Benjamin Franklin: A How-To Guide, Catalog of the Exhibition

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Benjamin Franklin: A How-to Guide

A Catalog of an Exhibition at Houghton Library
June 5 - September 23, 2006
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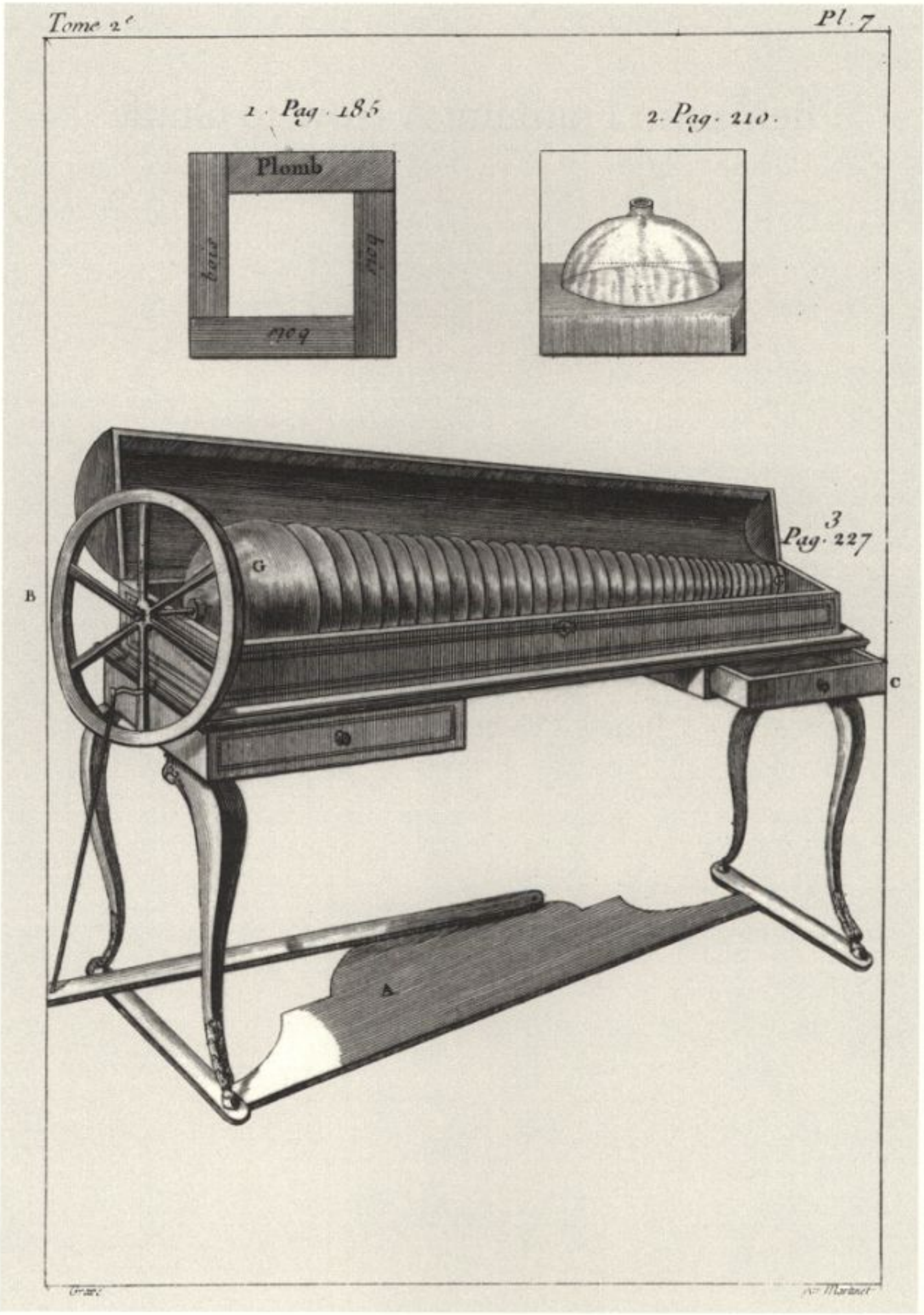

Figure 9. Glass Armonica, illustration from *Oeuvres de M. Franklin*, ED. JACQUES BARBEU-DUBOURG (Paris, 1773). Reproduction courtesy of Houghton Library.

Benjamin Franklin: A How-to Guide

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I. Houghton Library
The Circulation of Knowledge

WHAT DO YOU KNOW and how do you know it? Today, we are surrounded by self-help literature and how-to guides. This how-to universe did not always exist. It has a history, and its history explains a great deal about Benjamin Franklin, that self-made American who was the focus of this exhibition. The Houghton Library portion of the exhibit examined the circulation of knowledge, focusing on how information was made public.

During the eighteenth century, a wide variety of printed materials and technical instruments became available to consumers. These new consumer items gave people unprecedented access to knowledge about science, technology, geographic exploration, politics, music, and religion. The Age of Enlightenment may have been an age of philosophers, but ordinary people could learn what the philosophers were doing and saying, and even make their own contributions to knowledge.

Benjamin Franklin did just that. In his youth, he read many examples of how-to literature. As a printer, he produced his own examples, as in his newspaper, the *Pennsylvania Gazette*, and his almanac, *Poor Richard*. His famous electrical experiments were published in everyday English (rather than Latin) and appeared in multiple editions. He even used various how-to formats to promote the American revolutionary cause. And eventually, in his autobiography, Franklin gave the world a how-to guide to himself.

A. How to . . . learn things

How-to literature emerged in the late middle ages and Renaissance. It has grown in volume ever since. Printed material made public a great deal of new information, as well as forms of knowledge that had once been restricted to certain privileged groups. By the eighteenth century, the how-to genre included the most famous of popular guides to knowledge, encyclopedias. Other publications gave advice on specific topics. Beginning in his childhood, Franklin would read a variety of these printed sources.

1. Sir Hugh Plat, *The Jewell House of Art and Nature* (London, 1591). As early as the sixteenth century, people complained of an information overload. They wanted to organize knowledge for easy retrieval. This book was an early compendium of practical information—how to understand nature and how to use art to transform it. Some of its entries were on arcane topics; others were on everyday activities, such as cooking. Houghton Library, Harvard College Library (hereinafter Houghton) STC 19991 (A) - Gift to Harvard College Library from Daniel B. Fearing, 1915

THREE-*Legged Staff*, an Inſtrument conſiſting of three Wooden Legs, made with Joints, ſo to ſhut all together, and to take off in the Middle, for the better Carriage; and uſually having on its Top a Ball and Socket, ſerving to ſupport and adjuſt Inſtruments for Aſtronomy, Surveying, *&c.* See BALL and SOCKET.

THRENGUS, in our ancient Cuſtoms. See DRENCHES.

Quia vero non erant adhuc tempore Regis Willielmi *Milites in Angliâ, ſed* Threnges; *præcipit Rex ut de eis Milites fierent ad defendendam terram: fecit autem Lanfrancus* Threngos *ſuos Milites*, &c. Somn. Gavelk.

They were Vaſſals, but not of the loweſt Degree of thoſe who held Lands of the chief Lord.

The Name was impoſ'd by the Conqueror; for when one *Edwyn Sharnbourn* of *Norfolk*, and others, were ejected out of their Lands; they complain'd to the Conqueror; inſiſting, that they were always on his Side, and never oppos'd him: which, upon Enquiry, he found to be true; and therefore he commanded that every one ſhould be reſtor'd to their Lands, and for ever after be call'd *Drengbes*. *Spelm.*

THRENODY, THRENODIA, a mournful, or Funeral Song. See FUNERAL.

THROAT, the Part of an Animal between the Head and the Shoulders, wherein is the Gullet. See GULLET.

Phyſicians include under the Word *Throat*, all that Hollow or Cavity which may be ſeen when the Mouth is wide open.

It is ſometimes alſo call'd *Iſthmus*, by Reaſon it is narrow, and bears ſome Reſemblance to thoſe Streights call'd by the Geographers *Iſthmi*.

THROAT, in Architecture, Fortification, *&c.* See GORGE and GULA.

THRONE, from the *Greek* θρόνος, a magnificent Seat or Chair; is a Royal Seat, inrich'd with Ornaments of Architecture and Sculpture, made of ſome precious Matter, rais'd on ſeveral Steps, and cover'd with a kind of Canopy.

Such as are in the Rooms of Audience of Kings and other Sovereigns.

THROWS *of Women*, the Pains of Child-Birth. See DELIVERY, *&c.*

THROWSTER, one who *throws*, *i. e.* winds or rolls Silk. See SILK.

THUNDER, a Noiſe in the loweſt Region of the Air, excited by a ſudden kindling of ſulphurous Exhalations. See AIR, ATMOSPHERE, EXHALATIONS, *&c.*

Sources, *Rohault*, and other Authors, both ancient and modern, account for *Thunder*, by ſuppoſing two Clouds impending over one another, the upper and rarer whereof becoming condens'd by a freſh Acceſſion of Air rais'd thither by Warmth from the lower Parts of the Atmoſphere; or driven upon it by the Wind; immediately falls forcibly down upon the lower, and denſer Cloud: By which Fall, the Air interpoſ'd between the two being compreſs'd; that next the Extremities of the two Clouds is ſqueez'd out, and leaves Room for the Extremity of the upper Cloud to cloſe tight upon the under: Thus a great Quantity of Air is incloſ'd, which at length eſcaping thro' ſome winding irregular Vent or Paſſage, it occaſions that Noiſe we call *Thunder*. See CROWN, *&c.*

But this only reaches to the Phænomena of *Thunder* heard without Lightening; and, in effect, we have now a better Solution: *Thunder* is not occaſion'd by the falling of Clouds; but by the kindling of ſulphurous Exhalations, in the ſame Manner as the Noiſe of Aurum Fulminans.

"There are ſulphurous Exhalations, ſays Sir *Iſaac Newton*, always aſcending into the Air when the Earth is dry; "there they ferment with the nitrous Acids, and ſometimes "taking Fire, generate into *Thunder*, Lightening, *&c.*

That, beſide the Vapours rais'd from Water, *&c.* there are alſo Exhalations carry'd off from Sulphur, Bitumen, Volatile Salts, *&c.* is paſt all doubt; the vaſt Quantity of ſulphurous and bituminous Matter all over the Surface of the Earth, and the Volatile Salts of Plants and Animals, afford ſuch an ample Stock thereof; that 'tis no Wonder the Air ſhould be fill'd with ſuch Particles, rais'd higher or lower, according to their greater or leſs Degree of Subtility and Activity; and more copiouſly ſpread in this or that Quarter, according to the Direction of the Winds, *&c.* See SULPHUR.

Now, the Effects of *Thunder* are ſo like thoſe of fir'd Gunpowder, that Dr. *Willis* thinks we need not ſcruple to aſcribe them to the ſame Cauſe: But the principal Ingredients in Gunpowder we know are Nitre and Sulphur; Charcoal only ſerving to keep the Parts ſeparate, for the better kindling. See GUNPOWDER.

Hence, if we conceive in the Air a convenient Mixture of nitrous and ſulphurous Particles, from the Sources above-mention'd; and thoſe, from ſome Cauſe, to take Fire; ſuch Exploſion may well follow, and with ſuch *Noiſe* and *Light*, the two Phænomena of *Thunder*: as in the firing of Gunpowder: and being once kindled, it will run from Place to Place, this Way or that, as the Exhalations happen to lead it; as in a Train of Gunpowder.

This Exploſion, if high in the Air, and remote from us, will do no Miſchief; but if near us, may deſtroy Trees, Animals, *&c.* as Gunpowder would do in the like Circumſtances.

This Nearneſs or Farneſs may be eſtimated by the Interval of Time between the Flaſh and the Noiſe: Dr. *Wallis* obſerves, that ordinarily the Difference between the two is about ſeven Seconds; which, at the Rate of 1142 Feet in a Second of Time, gives the Diſtance about a Mile and half: But ſometimes it comes in a Second or two, which argues the Exploſion very near us, and even among us. And in ſuch Caſes, the Revd. Doctor aſſures us, he has more than once foretold the Miſchiefs that befell.

Upon the whole, that there is in Lightening a ſulphurous Vapour, appears from the Sulphur which attends it, and from the ſultry Heat in the Air which uſually precedes it; and that there is a nitrous Vapour along with it, the ſame Author concludes hence, that we know of no other Body ſo liable to a ſudden and violent Exploſion. And as to the kindling of theſe Materials, we know that a Mixture of Sulphur and Steel Filings, with a little Water, will break forth into actual Flame. Nothing therefore is wanting to the Exploſion, but ſome Chalybeat, or Vitriolic Vapour; and among the various Effluvia from the Earth, the Doctor does not doubt, but there muſt be ſome of that: But what he leaves as a Probability, we can produce a kind of Proof of.

In Hiſtory we meet with Inſtances of its raining Iron in *Italy*, and Iron Stones in *Germany*: *Jul. Scaliger* tells us, he had by him a Piece of Iron rain'd in *Savoy*. *Cardan* reports 1200 Stones to have fallen from Heaven, ſome of them weighing 30, ſome 40, and one an hundred and twenty Pound, all very hard, and of the Colour of Iron.

The Matter of Fact is ſo well atteſted, that Dr. *Liſter*, in the *Philoſophical Tranſactions*, builds a whole Theory of *Thunder* and Lightening on it; maintaining, that they both owe their Matter to the Breath or Exhalation of *Pyrites*. See PYRITES.

That Rattling in the Noiſe of *Thunder*, which makes it ſeem as if it paſs'd thro' Arches, or were broken variouſly, is doubtleſs owing to the Sound being excited among Clouds hanging over one another, and the agitated Air paſſing between them. See LIGHTENING.

THUNDER-*Bolt*. If what we call *Lightning*, act with extraordinary Violence, and break or ſhatter any thing; it is call'd a *Thunder-bolt*; which the People, to fit it for ſuch Effects, ſuppoſe to be a hard Body, and even a Stone. See LIGHTENING.

But that we need not have recourſe to a hard ſolid Body to account for the Effects commonly attributed to the *Thunder-bolt*, will be evident to any one, who conſiders thoſe of Pulvis Fulminans, *&c.* of Gun-powder. See FULMINANS.

