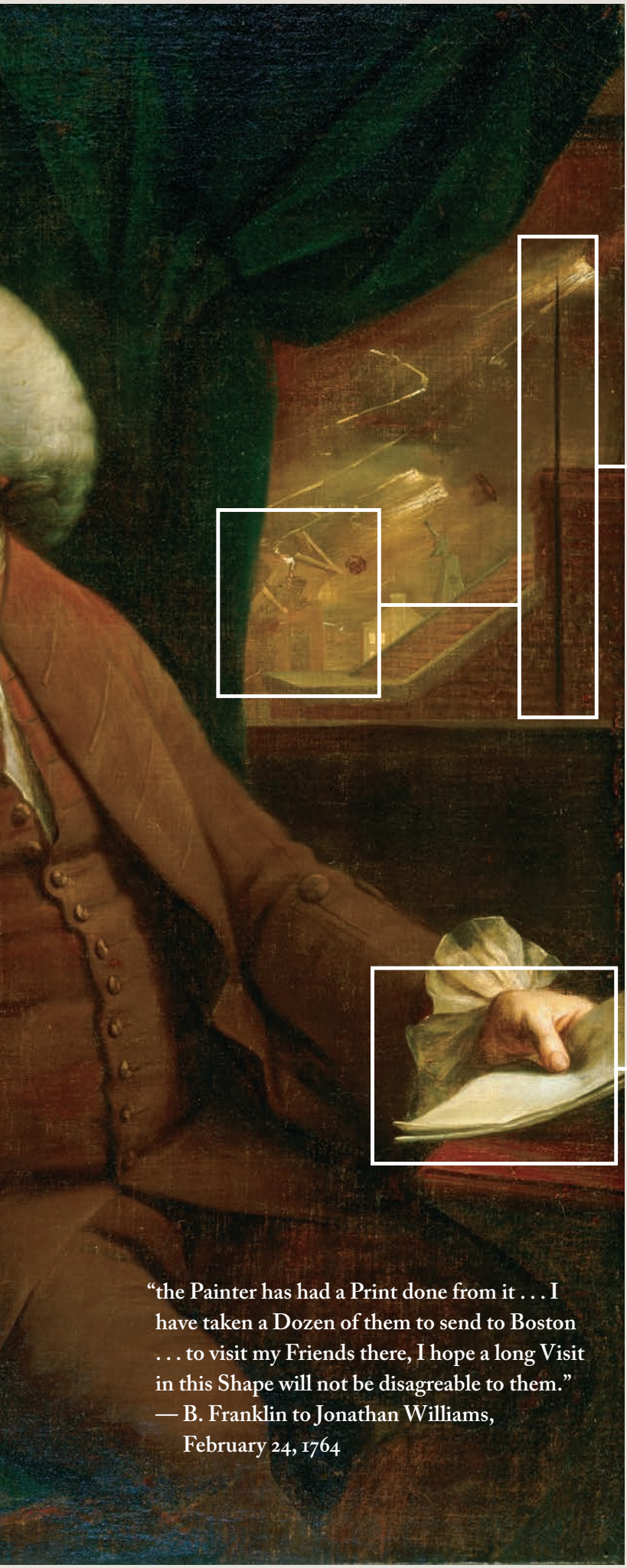
FIGURE 13
DETAIL OF CORK BALLS (FIG. VII)
Illustration from *Experiments and Observations*, 5th ed.
1771
Engraving
APS.

"Two large cork balls, suspended by silk strings, and both well and equally electrified, separate to a great distance . . . the electric fluid is attracted strongly by all other matter that we know of, while the parts of that fluid mutually repel each other."

– B. Franklin to Ebenezer Kinnersley, February 20, 1762

FIGURE 14
PORTRAIT OF BENJAMIN FRANKLIN
Mason Chamberlin
1762
Oil on canvas
Philadelphia Museum of Art, Gift of Mr. and Mrs. Wharton Sinkler, 1956, 1956-88-1.

This portrait represents Benjamin Franklin as an American scientist. See how he is dressed plainly in a simple setting, while performing electrical experiments? He sent printed copies of this portrait to friends and family.



"the Painter has had a Print done from it . . . I have taken a Dozen of them to send to Boston . . . to visit my Friends there, I hope a long Visit in this Shape will not be disagreable to them."
— B. Franklin to Jonathan Williams, February 24, 1764

FIGURE 15
THUNDER HOUSE
Rev. John Prince

1789
Tin, mahogany, brass
Courtesy Harvard University Collection of Historical Scientific Instruments.

Thunder house experiments demonstrated how lightning rods safely conducted electricity and protected buildings. Here, a house with a rounded lightning rod, designed by one of Franklin's rivals, explodes. Franklin's pointed lightning rod saves a house nearby.

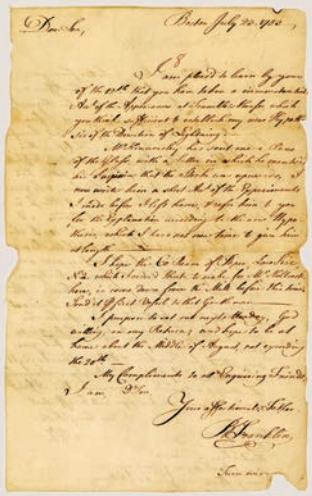
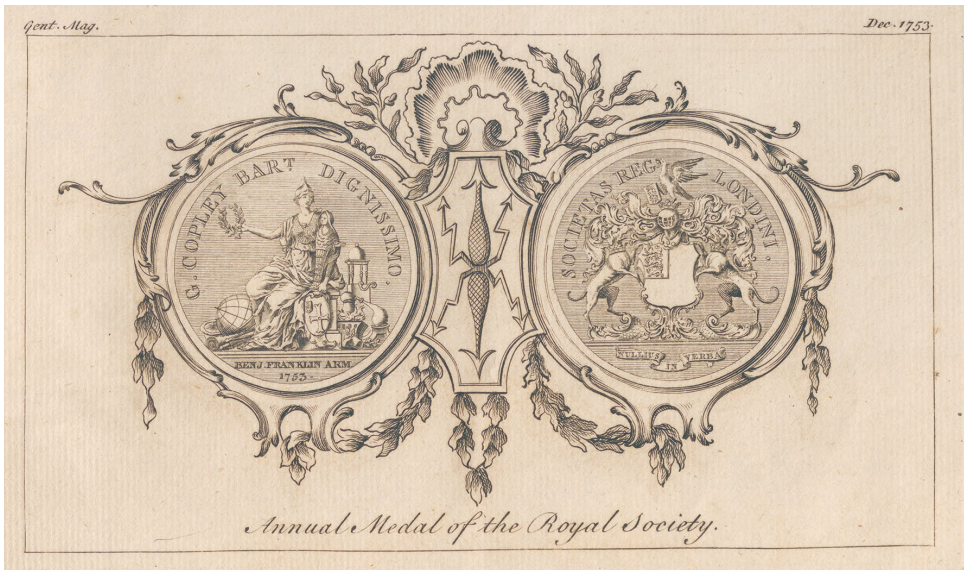


FIGURE 16
LETTER TO WILLIAM FRANKLIN

July 23, 1753
Ink on paper
APS.

Franklin exchanged notes about electrical observations and theories with friends and family.



60
COPLEY MEDAL ENGRAVING
Royal Society of London

London, 1753
Bound manuscript and engraving
Address of Earl of Macclesfield to Royal Society, APS. Gift of A.D. Bache, 1882.

Franklin's electrical experiments won him praise from the most important scientific institution in the British Empire. In 1753, the Royal Society of London awarded Franklin its prestigious Copley Medal, illustrated here. Three years later he was elected to membership.

61
HARVARD DIPLOMA BOX
Unknown maker

Boston, 1753
Tin and paint
APS, 1840.1. Gift of Charles Pemberton and Mary Fox, 1840.

Colonial institutions celebrated Franklin's scientific achievements. Harvard awarded him its first honorary degree for "considerable improvements in Learning." Franklin received several honorary degrees—meaningful recognition for a man whose formal education ended at age 10.

FIGURE 17
DIPLOMA OF MASTER OF ARTS HARVARD

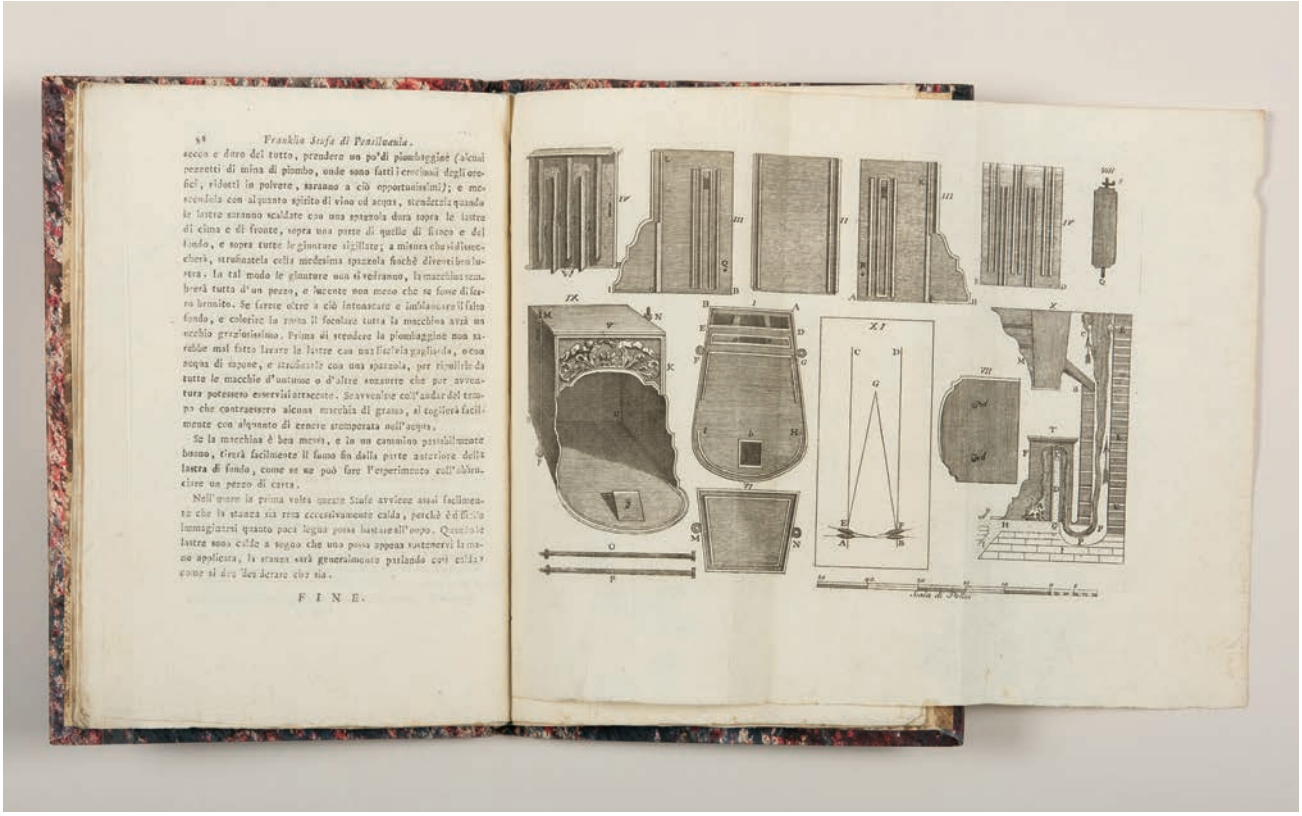
1753
Ink on parchment
Benjamin Franklin Diplomas Collection, APS. Gift of Pemberton and Mary Fox, 1840.

SCIENTIFIC HOMES

Franklin's citizen science began in the home, where diverse people produced and exchanged useful knowledge. Household and trade sciences, often dismissed as the labor of women and tradespeople, shaped Franklin's scientific practice even after he entered elite circles. His parents operated a soap- and candle-making business from their Boston residence. His mother-in-law, Sarah White Read, made medicines in their Philadelphia home where he and Deborah ran a press. All of these sciences turned his homes into laboratories and inspired his inventions. Franklin used his London and Paris residences as scientific gathering places. The members of the Franklin households, including enslaved people, enabled his success.

62
DESCRIZIONE DELLA STUFA DI PENSILVANIA
Benjamin Franklin
Venice, 1791
Bound volume
APS.

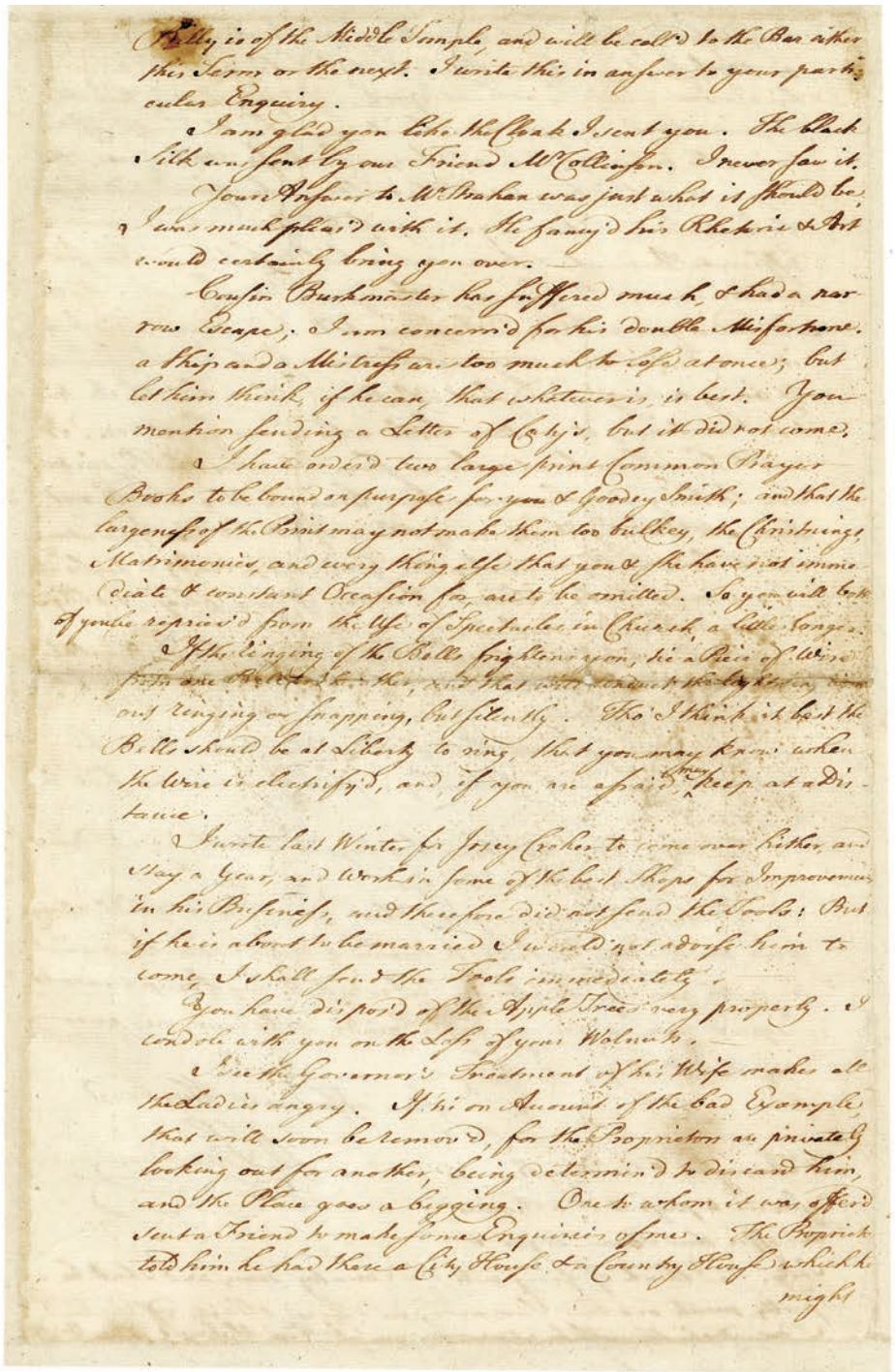
As Pennsylvania firewood supplies declined, Franklin invented a stove that used less wood to warm homes. He continued to improve his 1739–1740 design based on theories of air circulation. It attracted international interest, as this later Italian publication suggests.



63 (OPPOSITE)
PORTRAIT OF DEBORAH READ FRANKLIN
Benjamin Wilson, after unknown artist

London, c. 1758–1759
Oil on canvas
APS, 58.P.44.

This is the only surviving portrait of Deborah Franklin. Deborah helped manage the Franklin businesses and household. During Franklin's absences from Philadelphia, she became part of his scientific network, sending him information and specimens. Acknowledging her importance in his life, Franklin displayed her likeness in his London home.



Polly is of the Middle Temple, and will be call'd to the Bar either this Term or the next. I write this in answer to your particulars Enquiry.

I am glad you like the Cloak I sent you. The black silk was sent by our Friend McCollister. I never saw it.

Your Answer to Mr Strahan was just what it should be. I am much pleas'd with it. He fancy'd his Rhetoric & Art would certainly bring you over.

Cousin Bushmaster has suffered much & had a narrow Escape. I am concern'd for his double Misfortune. a Ship and a Mistress are too much to lose at once; but let him think, if he can, that whatever is, is best. You mention sending a Letter of Mrs's, but it did not come.

I have order'd two large print Common Prayer Books to be bound on purpose for you & Goody Smith; and that the largeness of the Print may not make them too bulkey, the Christenings, Matrimonies, and every thing else that you & she have not immediate & constant Occasion for are to be omitted. So you will hope of your reprieve from the Use of Spectacles in Church a little longer.