The Phænomena of the *Thunder-bolt* are, that it oftener ſtrikes on high Places than on low: That it frequently burns Peoples Cloaths, without touching their Bodies: That it ſometimes breaks their Bones, without hurting their Fleſh, or their Cloaths; that it has even melted the Sword without touching the Scabbard, *&c.*

The Firſt is eaſily accounted for, from the ordinary Height of the Clouds, out of which the Lightening darts: As to the reſt, ſince Exhalations may be very different from one another; ſome, *e. gr.* coming neareſt the Nature of Sulphur, may only yield a very ſlight lambent Flame, which will only affect ſuch things as take Fire the ſooneſt. And others, on the contrary, ſo ſubtile and penetrating, as to come near the Nature of Volatile Salts or Aqua-fortis, which ſpare ſoft Bodies, and ſpend their whole Force on hard ones.

The Chevalier *de Louville* of the *French* Academy of Sciences, accounts for ſome of the Effects of Thunder upon a new Principle; as to killing of Animals, without burning or wounding them, 'tis naturally enough aſcribed to the Sulphur, which falling near enough the Perſon, the Fumes thereof ſtop his Reſpiration. As to Trees, Buildings, *&c.* ſplit or beat down, there muſt be another Cauſe. M. *de Louville*, therefore, ſuppoſes, that when the Thunder is ſo high, its Flame is diſſipated e'er it arrive at the Earth: And that the Air being violently driven along by the impetuous Motion of the Flame, and of conſequence exceedingly condenſed, becomes a kind of hard Body, capable of producing terrible Effects.

Places ſtruck with *Thunder-bolts*, were held Sacred among the Ancients. *Nigidius* has a very curious Treatiſe on the *Thunder-bolt*.

Marcilius Ficinus, and ſome others, maintain, that Coral diſſipates panic Fears, and keeps off *Thunder-bolts* and Hail: *Ferrarius Locrus* has endeavour'd to account for it phyſically. F. *le Brun* proves very eaſily, that thoſe Philoſophers are miſtaken.

On Medals, the *Thunder-bolt* is ſometimes found to accompany the Emperors Heads; as that of *Auguſtus*. In which Caſe, it is a Mark of Sovereignty, and of a Power equal with the Gods.

Appian informs us, that the *Thunder-bolt* was the principal Divinity of *Sidonia*; adding, that it was adored even in his Time, with various Hymns and Ceremonies. See GOD.

THUS.

Figure 10. EPHRAIM CHAMBERS, *Cyclopedia* (London, 1728), entry on thunder (item 2). Reproduction courtesy of Houghton Library.

2. Ephraim Chambers, *Cyclopaedia* (London, 1728). Chambers wrote the original encyclopedia, a compendium of information about a variety of topics (figure 10). His *Cyclopaedia* was popular in the American colonies. For a time, Franklin printed excerpts from Chambers in his newspaper, the *Pennsylvania Gazette*. Houghton *fEC7.C3558.728c v.1 - Gift to Harvard College Library from Chambers Russell, 1743

3. Denis Diderot, *Encyclopédie* (Paris, 1751). The first of the great multi-volume encyclopedias, the French Encyclopédie began as a translation of Chambers's *Cyclopaedia*. Its editors kept commissioning articles on new topics until they had managed to create an entirely new product. Their ambitions were vast. They used their work, daringly, to criticize religious beliefs and political structure in France. Houghton *fFP7.En189

4. Melchesedech Thevenot, *L'Art de nager* (Paris, 1696). Thevenot told people that swimming was healthy, easy, and fun. He included pictures of different swimming positions, which allowed people who could not read French (or read at all) to figure out how to swim. When young, Franklin read this book and became an enthusiast for the art of swimming. Department of Printing and Graphic Arts, Houghton Library, Harvard College Library Typ 615.96.832 - Bequest of Philip Hofer, 1984

5. Thomas Tryon, *The Way to Health* (London, 1691). Diets are nothing new. From an early date, many experts gave advice on how to achieve good health through diet. "When about 16 Years of Age," Franklin recalled, "I happen'd to meet with a Book written by one Tryon, recommending a Vegetable Diet. I determined to go into it." Franklin wasn't a vegetarian for very long, however. Houghton *EC65. T7815.683wb

6. Cotton Mather, *Bonifacius* (Boston, 1710). Mather was an eminent Boston minister, well known to Franklin and his family. *Bonifacius* was also called *Essays to do Good*. Franklin read the essays and noted the value of small organizations meant to improve civic life. He created such a group in Philadelphia: the Junto. This was a club in which Franklin and other young men read and debated the ideas of the day. Houghton *AC7.M4208.710b (Lobby VI.4.1) - Bequest of Thomas Hubbard to Harvard College Library, 1774

7. *The Spectator*, vol. 1, 1710–1711 (London, 1750). This short-lived magazine included essays on everything—art, science, politics—and became one of the most influential pieces of prose writing in the English-speaking world. From it, Franklin learned how to write. He studied its essays and painstakingly reworked them in both prose

and verse. Houghton Hyde Coll. *2003J-EC4 v.1 - Bequest of Mary Hyde Eccles, 2004

B. How to . . . get the word out

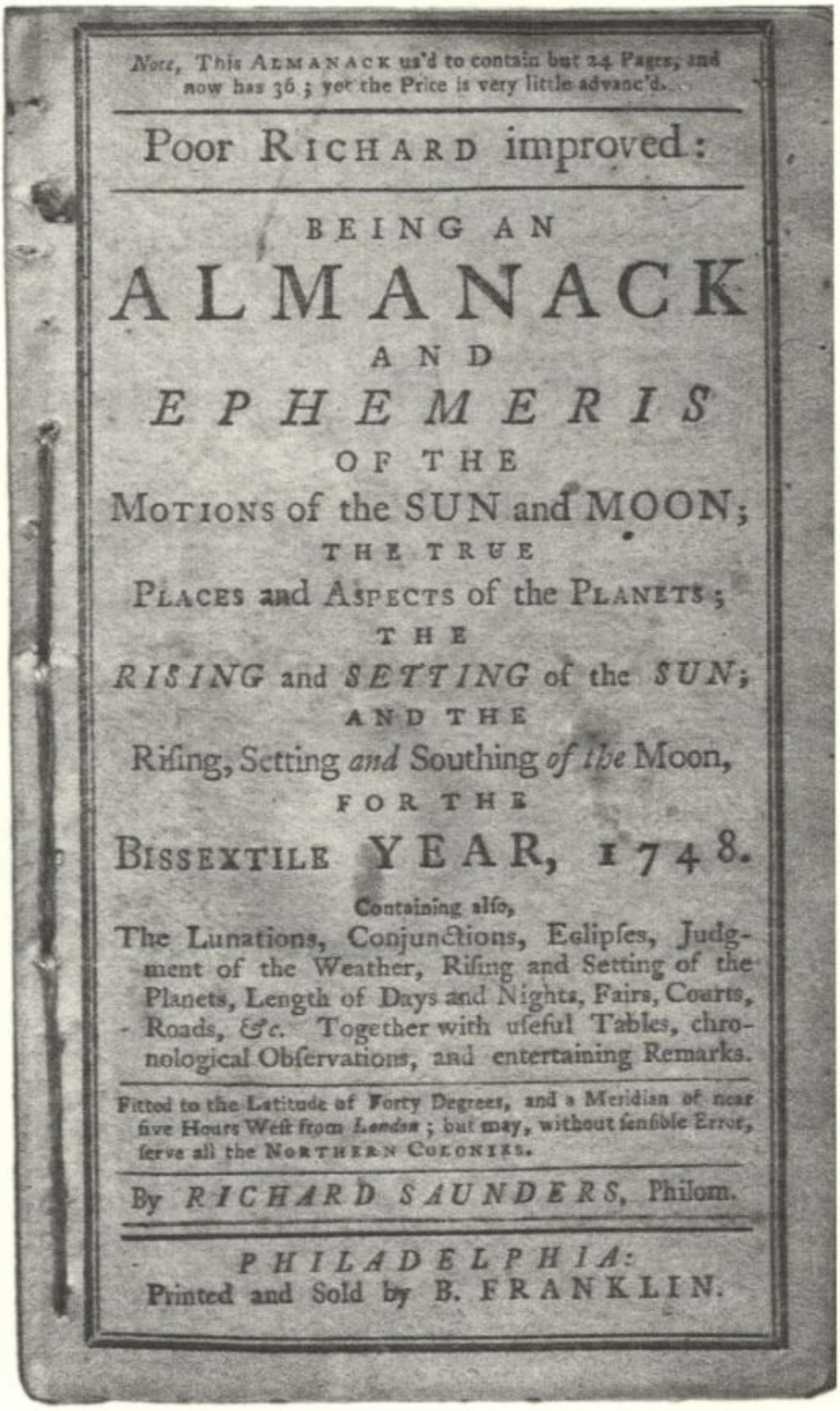
Franklin was a printer and an author at a time when the amount of printed material was growing at a tremendous rate. He wanted to produce things that would stand out. In newspapers, almanacs, essays, and books, he created highly readable assessments of religion, politics, science, health, law, pleasurable pastimes—nearly everything. He effectively used humor, rhetoric, and illustrations to get readers' attention.

8. *The New-England Courant* (No. 80, Aug. 7, 1723). James Franklin, Benjamin's older brother, began to publish this newspaper while Benjamin was his apprentice. James needed to attract readers and so published more essays and opinion pieces than appeared in a typical colonial newspaper, which tended to have more advertisements and news items. (Compare to Benjamin Franklin's later *Pennsylvania Gazette*; see item 64, below.) The *Courant* was controversial and gave young Benjamin an excellent education in how and what to publish. Houghton *69-1181F

9. William Wollaston, *The Religion of Nature Delineated* (London, 1724). Franklin read Wollaston's religious treatise when he helped print it while working in a London print shop. He disagreed with the work and published his own *Dissertation on Liberty and Necessity* . . . (1725) which questioned orthodox religion. He later regretted the publication—in the future, he would think carefully before publishing anything. Houghton *EC7.W8348.722rc

10. George Whitefield, *A Continuation of the Rev. Mr. Whitefield's Journal* (Philadelphia, 1740). Franklin would publish many conventional religious works, especially when he thought they had a ready market. Whitefield was the most popular British preacher of the eighteenth century. When Whitefield toured the colonies, Franklin realized his writings would sell and offered to publish anything Whitefield would give him. Houghton *EC7.W5865J.1739 v.2 - Gift of Mrs. Arthur H. Lea, 1938

11. *Poor Richard Improved . . . for the Year . . . 1748* (Philadelphia, 1747). Poor Richard? Franklin's famous almanac (figure 11) was a steady best-seller—it made him rich. Almanacs were popular because they contained much practical advice about weather, health, public events, postage rates, and so on. Franklin added many witty sayings but also serious discussions of scientific discoveries. Houghton *42-660



Note, This ALMANACK us'd to contain but 24 Pages, and now has 36; yet the Price is very little advanc'd.

Poor RICHARD improved:

BEING AN

ALMANACK

AND

EPHEMERIS

OF THE

MOTIONS of the SUN and MOON;

THE TRUE

PLACES and ASPECTS of the PLANETS;

THE

RISING and *SETTING* of the *SUN*;

AND THE

Rising, Setting *and* Southing *of the* Moon,

FOR THE

BISSEXTILE YEAR, 1748.

Containing also,

The Lunations, Conjunctions, Eclipses, Judgment of the Weather, Rising and Setting of the Planets, Length of Days and Nights, Fairs, Courts, Roads, &c. Together with useful Tables, chronological Observations, and entertaining Remarks.

Fitted to the Latitude of Forty Degrees, and a Meridian of near five Hours West from *London*; but may, without sensible Error, serve all the NORTHERN COLONIES.

By *RICHARD SAUNDERS*, Philom.

PHILADELPHIA:
Printed and Sold by B. FRANKLIN.

Figure 11. *Poor Richard Improved ... for the Year ... 1748* (Philadelphia, 1747), title page (item 11). Reproduction courtesy of Houghton Library.

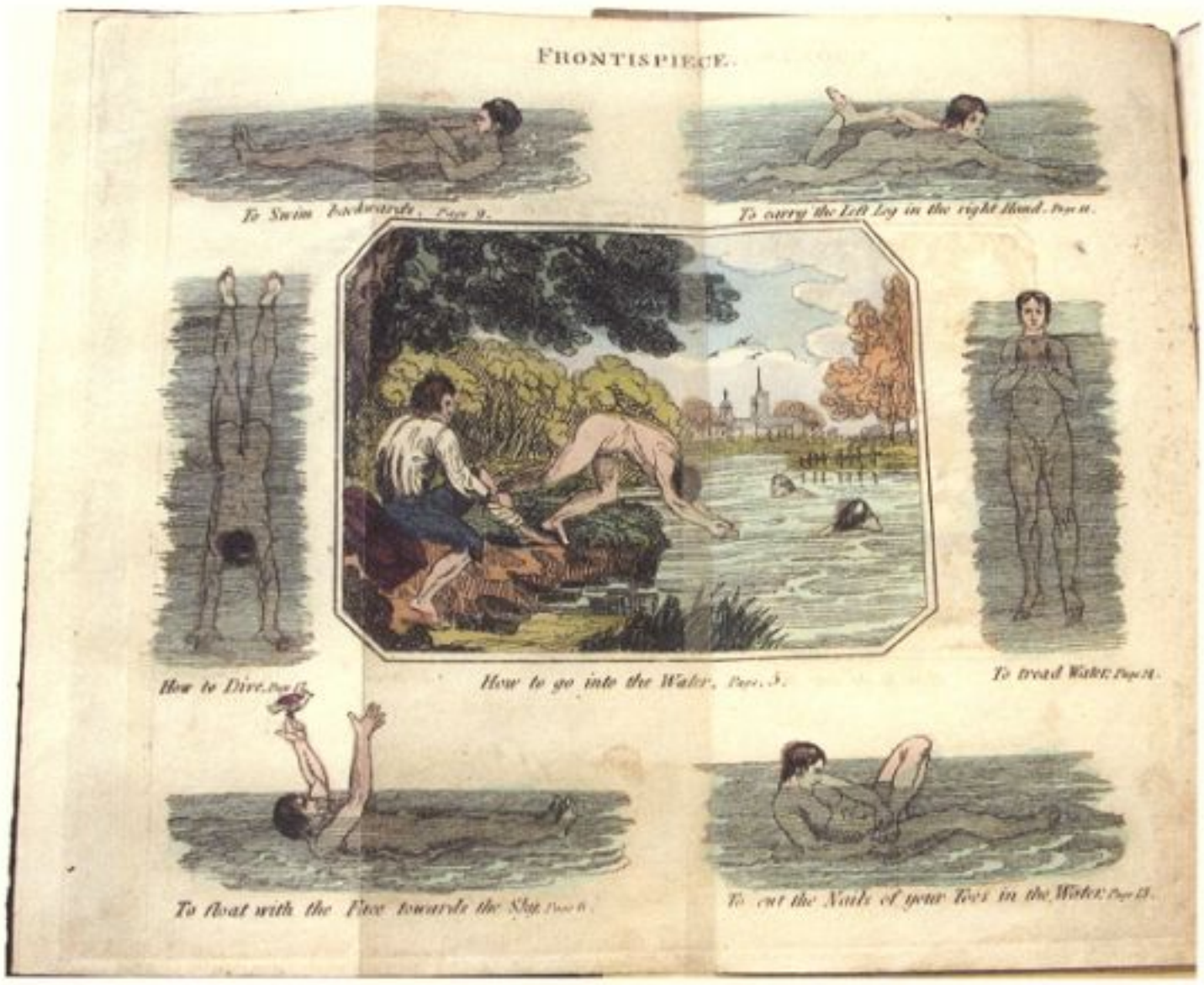


Figure 12. Benjamin Franklin, *The Art of Swimming* (London, 1829), fold-out frontispiece (item 14). Reproduction courtesy of Houghton Library.

12. [Benjamin Franklin], *Plain Truth* (Philadelphia, 1747). Franklin's pamphlet was a call to arms. In it, he criticized Pennsylvania's inadequate defense during King George's War and told colonists how to organize a militia. The pamphlet had, he recalled, a "sudden and surprizing Effect" and made him a political arbiter in the colony. It also featured the first American political cartoon, with a caption roughly translated as "God helps those who help themselves"—perhaps the ultimate in how-to advice. Houghton Nor 2978

13. [Benjamin Franklin], "Speech of Miss Polly Baker," *London Magazine*, XVI (London, 1747). Sex sells. Miss Baker defends herself, in a Connecticut courtroom, against charges of fornication. (She carries in her arms her third illegitimate child.) Citing natural and divine laws that encourage procreation, Baker protests the charges, which are dropped. Was the pamphlet about sexual morality or about female autonomy? Either topic was controversial; Franklin published the piece anonymously. Houghton US 4531.3

14. Benjamin Franklin, *The Art of Swimming* (London, 1829). Franklin had studied Thevenot's book on the art of swimming (see item 4, above) carefully and tested his own techniques and equipment. He encouraged a terrified friend to learn to swim

and in 1769 published his letter to that friend so a larger audience would benefit from the advice. It was a classic Franklin "how-to" publication and ran through many editions (figure 12). Houghton *44W-1130

15. Asbestos. This fire-resistant material fascinated Franklin. He even experimented with paper made of asbestos—how better to preserve the printed word from heat or acids? Franklin astonished another printer by flinging a printed asbestos page into a fire and then retrieving it undamaged. Mineralogical Museum, Harvard University #131702

16. Pennsylvania twenty-shilling note, June 1764. "To Counterfeit is DEATH." Franklin put printed texts of many kinds into circulation. He thought that paper money benefited an economy, he printed a pamphlet recommending its use in Pennsylvania, and he got the contract to print the money. His nature prints (made from real plants) were impossible to duplicate and so discouraged counterfeiters. Franklin kept secret his technique of nature printing—he provided no how-to guide. Private Collection

C. How to . . . understand the big theories

Printed guides and instructional devices taught people about even the most complicated topics. Some works in science were still printed in Latin and might contain higher mathematics, both of which made them inaccessible to general readers. Popular works bridged the gap. Consumers welcomed such items, and some authors and manufacturers specialized in popular guides and devices related to the sciences.

17. Samuel Sturmy, *The Mariner's Magazine* (London, 1700). It is always useful to know how to get from one place to another. In the age of sail, mariners published guides to navigation and manuals on how to use a ship's instruments. The art of navigation depended on mathematics, especially as applied to methods of calculating distance and position. From a book by Sturmy, Franklin learned geometry. Houghton *fEC65.St974.669md - Gift of David P. Wheatland, 1986

18. Universal ring dial, English, ca. 1700-1775 (figure 13). One navigational instrument that Sturmy described was the universal ring dial. The back of the instrument has a quadrant that sailors used to find their latitude by means of the sun's altitude. The front of the instrument is a sundial that can be used to find the time in any part of the world. The universal ring dial is self-aligning and requires no magnetic compass to orient it to true north. Navigators used it to correct the ship's compass, which

deviated from true north. Collection of Historical Scientific Instruments, Harvard University (hereinafter CHSI) 7868

19. Lodestone, English, 18th century. A lodestone is a naturally magnetic ore. At sea, it kept the ship's compass in good working order. On land, it was used in scientific demonstrations of magnetic attraction and repulsion. Natural philosophers, such as Franklin, noted the similarities between the actions of magnetic and electrically charged bodies, but had different theories to explain these effects. CHSI DW0114

20. Thomas Burnet, *The Theory of the Earth* (London, 1691). By the early eighteenth century, readers could buy printed works that explained the latest in scientific discoveries and theories. Burnet wrote a widely read and influential guide to the earth and the other planets in the solar system (figure 13). His interpretation of the sacred theory of the earth showed the co-existence of science and religion, which Franklin (like most of his contemporaries) accepted. Houghton *fEC65.B9346. B691t - Gift of Mary E. Haven, 1914

Figure 13. Part of case, "How to … understand the big theories," including items 18, 20, 21.

21. Portable orrery and planetarium, Peter and John Dollond, London, ca. 1766-1804. The orrery and planetarium were mechanical models of the relative motions of the earth, moon, and planets around the sun. People used them to teach astronomy, to demonstrate the clockwork nature of the universe, and to extol God's wisdom in contriving such an orderly world. Franklin himself purchased instruments from the London firm of Dollond, which made these devices (figure 13). CHSI DW0701

22. Benjamin Martin, *The Young Gentleman and Lady's Philosophy* (London, 1759). Natural philosophy, or the natural sciences, was part of the education of the upper and middle classes in the eighteenth century. Martin wrote a very popular work for young people and sold it alongside instruments he built to demonstrate scientific principles and to help people with mathematical calculations. Houghton *EC75. M3632.755ga pt. 1 (A) - Gift of David P. Wheatland, 1972

23. Sector with folding square, Benjamin Martin, London, ca. 1738-1777. Benjamin Martin sold philosophical instruments for studying nature as well as mathematical tools required by navigators, surveyors, gunners, architects, and others. The sector was a sophisticated instrument for calculating relative proportions between lines, areas, and solids, extracting square and cube roots, calculating interest rates, and performing trigonometric and logarithmic computations. CHSI DW0501

D. How to . . . do good

Learning how to do things was good—actually doing those things was even better. Franklin wrote that "the noblest question in the world is *What Good may I do in it?*" He would put what he knew to good use in many projects meant to educate others and to improve the world.

24. *The Charter, Laws, and Catalogue of Books of the Library Company of Philadelphia* (Philadelphia, 1764). Franklin and other members of his reading club, the Junto, created the Library Company of Philadelphia. It was North America's first subscription library; members (men only) paid dues and could then borrow books. The Library Company bought many examples of encyclopedias and other guides to knowledge. It also owned scientific instruments and sponsored lectures in science. Special Collections, Harvard Law School E.L 697c.764

25. Solar microscope with slides and accessories, Dollond, London, ca. 1760-1770. With a solar microscope (see item 65, below), an audience could witness the wonders of the microscopic world. The instrument was mounted to a window shutter. Sunlight

SOME

ACCOUNT

Of the Success of

INOCULATION

FOR THE

SMALL-POX

IN

England and *America.*

By Benjamin Franklin

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, M,DCC,LIX.

Figure 14. BENJAMIN FRANKLIN, *Some Account of the Success of Inoculation for the Small-Pox* (London, 1759), title page (item 28). Reproduction courtesy of Houghton Library.

reflected off the mirror and through the microscope, projecting an image onto the wall of the darkened room. CHSI 1224

26. [Benjamin Franklin], *Proposals Relating to the Education of Youth in Pensilvania* (Philadelphia, 1749). Although his own formal education had been minimal, Franklin thought it valuable in general. He recommended the creation of a college in his colony, described in his proposals of 1749. The result was the foundation of the University of Pennsylvania. The college was distinctive in two ways: it was not tied to a specific religious denomination (which made higher education available to a broad range of men) and it had an unusual emphasis on natural science. Houghton *AC7.F8545.749p - Gift of William Prescott, 1845

27. Lieberkühn compass microscope, England, ca. 1740-1750. J. N. Lieberkühn devised a microscope in which the eyepiece was surrounded by a reflector, the better to illuminate opaque specimens. It was a portable, affordable, yet powerful tool for science. CHSI 1189

28. Benjamin Franklin, *Some Account of the Success of Inoculation for the Small-Pox* (London, 1759). Public health was of great concern in Europe and the colonies. Smallpox, a virulent killer, could be controlled through inoculation, an early version of vaccination. Franklin advocated the use of inoculation and used statistics to show how it lessened mortality. A London friend, the eminent printer William Strahan, printed this tract (figure 14). Houghton *AC7.J3843.Zz797b - Gift of John Jeffries, M.D., and Benjamin Joy Jeffries, M.D., 1867

29. *The Examination of Doctor Benjamin Franklin before an August Assembly, relating to the Repeal of the Stamp-Act* (London, 1766). The Stamp Act, Britain's 1765 attempt to tax the colonies, angered the colonists, who threatened violent resistance to it. Franklin helped resolve the crisis by giving British Parliament advice on how to tax the colonists in another way, by regulating trade. It was bad advice—the colonists rejected all attempts to tax them. Houghton *EC75.G798P.766ef (B)

30. Benjamin Franklin, "Remarks Concerning the Savages of North America" (London, 1784). Few Europeans or white Americans respected American Indians. Franklin had looked down on Indians until 1763, when some Pennsylvanians had massacred a group of Christian Indians. Thereafter, Franklin defended Indians, as in this essay: "Savages we call them, because their manners differ from ours." It was an early exploration of cultural relativism. Houghton *AC7.F8545.B784tb

E. How to . . . be a political animal

Can politics be reduced to a science? People in the eighteenth century certainly used science and technical instruments to analyze human affairs. Franklin used arithmetic to analyze human populations as a source of political power. The language of science even entered the Declaration of Independence, which Franklin helped to write.

31. [Benjamin Franklin], *Observations Concerning the Increase of Mankind* (Boston, 1751). Political arithmetic was an early form of demography. It used statistics to make political arguments about human populations. Franklin calculated that the colonial population was doubling every twenty years. It would eventually be ridiculous for Britain, an island nation with a small population, to rule over a continent full of Americans. Britons thought differently, needless to say. Houghton Can 327.1*

32. Pocket telescope, George Adams, London, ca. 1760-1761. Knowledge is power. George III was the British monarch best educated in science—ever. As Prince of Wales, he amassed an enormous and deluxe collection of scientific instruments. His silver telescope is testament to his faith that science was an appropriate form of knowledge for political leaders. He was rumored to admire Dr. Franklin—until the American Revolution. This pocket telescope, or spyglass, is adorned with the coat of arms of the Prince of Wales. CHSI DW0975

33. *In Congress, July 4, 1776. A Declaration by the Representatives of the United States of America* (Philadelphia, 1776). "We hold these Truths to be self-evident." Nature's truths were so self-evident that humans could easily see them, just as the former colonists could see British tyranny over them. Franklin probably added the phrase about "the Laws of Nature and of Nature's God" to support the claim to American independence. First edition of the Declaration of Independence, one of twenty-five surviving copies. Houghton *pAC7.Un 33D.776d (horz)

34. Emmerich de Vattel, *Le droit des gens* . . . (Amsterdam, 1775). The new United States had to scramble to define itself in relation to other nations. Franklin gave advice—and books. He donated copies of Vattel's important work on international law to several American organizations, including the Continental Congress and Harvard College. Congress's copy is lost; Harvard's is here. Houghton *AC7.F8545.Zz775v - Gift of Benjamin Franklin, 1776

35. Appointment and instructions to Benjamin Franklin, Silas Deane, and Thomas Jefferson as commissioners to make a treaty with France, Philadelphia, Sept. 30, 1776 (figure 15). To win its War of Independence against Great Britain, the United

The Delegates of the united States of New-hampshire, Massachusetts bay, Rhode-island, Connecticut, New-york, New-jersey, Pensylvania, Delaware, Maryland Virginia, North-carolina, South-carolina and Georgia to all who shall see these presents greeting.

Whereas a trade upon equal terms between the subjects of his most Christian Majesty the king of France and the people of these states will be beneficial to both nations. Know ye therefore that we confiding in the prudence and integrity of Benjamin Franklin one of the delegates in Congress from the state of Pensylvania and president of the Convention of the said state & Silas Deane late a delegate from the state of Connecticut, now in France, and Thomas Jefferson a delegate from the state of Virginia have appointed and deputed and by these presents do appoint and depute them the said Benjamin Franklin, Silas Deane and Thomas Jefferson our Commissioners, giving and granting to them the said Benjamin Franklin, Silas Deane & Thomas Jefferson or to any two of them and in case of the death, absence or disability of any two or more of them full power to communicate, treat, agree and conclude with his most Christian Majesty the king of France, or with such person or persons as shall by him be for that purpose authorised, of and upon a true and sincere friendship and a firm, inviolable and universal peace for the defence protection and safety of the navigation and mutual commerce of the subjects of his most Christian Majesty and the people of the united states, and to do all other things which may conduce to those desireable ends, & promising in good faith to ratify whatsoever our said commissioners shall transact in the premisses. Done in Congress at Philadelphia the thirtieth day of September in the year of our Lord one thousand seven hundred and seventy six. In testimony whereof the president by order of the said Congress hath hereunto subscribed his name and affixed his seal.