If the ringing of the Bells frighten you, tie a Piece of Wire from one Bell to the other, and that will transmit the Vibration, & not ringing or snapping, but silently. Tho' I think it best the Bells should be at Liberty to ring, that you may know when the Wire is electrify'd, and if you are afraid to keep at a distance.

I wrote last Winter for Josey Crocker to come over hither, and stay a Year, and Work in some of the best Shops for Improvement in his Business, and therefore did not send the Tools: But if he is about to be married I would not advise him to come. I shall send the Tools immediately.

You have dispos'd of the Apple Trees very properly. I condole with you on the Loss of your Walnuts.

I see the Governor's Treatment of his Wife makes all the Ladies angry. If his on Account of the bad Example, that will soon be remov'd, for the Proprietors are privately looking out for another, being determin'd to discard him, and the Place goes a begging. One to whom it was offer'd sent a Friend to make some Enquiries of me. The Proprietors told him he had there a City House & a Country House which he might

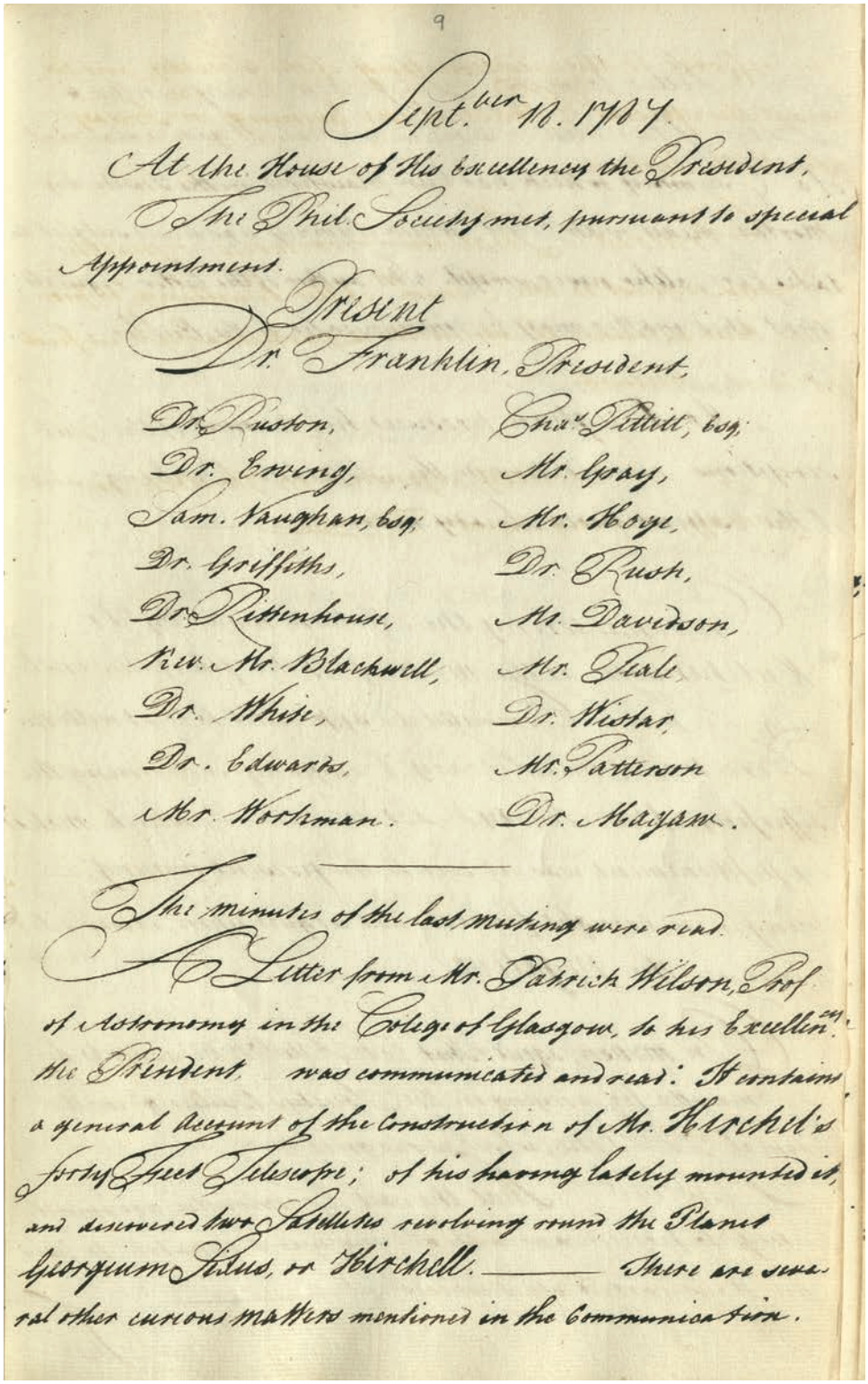
64
LETTER TO DEBORAH FRANKLIN
Benjamin Franklin

London, June 10, 1758
Ink on paper
Benjamin Franklin Papers, APS. Gift of Charles Pemberton and Mary Fox, 1840.

Franklin attached a lightning rod to his home so that he and members of his household could catch lightning for his experiments. Connected bells rang when the rod was electrified. Here, at Deborah's request, Franklin explained how to silence them.

65
MINUTES OF THE APS
APS
Philadelphia, September 18, 1787
Bound manuscript volume
Archives, APS.

Franklin opened his residences for scientific demonstrations and discussions, including this APS Meeting in his Philadelphia home. Sarah "Sally" Franklin Bache lived with her father, and likely filled the essential role of hostess to his guests listed here.



9

Sept.ber 18. 1787.

At the House of His Excellency the President,
The Phil. Society met, pursuant to special
Appointment.

Present

Dr. Franklin, President.

Dr. Ruston,	Chas. Pettit, Esq.
Dr. Ewing,	Mr. Gray,
Sam. Vaughan, Esq.	Mr. Hoye,
Dr. Griffiths,	Dr. Rush,
Dr. Rittenhouse,	Mr. Davidson,
Rev. Mr. Blackwell,	Mr. Peale,
Dr. White,	Dr. Wistar,
Dr. Edwards,	Mr. Patterson
Mr. Workman.	Dr. Magaw.

The minutes of the last meeting were read.

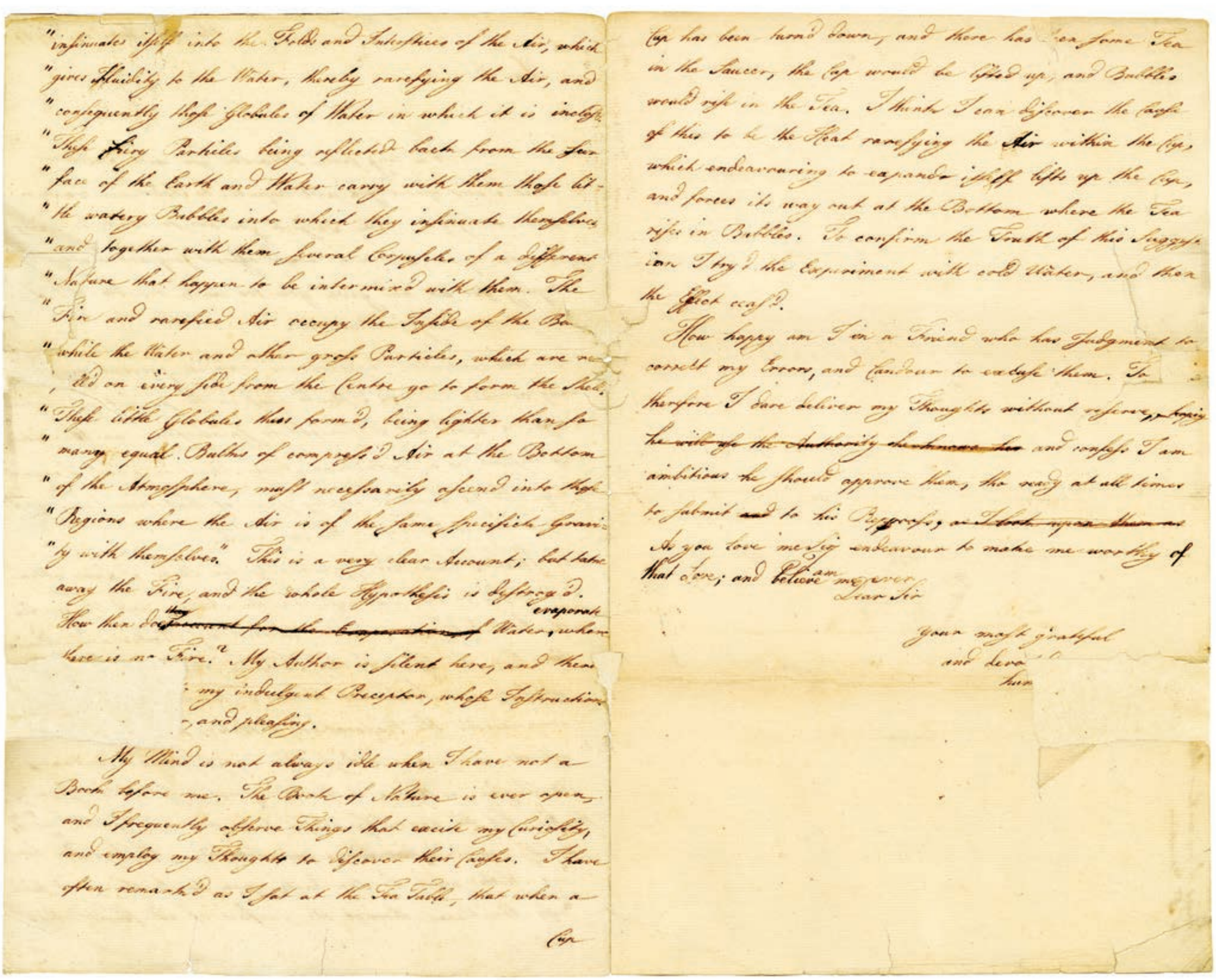
A Letter from Mr. Patrick Wilson, Prof. of Astronomy in the College of Glasgow, to his Excellency the President was communicated and read: It contains a general Account of the Construction of Mr. Herschel's forty Feet Telescope; of his having lately mounted it, and discovered two Satellites revolving round the Planet Georgium Sidus, or Herschell. ——— There are several other curious matters mentioned in the Communication.

Franklin met Polly Stevenson in 1757 when he boarded with her family in London. As she grew up, they became like family. Franklin likely gifted her this chess set, a “beneficial amusement” that “strengthened” the mind.

66
MINIATURE CHESS SET
Unknown maker
18th century
Leather, ivory, paint, and silver
APS, 2009.25. Gift of Frances Margaret Bradford, 1960.

67
LETTER TO BENJAMIN FRANKLIN
Mary “Polly” Stevenson
London, January 13, 1761
Ink on paper
James S. and Frances M. Bradford Collection, APS. Gift of James S. and Frances M. Bradford, 1956 and 1960.

After closely observing her tea, Stevenson wrote to Franklin to float her theory of how bubbles form. She based her explanation on experiments and scientific reading. They frequently discussed science, and Franklin later published some of their correspondence in *Experiments and Observations*.



"insinuates itself into the Folds and Interstices of the Air, which "gives Fluidity to the Water, thereby rarefying the Air, and "consequently those Globules of Water in which it is inclos'd "These Fiery Particles being reflected back from the Sur-"face of the Earth and Water carry with them those lit-"tle watery Bubbles into which they insinuate themselves "and together with them several Corpuscles of a different "Nature that happen to be intermixed with them. The "Fire and rarefied Air occupy the Inside of the Bu[bble] "while the Water and other gross Particles, which are ... ted on every side from the Centre go to form the Shell. "These little Globules thus form'd, being lighter than so "many equal Bulks of compress'd Air at the Bottom "of the Atmosphere, must necessarily ascend into those "Regions where the Air is of the same specifick Gravi-"ty with themselves." This is a very clear Account; but take away the Fire, and the whole Hypothesis is destroy'd. How then do they evaporate Water, when there is no Fire." My Author is silent here, and there ... my indulgent Preceptor, whose Instructions ... and pleasing.

My Mind is not always idle when I have not a Book before me. The Book of Nature is ever open, and I frequently observe Things that excite my Curiosity, and employ my Thoughts to discover their Causes. I have often remark'd as I sat at the Tea Table, that when a Cup has been turn'd down, and there has been some Tea in the Saucer, the Cup would be lifted up, and Bubbles would rise in the Tea. I think I can discover the Cause of this to be the Heat rarefying the Air within the Cup, which endeavouring to expand itself lifts up the Cup, and forces its way out at the Bottom where the Tea rises in Bubbles. To confirm the Truth of this Supposition I try'd the Experiment with cold Water, and then the Effect ceas'd.

How happy am I in a Friend who has Judgment to correct my Errors, and Candour to excuse them. To you therefore I dare deliver my Thoughts without reserve, and confess I am ambitious he should approve them, tho ready at all times to submit to his Reproofs.

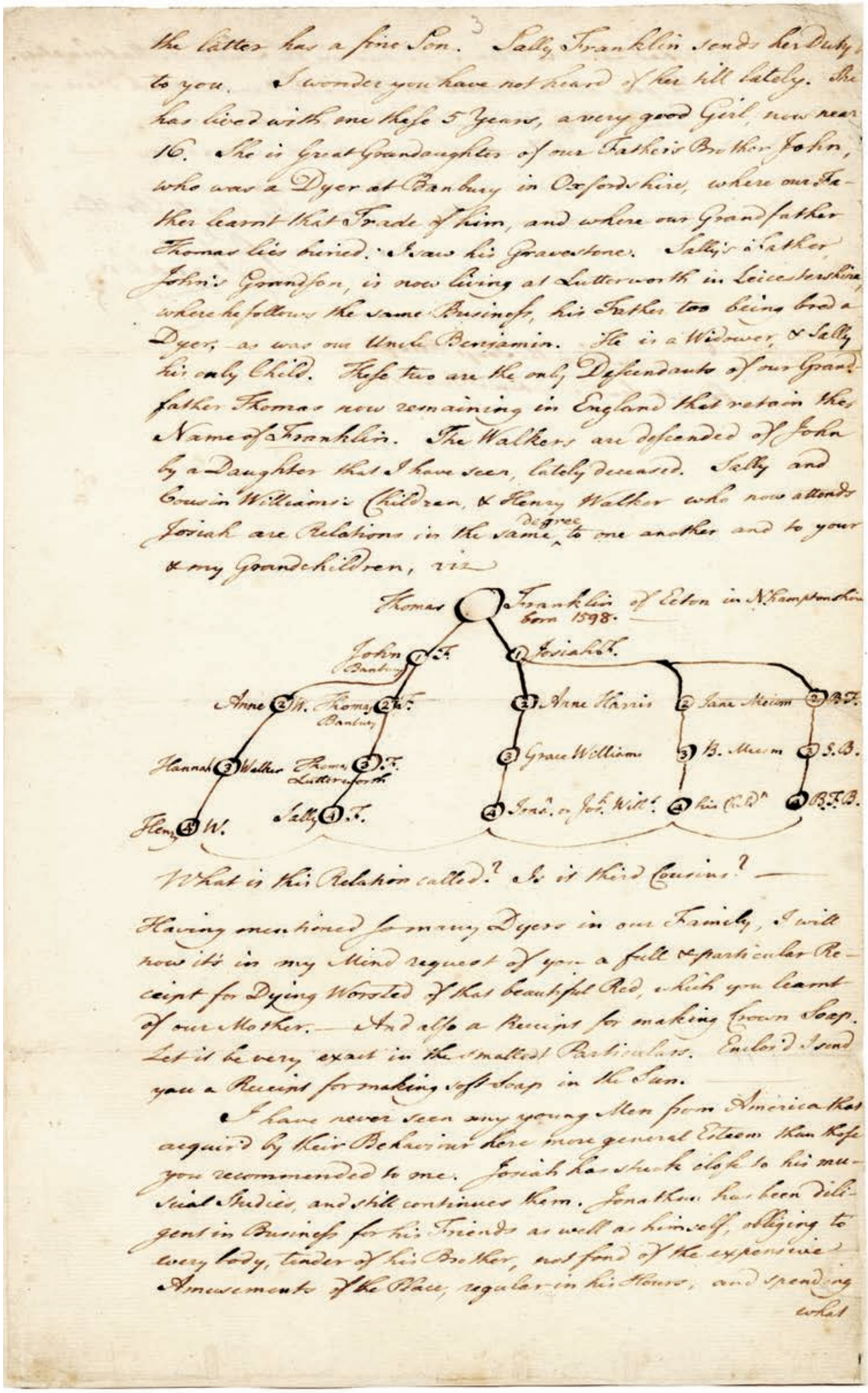
As you love me, endeavour to make me worthy of that Love; and believe me I am ever

Dear Sir

Your most grateful
and devo...
hum...

68
LETTER TO
JANE FRANKLIN MECOM
Benjamin Franklin
London, July 17, 1771
Ink on paper
Jane Mecom Collection, APS.

Writing to his beloved sister, Franklin described the legacy of cloth dyeing in their father's family. Then he requested a recipe for red dye, which Mecom learned from their mother, Abiah Folger Franklin. He respected their mastery of the science of cloth dyeing.

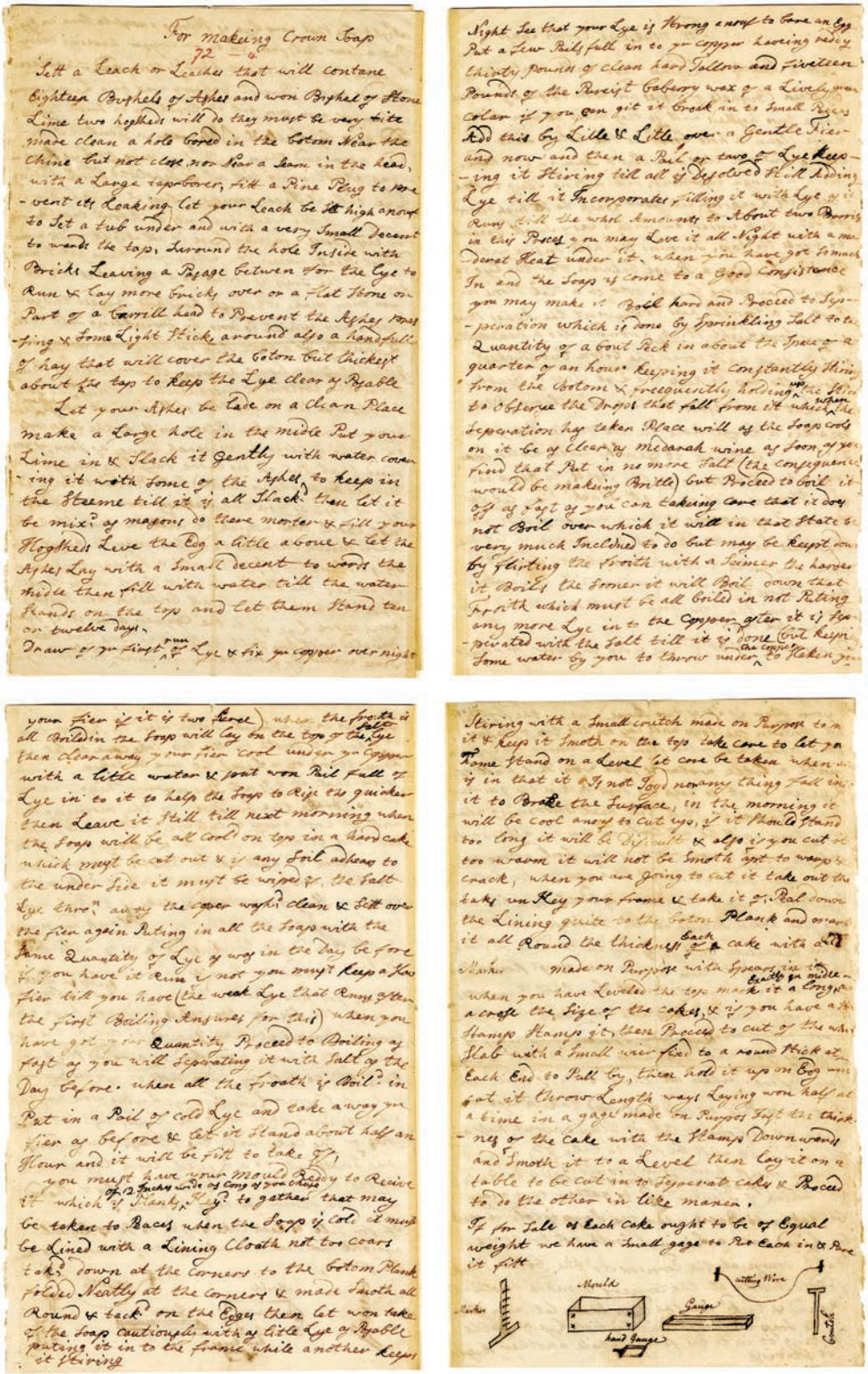


the latter has a fine Son. Sally Franklin sends her Duty to you. I wonder you have not heard of her till lately. She has lived with me these 5 Years, a very good Girl, now near 16. She is Great Granddaughter of our Father's Brother John, who was a Dyer at Banbury in Oxfordshire, where our Father learnt that Trade of him, and where our Grandfather Thomas lies buried. I saw his Gravestone. Sally's Father John's Grandson, is now living at Lutterworth in Leicestershire, where he follows the same Business, his Father too being bred a Dyer, as was our Uncle Benjamin. He is a Widower, & Sally his only Child. These two are the only Descendants of our Grandfather Thomas now remaining in England that retain the Name of Franklin. The Walkers are descended of John by a Daughter that I have seen, lately deceased. Sally and Cousin Williams's Children, & Henry Walker who now attends Josiah are Relations in the same degree to one another and to your & my Grandchildren, viz

What is this Relation called? Is it third Cousins? —

Having mentioned so many Dyers in our Family, I will now its in my Mind request of you a full & particular Receipt for Dying Worsted of that beautiful Red, which you learnt of our Mother. — And also a Receipt for making Crown Soap. Let it be very exact in the smallest Particulars. Enclos'd I send you a Receipt for making soft Soap in the Sun.

I have never seen any young Men from America that acquir'd by their Behaviour here more general Esteem than those you recommended to me. Josiah has stuck close to his musical Studies, and still continues them. Jonathan has been diligent in Business for his Friends as well as himself, obliging to every body, tender of his Brother, not fond of the expensive Amusements of the Place, regular in his Hours, and spending what

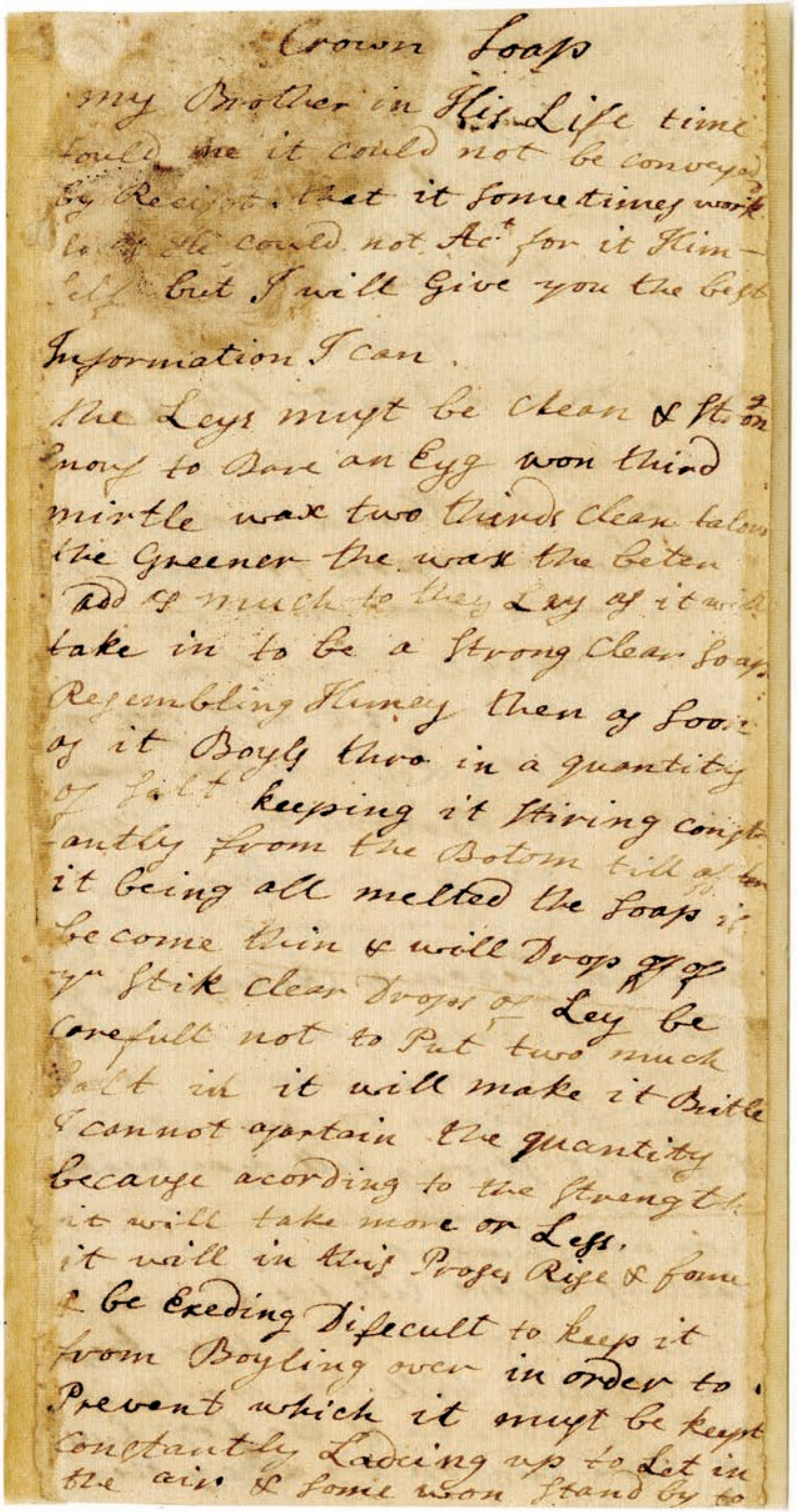


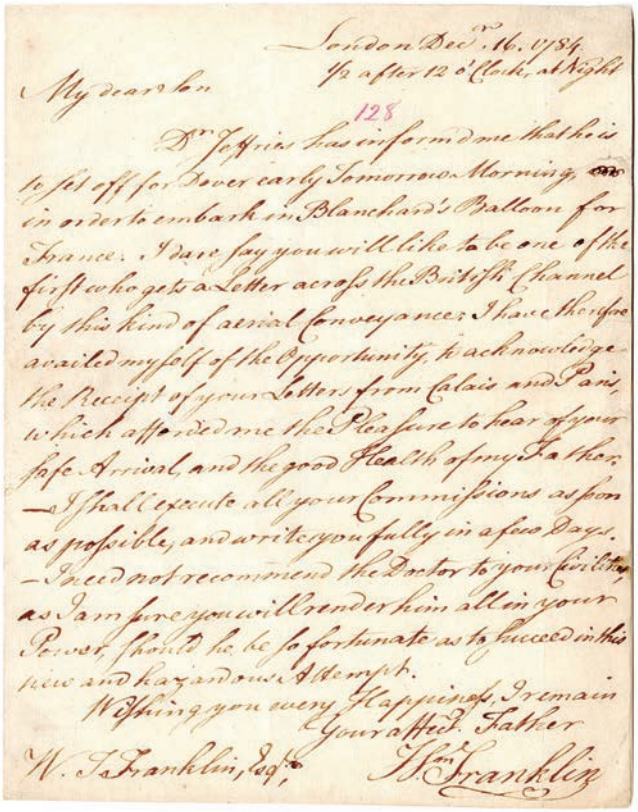
69
RECEIPT FOR CROWN SOAP
Jane Franklin Mecom,
Benjamin Franklin (diagram)
Boston, between 1771 and 1786
Ink on paper
Benjamin Franklin Papers,
APS. Gift of Charles
Pemberton and Mary Fox, 1840.

Upon Franklin's request, Mecom sent this detailed four-page soap recipe. She described the process based on her experiences and observations. Below, Franklin drew a diagram for cutting soap according to her instructions.

70
RECEIPT FOR CROWN SOAP
Jane Franklin Mecom
Boston, probably after 1790
Ink on paper
Franklin-Bache Papers, APS.
Gift of Mr. and Mrs. Franklin Bache, 1937.

Franklin never mastered soapmaking and continued to request Mecom's assistance. As she told him, "There is a good deal of Phylosephy in the working of crown soap." He encouraged other family members to study the theory and practice of it.


Crown Soap
my Brother in His Life time
found [illegible] it could not be conveyed
by Receipt. that it sometimes work
[illegible] He could not Act for it Him-
self but I will Give you the best
Information I can.
the Leys must be Clean & St[illegible]
enough to Bare an Egg won third
mirtle wax two thirds Clean talow
the Greener the wax the beter
add as much to they Ley as it will
take in to be a Strong Clear Soap
Resembling Huney then as Soon
as it Boyls thro in a quantity
of Salt keeping it Stiring const-
antly from the Botom till [illegible]
it being all melted the Soap is
become thin & will Drop of of
yr Stik Clear Drops of Ley be
carefull not to Put two much
Salt in it will make it Britle
I cannot ascertain the quantity
because acording to the Strength
it will take more or Less.
it will in this Proses Rise & fome
& be Exeding Difecult to keep it
from Boyling over in order to
Prevent which it must be keept
Constantly Ladeing up to Let in
the air & Some won Stand by to



71
PREMIER VOYAGE AÉRIEN
Ch. Launois and N. Sauvage

Paris, c. 1783
Hand-colored engraving
APS.

As minister to France from 1777 to 1785, Franklin lived near Paris, a scientific center where technology reached new heights. This print shows the view he and his guests enjoyed from his terrace of the first piloted balloon flight on November 21, 1783.

72
LETTER TO WILLIAM TEMPLE FRANKLIN
William Franklin

London, December 16, 1784
Ink on paper
William Temple Franklin Papers, APS. Gift of Charles Pemberton Fox, 1840.

Temple Franklin lived with his grandfather in Paris when he received this letter. His father, William, sent it by balloon from England with Dr. Jeffries, a scientist studying the atmosphere during flight. As former postmaster, Franklin likely delighted in the first documented airmail delivery.

OBSERVATIONS ON HUMANKIND

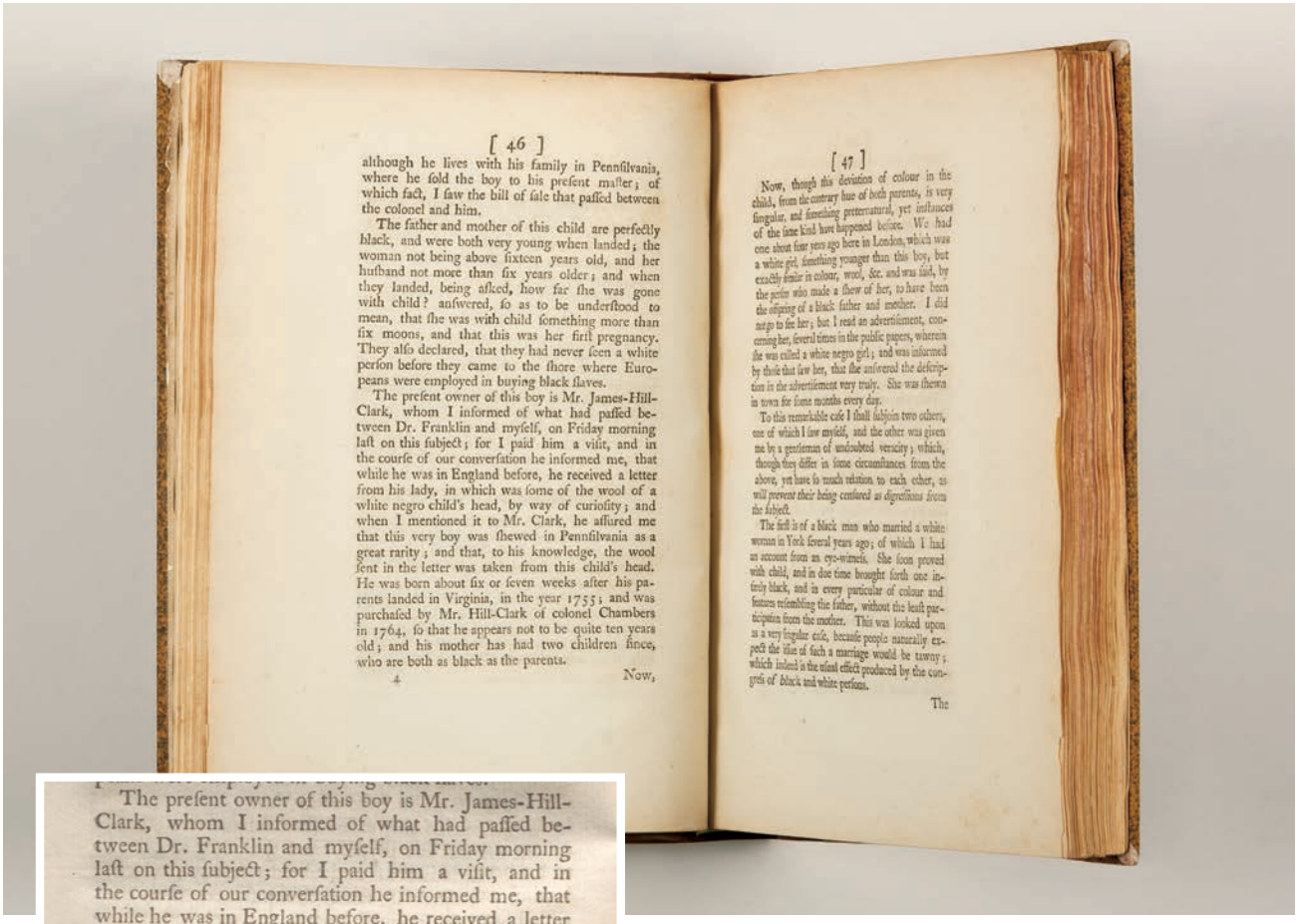
People have long associated qualities such as moral character and intelligence with appearance, culture, and country of origin. These assumptions shaped the way many 18th-century scientists, including Franklin, investigated the sources of human differences. They incorrectly concluded that people were born with unchangeable qualities signified by their skin color, or complexion. Westerners organized people into a spectrum based on complexion. They linked positive qualities to the lightest complexions and negative qualities to the darkest complexions. The English, identifying as "purely white," reserved the very best qualities for themselves.

Maintaining 18th-century speculations, later scientists problematically categorized people into "races." The destructive effects of their research, which offered support for racism and white supremacy, endure in modern society.