Attest
Chas Thomson secy

John Hancock Presid.

Figure 15. U.S. Commission to Franklin, Silas Deane, Thomas Jefferson, September 30, 1776 (item 35). Reproduction courtesy of Houghton Library.

States needed military and political support. Franklin and three other American Commissioners were sent to Paris to get French recognition and aid. Franklin's reputation in science and experience in politics would help get that support. Houghton bMS Am 811.1 (73) - Gift of Richard H. Lee, 1827

36. [Henry Edmunds and William Harns, eds.], *A Compleat Collection of all the Articles and Clauses which Relate to the Marine* ... (London, 1760). While in Paris, Franklin needed information about diplomacy and international law, both to guide his own actions and to give advice to others. Maritime policies were a particular concern. This book was Franklin's copy of a compendium on naval affairs. Houghton *EC7. Ed596.741ed

F. How to ... spread your ideas

If you want to spread your ideas, publish them. In the eighteenth century, even ordinary people could become published authors. Franklin wrote several works that were reprinted widely during his lifetime. Both his scientific works and his folksy writings made him internationally famous. People saw him as a learned philosopher with sophisticated ideas but also as a self-made man who had—and used—common sense.

37. Benjamin Franklin, *New Experiments and Observations on Electricity* (London, 1760). Franklin's work in science made him famous throughout Europe (figure 16). The first edition of his scientific writings, in English, had appeared in 1751. Three subsequent editions in English appeared during his life. Translations into other languages quickly followed. Houghton *AC7.F8545.751ec - Gift of David P. Wheatland, 1986

38. Benjamin Franklin, *Expériences et observations sur l'electricité* (Paris, 1752). Franklin's scientific writings were initially translated into French. This book was the first French edition. Franklin's theory of electricity followed the theories and hypotheses of Isaac Newton. French Newtonians used this 1752 publication to argue that Newton, and Franklin, were right. Houghton *AC7.F8545.Eh752d

39. Benjamin Franklin], *Des Herrn Benjamin Franklin* ... (Leipzig, 1758). German theorists also embraced Franklin's conclusions about electricity. As in France, Franklin's writings proliferated, and German-speaking men of science repeated his experiments. One of them argued that Franklin's definitions of electricity could

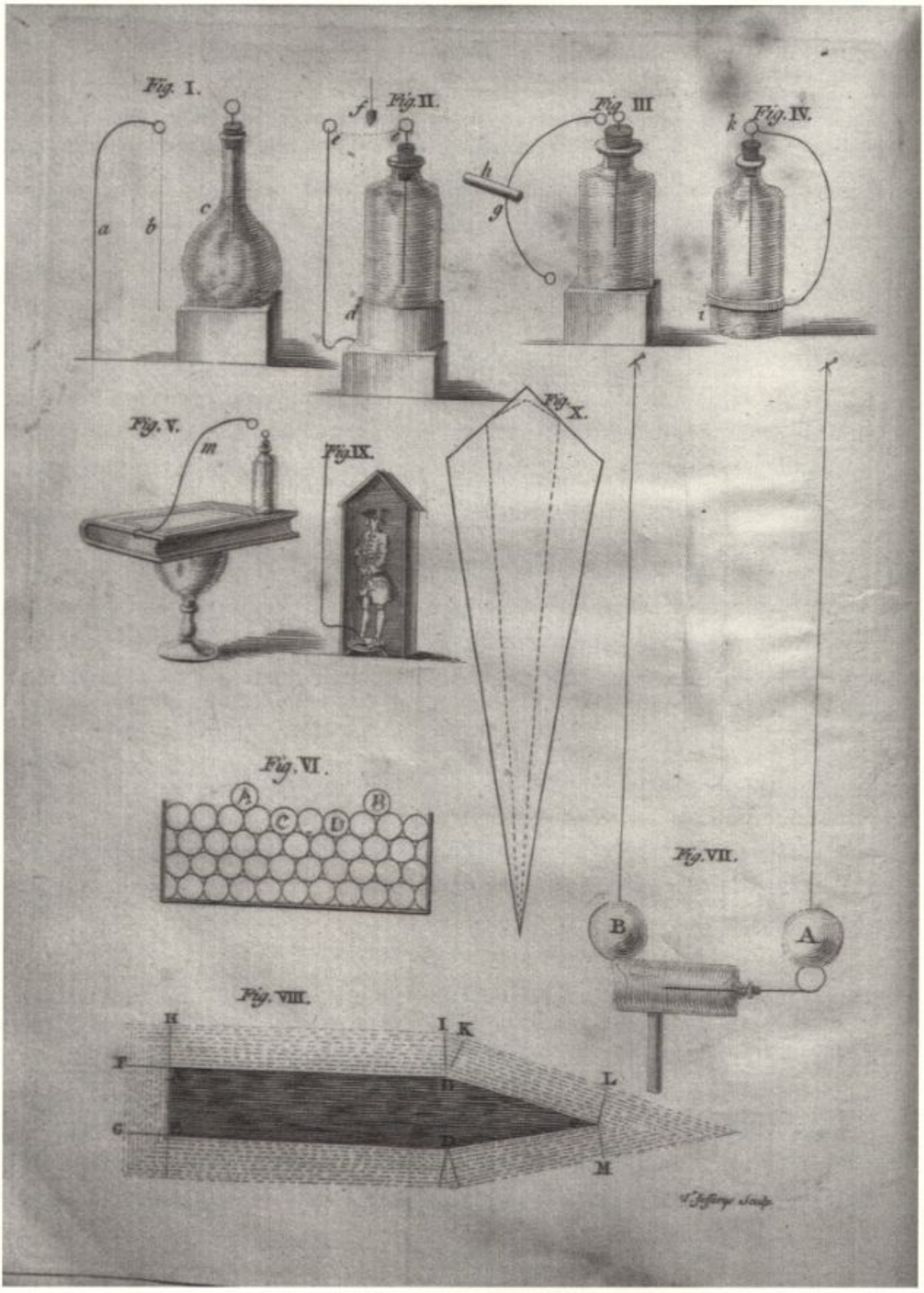


Figure 16. Benjamin Franklin, *New Experiments and Observations on Electricity* (London, 1760), diagrams, which showed others how to repeat the experiments (item 37). Reproduction courtesy of Houghton Library.

also be applied to magnetism. Houghton *AC7.F8545.En758wa - Gift to Houghton Library in memory of Professor and Mrs. A. Lawrence Rotch, 1942

40. Carlo Barletti, *Nuovo sperienze elettriche* (Milan, 1771). Franklin had a strong following in Italy. He corresponded with several Italian experimenters and became a fellow of the learned society at Padua, Europe's oldest scientific society. Houghton *IC7.Al 325.737ne - Gift of David P. Wheatland, 1986

41. Benjamin Franklin, *Oeuvres de M. Franklin*, ed. Jacques Barbeu-Dubourg (Paris, 1773). Barbeu-Dubourg was a friend who published an expanded edition of Franklin's writings (figure 1), and even coaxed from him several essays that had not yet been published in English. This collection would establish Franklin's authority in France just before he arrived (in 1776) to plead for help in the War for Independence. Houghton *AC7.F8545.Eh733b (A) - Gift to Houghton Library in memory of Professor and Mrs. A. Lawrence Rotch, 1942

42. Benjamin Franklin, *Political, Miscellaneous, and Philosophical Pieces* [ed. Benjamin Vaughan] (London, 1779). Amazingly, this expanded English edition of Franklin's works was published in London during the War for Independence. It was testament to the belief that true knowledge was above national differences. Houghton *AC7. F8545.B779p

43. Benjamin Franklin, *The Way to Wealth* (Philadelphia, 1779). Many people knew Franklin through his folksy writings. His mock advice about how to become wealthy was actually a collection of the sayings he had used in his Poor Richard almanacs. As with his scientific work, it was widely reprinted and translated. Houghton *pAB7. F8545.760f.1780

44. Benjamin Franklin, *La Science du Bonhomme Richard* (Paris, 1777). In France, "Poor Richard" became Bonhomme (Goodman) Richard. Some French readers were convinced that the collection of amusing sayings was practical advice that would actually work in the rustic American colonies. In 1778, the French agreed to support the United States against Great Britain. To honor the American who had helped to create the Franco-American alliance, an allied warship was named the *Bonhomme Richard*, perhaps the only time a warship bore the title of a piece of how-to literature. Houghton *61-158

45. Augustin de Saint-Aubin, 1736–1807. *Benjamin Franklin*. Engraving, France, 1777. The famous fur cap makes its appearance. Franklin had become an icon—his face, he bragged to his daughter, was as well known as that of the moon. Fogg Art

Figure 17. Part of case, "How to . . . see the world," including items 46, 48, 51, 53.

Museum, Harvard University Art Museums R4409 - Gift of Belinda L. Randall from the collection of John Witt Randall

G. How to . . . see the world

Some of the most interesting guides to the world described the parts of it not well known to people in Europe and North America. Oceanic explorers brought data, artifacts, and even people back from their travels. Published travel accounts were very popular reading and left their mark on science and literature of the eighteenth and nineteenth centuries. Together, these accounts provide a remarkable history of European imperialism.

46. Henry Ellis, *A Voyage to Hudson's-Bay* (Dublin, 1748). Did oceans connect? In the eighteenth century, no one was quite sure. Many, including Franklin, believed that there must be a Northwest Passage between the Atlantic and Pacific. Franklin studied Ellis's account for any evidence that the passage existed. Ellis was one of many explorers whose accounts gave armchair travelers a sense of the larger world (figure 17). Houghton *EC75.El592.748vc

47. Hadley's quadrant, English, 1750. Navigators prized Hadley's quadrant (or octant) because it allowed them to make observations of the sun and stars from the deck of a rocking ship. Invented in 1731, its double-mirror arrangement gave the navigator a very stable image of the horizon and a celestial body in his sights. An observer could read angles of up to 90° off the instrument's limb and use those readings to compute latitude. The quadrant shown here is inscribed for "Capt. Alexander Caldwell 1750." CHSI 5303

48. Azimuth compass, Richard Patten, New York, ca. 1813 (figure 17). Since the Middle Ages, sailors have learned to steer their ships by means of a magnetic compass. But in the sixteenth century, sailors discovered a disturbing fact: at different times and places on the globe, magnetic north varied from true geographic north. Navigators found a way to measure the variation and correct their compasses by using sights on the azimuth compass to observe the sun's position. CHSI DW0138

49. Henry Ellis, "A Letter to the Rev. Dr. Hales, F. R. S." *Philosophical Transactions*, XLVII (London, 1751-52). The Royal Society of London published news about scientific findings in its *Philosophical Transactions*. In this letter, Ellis reported his experiments with a water sampler, a device that collected water below the surface of the ocean. Franklin read the letter and would do his own water sampling in the Gulf Stream in 1785. Houghton LSoc 1816.12* v.47

50. Pocket sextant, William and Samuel Jones, London, ca. 1791-1800. A sextant worked on the same principles as an octant, using the same double-reflection design, but its

divided arc was a sixth of a circle rather than an octant's eighth, and it could measure angles up to 120°. Pocket sextants were very portable and favored by explorers for finding latitude and longitude and making maps. CHSI 0062

51. James Cook, *A Voyage towards the South Pole, and Round the World* (London, 1777). European exploration of the Pacific Ocean and its islands was big news in the eighteenth century. French and British voyages, including Cook's three journeys, brought back maps, written accounts, natural specimens, Polynesian artifacts, and even people. Omai, whose portrait appears in this account (figure 17), was the best-known Tahitian to visit Britain. Houghton Oc 127.72.2*F v.1

52. Tahitian tapa or barkcloth. This specimen of Tahitian cloth is strikingly similar to the garment Omai wears in his portrait in Cook's 1777 account. Franklin had received a sample of barkcloth quite early, probably from friends who knew the French explorers who had preceded Cook into the Pacific. Peabody Museum of Archaeology and Ethnology, Harvard University 56-41-70/3801

53. Globe with the track of Captain Cook, P. S. M., German, ca. 1840 (figure 17). Cook's voyages were so astonishing that they were still celebrated during the nineteenth century. This small German globe marked the routes that Cook sailed around the world. CHSI 7403

H. How to . . . be Benjamin Franklin

How did Franklin do it? Born in humble circumstances, he became one of the most famous people of the eighteenth century. He used his memoirs to explain how it had happened. Others used his life as a success story. Even today, how-to guides use Franklin as an inspiring example.