Today, scientists know that there is no such thing as biological "race." Yet racism persists. Racism is expressed explicitly through behaviors such as hate speech and crimes. Racism exists implicitly through the unintentional but still damaging beliefs and assumptions that affect the way we interact with others. These biases are the underpinnings of structural racism.

Structural racism is the way community and individual practices, policies, laws, and institutions—all of which are slow and difficult to change—privilege some members of society more than others.

Throughout his lifetime, Franklin reflected on his own prejudices and confronted and modified his views on human difference. Some of his writings on public policy and education reveal these changes. As a citizen scientist, he was willing to learn and grow. We can take a lesson from Franklin's willingness to confront his own prejudices.



[46]

although he lives with his family in Pennſilvania, where he ſold the boy to his preſent maſter; of which fact, I ſaw the bill of ſale that paſſed between the colonel and him.

The father and mother of this child are perfectly black, and were both very young when landed; the woman not being above ſixteen years old, and her huſband not more than ſix years older; and when they landed, being aſked, how far ſhe was gone with child? anſwered, ſo as to be underſtood to mean, that ſhe was with child ſomething more than ſix moons, and that this was her firſt pregnancy. They alſo declared, that they had never ſeen a white perſon before they came to the ſhore where Europeans were employed in buying black ſlaves.

The preſent owner of this boy is Mr. James-Hill-Clark, whom I informed of what had paſſed between Dr. Franklin and myſelf, on Friday morning laſt on this ſubject; for I paid him a viſit, and in the courſe of our converſation he informed me, that while he was in England before, he received a letter from his lady, in which was ſome of the wool of a white negro child's head, by way of curioſity; and when I mentioned it to Mr. Clark, he aſſured me that this very boy was ſhewed in Pennſilvania as a great rarity; and that, to his knowledge, the wool ſent in the letter was taken from this child's head. He was born about ſix or ſeven weeks after his parents landed in Virginia, in the year 1755; and was purchaſed by Mr. Hill-Clark of colonel Chambers in 1764, ſo that he appears not to be quite ten years old; and his mother has had two children ſince, who are both as black as the parents.

4 Now,

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Now, though this deviation of colour in the child, from the contrary hue of both parents, is very ſingular, and ſomething preternatural, yet inſtances of the ſame kind have happened before. We had one about four years ago here in London, which was a white girl, ſomething younger than this boy, but exactly ſimilar in colour, wool, &c. and was ſaid, by the perſon who made a ſhew of her, to have been the offspring of a black father and mother. I did not go to ſee her; but I read an advertiſement, concerning her, ſeveral times in the public papers, wherein ſhe was called a white negro girl; and was informed by thoſe that ſaw her, that ſhe anſwered the deſcription in the advertiſement very truly. She was ſhewn in town for ſome months every day.

To this remarkable caſe I ſhall ſubjoin two others, one of which I ſaw myſelf, and the other was given me by a gentleman of undoubted veracity; which, though they differ in ſome circumſtances from the above, yet have ſo much relation to each other, as will prevent their being cenſured as digreſſions from the ſubject.

The firſt is of a black man who married a white woman in York ſeveral years ago; of which I had an account from an eye-witneſs. She ſoon proved with child, and in due time brought forth one entirely black, and in every particular of colour and features reſembling the father, without the leaſt participation from the mother. This was looked upon as a very ſingular caſe, becauſe people naturally expect the iſſue of ſuch a marriage would be tawny; which indeed is the uſual effect produced by the congreſs of black and white perſons.

The

The preſent owner of this boy is Mr. James-Hill-Clark, whom I informed of what had paſſed between Dr. Franklin and myſelf, on Friday morning laſt on this ſubject; for I paid him a viſit, and in the courſe of our converſation he informed me, that while he was in England before, he received a letter from his lady, in which was ſome of the wool of a white negro child's head, by way of curioſity; and when I mentioned it to Mr. Clark, he aſſured me that this very boy was ſhewed in Pennſilvania as a great rarity; and that, to his knowledge, the wool ſent in the letter was taken from this child's head. He was born about ſix or ſeven weeks after his parents landed in Virginia, in the year 1755; and was purchaſed by Mr. Hill-Clark of colonel Chambers in 1764, ſo that he appears not to be quite ten years old; and his mother has had two children ſince, who are both as black as the parents.

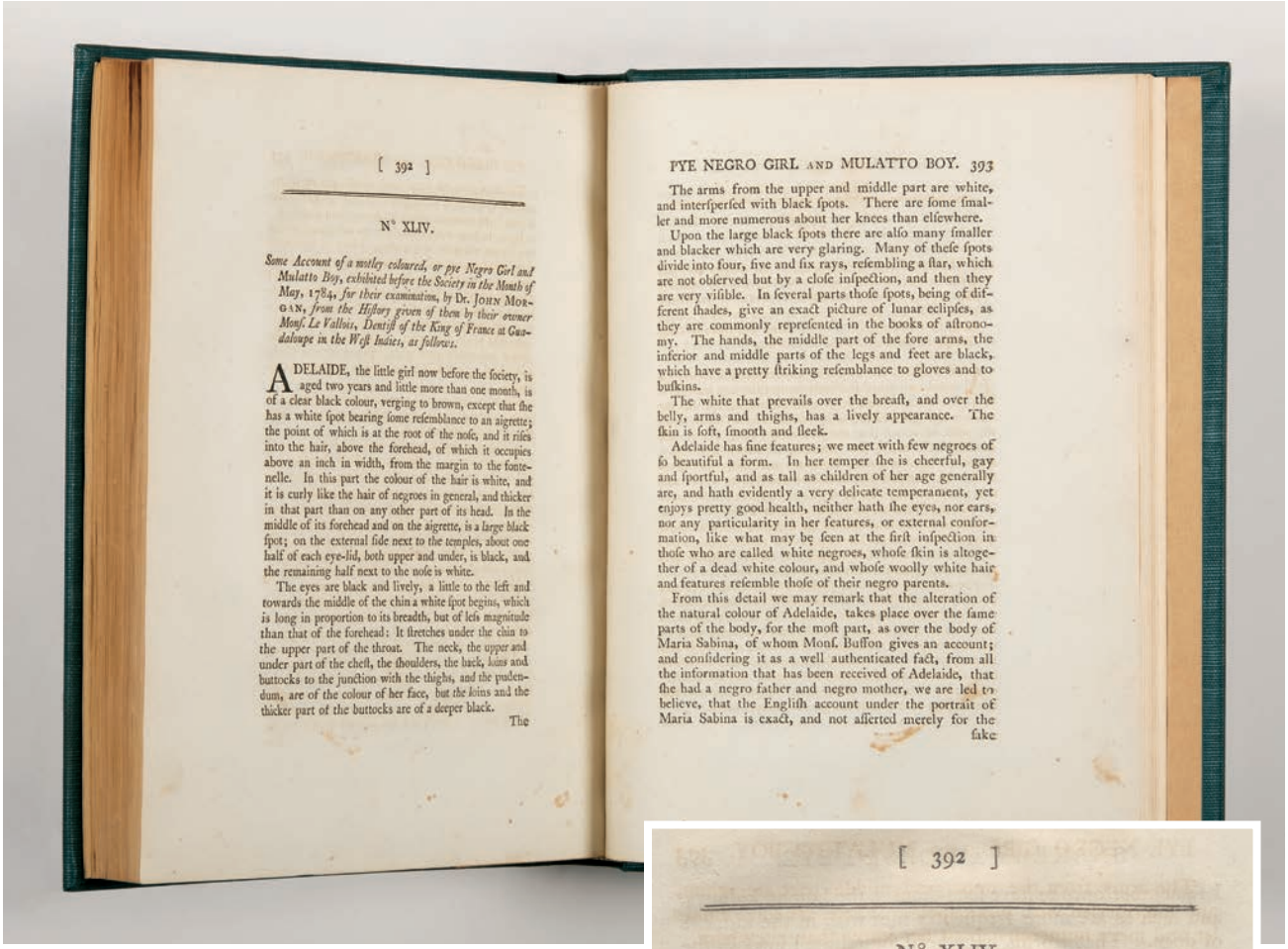
73

"AN ACCOUNT OF THE WHITE NEGRO SHOWN BEFORE THE ROYAL SOCIETY"

James Parsons, Royal Society of London

London, 1765
Bound volume
APS.

Deborah Franklin attended the Philadelphia exhibition of an enslaved child who had white skin and hair even though the child was born to dark-skinned parents. (Today we know this child had a genetic condition called albinism.) Deborah collected a lock of the youth's hair and sent it to Franklin in support of his study of human difference. He shared the "specimen" with London colleagues, as recorded here in the Royal Society's *Transactions*.



[392]

N° XLIV.

Some Account of a motley coloured, or pye Negro Girl and Mulatto Boy, exhibited before the Society in the Month of May, 1784, for their examination, by Dr. JOHN MORGAN, *from the Hiſtory given of them by their owner Monſ. Le Vallois, Dentiſt of the King of France at Guadaloupe in the Weſt Indies, as follows.*

ADELAIDE, the little girl now before the ſociety, is aged two years and little more than one month, is of a clear black colour, verging to brown, except that ſhe has a white ſpot bearing ſome reſemblance to an aigrette; the point of which is at the root of the noſe, and it riſes into the hair, above the forehead, of which it occupies above an inch in width, from the margin to the fontenelle. In this part the colour of the hair is white, and it is curly like the hair of negroes in general, and thicker in that part than on any other part of its head. In the middle of its forehead and on the aigrette, is a large black ſpot; on the external ſide next to the temples, about one half of each eye-lid, both upper and under, is black, and the remaining half next to the noſe is white.

The eyes are black and lively, a little to the left and towards the middle of the chin a white ſpot begins, which is long in proportion to its breadth, but of leſs magnitude than that of the forehead: It ſtretches under the chin to the upper part of the throat. The neck, the upper and under part of the cheſt, the ſhoulders, the back, loins and buttocks to the junction with the thighs, and the pudendum, are of the colour of her face, but the loins and the thicker part of the buttocks are of a deeper black.

The

PYE NEGRO GIRL AND MULATTO BOY. 393

The arms from the upper and middle part are white, and interſperſed with black ſpots. There are ſome ſmaller and more numerous about her knees than elſewhere.

Upon the large black ſpots there are alſo many ſmaller and blacker which are very glaring. Many of theſe ſpots divide into four, five and ſix rays, reſembling a ſtar, which are not obſerved but by a cloſe inſpection, and then they are very viſible. In ſeveral parts thoſe ſpots, being of different ſhades, give an exact picture of lunar eclipſes, as they are commonly repreſented in the books of aſtronomy. The hands, the middle part of the fore arms, the inferior and middle parts of the legs and feet are black, which have a pretty ſtriking reſemblance to gloves and to buſkins.

The white that prevails over the breaſt, and over the belly, arms and thighs, has a lively appearance. The ſkin is ſoft, ſmooth and ſleek.

Adelaide has fine features; we meet with few negroes of ſo beautiful a form. In her temper ſhe is cheerful, gay and ſportful, and as tall as children of her age generally are, and hath evidently a very delicate temperament, yet enjoys pretty good health, neither hath ſhe eyes, nor ears, nor any particularity in her features, or external conformation, like what may be ſeen at the firſt inſpection in thoſe who are called white negroes, whoſe ſkin is altogether of a dead white colour, and whoſe woolly white hair and features reſemble thoſe of their negro parents.

From this detail we may remark that the alteration of the natural colour of Adelaide, takes place over the ſame parts of the body, for the moſt part, as over the body of Maria Sabina, of whom Monſ. Buffon gives an account; and conſidering it as a well authenticated fact, from all the information that has been received of Adelaide, that ſhe had a negro father and negro mother, we are led to believe, that the Engliſh account under the portrait of Maria Sabina is exact, and not aſſerted merely for the ſake

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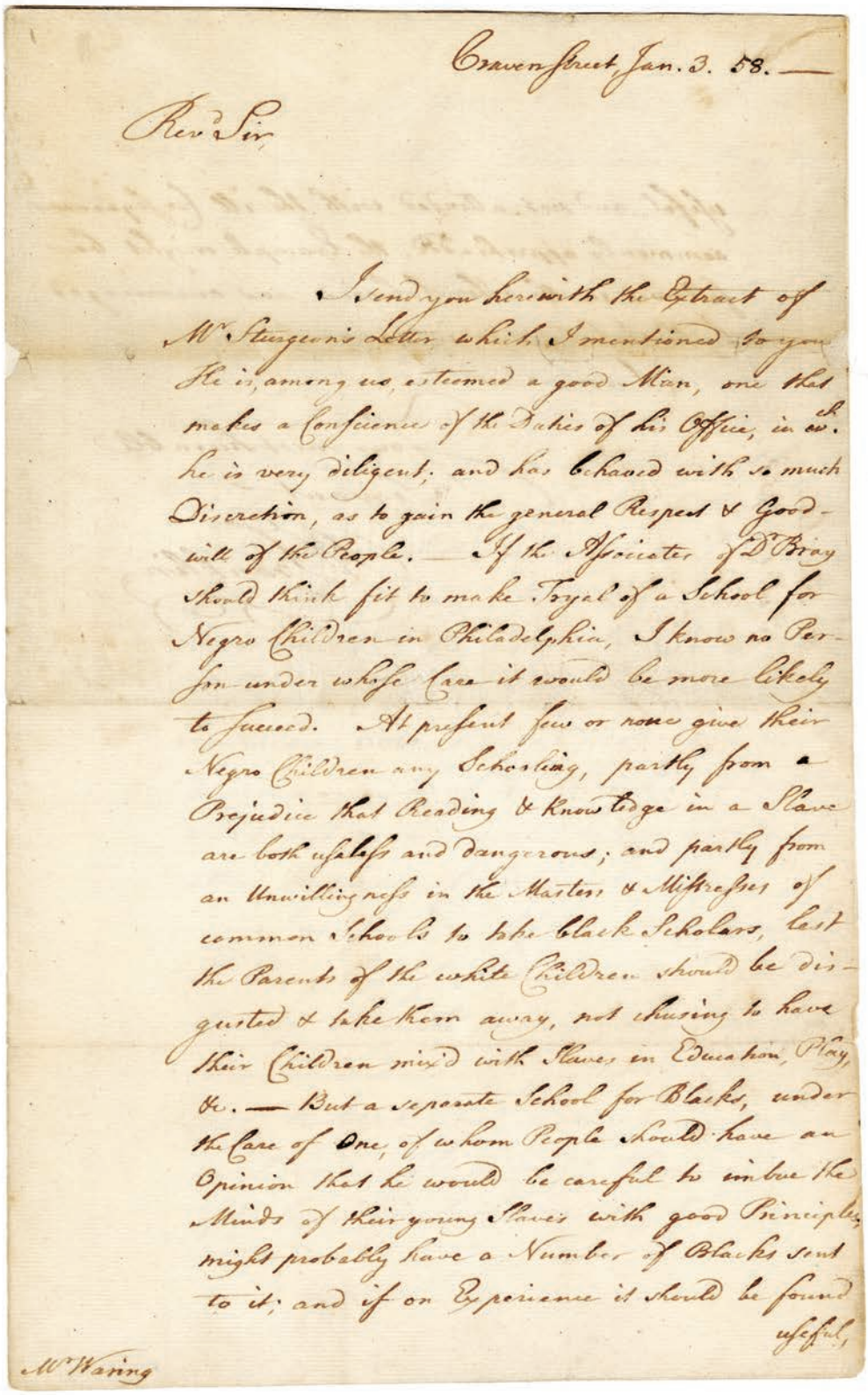
ADELAIDE, the little girl now before the ſociety, is aged two years and little more than one month, is of a clear black colour, verging to brown, except that ſhe

74

"ACCOUNT OF A MOTLEY COLOURED, OR PYE NEGRO GIRL AND MULATTO BOY, EXHIBITED BEFORE THE SOCIETY"
John Morgan, APS

Philadelphia, 1786
Bound volume
APS.

Eighteenth-century scientists studied bodies that defied the simple categorization of Black or white. At a 1784 meeting, APS Members examined two enslaved children, Adelaide and Jean Pierre, whose bodies had areas of lighter and darker skin. (Today we know they had a genetic condition called vitiligo.) The APS published descriptions of the inspection, seen here in its *Transactions*.



Craven Street, Jan. 3. 58.

Rev^d Sir,

I send you herewith the Extract of M^r Stinger's Letter which I mentioned to you. He is, among us, esteemed a good Man, one that makes a Conscience of the Duties of his Office, in w^ch he is very diligent; and has behaved with so much Discretion, as to gain the general Respect & Goodwill of the People. — If the Associates of D^r Bray should think fit to make Tryal of a School for Negro Children in Philadelphia, I know no Person under whose Care it would be more likely to succeed. At present few or none give their Negro Children any Schooling, partly from a Prejudice that Reading & Knowledge in a Slave are both useless and dangerous; and partly from an Unwillingness in the Masters & Mistresses of common Schools to take black Scholars, lest the Parents of the white Children should be disgusted & take them away, not chusing to have their Children mixed with Slaves in Education, Play, &c. — But a separate School for Blacks, under the Care of One, of whom People should have an Opinion that he would be careful to imbue the Minds of their young Slaves with good Principles, might probably have a Number of Blacks sent to it; and if on Experience it should be found useful,

M^r Waring

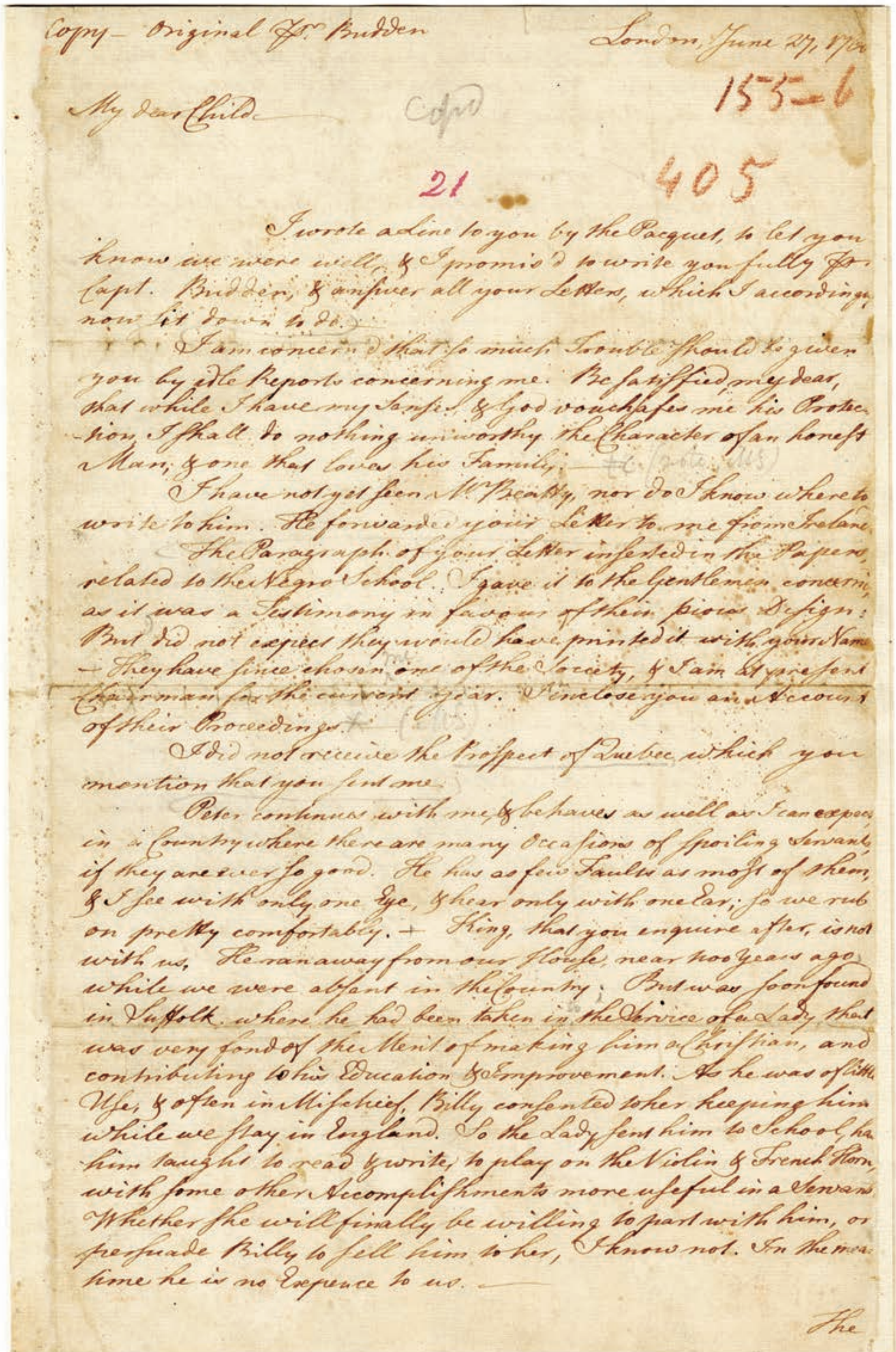
75
LETTER TO JOHN WARING
Benjamin Franklin
London, January 3, 1758
Ink on paper
Benjamin Franklin
Miscellaneous Collection, APS.

Franklin was interested in debates over how and what people of African descent could learn. He assisted John Waring, a member of an English Christian charity, with founding a Philadelphia school for African American children. Franklin wondered if such a school could survive, since most slaveowners believed that "Reading and Knowledge in a Slave are both useless and dangerous."

76
LETTER TO DEBORAH FRANKLIN
Benjamin Franklin

London, June 27, 1760
Ink on paper
Benjamin Franklin Papers, APS. Gift of Charles Pemberton and Mary Fox, 1840.

In this letter, Franklin acknowledged receiving Deborah's positive account of the Philadelphia African American school and her decision to enroll Othello, the Franklin family's enslaved youth. He returned news of Peter and King, two enslaved men he had brought with him to London. Ironically, King had run away and was working for an Englishwoman who provided him with an education.



Copy – Original per Budden London, June 27, 1760

155–6

My dear Child

21 405

I wrote a Line to you by the Pacquet, to let you know we were well, & I promis'd to write you fully per Capt. Budden, & answer all your Letters, which I accordingly now sit down to do.

I am concern'd that so much Trouble should be given you by idle Reports concerning me. Be satisfied, my dear, that while I have my Senses, & God vouchsafes me his Protection, I shall do nothing unworthy the Character of an honest Man, & one that loves his Family.

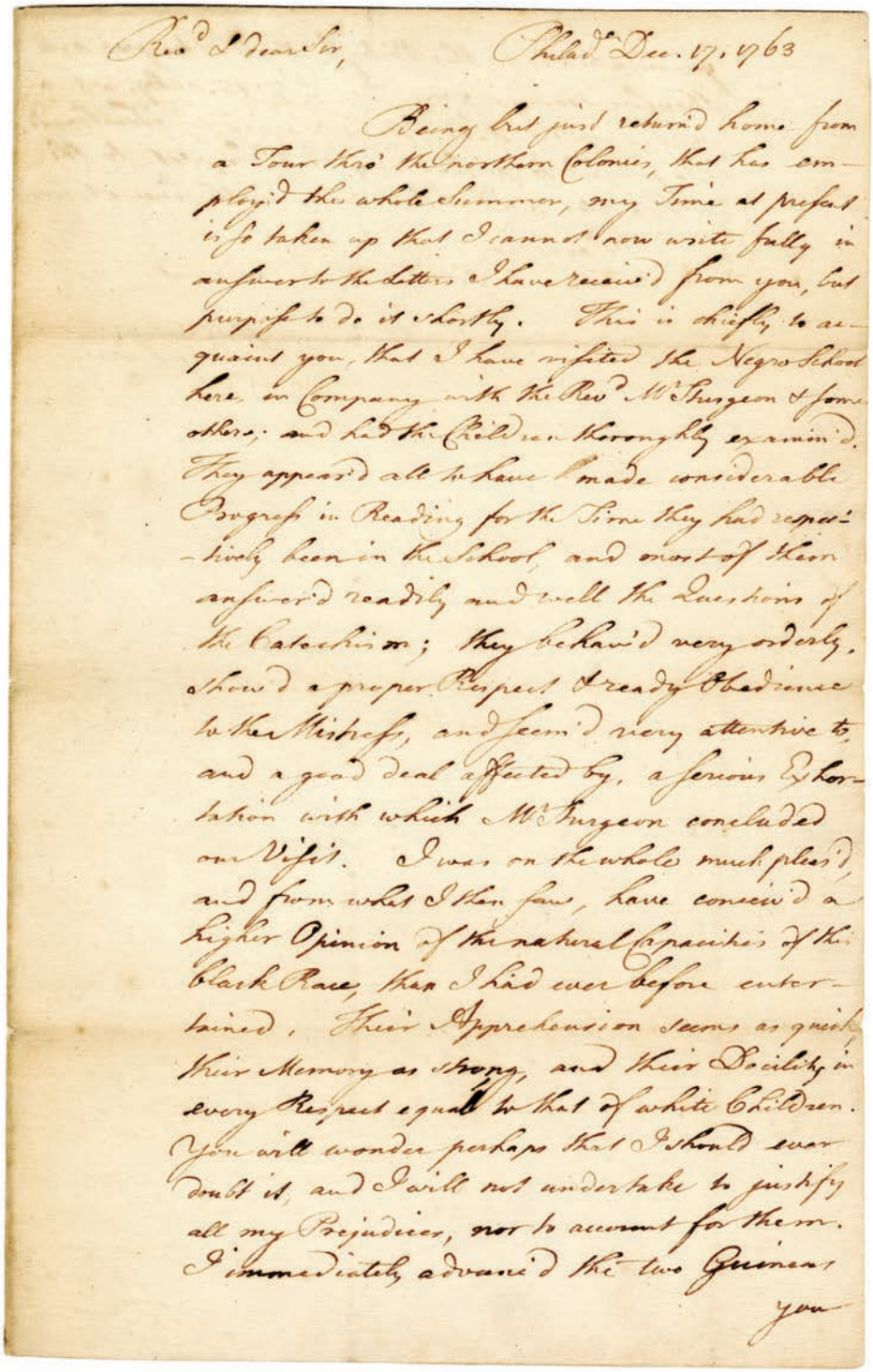
I have not yet seen Mr Beatty, nor do I know where to write to him. He forwarded your Letter to me from Ireland.

The Paragraph of your Letter inserted in the Papers, related to the Negro School. I gave it to the Gentlemen concern'd as it was a Testimony in favour of their pious Design: But did not expect they would have printed it with your Name. – They have since chosen me one of the Society, & I am at present Chairman for the current Year. I enclose you an Account of their Proceedings.

I did not receive the Prospect of Quebec which you mention that you sent me.

Peter continues with me, & behaves as well as I can expect in a Country where there are many Occasions of spoiling Servants, if they are ever so good. He has as few Faults as most of them, & I see with only one Eye, & hear only with one Ear; so we rub on pretty comfortably. – King, that you enquire after, is not with us. He ran away from our House, near two Years ago, while we were absent in the Country; But was soon found in Suffolk, where he had been taken in the Service of a Lady that was very fond of the Merit of making him a Christian, and contributing to his Education & Improvement. As he was of little Use, & often in Mischief, Billy consented to her keeping him while we stay in England. So the Lady sent him to School, has him taught to read & write, to play on the Violin & French Horn, with some other Accomplishments more useful in a Servant. Whether she will finally be willing to part with him, or persuade Billy to sell him to her, I know not. In the mean time he is no Expence to us. —

The

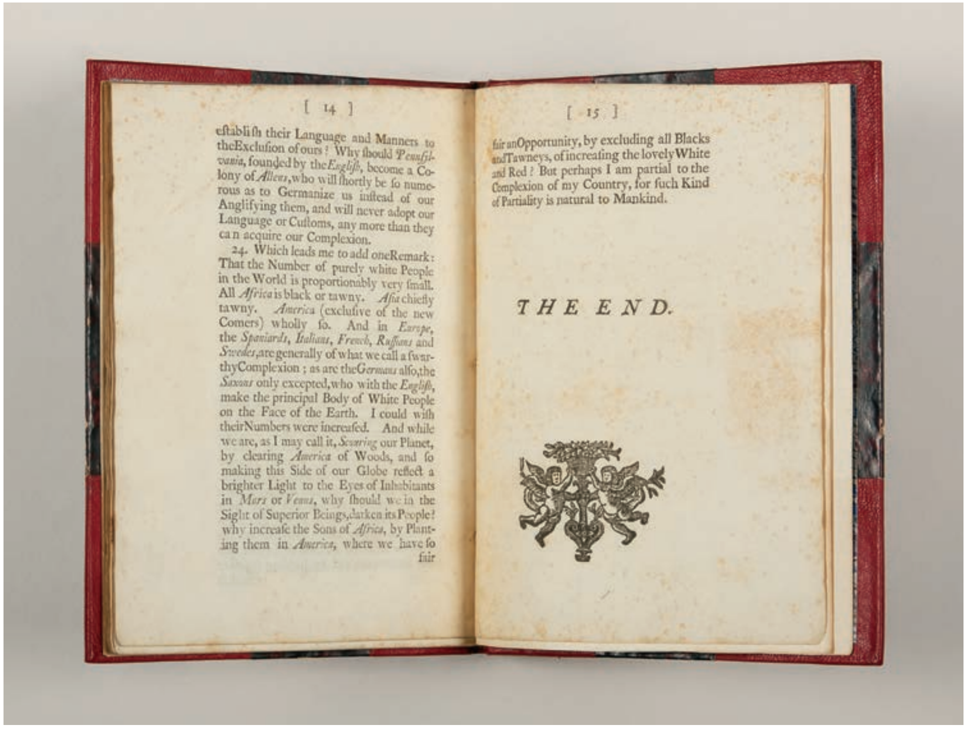


Revd & Dear Sir, Philad.a Dec. 17, 1763

Being but just returned home from a Tour thro' the northern Colonies, that has employ'd the whole Summer, my Time at present is so taken up that I cannot now write fully in answer to the Letters I have receiv'd from you, but purpose to do it shortly. This is chiefly to acquaint you, that I have visited the Negro School here, in Company with the Revd Mr Sturgeon & some others; and had the Children thoroughly examin'd. They appear'd all to have made considerable Progress in Reading for the Time they had respectively been in the School, and most of them answer'd readily and well the Questions of the Catechism; they behav'd very orderly, shew'd a proper Respect & ready Obedience to the Mistress, and seem'd very attentive to, and a good deal affected by, a serious Exhortation with which Mr Sturgeon concluded our Visit. I was on the whole much pleas'd, and from what I then saw, have conceiv'd a higher Opinion of the natural Capacities of the black Race, than I had ever before entertained. Their Apprehension seems as quick, their Memory as strong, and their Docility in every Respect equal to that of white Children. You will wonder perhaps that I should ever doubt it, and I will not undertake to justify all my Prejudices, nor to account for them. I immediately advanc'd the two Guineas you

77
LETTER TO JOHN WARING
Benjamin Franklin
Philadelphia, December 17, 1763
Ink on paper
Benjamin Franklin
Miscellaneous Collection, APS.

When Franklin returned to Philadelphia, he visited the African American school. The experience changed him. Franklin reported to Waring that he now had "a higher Opinion of the natural Capacities of the black Race, than I had ever before entertained . . . I will not undertake to justify all my Prejudices, nor to account for them."



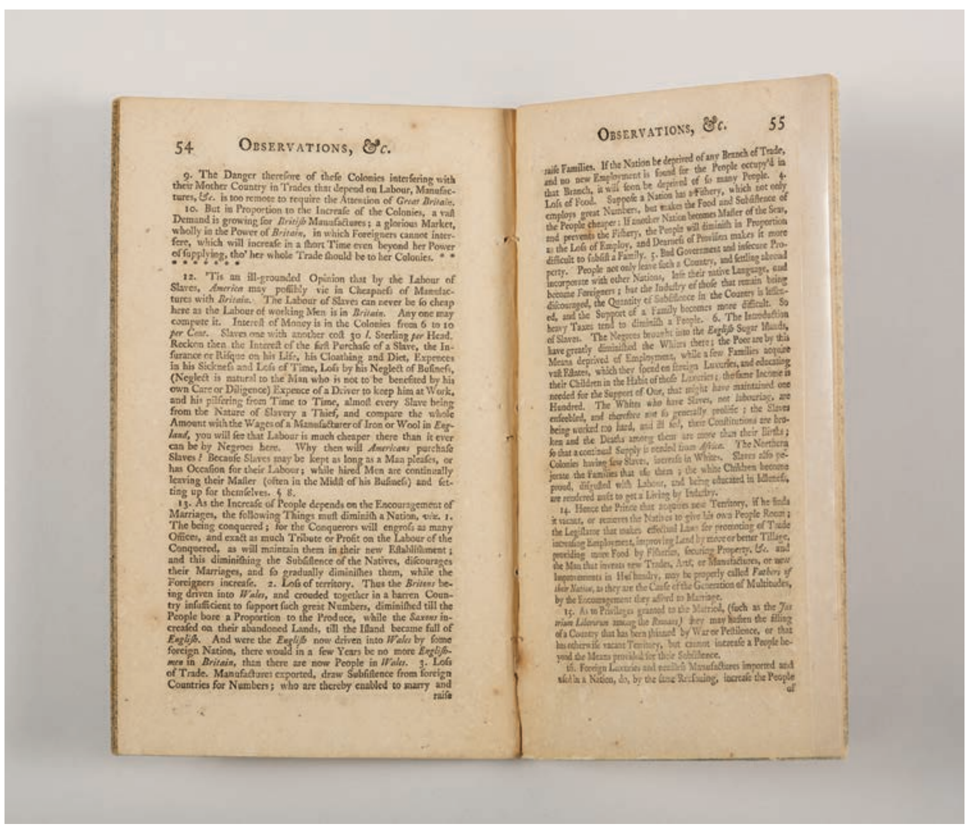
78
"OBSERVATIONS CONCERNING THE INCREASE OF MANKIND," 1ST ED.
Benjamin Franklin (author),
S. Kneeland (printer)

Boston, 1755
Pamphlet
APS.