54. Benjamin Franklin, *Mémoires de la vie privée de Benjamin Franklin* (Paris, 1791). Franklin wrote his memoirs in sections (when he had time to do so). He had only reached the events of the year 1757 when he died. He had written an early and rare example of an autobiography. This is the first edition, in which only the material down to the year 1731 was written by Franklin. Houghton *AC7.F8545L.Eh791g

55. Benjamin Franklin, *Private Life of the Late Benjamin Franklin* (London, 1793). This English edition of Franklin's memoirs was translated from the French version. The rush to publish a translation of a flawed and partial version of his autobiography showed that people were already fascinated with Franklin's life story. Only later

would a full version of Franklin's own account be published. Houghton*AC7 F8545L 1793 - Bequest of Joseph Halle Schaffner, 1972

56. M. L. Weems, *The Life of Benjamin Franklin* (Philadelphia, 1835). Franklin became a myth, a symbol of American character, especially a patriotic and hard-working character. "Parson" Weems had created a similarly mythological George Washington (the one who chopped down the cherry tree). Houghton US 4534.13*

57. William M. Thayer, *The Printer Boy* (Boston, 1860). Since Franklin's death, authors, educators, and politicians have used his life to inspire and admonish others. In Thayer's story, the young Franklin has virtues that are bound to make him rise in the world. Houghton US 4530.35*

58. Robert Lawson, *Ben and Me: An Astonishing Life of Benjamin Franklin by His Good Mouse Amos* (Boston, 1939). Franklin remains a larger-than-life character, easily accessible to young and old. The city of Philadelphia has for the past few years had an interesting project: everyone reads the same book. In 2006, the three hundredth anniversary of Franklin's birth, adults read Franklin's *Autobiography* and children read *Ben and Me*. Private Collection

59. Franklin Institute, *The Ben Franklin Book of Easy & Incredible Experiments, Activities, Projects, and Science Fun* (New York, 1995). For younger readers, a how-to guide to Franklin's experiments. Private Collection

60. B. A. Slade, ed., *Short Cut Mathematics . . . A Benj. Franklin Home-Study Course in One Volume Answers Included* (Chicago, 1941). Franklin had trouble with arithmetic at school. He later tried to teach himself mathematics from printed guides. Maybe this one could have helped him. Private Collection

61. Blaine McCormick, *Ben Franklin's 12 Rules of Management* (Irvine, Calif., 2000). He was successful in so many realms—perhaps Franklin can still teach people how to do things? Private Collection

62. Electrical printing press with stencil marked "PEINT PAR LA FOUDRE / FRANKLIN" ("Paint Franklin by Lightning"), English, ca. 1760 (figure 18). In one of his experiments, Franklin had run electricity around the gilding in a book binding, which made the lines of metal sparkle in the dark. Electrified gilding could also make portraits of the Master Electrician. How to do it? Sandwich a piece of gold foil in the stencil. Place the stencil on top of a piece of paper in the wooden

press. Send an electric spark through the brass screws to the stencil in the press, and—abracadabra—there is the famous, fur-capped philosopher! CHSI DW0352

I. Additional items

63. Benjamin Franklin (1706-1790). After Jean-Antoine Houdon, 1741-1828. Bronze, ca. 1880. Fogg Art Museum, Harvard University Art Museums 1977.15 - Gift of Joseph Y. Jeanes, Jr.

Figure 18. Electrical printing press and stencil, English, ca. 1760 (item 62).
Reproduction courtesy of the Collection of Historical Scientific Instruments.

64. *Pennsylvania Gazette*, January 6 to January 13, 1736/7 (figure 19). In the eighteenth century, dictionaries, like encyclopedias, were new and important reference works. Franklin loved words and consulted dictionaries. For his newspaper, he reproduced a mock dictionary that alphabetically organized a list of descriptions of a drunken man: "Cherubimical," "Fuzl'd", "Juicy," "very Weary." This fake information was surrounded by the real information that normally appeared in a newspaper. Library Company of Philadelphia

65. *Just arrived from LONDON, For the ENTERTAINMENT of the CURIOUS and Others* (Philadelphia, 1744). A solar microscope could project onto a blank wall the images of the things that it enlarged. It was a perfect tool for public demonstrations of the normally invisible parts of nature, such as "the Circulation of the Blood in a Frog's Foot." People who had never seen (or could not afford) a microscope could thus see how one worked. In 1744, Franklin printed the advertisement for these Philadelphia demonstrations, which also featured an elaborate music box. Library Company of Philadelphia

66. Lewis Evans, *A map of Pensilvania, New-Jersey, New-York, and the three Delaware counties* (Philadelphia, 1749). Franklin's first publication on electricity was part of this map, done by his friend and protégé, Lewis Evans. The upper left corner features Franklin's explanation of electrical storms that moved up the North American coast. Cartographers interpreted—and promoted—different parts of the world to the growing number of consumers who bought maps. This map presented Franklin's region as an expanding part of the British empire, one with a great deal of land and distinctive natural features. Harvard Map Collection, Harvard College Library

67. Barthélemy Faujas de Saint-Fond, *Premiere suite de la description des expériences aérostatiques de mm. de Montgolfier* (Paris, 1784). Balloons were the first examples of successful aerial flight and huge public spectacles when they were set aloft in France. As the caption of this picture notes, the first manned aerial flight was visible from the terrace of Franklin's residence in Passy, outside Paris, in 1783. One onlooker asked what possible good the balloon might serve. "What good is a newborn baby?" Franklin replied. Inventions might not have immediate use, but were still important measures of human endeavor. Franklin received the world's first airmail letter, via balloon, when his estranged son William Franklin wrote to him from London to Paris in 1785. It was the start of an entirely new way to circulate information. Department of Printing and Graphic Arts, Houghton Library, Harvard College Library Typ 715.84.386

Numb. 422.

THE Pennſylvania GAZETTE.

Containing the freſheſt Advices Foreign and Domeſtick.

From January 6. to January 13. 1736,7.

Nothing more like a Fool than a drunken Man.
Poor Richard.

'TIS an old Remark, that Vice always endeavours to aſſume the Appearance of Virtue: Thus Covetouſneſs calls itſelf *Prudence*; *Prodigality* would be thought *Generoſity*; and ſo of others. This perhaps ariſes hence, that Mankind naturally and univerſally approve Virtue in their Hearts, and deteſt Vice; and therefore, whenever thro' Temptation they fall into a Practice of the latter, they would if poſſible conceal it from themſelves as well as others, under ſome other Name than that which properly belongs to it.

But DRUNKENNESS is a very unfortunate Vice in this reſpect. It bears no kind of Similitude with any ſort of Virtue, from which it might poſſibly borrow a Name; and is therefore reduc'd to the wretched Neceſſity of being expreſs'd by diſtant round-about Phraſes, and of perpetually varying thoſe Phraſes, as often as they come to be well underſtood to ſignify plainly that A MAN IS DRUNK.

Tho' every one may poſſibly recollect a Dozen at leaſt of the Expreſſions us'd on this Occaſion, yet I think no one who has not much frequented Taverns would imagine the number of them ſo great as it really is. It may therefore ſurprize as well as divert the ſober Reader, to have the Sight of a new Piece, lately communicated to me, entitled

The DRINKERS DICTIONARY.

A

He is Addled,
He's caſting up his Accounts,
He's Afflicted,
He's in his Airs.

B

He's Biggy,
Bewitch'd,
Block and Block,
Boozy,
Bows'd,
Been at Barbadoes.
Piſs'd in the Brook,
Dunk as a Wheel-Barrow,
Bundock'd,
Buskey,
Buzzey,
Has Stole a Manchet out of the Brewer's Basket,
His Head is full of Bees,
Has been in the Bibbing Plot,
Has drank more than he has bled,
He's Bungey,
As Drunk as a Beggar,
He ſees the Bears,
He's kiſs'd black Betty,
He's had a Thump over the Head with Sampſon's Jaw-bone,
He's Bridgey.

C

He's Cat,
Cagrin'd,
Capable,
Cramp'd,
Cherubimical,
Cherry Merry,
Wamble Crop'd,
Crack'd,
Concern'd,
Half Way to Concord,
Has taken a Chirriping-Glaſs,
Got Corns in his Head,
A Cup to much,
Coguy,
Copey,
He's heat his Copper,
He's Crocus,
Catch'd,
He cuts his Capers,
He's been in the Cellar,
He's in his Cups,
Non Compos,
Cock'd,
Curv'd,
Cut,
Chipper,
Chickery,
Loaded his Cart,
He's been too free with the Creature,
Sir Richard has taken off his Conſidering Cap,
He's Chap-fallen,

D

He's Diſguis'd,
He's got a Diſh,
Kill'd his Dog,
Took his Drops,
It is a Dark Day with him,
He's a Dead Man,
Has Dipp'd his Bill,
He's Dagg'd,
He's ſeen the Devil,

E

He's Prince Eugene,
Enter'd,
Wet both Eyes,
Cock Ey'd,
Got the Pole Evil,
Got a brass Eye,
Made an Example,
He's Eat a Toad & half for Breakfaſt
In his Element,

F

He's Fiſhey,
Fox'd,
Fuddled,
Sore Footed,
Frozen,
Well in for't,
Owes no Man a Farthing,
Fears no Man,
Crump Footed,
Been to France,
Flush'd,
Froze his Mouth,
Fetter'd,
Been to a Funeral,
His Flag is out,
Fuzl'd,
Spoke with his Friend,
Been at an Indian Feaſt.

G

He's Glad,
Groatable,
Gold-headed,
Glaiz'd,
Generous,
Booz'd the Gage,
As Dizzy as a Goose,
Been before George,
Got the Gout,
Had a Kick in the Guts,
Been with Sir John Goa,
Been at Geneva,
Globular,
Got the Glanders.

H

Half and Half,
Hardy,
Top Heavy,
Got by the Head,
Hiddey,
Got on his little Hat,
Hammerish,
Looſe in the Hilts,
Knows not the way Home,
Got the Homſon,
Haunted with Evil Spirits,
Has Taken Hippocrates's grand Elixir.

I

He's Intoxicated,
Jolly,
Jagg'd,
Jumbled,

Going

Figure 19. *Pennsylvania Gazette*, January 6 to January 13, 1736/7 (item 64). Reproduction courtesy of the Library Company of Philadelphia.

II. Collection of Historical Scientific Instruments
Science and Sociability

IMAGINE THE FOLLOWING: You buy an instrument. You consult experts and printed guides on the instrument. You practice on it. You invite your friends over so they can watch you perform—or so you and they can use all your instruments together, in concert. Would you be playing music or doing science? If you lived in the eighteenth century, you might—like Benjamin Franklin—be doing either. Numerous self-help guides and instructional instruments would have shown you the way.

During the eighteenth century, a variety of printed materials and instruments of science became affordable. These new consumer items gave people unprecedented access to knowledge about science, technology, geographic exploration, politics, music, and religion.

How-to guides told people about new discoveries and taught them new skills, including how to be sociable—that is, how to behave politely, write letters, make conversation, or work with others. Scientific experiments, for example, were meant to be done collaboratively, sometimes in front of an audience. Franklin loved the sociability. His letters, conversation, music, and science were meant to display his politeness and his learning in equal measure.

A. How to . . . be well rounded

In the eighteenth century, to be accomplished required knowing many things. It was as important to know the rudiments of natural science as it was to know how to play cards. People entertained each other by singing songs and by generating electrical sparks. New technical devices assisted sociability. Franklin claimed that corrective eyeglasses allowed him to learn conversational French because he could observe the facial movement of his French friends.

68. Electrical conductor on glass stand, English, before 1779. Collection of Historical Scientific Instruments, Harvard University (hereinafter CHSI) 0092

69. Electrical discharger on glass stand, English, late 18th century. CHSI 1997-1-1389

70. Double-barreled air pump (similar to one that Franklin owned), Benjamin Martin, London, ca. 1765. CHSI DW0893

71. Round-frame, temple spectacles (similar to those Franklin wore), silver, with shagreen case, English, late 18th century. David Fleishman, MD, www.antiquespectacles.com

72. *Beggar's Opera* playing cards, ca. 1730. Houghton Library, Harvard College Library (hereinafter Houghton) MS Eng 1561

B. How to . . . be charming

Eighteenth-century sociability was both an art and a science. Philosophers explained that humans were, by nature, sociable beings: they used language and crafted customs to interact peacefully with each other. At the highest level of sociability, people engaged in specialized activities—conversation, dance, music, science, games, art, politics, and writing—that were polished forms of social performance. People wrote letters, organized clubs, and attended literary or scientific salons in order to perfect their social interactions.

73. Samuel Richardson, *Letters Written to and for Particular Friends* (London, 1741). Before the telegraph, the telephone, and the Internet, people wrote letters—lots and lots of letters. Most of Franklin's scientific essays began as letters. Whether friendly or formal, letters had to follow certain rules. To learn the proper way to address different correspondents, writers consulted guides, such as this one by the novelist Samuel Richardson. Houghton *EC7.R3961.741l

74. Francis Hopkinson, *Science. A Poem* (Philadelphia, 1762). The achievements of scientists inspired poems. Francis Hopkinson was a poet, composer, and son of a man who had collaborated with Franklin on his famous electrical experiments. In his will, Franklin left Hopkinson his "philosophical" or scientific instruments. Hopkinson's varied interests united in this poem praising science. Houghton *AC7. H7777.762s - Gift of Samuel A. Eliot, 1845

75. Sharkskin etui of nine drawing instruments, English, ca. 1800. Before cameras and film, people drew pictures to represent themselves, each other, and their surroundings. To draw was to have a valuable skill. Parents who could afford to do so hired "drawing masters" to instruct their children. Artists used ink and watercolors to record experiments or scientific expeditions. (Captain Cook took several sketch artists with him to the Pacific.) Others drew pictures to amuse their families and friends. CHSI 5458

76. Camera obscura in the shape of a book, Benjamin Martin, London, ca. 1765. Selected for Harvard College by Benjamin Franklin. Instrument makers sold specialized equipment to amateur and professional artists. A camera obscura, for example, was a device that projected an image onto paper, where it could be traced. CHSI 0010

77. Portable orrery, by "West," London, ca. 1829. From models of the solar system, such as this portable orrery, young people could learn about the latest astronomical discoveries and join polite conversation on scientific topics. A flaming oil lamp could be placed in the sun's position, to the delight of evening guests. CHSI DW0435

78. Five Magic Lantern slides with crank and gearwork, William and Samuel Jones, London, ca. 1791-1815. Magic lantern slides, with or without moving images, provided popular evening diversions. Slides included scenes of nature, famous landmarks, heavenly constellations, solar and lunar eclipses, and the motions of the planets. At Harvard, instructors used lantern slides that could be turned with gears. CHSI 1998-1-1272

79. *The Muses Delight: An Accurate Collection of English and Italian Songs, Cantatas and Duetts* (Liverpool, 1754-56). Music was an important accomplishment for men and women in the eighteenth century. Social gatherings featured polite activities such as singing and playing instruments. These entertainments were meant to display one's good manners and education. "Heavenly" was a common word of praise for musical performance—in this work's frontispiece, heavenly beings even stop to listen to the humans who are playing. Houghton Mus 535.9*

80. *Universal Harmony or the Gentleman & Ladies Social Companion* (London, 1745). Singing was a suitable pastime for polite people. Collections of lyrics allowed them to learn new songs and sing them together. Department of Printing and Graphic Arts, Houghton Library, Harvard College Library Typ 705.45.860

81. Glass armonica (figure 9), illustration from Benjamin Franklin, *Oeuvres de M. Franklin*, ed.Jacques Barbeu-Dubourg (Paris, 1773). Franklin constructed his earliest version of the glass armonica by 1761. Instead of running a finger around the rims of glasses filled with varying amounts of water, he put the glasses into motion, rotating them on a spindle and letting his wet fingers glide along their sides. It might be said that he drew music from the rotating glasses of his armonica as easily as he drew electricity from the rotating glasses of his electrical machines. Houghton *AC7. F8545.Eh733b (A)

Figure 20. Part of case, "How to … see clearly," including items 91, 92, 94.

82. George Frederick Handel, *Handel's Celebrated Water Musick* (London, 1743). Handel wrote his *Water Music* for an orchestra to perform publicly, but this arrangement was for harpsichord to be performed privately among family and friends. Franklin wrote a critique of Handel's music and gave instructions about playing his *Water Music* on the glass armonica. Houghton*93B-342F

83. Charles Wilson, ed., *St. Cecilia; or, the Lady's and Gentleman's Harmonious Companion* (Edinburgh, 1779). Many song books combined English and Scottish

tunes. The latter were considered particularly unaffected and fresh. Franklin adored "old Scotch Tunes" and played them on his glass armonica. Houghton 25262.6*

84. *The Beggar's Opera* playing cards (ca. 1730). Card games were often the central activity at parties and other social gatherings. This set of cards took songs from John Gay's opera, a musical commentary on contemporary London. Franklin enjoyed playing cards but probably disapproved of the criminal culture that Gay had glamorized. Houghton MS Eng 1561

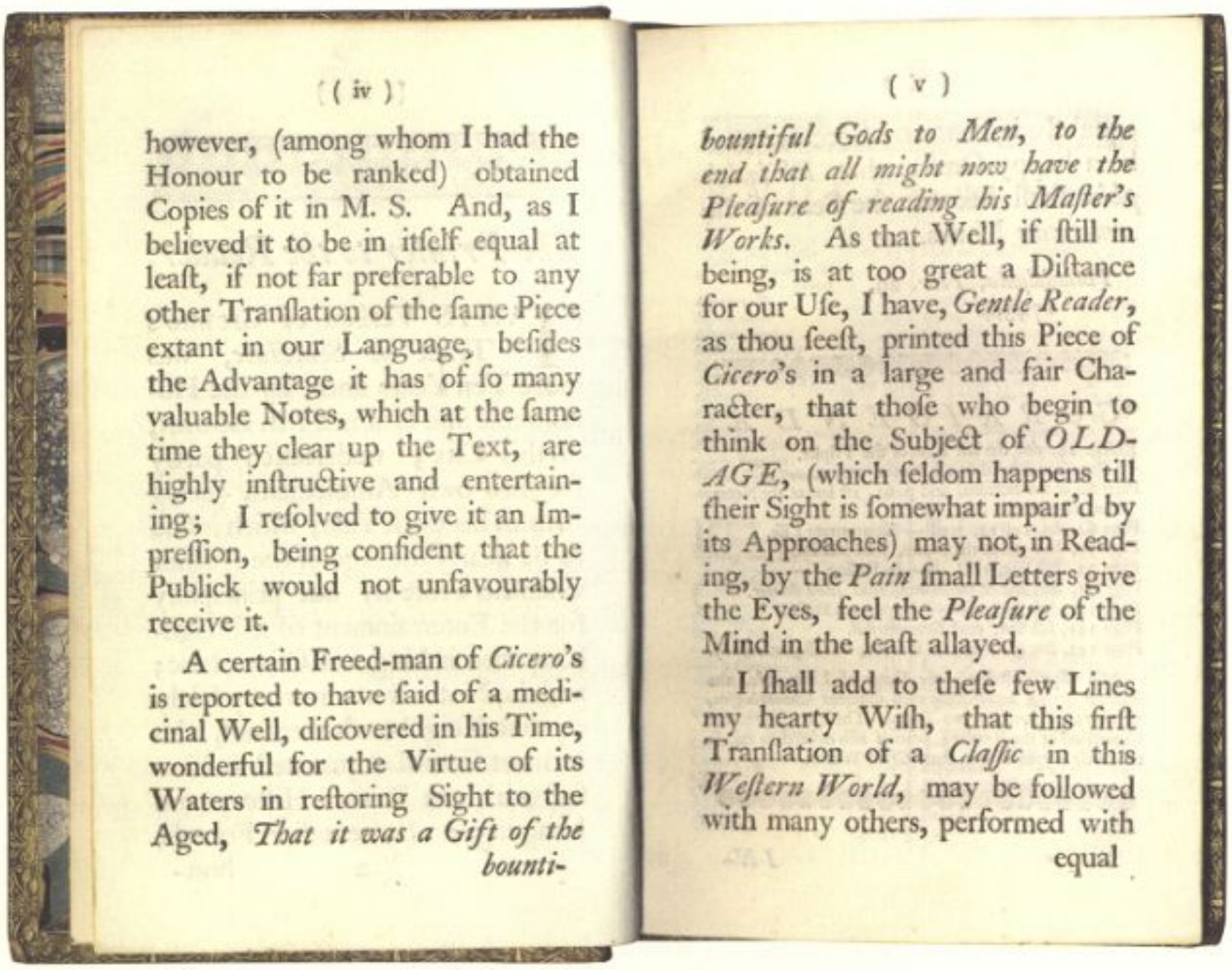
C. How to . . . see clearly

The human eye cannot see all parts of nature without help. In the seventeenth century, microscopes and telescopes became standard instruments of science, making visible the very distant and the very small. By the eighteenth century, these instruments were common consumer items. Improvements in optical technology and the design of spectacles even helped people see each other better.

85. Refracting telescope, John Gilbert, London, ca. 1719-50. In Europe and in colonial America, fashionable people enjoyed stargazing with simple telescopes and conversing about astronomical news. Newspapers reported solar and lunar eclipses, comets, and the aurora borealis. Franklin and his friends witnessed the first predicted return of Halley's Comet, the discovery of Uranus, and two rare Transits of Venus. CHSI 0003

86. [James Logan, trans.], *M. T. Cicero's Cato Major, or His Discourse of Old-Age* (Philadelphia, 1744), Franklin printed an edition of Cicero's *Discourse of Old-Age* that his Philadelphia friend, James Logan, had translated. He used extra-large type so that elderly people with failing eyesight might read the work (figure 21). The volume is perhaps the most beautiful of Franklin's printed works, with an attractive title page done in red and black. Houghton *AC7.F8545.Zc744c - Bequest of Harriet J. Bradbury, 1930

87. Round-frame, temple spectacles, steel, with steel case, English, 1764. Spectacles had aided readers since 1286 but, in Franklin's day, they underwent a revolutionary change—the addition of side arms, or temples, which London optician Edward Scarlett invented around 1728. Readers no longer had to hold or balance their eyeglasses on their noses. David Fleishman, MD, www.antiquespectacles.com



(iv)

however, (among whom I had the Honour to be ranked) obtained Copies of it in M. S. And, as I believed it to be in itſelf equal at leaſt, if not far preferable to any other Tranſlation of the ſame Piece extant in our Language, beſides the Advantage it has of ſo many valuable Notes, which at the ſame time they clear up the Text, are highly inſtructive and entertaining; I reſolved to give it an Impreſſion, being confident that the Publick would not unfavourably receive it.

A certain Freed-man of *Cicero*'s is reported to have ſaid of a medicinal Well, diſcovered in his Time, wonderful for the Virtue of its Waters in reſtoring Sight to the Aged, *That it was a Gift of the bounti-*

(v)

bountiful Gods to Men, to the end that all might now have the Pleaſure of reading his Maſter's Works. As that Well, if ſtill in being, is at too great a Diſtance for our Uſe, I have, *Gentle Reader*, as thou ſeeſt, printed this Piece of *Cicero*'s in a large and fair Character, that thoſe who begin to think on the Subject of *OLD-AGE*, (which ſeldom happens till their Sight is ſomewhat impair'd by its Approaches) may not, in Reading, by the *Pain* ſmall Letters give the Eyes, feel the *Pleaſure* of the Mind in the leaſt allayed.

I ſhall add to theſe few Lines my hearty Wiſh, that this firſt Tranſlation of a *Claſſic* in this *Weſtern World*, may be followed with many others, performed with equal

Figure 21. [James Logan, trans.], *M. T. Cicero's Cato Major* (Philadelphia, 1744), Franklin's preface (item 86). Reproduction courtesy of Houghton Library.

88. Round-frame spectacles with Ayscough-type, double-hinged side arms, silver, English, 1796-1797. Englishman James Ayscough lengthened the side arms of spectacles and added a double hinge in 1752. Franklin wore silver spectacles, but many American colonists had ones made of steel, as the example above. David Fleishman, MD, www.antiquespectacles.com

89. Split-lens bifocal spectacles, oval-frame, coin silver, American, ca. 1820. Franklin invented bifocals sometime between the 1730s and the 1760s by combining split lenses of different powers in the same frame. The top half was ground to correct for distant vision; the bottom half for near vision. A portrait of Franklin painted by Charles Willson Peale in 1785 is the only known image of the inventor wearing bifocals. David Fleishman, MD, www.antiquespectacles.com

90. *Poor Richard Improved . . . for the Year . . . 1752* (Philadelphia, 1751). In his almanacs, Franklin told readers what to look at in nature and how to see it clearly. He encouraged backyard astronomy. In this issue, he advises his readers how to observe

a solar eclipse in 1752. An advertisement for lampblack at the bottom of the page was probably a warning to readers to use the soot to darken the lenses or glass through which they would look at the sun. In another year's almanac, Franklin assured readers that, if they rose at dawn, they needed only ordinary spectacles to see Mercury's transit across the sun—no lampblack was needed at that time of day. Houghton *42-661

91. Gregorian reflecting telescope, Claude-Siméon Passemant, Paris, ca. 1740-1769 (figure 20). Franklin was unusual, among American almanac makers, in doing his own astronomical observations, for which he used a telescope. CHSI DW0936

92. Culpeper-type, screw-barrel microscope with compound body. Shown with accessories and original sharkskin case. Edmund Culpeper, London, ca. 1730 (figure 20). Microscopes, invented in the mid-seventeenth century, became affordable consumer items by the middle of the eighteenth century. CHSI 1173

93. Cuff-type compound microscope, George Adams, London, ca. 1745. George Adams, a London instrument maker, produced a variety of microscopes for consumers on both sides of the Atlantic Ocean. CHSI 1109

94. George Adams, *Micrographia Illustrata* (London, 1747), (figures 20, 22). Franklin published excerpts from this popular guide in *Poor Richard Improved . . . for . . . 1751*, in which he extolled "that admirable Instrument the MICROSCOPE." Houghton *EC75.Ad176.746mb - Gift of David P. Wheatland, 1986

D. How to . . . do an experiment

In Franklin's day, many sorts of people did experiments, published their findings, and developed new scientific instruments. Franklin believed that working people, no less than aristocrats, could undertake scientific investigations. Moreover, the experimental space was a social space, gathering together collaborators and witnesses. Results were communicated by letters and conversation. Some people even preferred electrical amusements to musical entertainments. In 1745, the *Gentleman's Magazine* reported how people "procured electrical machines, and try'd the experiments themselves, and electricity took the place of quadrille" dancing.

95. Benjamin Franklin, *An Account of the New Invented Pennsylvanian Fire-Places* (Philadelphia, 1744). Franklin used a room in his house as an experimental space in order to investigate the movement of air. Heat made the air expand and take up

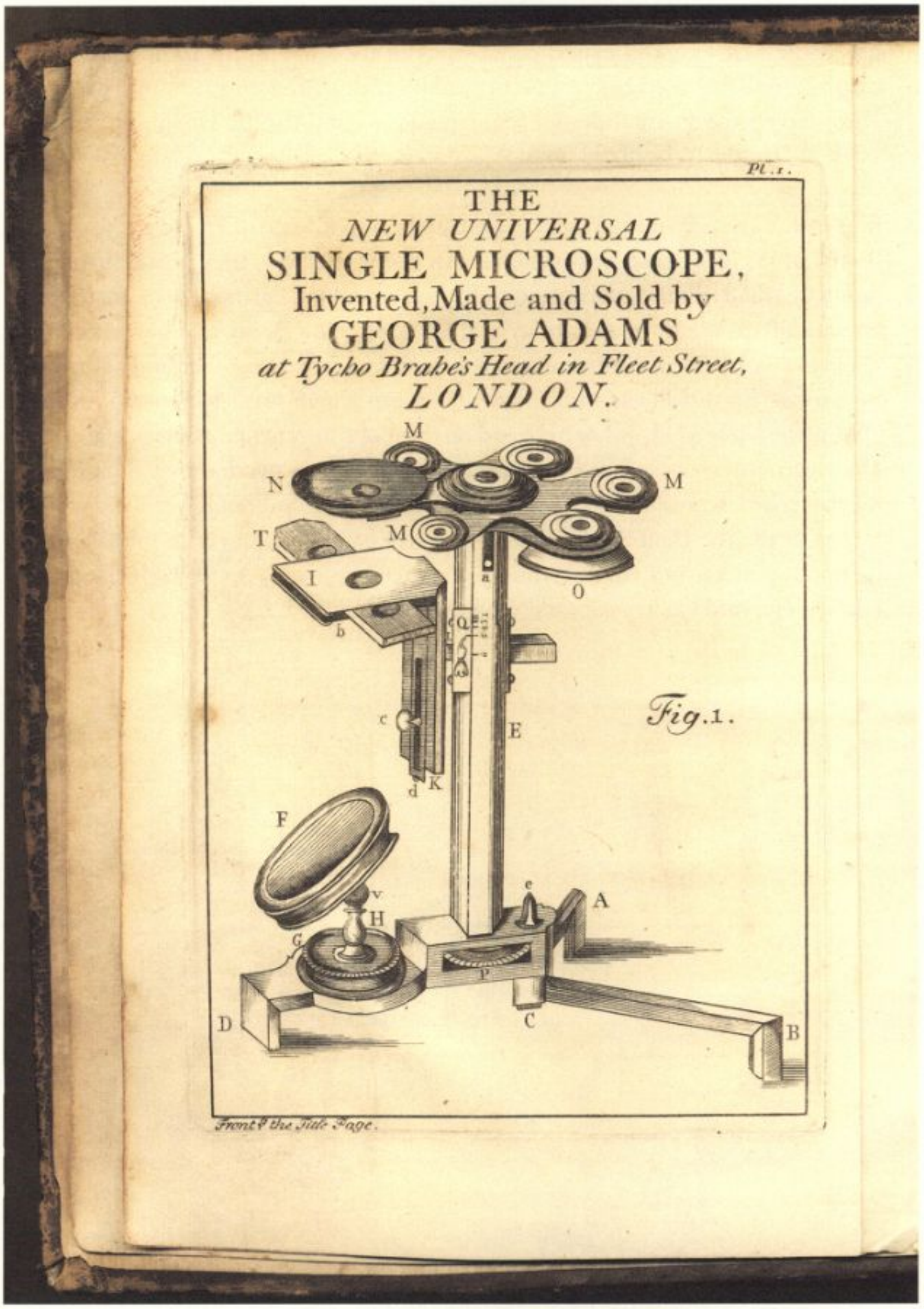


Figure 22. George Adams, *Micrographia Illustrata* (London, 1747), diagram (item 94). Reproduction courtesy of Houghton Library.