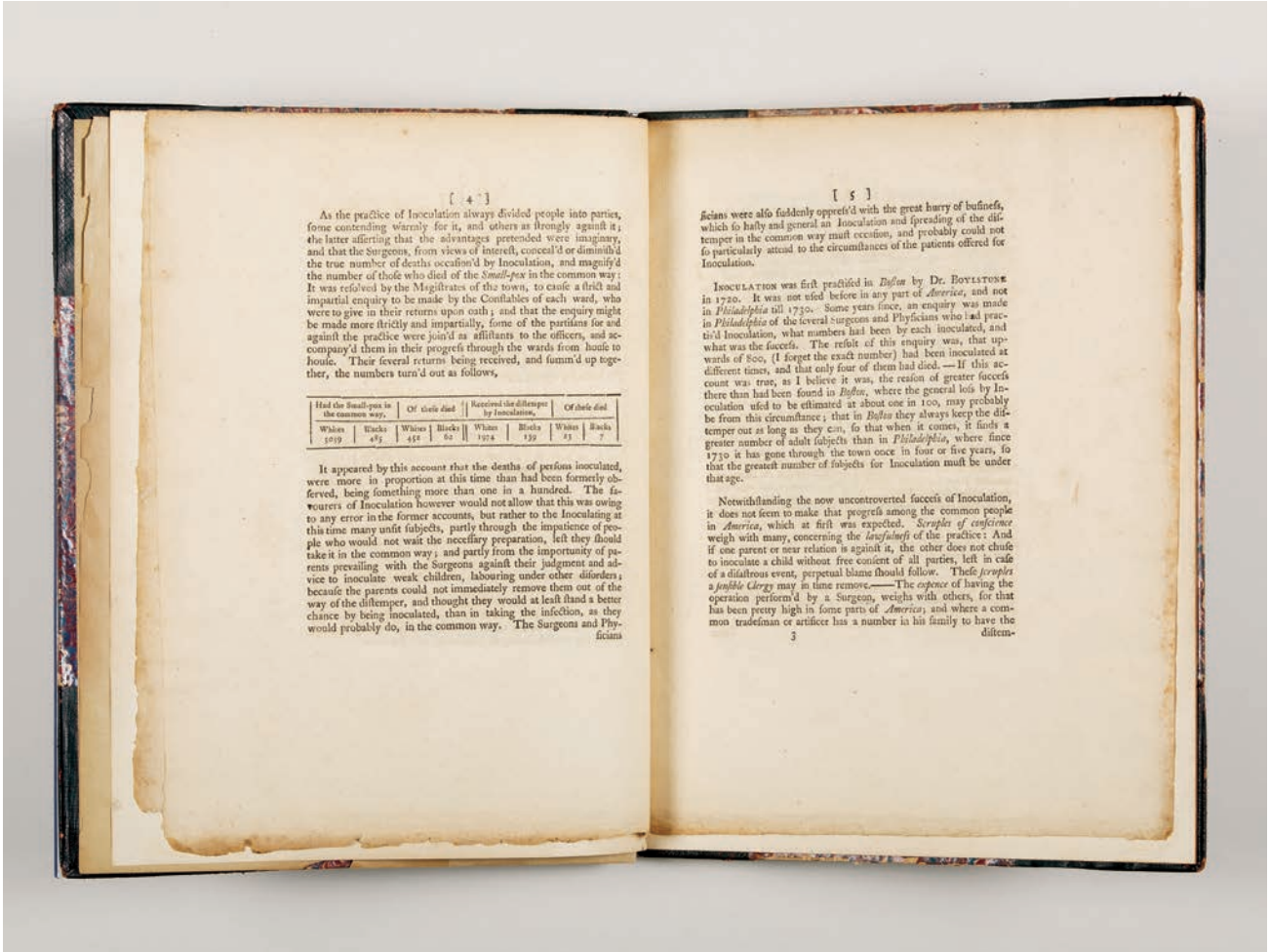
In this text about immigration and population growth, Franklin advocated public policies based on the dominant theories about human difference. In clause 24, he argued that America should privilege European immigrants over all others, including Indigenous peoples who were already living on the land.

79
"OBSERVATIONS CONCERNING THE INCREASE OF MANKIND," 2ND ED.
Benjamin Franklin (author),
Benjamin Mecom (printer)

Boston, 1760
Pamphlet
APS.



Published only five years after the original, Franklin's revised edition reveals his changing attitudes about human nature. First, he removed the explicitly racist clause 24. Second, in clause 12 he acknowledged that the criminal behavior he previously blamed on the nature of African people was *caused* by the inhumane "Nature of Slavery."



[4]

As the practice of Inoculation always divided people into parties, some contending warmly for it, and others as strongly against it; the latter asserting that the advantages pretended were imaginary, and that the Surgeons, from views of Interest, conceal'd or diminish'd the true number of deaths occasion'd by Inoculation, and magnify'd the number of those who died of the *Small-pox* in the common way: It was resolved by the Magistrates of the town, to cause a strict and impartial enquiry to be made by the Constables of each ward, who were to give in their returns upon oath; and that the enquiry might be made more strictly and impartially, some of the partisans for and against the practice were join'd as assistants to the officers, and accompany'd them in their progress through the wards from house to house. Their several returns being received, and summ'd up together, the numbers turn'd out as follows,

Had the Small-pox in the common way.		Of these died		Received the distemper by Inoculation.		Of these died	
Whites	Blacks	Whites	Blacks	Whites	Blacks	Whites	Blacks
5019	485	450	60	1904	139	23	7

It appeared by this account that the deaths of persons inoculated, were more in proportion at this time than had been formerly observed, being something more than one in a hundred. The favourers of Inoculation however would not allow that this was owing to any error in the former accounts, but rather to the Inoculating at this time many unfit subjects, partly through the impatience of people who would not wait the necessary preparation, lest they should take it in the common way; and partly from the importunity of parents prevailing with the Surgeons against their judgment and advice to inoculate weak children, labouring under other disorders; because the parents could not immediately remove them out of the way of the distemper, and thought they would at least stand a better chance by being inoculated, than in taking the infection, as they would probably do, in the common way. The Surgeons and Physicians

[5]

ficians were also suddenly oppress'd with the great hurry of business, which so hasty and general an Inoculation and spreading of the distemper in the common way must occasion, and probably could not so particularly attend to the circumstances of the patients offered for Inoculation.

INOCULATION was first practised in *Boston* by Dr. BOYLSTON in 1720. It was not used before in any part of *America*, and not in *Philadelphia* till 1730. Some years since, an enquiry was made in *Philadelphia* of the several Surgeons and Physicians who had practis'd Inoculation, what numbers had been by each inoculated, and what was the success. The result of this enquiry was, that upwards of 800, (I forget the exact number) had been inoculated at different times, and that only four of them had died. — If this account was true, as I believe it was, the reason of greater success there than had been found in *Boston*, where the general loss by Inoculation used to be estimated at about one in 100, may probably be from this circumstance; that in *Boston* they always keep the distemper out as long as they can, so that when it comes, it finds a greater number of adult subjects than in *Philadelphia*, where since 1730 it has gone through the town once in four or five years, so that the greatest number of subjects for Inoculation must be under that age.

Notwithstanding the now uncontroverted success of Inoculation, it does not seem to make that progress among the common people in *America*, which at first was expected. *Scruples of conscience* weigh with many, concerning the *lawfulness* of the practice: And if one parent or near relation is against it, the other does not chuse to inoculate a child without free consent of all parties, lest in case of a disastrous event, perpetual blame should follow. These *scruples* a *sensible Clergy* may in time remove.——The *expence* of having the operation perform'd by a Surgeon, weighs with others, for that has been pretty high in some parts of *America*; and where a common tradesman or artificer has a number in his family to have the distem-

3

80
SOME ACCOUNT OF THE SUCCESS OF INOCULATION FOR THE SMALL-POX IN ENGLAND AND AMERICA
Benjamin Franklin

London, 1759
Bound pamphlet
APS.

Franklin promoted public health through the practice of smallpox inoculation. He used survival statistics to prove the benefits of inoculation for all people, even as he categorized them by skin color. Franklin credits a white doctor for inoculation's success in Boston. An enslaved man named Onesimus actually taught the doctor the West African medical treatment.

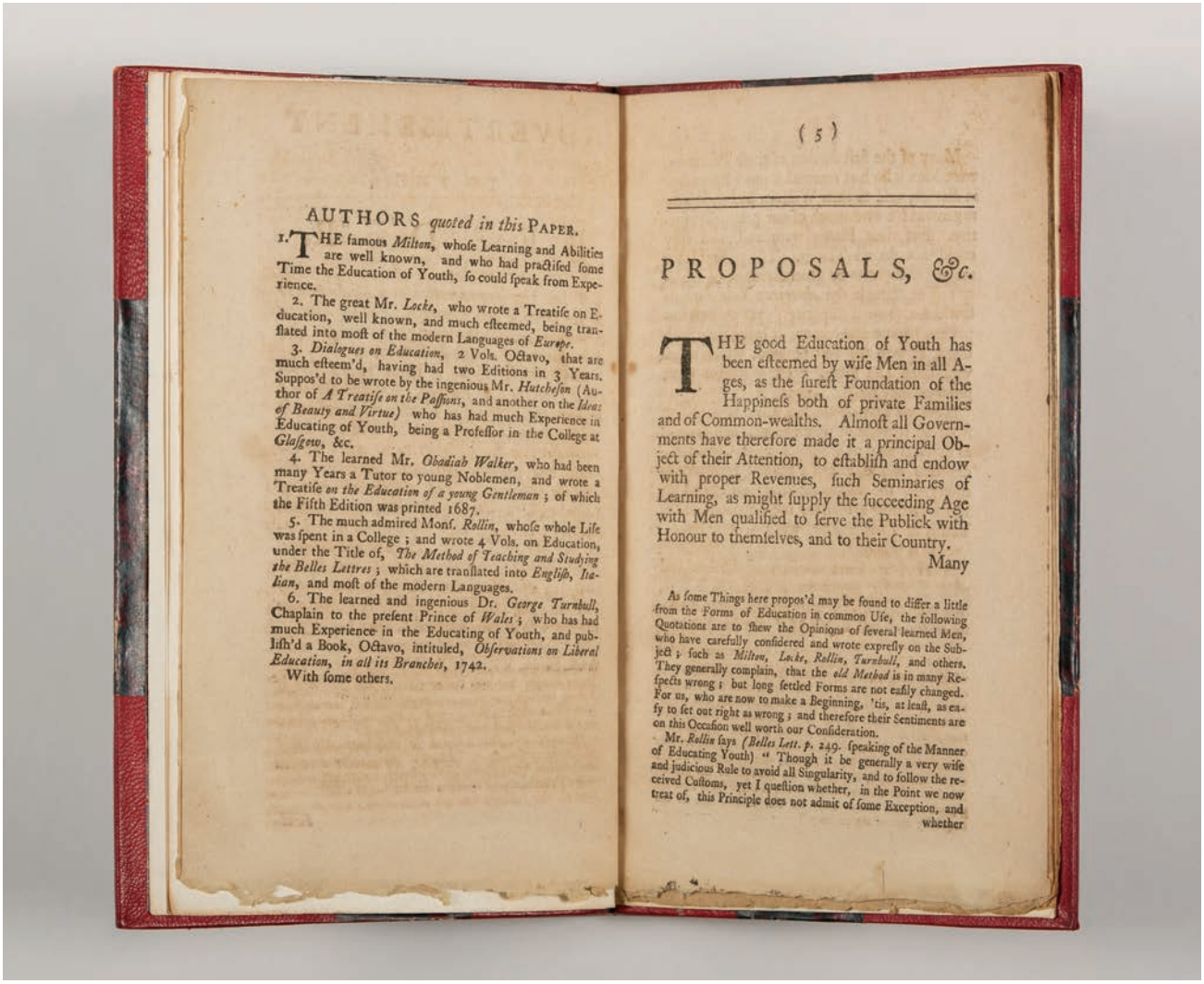
For the Benefit of "Mankind" in General

Franklin remained committed to advancing useful knowledge for "the Benefit of Mankind in General" even as his responsibilities as a public servant demanded more of his time. He believed that "there is no Rank in Natural Knowledge of equal Dignity and Importance with that of being . . . a good Neighbour or Friend, a good Subject or Citizen."

Franklin applied his privileged position to civic improvement by founding or patronizing institutions that promoted research and education, empowering the next generation of American citizen scientists. Many of these institutions still exist today, including the American Philosophical Society, the Library Company of Philadelphia, Pennsylvania Hospital, and the University of Pennsylvania. However, in his lifetime, the vast majority of people who benefited were elite, white men.

FIGURE 18
LE DOCTEUR FRANCKLIN COURONNÉ PAR LA LIBERTÉ
Jean Claude Richard abbé Saint Non

1778
Aquatint and etching
APS.



AUTHORS *quoted in this* PAPER.

1. THE famous *Milton*, whose Learning and Abilities are well known, and who had practiſed ſome Time the Education of Youth, ſo could ſpeak from Experience.

2. The great Mr. *Locke*, who wrote a Treatiſe on Education, well known, and much eſteemed, being tranſlated into moſt of the modern Languages of *Europe*.

3. *Dialogues on Education*, 2 Vols. Octavo, that are much eſteem'd, having had two Editions in 3 Years. Suppos'd to be wrote by the ingenious Mr. *Hutcheſon* (Author of *A Treatiſe on the Paſſions*, and another on the *Ideas of Beauty and Virtue*) who has had much Experience in Educating of Youth, being a Profeſſor in the College at *Glaſgow*, &c.

4. The learned Mr. *Obadiah Walker*, who had been many Years a Tutor to young Noblemen, and wrote a Treatiſe *on the Education of a young Gentleman*; of which the Fifth Edition was printed 1687.

5. The much admired Monſ. *Rollin*, whoſe whole Life was ſpent in a College; and wrote 4 Vols. on Education, under the Title of, *The Method of Teaching and Studying the Belles Lettres*; which are tranſlated into *Engliſh*, *Italian*, and moſt of the modern Languages.

6. The learned and ingenious Dr. *George Turnbull*, Chaplain to the preſent Prince of *Wales*; who has had much Experience in the Educating of Youth, and publiſh'd a Book, Octavo, intituled, *Obſervations on Liberal Education, in all its Branches*, 1742.

With ſome others.

(5)

PROPOSALS, &c.

THE good Education of Youth has been eſteemed by wiſe Men in all Ages, as the ſureſt Foundation of the Happineſs both of private Families and of Common-wealths. Almoſt all Governments have therefore made it a principal Object of their Attention, to eſtabliſh and endow with proper Revenues, ſuch Seminaries of Learning, as might ſupply the ſucceeding Age with Men qualified to ſerve the Publick with Honour to themſelves, and to their Country.

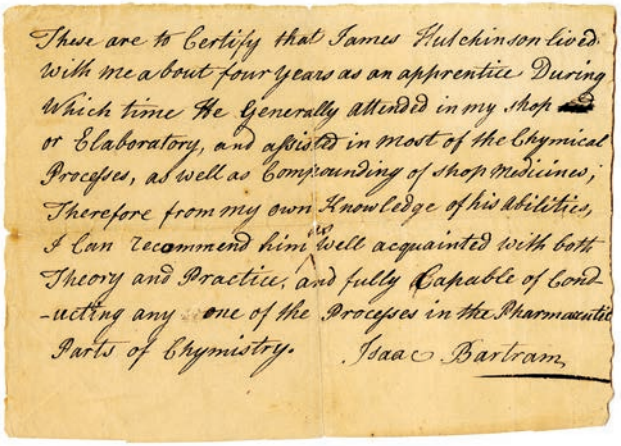
Many

As ſome Things here propos'd may be found to differ a little from the Forms of Education in common Uſe, the following Quotations are to ſhew the Opinions of ſeveral learned Men, who have carefully conſidered and wrote expreſly on the Subject; ſuch as *Milton*, *Locke*, *Rollin*, *Turnbull*, and others. They generally complain, that the *old Method* is in many Reſpects wrong; but long ſettled Forms are not eaſily changed. For us, who are now to make a Beginning, 'tis, at leaſt, as eaſy to ſet out right as wrong; and therefore their Sentiments are on this Occaſion well worth our Conſideration.

Mr. *Rollin* ſays (*Belles Lett.* p. 249. ſpeaking of the Manner of Educating Youth) "Though it be generally a very wiſe and judicious Rule to avoid all Singularity, and to follow the received Cuſtoms, yet I queſtion whether, in the Point we now treat of, this Principle does not admit of ſome Exception, and whether

81
PROPOSALS RELATING TO THE EDUCATION OF YOUTH IN PENSILVANIA
Benjamin Franklin
Philadelphia, 1749
Pamphlet
APS. Gift of J. P. Norris, 1815.

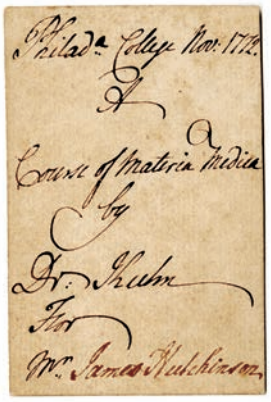
Franklin proposed founding a school to produce "Men qualified to serve the Publick with Honour to themselves, and to their Country." He suggested courses in science, history, and morality taught through lectures and hands-on experiences. The institution, previously known as the College, Academy, and Charity School of Philadelphia, became the University of Pennsylvania in 1791.

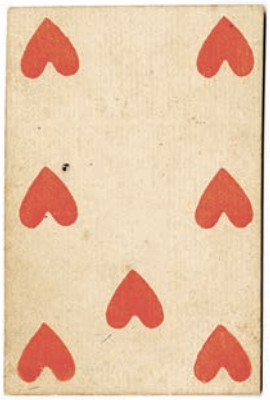

These are to Certify that James Hutchinson lived with me about four years as an apprentice During which time He Generally attended in my Shop or Elaboratory, and assisted in most of the Chymical Processes, as well as Compounding of Shop Medicines; Therefore from my own Knowledge of his abilities, I Can recommend him well acquainted with both Theory and Practice, and fully Capable of Conducting any one of the Processes in the Pharmaceutic Parts of Chymistry. Isaac Bartram

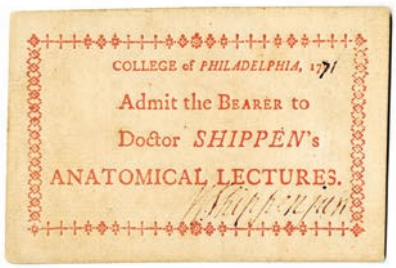
82
APOTHECARY CERTIFICATION FOR JAMES HUTCHINSON
Isaac Bartram

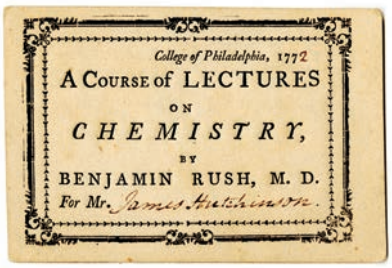
Philadelphia, 1773
Ink on paper
James Hutchinson Papers, APS. Gift of S. Pemberton Hutchinson, 1962.