more space in the room, pushing against the drafts that would have kept it cold. It was the first Franklin experiment. Franklin used his results to design a better fireplace, one that used convection to send more draft-resisting heat into the room. The simple experimental design was ingenious—and thrifty. Houghton *90W-81 - Gift of David P. Wheatland, 1991

96. Illustration from William Watson's contribution to *Recueil de traités sur l'electricité* (Paris, 1748). Electrical experiments fascinated people. They were surprising, dramatic—and slightly dangerous. They also probed the nature of matter and natural forces. What was electricity? Where could it be found, and how could it be made visible? Why did some electrified bodies attract each other and some repel each other? In this illustration (figure 23), a gentleman turns a crank to revolve a glass globe while a lady holds her hand on the globe to generate an electrical charge. The electricity travels, foot to hand, through a boy suspended by silk cords. He touches a girl, who stands on a tub of insulating pitch and holds her hand above a tray of chaff. The chaff is attracted to the girl's hand and dances in midair. Above them all, a metal rod conducts more electricity to ring a set of bells. Houghton Library, Harvard College Library *EC75.W3392.Eh748r

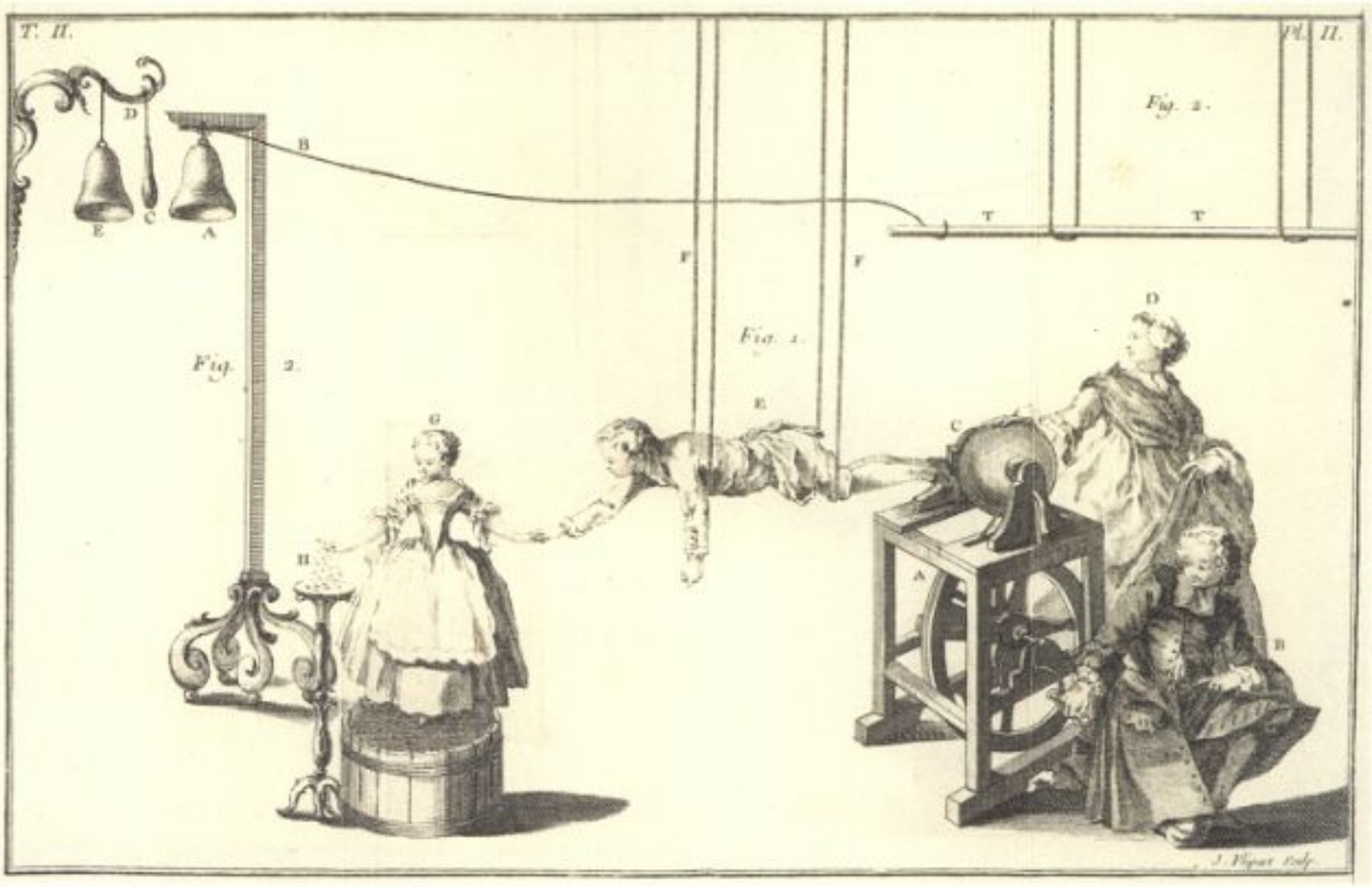


Figure 23. Illustration from William Watson's contribution to *Recueil de traités sur l'electricité* (Paris, 1748), showing electrical amusements (item 96). Reproduction courtesy of Houghton Library.

97. Portable electrical machine in travel box with accessories, Nairne and Blunt, London, ca., 1774-1793. Itinerant lecturers traveled about the American countryside dazzling rich and poor alike with electrical wonders. They used portable devices that could be easily unpacked and mounted in a public venue. One of these lecturers, a Dr. Spencer, gave Franklin his first view of electricity in Boston in 1743. CHSI DW0338

98. [Ebenezer Kinnersley], *Notice is hereby given to the curious* ... (Newport, Rhode Island, 1752?). Ebenezer Kinnersley, who had been a Baptist minister, became an itinerant electrical showman. James Bowdoin (Harvard AB 1745) saw his performances at Boston's Faneuil Hall in 1751 and wrote to Franklin about them. This hand-bill advertises a Kinnersley lecture in a private home in Rhode Island. He later helped Franklin do his own famous electrical experiments in Philadelphia. Houghton*AB7.B3181.752n

(99-112). Instruments for electrical experiments. The gift of a glass tube and instructions in its use prompted Franklin and three other members of the Library Company of Philadelphia to do their own electrical experiments. Many people came to watch "these new Wonders."

99. Glass rod. To be rubbed by silk or fur in order to produce electricity. CHSI 1997-1-1411

100. Cat skin. For rubbing glass or rosin to produce electricity. CHSI 1997-1-1291

101. Rosin. A resinous material that, like amber, possesses electricity. CHSI 1997-1-1317

102. Leyden jar, English or American, ca. 1800. A bottle for storing "electrical fluid." CHSI DW0023

103. Jointed discharger on glass handle, English, ca. 1770-1790. An insulated conductor used to connect two differently electrified bodies in order to bring them into equilibrium. CHSI DW0031

104. Battery of four Leyden jars, English or American, ca. 1825-1850. A device for storing up a lot of electricity for use in experiments. CHSI 1997-1-0677

105. Hinged electrical discharging spheres on a glass stand, English, ca. 1770-1790. For studying electric discharge as a function of the gap between conductors. CHSI 1997-1-0667

106. Black silk. For rubbing glass to produce electricity. CHSI 1998-1-0796

107. Spangled tube, English, ca. 1800. A glass tube glued with strips of metal that would sparkle when electrified. CHSI 1997-1-0472b

108. Discharge rod with hook, English, ca. 1770-1790. CHSI 1997-1-1365

109. Volta's eudiometer, English?, ca. 1790-1825. For combining measured amounts of gases with an electric spark in order to witness physical or chemical changes. CHSI 0033

110. Electrical sparker or discharge cylinder, English, ca. 1825. For showing how electricity sent through different atmospheric conditions will produce sparks or luminescence. CHSI DW0478

111. Pith balls with case, English or American, ca. 1750. A device for qualitatively showing the intensity of electrification, because pith balls will repel each other more or less according to the amount of electricity they each possess. CHSI DW0359

112. Quadrant electrometer, English, ca. 1780-1810. A measuring device for quantifying the amount of electricity. CHSI DW0015

113. Benjamin Franklin, *Experiments and Observations on Electricity* (London, 1751). Franklin made the investigation of electricity into a science by positing uniform laws about its nature and by quantifying its force. His account of the Philadelphia experiments established him as an important "natural philosopher," someone who theorized about natural forces. Houghton *90W-82

114. Diagrams from Benjamin Franklin, *Experiments and Observations on Electricity* (London, 1751). Franklin published illustrations of his experiments (figure 16) so readers would know how to replicate them. He used electricity to illuminate the gilding on a book cover and he attracted atmospheric electricity into an experimental sentry box via a pointed metal wire. His goal in the latter procedure was similar to that of the famous kite experiment, in which Franklin drew electricity down from thunder clouds. Houghton *90W-82

115. Electrical machine, Benjamin Martin, London, 1766, with repairs by John Prince, Salem, Mass., 1789 (figure 24). Franklin selected this large electrical machine from the London shop of Benjamin Martin in 1766 and had it shipped to Harvard

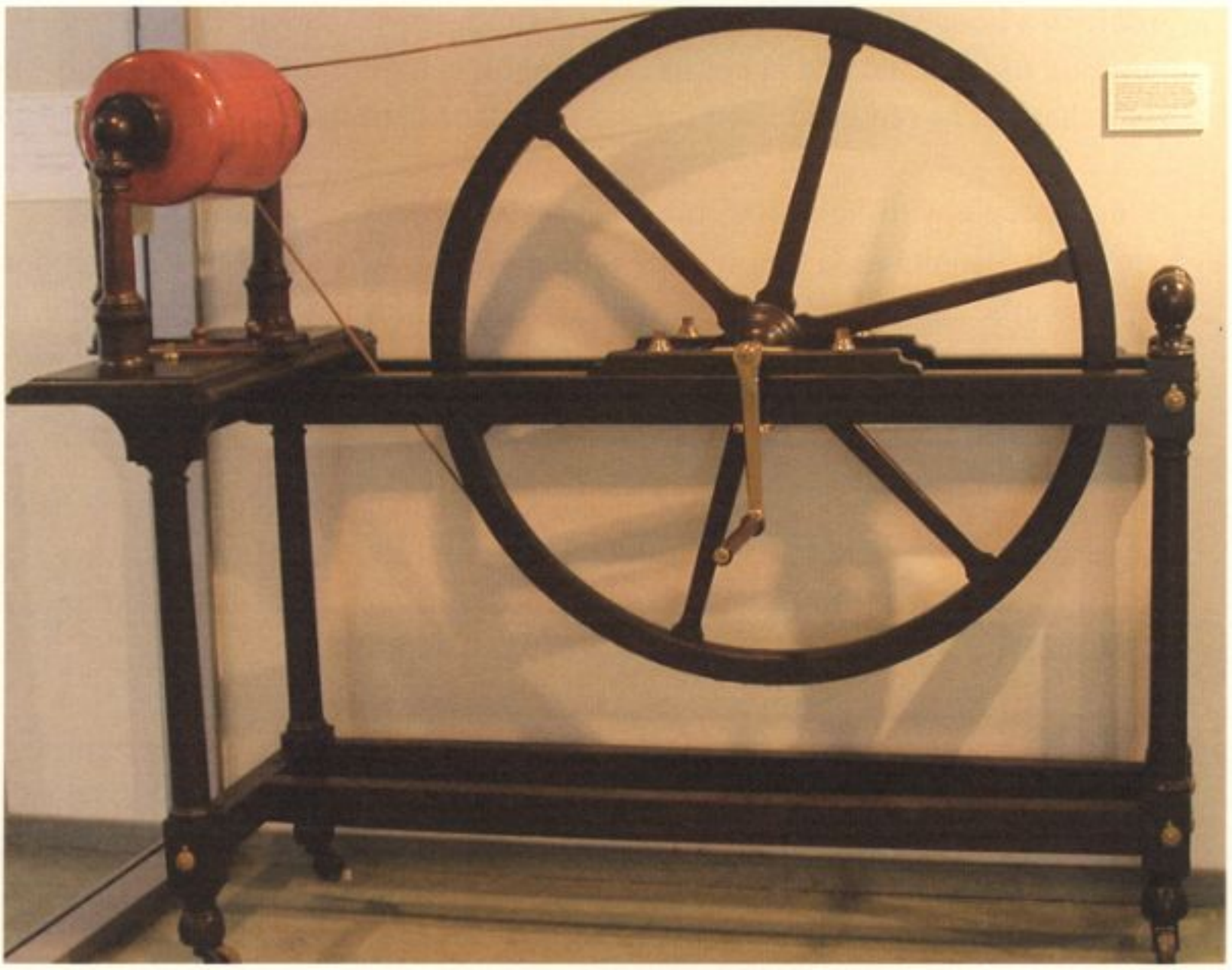


Figure 24. Electrical machine, Benjamin Martin, London, 1766, with repairs by John Prince (item 115). Reproduction courtesy of the Collection of Historical Scientific Instruments.