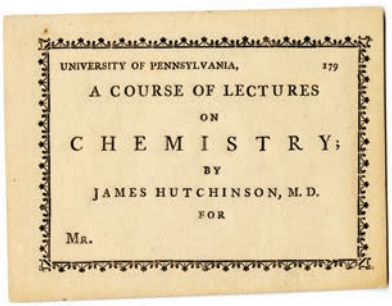
By the late 18th century, Franklin and his peers had become the patrons they once sought in Europe. They supported the next generation of American leaders, like James Hutchinson, who began his distinguished medical career as an apprentice with Philadelphia's Bartram family.


Philad.a College Nov. 1772.
A
Course of Materia Medica
by
Dr. Kuhn
For
Mr. James Hutchinson.




COLLEGE of PHILADELPHIA, 177[illegible]
Admit the Bearer to
Doctor SHIPPEN's
ANATOMICAL LECTURES.

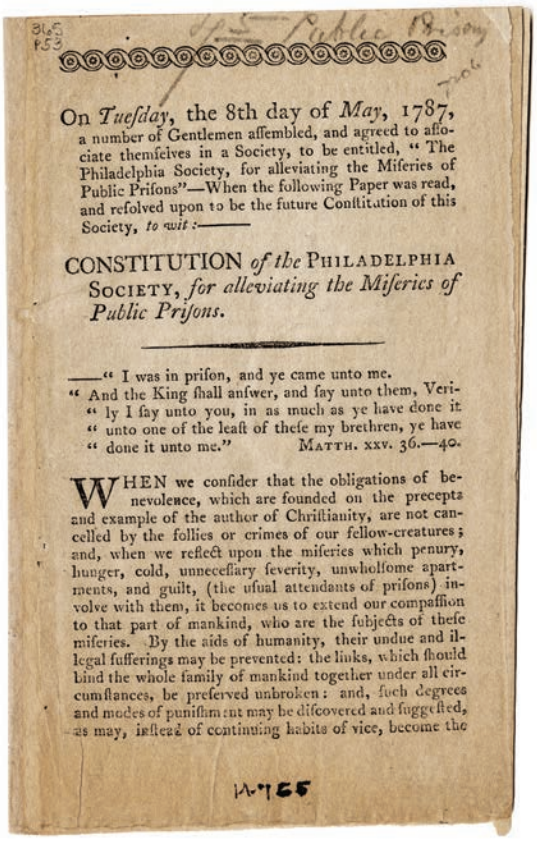

College of Philadelphia, 1772
A Course of LECTURES
ON
CHEMISTRY,
BY
BENJAMIN RUSH, M. D.
For Mr. James Hutchinson.


UNIVERSITY OF PENNSYLVANIA, 179
A COURSE OF LECTURES
ON
CHEMISTRY;
BY
JAMES HUTCHINSON, M.D.
FOR
MR.

83–86
TICKETS TO MEDICAL LECTURES
Benjamin Rush, William Shippen, Adam Kuhn, James Hutchinson

Philadelphia, 1772–1790
Stencil, letterpress, and engraving
James Hutchinson Papers, APS. Gift of S. Pemberton Hutchinson, 1962.

Franklin and his friends founded both the College of Philadelphia's Medical School and the Pennsylvania Hospital, the first institutions of their kinds in British America. Students attended ticketed lectures on medical theory and observed patient care at the Hospital. Tickets for Adam Kuhn's lectures appeared on the back of playing cards.



On *Tuesday*, the 8th day of *May*, 1787, a number of Gentlemen assembled, and agreed to associate themselves in a Society, to be entitled, "The Philadelphia Society, for alleviating the Miseries of Public Prisons"—When the following Paper was read, and resolved upon to be the future Constitution of this Society, *to wit*:——

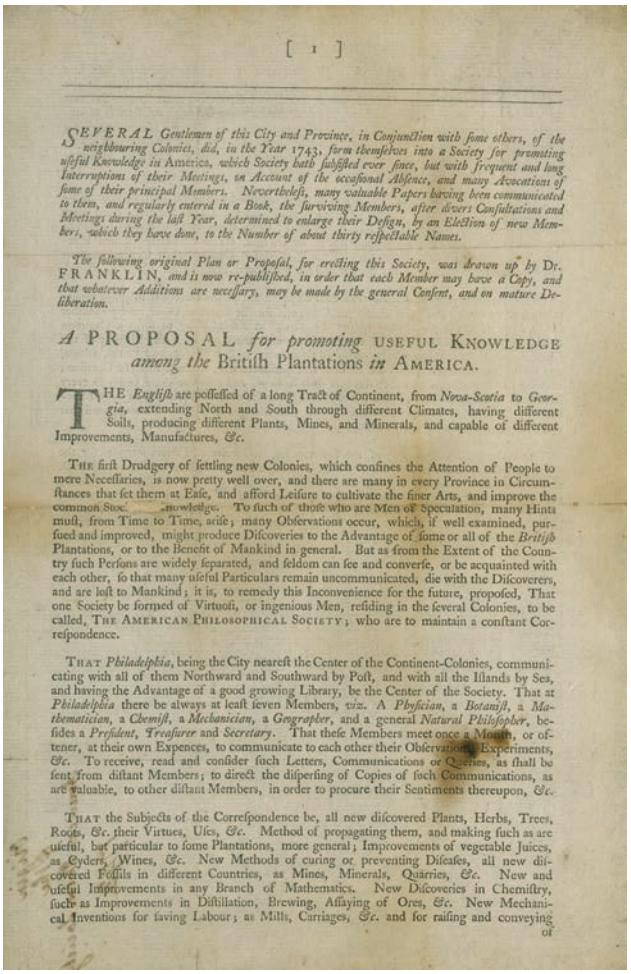
CONSTITUTION *of the* PHILADELPHIA SOCIETY, *for alleviating the Miseries of Public Prisons.*

——"I was in prison, and ye came unto me.
"And the King shall answer, and say unto them, Verily I say unto you, in as much as ye have done it "unto one of the least of these my brethren, ye have "done it unto me." MATTH. xxv. 36.—40.

WHEN we consider that the obligations of benevolence, which are founded on the precepts and example of the author of Christianity, are not cancelled by the follies or crimes of our fellow-creatures; and, when we reflect upon the miseries which penury, hunger, cold, unnecessary severity, unwholsome apartments, and guilt, (the usual attendants of prisons) involve with them, it becomes us to extend our compassion to that part of mankind, who are the subjects of these miseries. By the aids of humanity, their undue and illegal sufferings may be prevented: the links, which should bind the whole family of mankind together under all circumstances, be preserved unbroken: and, such degrees and modes of punishment may be discovered and suggested, as may, instead of continuing habits of vice, become the

87
CONSTITUTION OF THE PHILADELPHIA SOCIETY, FOR ALLEVIATING THE MISERIES OF PUBLIC PRISONS
Philadelphia, 1789
Pamphlet
APS.

In 1787, Franklin joined a prison reform society, whose constitution and mission appeared in this pamphlet. Drawing on recent medical studies, reformers encouraged the rehabilitation of criminals, in part through training in profitable trades and exposure to fresh air. The Society's efforts resulted in the Eastern State Penitentiary, which opened in 1829.



[1]

SEVERAL Gentlemen of this City and Province, in Conjunction with some others, of the neighbouring Colonies, did, in the Year 1743, form themselves into a Society for promoting useful Knowledge in America, which Society hath subsisted ever since, but with frequent and long Interruptions of their Meetings, on Account of the occasional Absence, and many Avocations of some of their principal Members. Nevertheless, many valuable Papers having been communicated to them, and regularly entered in a Book, the surviving Members, after divers Consultations and Meetings during the last Year, determined to enlarge their Design, by an Election of new Members, which they have done, to the Number of about thirty respectable Names.

The following original Plan or Proposal, for erecting this Society, was drawn up by Dr. FRANKLIN, *and is now re-published, in order that each Member may have a Copy, and that whatever Additions are necessary, may be made by the general Consent, and on mature Deliberation.*

A PROPOSAL *for promoting* USEFUL KNOWLEDGE *among the* British Plantations *in* AMERICA.

THE *English* are possessed of a long Tract of Continent, from *Nova-Scotia* to *Georgia*, extending North and South through different Climates, having different Soils, producing different Plants, Mines, and Minerals, and capable of different Improvements, Manufactures, *&c.*

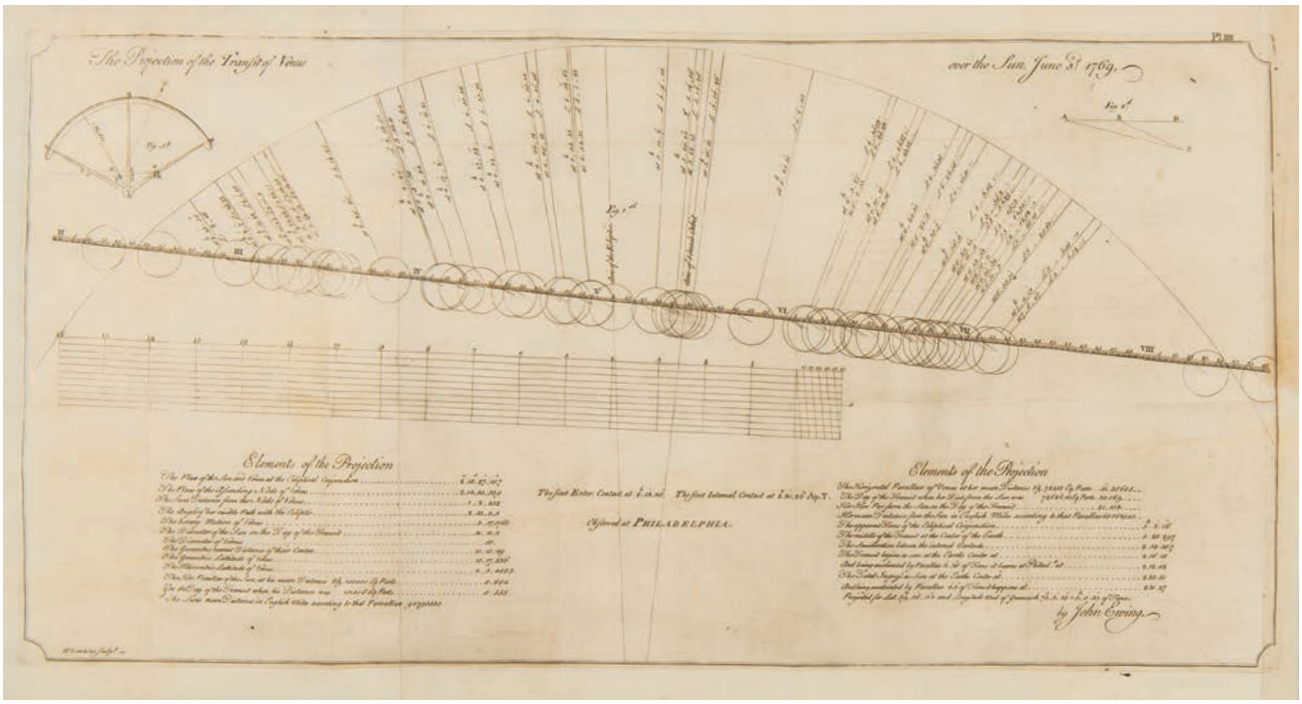
THE first Drudgery of settling new Colonies, which confines the Attention of People to mere Necessaries, is now pretty well over, and there are many in every Province in Circumstances that set them at Ease, and afford Leisure to cultivate the finer Arts, and improve the common Stock of Knowledge. To such of those who are Men of Speculation, many Hints must, from Time to Time, arise; many Observations occur, which, if well examined, pursued and improved, might produce Discoveries to the Advantage of some or all of the *British* Plantations, or to the Benefit of Mankind in general. But as from the Extent of the Country such Persons are widely separated, and seldom can see and converse, or be acquainted with each other, so that many useful Particulars remain uncommunicated, die with the Discoverers, and are lost to Mankind; it is, to remedy this Inconvenience for the future, proposed, That one Society be formed of Virtuosi, or ingenious Men, residing in the several Colonies, to be called, THE AMERICAN PHILOSOPHICAL SOCIETY; who are to maintain a constant Correspondence.

THAT *Philadelphia*, being the City nearest the Center of the Continent-Colonies, communicating with all of them Northward and Southward by Post, and with all the Islands by Sea, and having the Advantage of a good growing Library, be the Center of the Society. That at *Philadelphia* there be always at least seven Members, *viz.* A *Physician*, a *Botanist*, a *Mathematician*, a *Chemist*, a *Mechanician*, a *Geographer*, and a general *Natural Philosopher*, besides a *President*, *Treasurer* and *Secretary*. That these Members meet once a Month, or oftener, at their own Expences, to communicate to each other their Observations, Experiments, *&c.* To receive, read and consider such Letters, Communications or Queries, as shall be sent from distant Members; to direct the dispersing of Copies of such Communications, as are valuable, to other distant Members, in order to procure their Sentiments thereupon, *&c.*

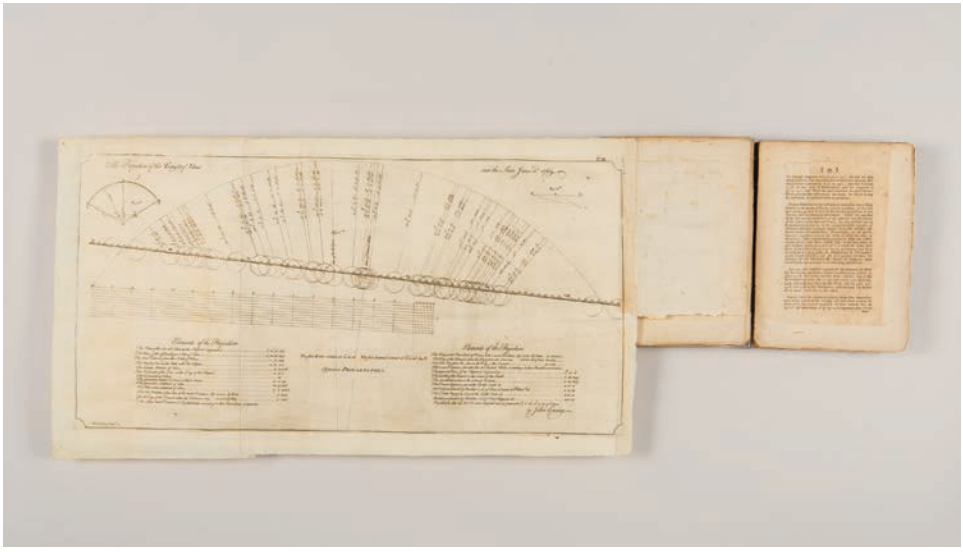
THAT the Subjects of the Correspondence be, all new discovered Plants, Herbs, Trees, Roots, *&c.* their Virtues, Uses, *&c.* Method of propagating them, and making such as are useful, but particular to some Plantations, more general; Improvements of vegetable Juices, as Cyders, Wines, *&c.* New Methods of curing or preventing Diseases, all new discovered Fossils in different Countries, as Mines, Minerals, Quarries, *&c.* New and useful Improvements in any Branch of Mathematics. New Discoveries in Chemistry, such as Improvements in Distillation, Brewing, Assaying of Ores, *&c.* New Mechanical Inventions for saving Labour; as Mills, Carriages, *&c.* and for raising and conveying of

88
A PROPOSAL FOR PROMOTING USEFUL KNOWLEDGE AMONG THE BRITISH PLANTATIONS IN AMERICA
Benjamin Franklin
Philadelphia, 1768
Pamphlet
APS.

In 1743, Franklin and friends formed a club for discussing useful knowledge and improving society. Joining with another group in 1768, it became the American Philosophical Society. Franklin's 1743 proposal was reprinted, as displayed here, to mark the occasion.



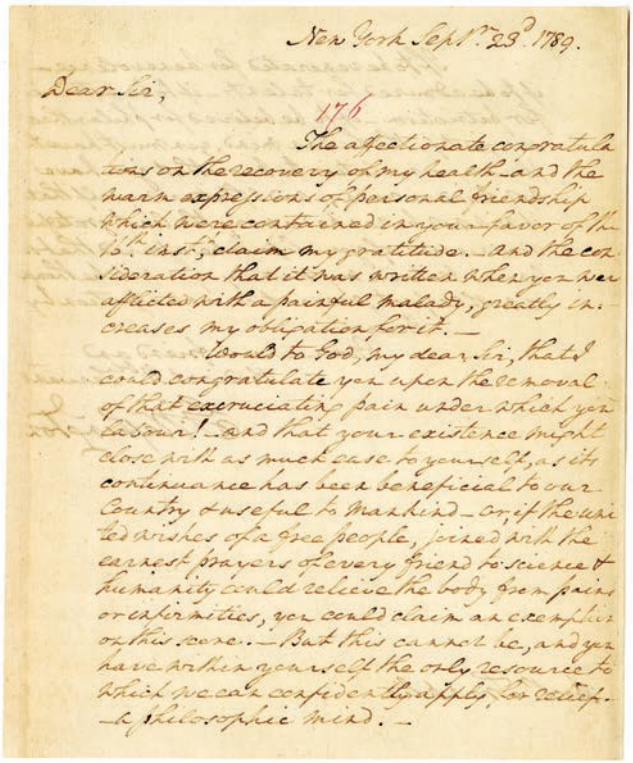
89
PROJECTION OF THE TRANSIT OF VENUS, OBSERVED AT PHILADELPHIA, JUNE 3, 1769
John Ewing (author), APS
Philadelphia, 1771
Bound volume
APS. Gift of Hiester Muhlenberg.



The first volume of the *Transactions of the American Philosophical Society* featured observations of Venus as it traveled across the sun. The Society participated in this global effort, which allowed scientists to calculate the distance between the earth and sun. This publication brought the APS international recognition.

90
BACK OF THE STATE HOUSE
William Birch
Philadelphia, 1799
Hand-colored engraving
APS.

This print shows familiar landmarks of Franklin's Philadelphia: the APS's Philosophical Hall, the original Library Company of Philadelphia, and the State House (Independence Hall). The presence of women and Indigenous peoples shows that 18th-century public life was more diverse than institutional records admit.



New York Sept.r 23.d 1789.

Dear Sir,

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The affectionate congratulations on the recovery of my health, and the warm expressions of personal friendship which were contained in your favor of the 15.th inst.t claim my gratitude. And the consideration that it was written while you were afflicted with a painful malady, greatly increases my obligation for it. —

Would to God, my dear Sir, that I could congratulate you upon the removal of that excruciating pain under which you labour! — and that your existence might close with as much ease to yourself, as its continuance has been beneficial to our Country & useful to Mankind — or if the united wishes of a free people, joined with the earnest prayers of every friend to science & humanity could relieve the body from pains or infirmities, you could claim an exemption on this score. — But this cannot be, and you have within yourself the only resource to which we can confidently apply, for relief. — A philosophic mind. —

91
LETTER TO BENJAMIN FRANKLIN
George Washington
New York, September 23, 1789
Ink on paper
Benjamin Franklin Papers, APS. Gift of Charles Pemberton and Mary Fox, 1840.

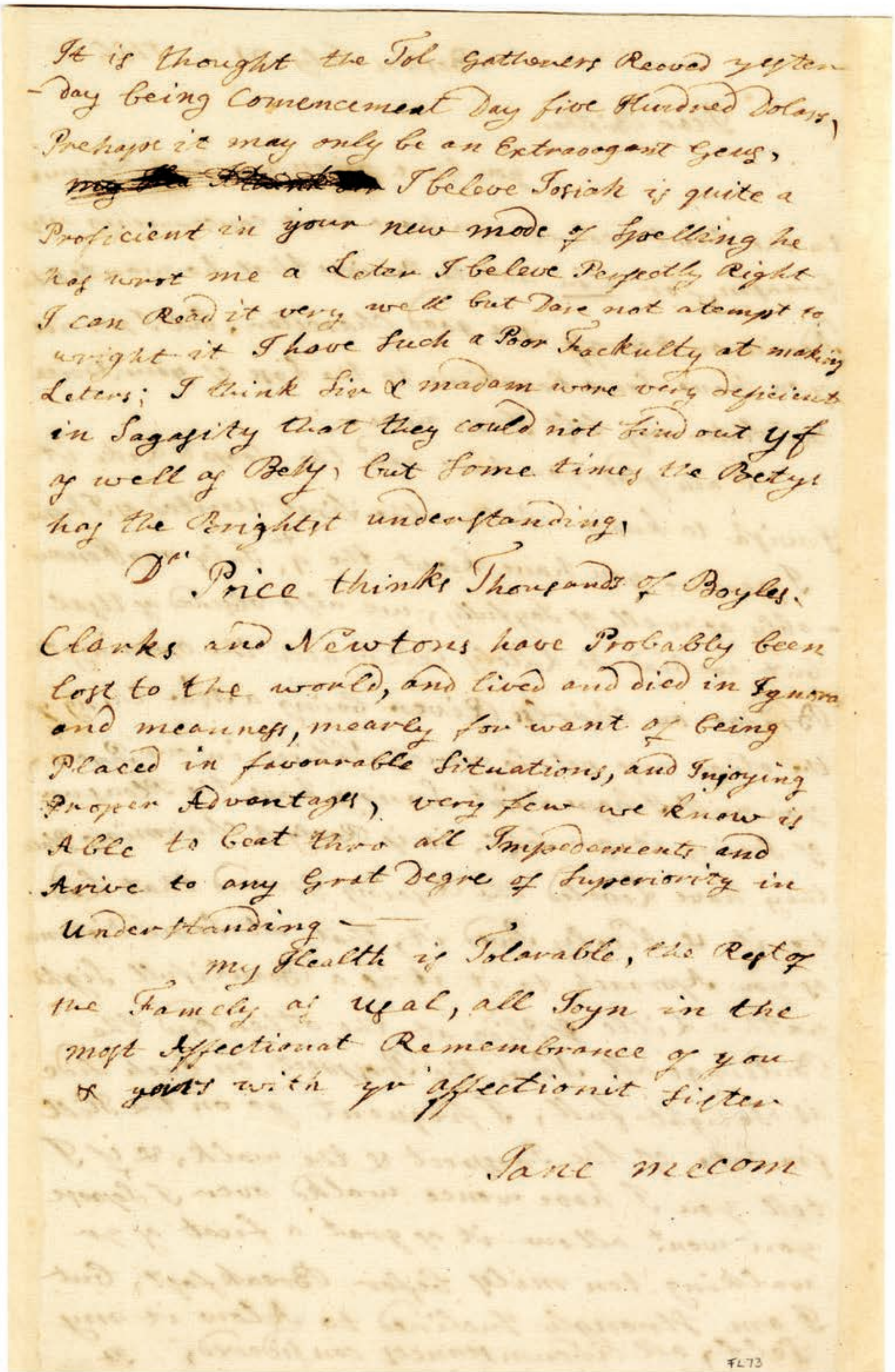
President Washington wrote to the ailing 83-year-old Franklin, praising his "philosophic mind." He encouraged his friend to take comfort in knowing that his life's labors were "beneficial to our Country and useful to Mankind." Franklin passed away on April 17, 1790.

"Lost to the World"

When Franklin died, his work as a citizen scientist had made him the most recognizable American in the world. He had risen above his working-class origins and counted presidents and kings among his friends.

Jane Franklin Mecom's world rarely extended beyond her birthplace of Boston, except through the letters she and her brother exchanged their entire lives. Denied formal education, married at 15, and forced to support her aging parents, 12 children, and other family, she watched her brother "beat thro all Impedements" using advantages unavailable to her. Mecom's life and legacy stand in stark contrast to her brother's.

Unequal opportunities and rewards for people based on gender, race, ethnicity, religion, and class continue to shape society. Today, we rephrase Mecom's letter reproduced and quoted here, to ask: How many people, like Jane, have been "lost to the world" because they were born into circumstances beyond their control?


It is thought the Tol Gatherers Recevd yesten-
-day being Comencement Day five Hundred Dolars,
Prehaps it may only be an Extravagant Gess,
I beleve Josiah is quite a
Proficient in your new mode of Spelling he
has wrot me a Leter I beleve Perfectly Right
I can Read it very well but Dare not atempt to
wright it I have such a Poor Fackulty at making
Leters; I think Sir & madam were very deficient
in Sagasity that they could not find out yt
as well as Bety, but Some times the Betys
has the Brightest understanding,

Dr Price thinks Thousands of Boyles.
Clarks and Newtons have Probably been
lost to the world, and lived and died in Ignorans
and meanness, mearly for want of being
Placed in favourable Situations, and Injoying
Proper Advantages, very few we know is
Able to beat thro all Impedements and
Arive to any Grat Degre of Superiority in
Understanding —

my Health is Tolerable, the Rest of
the Famely as usal, all Joyn in the
most Affectionat Remembrance of you
& yours with yr affectionat Sister

Jane mecom

FL73

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LETTER TO DR. FRANKLIN

Jane Franklin Mecom

Boston, July 21, 1786
Ink on paper
Franklin-Bache Papers, APS.
Gift of Mr. and Mrs. Franklin Bache, 1937.

After reading a book on moral philosophy by Richard Price, Mecom reflected to her brother:

"Thousands of Boyles Clarks and Newtons have Probably been lost to the world, and lived and died in Ignorans and meanness, mearly for want of being Placed in favourable situations, and Injoying Proper Advantages, very few we know is Able to beat thro all Impedements and Arive to any Grat Degre of superiority in Understanding."

Selected Bibliography

FOR *DR. FRANKLIN, CITIZEN SCIENTIST*

Bensaude-Vincent, Bernadette, and Christine Blondel, eds. *Science and Spectacle in the European Enlightenment*. Burlington, VT: Ashgate Publishing, 2008.

Bunker, Nick. *Young Benjamin Franklin: The Birth of Ingenuity*. New York: Alfred A. Knopf, 2018.

Chaplin, Joyce E. *The First Scientific American: Benjamin Franklin and the Pursuit of Genius*. New York: Basic Books, 2006.

Chiles, Katy L. *Transformable Race: Surprising Metamorphoses in the History in the Literature of Early America*. New York: Oxford University Press, 2014.

Cohen, I. Bernard. *Benjamin Franklin's Science*. Cambridge: Harvard University Press, 1990.

Cohn, Ellen R. "Benjamin Franklin, Georges-Louis le Rouge and the Franklin/Folger Chart of the Gulf Stream." *Imago Mundi* 52, no. 1 (January 2000): 124–42.

Conger, Vivian Bruce. "Reading Early American Women's Political Lives: The Revolutionary Performances of Deborah Read Franklin and Sally Franklin Bache." *Early American Studies* 16, no. 2 (2018): 317–52.

———. "'There is Graite Odds between A Mans being At Home And A Broad': Deborah Read Franklin and the Eighteenth-Century Home." *Gender and History* 21, no. 3 (November 2009): 392–607.

Curran, Andrew S. *The Anatomy of Blackness: Science and Slavery in an Age of Enlightenment*. Baltimore: Johns Hopkins University Press, 2012.

Darnton, Robert. *Mesmerism and the End of the Enlightenment in France*. Cambridge: Harvard University Press, 1968.

Delbourgo, James. *A Most Amazing Scene of Wonders: Electricity and Enlightenment in Early America*. Cambridge: Harvard University Press, 2006.

Delbourgo, James, and Nicholas Dew, eds. *Science and Empire in the Atlantic World*. New York: Routledge, 2008.

Finger, Stanley. *Doctor Franklin's Medicine*. Philadelphia: University of Pennsylvania Press, 2006.

Fleming, James Rodger. *Historical Perspectives of Climate Change*. New York: Oxford University Press, 2005.

Fortune, Brandon Brame, and Deborah Jean Warner. *Franklin and His Friends: Portraying the Man of Science in Eighteenth-Century America*. Washington, DC: Smithsonian National Portrait Gallery, 1999.

Fry, Jennifer Reed. "'Extraordinary Freedom and Great Humility': A Reinterpretation of Deborah Franklin." *The Pennsylvania Magazine of History and Biography* 127, no. 2 (April 2003): 167–96.

Golinski, Jan. "Enlightenment Science." In *The Oxford Illustrated History of Science*, edited by Iwan Rhys Morus, 180–212. Oxford: Oxford University Press, 2017.

Green, James N., and Peter Stallybrass. *Benjamin Franklin: Writer and Printer*. New Castle: Oak Knoll Press, 2006.

Hayes, Kevin J. "New Light on Peter and King, the Two Slaves Benjamin Franklin Brought to England." *Notes and Queries* 60, no. 2 (2013): 205–209.

Heilbron, J. L. *Electricity in the 17th and 18th Centuries: A Study of Early Modern Physics*. Berkeley: University of California Press, 1979.

Hogarth, Rana A. *Medicalizing Blackness: Making Racial Difference in the Atlantic World, 1780–1840*. Chapel Hill: University of North Carolina Press, 2017.

Kendi, Ibram X. *Stamped from the Beginning: The Definitive History of Racist Ideas in America*. New York: Nation Books, 2016.

Lemay, J. A. Leo. *Ebenezer Kinnersley: Franklin's Friend*. Philadelphia: University of Pennsylvania Press, 1964.

———. *The Life of Benjamin Franklin*. 3 vols. Philadelphia: University of Pennsylvania Press, 2005–2008.

Lepore, Jill. *Book of Ages: The Life and Opinions of Jane Franklin*. New York: Alfred A. Knopf, 2013.

McGregor, Deborah. "Coming Full Circle: Indigenous Knowledge, Environment, and Our Future." *American Indian Quarterly* 28, no. 3–4 (2004): 385–410.

Meyers, Amy R. W., and Lisa L. Ford, eds. *Knowing Nature: Art and Science in Philadelphia, 1740–1840*. New Haven: Yale University Press, 2011.

Meyers, Amy R. W., and Margaret Beck Pritchard, eds. *Empire's Nature: Mark Catesby's New World Vision*. Chapel Hill: Published for the Omohundro Institute of Early American History and Culture by the University of North Carolina Press, 1998.

Minardi, Margot. "The Boston Inoculation Controversy of 1721–1722: An Incident in the History of Race." *The William and Mary Quarterly* 61, no. 1 (2004): 47–76.

Morgan, Edmund S. *Benjamin Franklin*. New Haven: Yale University Press, 2003.

Mulford, Carla. *Benjamin Franklin and the Ends of Empire*. New York: Oxford University Press, 2015.

———. "Benjamin Franklin and Women: Or, Franklin's Women." *Pennsylvania History* 87, no. 3 (Summer 2020): 454–93.

———. "Benjamin Franklin's Savage Eloquence: Hoaxes from the Press at Passy, 1782." *Proceedings of the American Philosophical Society* 152, no. 4 (2008): 490–530.

Murphy, Kathleen S. "Collecting Slave Traders: James Petiver, Natural History, and the British Slave Trade." *The William and Mary Quarterly*, 3rd ser., 70, no. 4 (2013): 637–70.

———. "Translating the Vernacular: Indigenous and African Knowledge in the Eighteenth-Century British Atlantic." *Atlantic Studies* 8, no. 1 (2011): 29–48.

Nash, Gary B. "Franklin and Slavery." *Proceedings of the American Philosophical Society* 150, no. 4 (2006): 618–35.

———. "When We Were Young: The American Philosophical Society in the 18th Century." *Proceedings of the American Philosophical Society* 163, no. 1 (March 2019): 10–50.

Newman, Simon P. "Benjamin Franklin and the Leather-Apron Men: The Politics of Class in Eighteenth-Century Philadelphia." *Journal of American Studies* 43, no. 2 (August 2009): 161–75.

Parrish, Susan Scott. *American Curiosity: Cultures of Natural History in the Colonial British Atlantic World*. Chapel Hill: Published for the Omohundro Institute of Early American History and Culture by the University of North Carolina Press, 2006.

Pollack, John, ed. *"The Good Education of Youth": Worlds of Learning in the Age of Franklin*. New Castle: Oak Knoll Press, 2009.

Roberts, Jennifer L. "The Veins of Pennsylvania: Benjamin Franklin's Nature-Print Currency." *Grey Room* 69 (2018): 50–79.

Robinson, Martha. "New Worlds, New Medicines: Indian Remedies and English Medicine in Early America." *Early American Studies* 3, no. 1 (Spring 2005): 94–110.

Roney, Jessica C. *Governed by a Spirit of Opposition: The Origins of American Political Practice in Colonial Philadelphia*. Baltimore: Johns Hopkins University Press, 2014.

Schiebinger, Londa. "Agnotology and Exotic Abortifacients: The Cultural Production of Ignorance in the Eighteenth-Century Atlantic World." *Proceedings of the American Philosophical Society* 149, no. 3 (September 2005): 316–43.

———. "Scientific Exchange in the Eighteenth-Century Atlantic World." In *Soundings in Atlantic History: Latent Structures and Intellectual Currents, 1500–1830*, edited by Bernard Bailyn and Patricia L. Denault, 294–328. Cambridge: Harvard University Press, 2009.

———. *Secret Cures of Slaves: People, Plants, and Medicine in the Eighteenth-Century Atlantic World*. Stanford: Stanford University Press, 2017.

Schiffer, Michael Brian. *Draw the Lightning Down: Benjamin Franklin and Electrical Technology in the Age of Enlightenment*. Berkeley: University of California Press, 2003.

Shapin, Steven. "The Invisible Technician." *American Scientist* 77, no. 6 (1989): 554–63.

Stern, Jeremy A. "Jane Franklin Mecom: A Boston Woman in Revolutionary Times." *Early American Studies* 4, no. 1 (2006): 147–91.

Talbott, Page, ed. *Benjamin Franklin: In Search of a Better World*. New Haven: Yale University Press, 2005.

Tanford, Charles. *Ben Franklin Stilled the Waves: An Informal History of Pouring Oil on Water with Reflections on the Ups and Downs of Scientific Life in General*. Durham: Duke University Press, 1989.

Tise, Larry E., ed. *Benjamin Franklin and Women*. University Park: Pennsylvania State University Press, 2000.

Waldstreicher, David, ed. *A Companion to Benjamin Franklin*. Malden: Wiley-Blackwell, 2011.

———. *Runaway America: Benjamin Franklin, Slavery, and the American Revolution*. New York: Hill and Wang: 2004.

Winterer, Caroline. *American Enlightenments: Pursuing Happiness in the Age of Reason*. New Haven: Yale University Press, 2016.

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