to replace apparatus lost in a fire in 1764. It originally generated electricity by rubbing a silk cushion against a glass globe. After the globe broke, the college paid the Reverend John Prince of Salem to mount a great cylinder on the frame in 1789. The uprights holding the cylinder are made of glass coated in pitch. CHSI 0013

116. Globe electrical machine made by Edward Holyoke, Harvard President (1739-1769), Cambridge, Massachusetts, ca. 1750 (figure 25). President Holyoke built this crude electrical machine to do his own work on electricity. CHSI 0565

117. Thunder house of tin, Paris, ca. 1790-1830. Thunder houses (and thunder churches) demonstrated the effectiveness of one of Franklin's most famous inventions—the lightning rod. When the electrical circuit is grounded, a charge passes harmlessly through the house. When the circuit is broken, a spark will touch off gunpowder within the house and blow it up! CHSI DW0841

118. Profile of a house with lightning rod, English, ca. 1765. Scholars debated whether lightning rods should end in points (as Franklin believed) or balls. This model has a ball that can be removed from the rod in order to test the theories. CHSI 0017

119. Jointed steeple with lightning rod, English, ca. 1765. At Harvard, a professor of natural philosophy used this and the model immediately above to teach students physics in the eighteenth century. After a college building was struck by lightning in 1768, the professor was also required to erect and maintain lightning rods on Harvard buildings. CHSI 0018

120. Thunder house of wood, replica, 1939, of original by John Prince, Salem, Massachusetts, ca. 1789. Electrical amusements continued at Harvard—this replica of an 18th-century device entertained 20th-century students (figure 6). CHSI 1997-1-1363

121. Wild turkey, from the museum of Charles Willson Peale, Philadelphia (figure 26). Franklin, a lapsed vegetarian, had complicated relations with turkeys. When he tried to electrocute one during an experiment, he managed to knock himself out

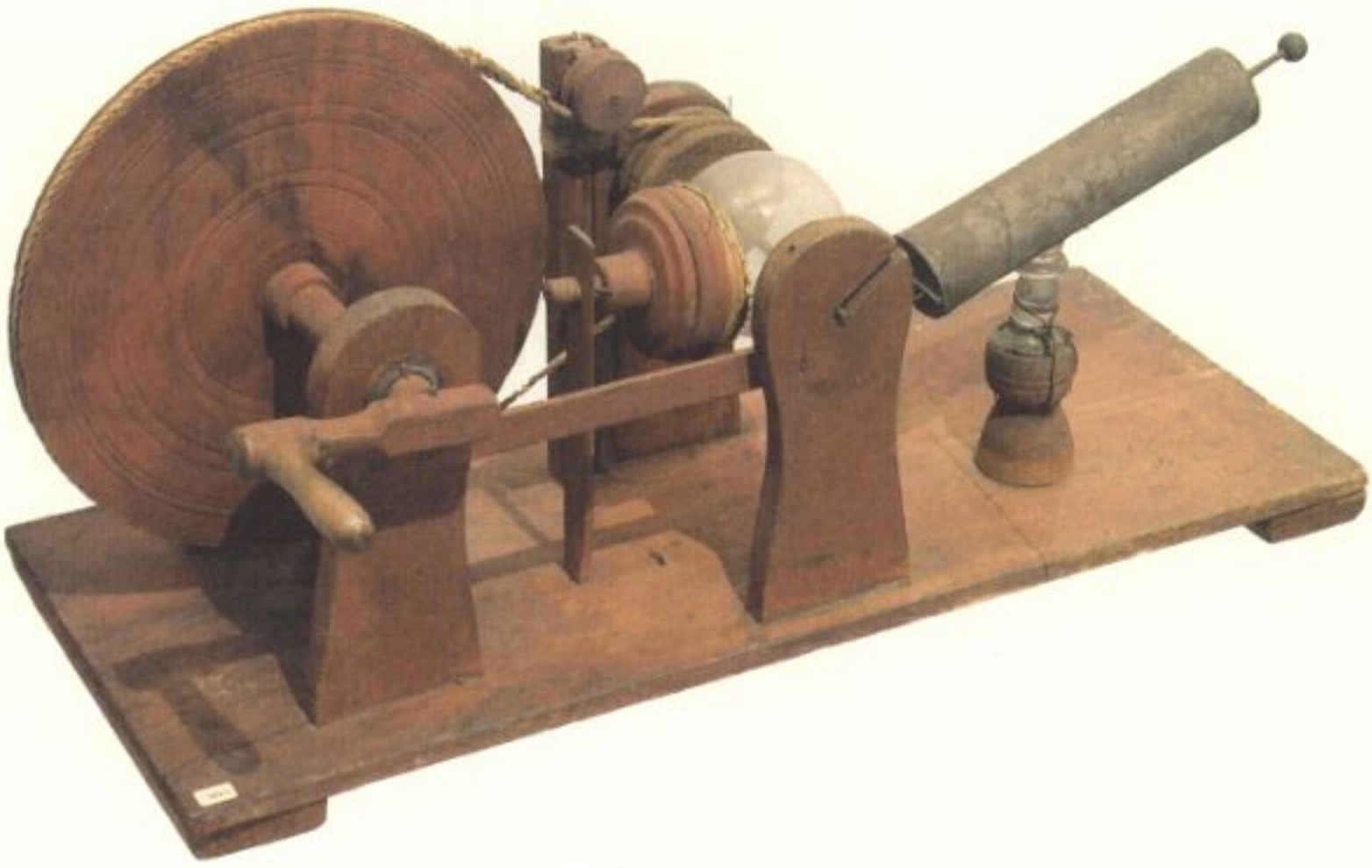


Figure 25. Electrical machine, EDWARD HOLYOKE, Cambridge, ca. 1750 (item 116). Reproduction courtesy of the Collection of Historical Scientific Instruments.

Figure 26. Wild turkey from the museum of Charles Willson Peale, Philadelphia (item 121). Reproduction courtesy of the Museum of Comparative Zoology, Ornithology Department, Harvard University.

with the charge intended for the bird. When he and his electrical collaborators celebrated their experiments with a 1749 picnic (a wonderful example of science and sociability), they killed and roasted a turkey using electricity. When the British colonies declared independence from Great Britain, the new nation's founders scrambled to create a national seal. The final version bore (and still bears) an eagle. Franklin disapproved. He thought the turkey a better symbol for the United States. The eagle, he claimed, was a cowardly scavenger whereas the wild turkey was a bold and admirable animal. Had Franklin prevailed, the turkey would have been the first laboratory animal to become a national symbol. Charles Willson Peale, who painted Franklin in 1785, had a museum that included this very stuffed turkey. Museum of Comparative Zoology, Ornithology Department, Harvard University

E. How to . . . talk to Neptune

As a boy, Franklin had wanted to be a sailor. His father vetoed that career choice but Franklin remained fascinated with the ocean, especially the Atlantic, which he crossed

Figure 27. *Sargassum bacciferum Ag.*, Gulf Weed (item 122).
Reproduction courtesy of the Harvard University Herbaria.

eight times. His interest was scientific but also social and political. The ocean was a means of connecting people (ships carried commodities, people, and information), an economic asset (especially for sailors and whalers), and a political prize, particularly during war. Franklin championed the knowledge that sailors had of the sea and brought it to greater public attention.

122. *Saragassum bacciferum Ag.* (Gulf Weed), Atlantic Ocean, floating (figure 27). While crossing the North Atlantic in 1726, the twenty-year-old Franklin gathered up sargassum, then called Gulf Weed, which the warm waters of the Gulf Stream carried northward. Harvard University Herbaria

123. Pelagic crabs from the Atlantic Ocean, adults and young in two Agassiz bottles. Different samples of Franklin's Gulf Weed had crabs of different sizes, from tiny young to larger adults. Franklin concluded that the crabs lived and bred on the plant. It was his first scientific investigation and the start of his lifelong interest in oceanic circulation. Museum of Comparative Zoology, Harvard University

124. Georges-Louis Le Rouge, *Remarques sur la navigation de Terre-Neuve* ... (Paris, ca. 1782-1785). In 1768, Franklin was the first person ever to chart the Gulf Stream. At the end of the Revolutionary War between Great Britain and the new United States, Franklin drafted a second chart, shown here. He might have produced this version in order to promote a continued alliance between France and the United States, particularly a Franco-American packet boat system to carry mail between the two nations. Harvard Map Collection, Harvard College Library

125. Benjamin Franklin, *Maritime Observations in a Letter ... to Mr. Alphonsus [sic] Le Roy* (Philadelphia, 1786). Franklin's last chart of the Gulf Stream shows the famous Philadelphian haranguing Neptune in the bottom right corner. On three of his Atlantic crossings, Franklin had gathered data on the surface and subsurface temperatures of the Gulf Stream, noting the location of each reading (which the ships' navigators gave to him). He published the data with this map. This was not only a historic contribution to oceanography, but also Franklin's last significant scientific publication. Houghton *AC7.F8545.786m

(126-132). Ships' instruments, and devices for doing science at sea, both became more sophisticated during Franklin's lifetime. Barometers and thermometers, respectively, gave readings of atmospheric pressure and of temperature in air and water; hygrometers indicated humidity. Compasses showed sailors the direction of travel; octants and sextants could be used to determine a ship's position at sea. In his "Maritime Observations," Franklin recorded his ship's positions during three journeys in order to log his temperature readings of the Gulf Stream.

126. Mercury barometer, William and Samuel Jones, London, ca. 1790. CHSI 1998-1-0251

127. Hair hygrometer, Jones, London, ca. 1780-1810. CHSI 5601

128. Mariner's compass, Edward Nairne, London, ca. 1765. Acquired by Harvard with Franklin's help. CHSI 0094

129. Mahogany octant, John Bleuler, London, ca. 1775, in stepped keystone case with label of Gedney King, Boston. CHSI 5304

130. Ebony octant in stepped keystone case with label of Samuel Emery, Salem, Massachusetts, ca. 1802. CHSI DW0534

131. Brass sextant with double scale, Ebenezer Hoppe, London, ca. 1809. CHSI 5309

132. Brass sextant with keystone case, George Whitbread, London, ca. 1836. CHSI 5307

F. How to . . . win friends and influence people

Franklin believed that he belonged to the republic of letters, a network of literate people who made or debated contributions to knowledge. Sociability, meaning conversation and letter-writing, connected the members of the republic of letters. The republic was supposed to transcend the differences of nation, religion, gender, and social status. The network included grand philosophers but also many educated men and women who were curious about the world and sought to investigate it. Certainly, the range of Franklin's friends indicated the inclusiveness of the republic of letters.

JOHN BARTRAM, a Philadelphia farmer and Quaker, was a self-taught but gifted botanist.

133. John Bartram, *A Description of East-Florida* (London, 1769). European theorists valued Bartram's descriptions of America and his specimens of its plants. Houghton *EC75.St745.766ab

134. Mastodon tooth. Both Bartram and Franklin assumed that species of plants and animals were permanent and could never become extinct. They were both mystified about the meaning of fossils, such as a mastodon tooth that Franklin owned. Museum of Comparative Zoology, Harvard University

135. *Franklinia alatamaha* Bartram ex Marshall. Bartram named this flowering American tree for his "dear Benjamin." Had Bartram not cultivated the tree, it might have become extinct. It can no longer be found in the wild. Harvard University Herbaria.

JOHN BASKERVILLE was an inventive printer and one of many Birmingham artisans whom Franklin befriended. In 1775, several of these Birmingham friends would organize the Lunar Society, a provincial learned society and outpost of the republic of letters.

136. John Baskerville, *A Specimen* (Birmingham, 1762). Baskerville designed a typeface (versions of which still bear his name) that Franklin defended against critics who claimed it was the "Means of blinding all the Readers in the Nation." Department of Printing and Graphic Arts, Houghton Library, Harvard College Library. TypTS 705.62.194 - Bequest of William Bentinck-Smith, 1993

PUBLII VIRGILII

MARONIS

BUCOLICA,

GEORGICA,

ET

AENEIS.

BIRMINGHAMIAE:

Typis JOHANNIS BASKERVILLE.

MDCCLVII.

Figure 28. VIRGIL, *Bucolica, Georgica, et Aeneis* (Birmingham, 1757), printed by John Baskerville (item 137). Reproduction courtesy of Houghton Library.

137. Virgil, *Bucolica, Georgica, et Aeneis* (Birmingham, 1757). As well as designing type, Baskerville made special paper and ink. He put all his innovations to use in this 1757 edition of Virgil. Franklin claimed it was "the most curiously [interestingly] printed of any Book hitherto done in the World" and bought several copies. He presented this one to Harvard College (figure 28). Houghton *AC7.F8545.Zz757v - Gift of Benjamin Franklin, 1758

MARY STEVENSON (later HEWSON) was the daughter of Franklin's London landlady.

138. Benjamin Franklin, *Experiments and Observations on Electricity* (London, 1769). When apart, Stevenson and Franklin wrote letters, many on scientific topics, several of which Franklin published in his collected works, as in this edition. It was still rare for women to be included in scientific correspondence, let alone any that was printed. (Franklin did not publish Stevenson's full name.) Houghton *AC7.F8545.751ed (B) - Gift of Thomas Hollis, 1769

139. Magnifying lens with wooden case, Nuremberg, mid-18th century. In the correspondence cited above, Franklin discussed how dark- and light-colored objects conducted heat differently. He told Stevenson to try to burn dark and light portions of printed paper using a magnifying lens as a burning glass. David Fleishman, MD, www.antiquespectacles.com

140. Magnifying lens in a horn case, European, ca. 1780. Another lens, of a more elaborate style. David Fleishman, MD, www.antiquespectacles.com

JOSIAH WEDGWOOD was another of Franklin's talented Birmingham friends, and another member of that city's Lunar Society.

141. Benjamin Franklin, jasperware medallion by Wedgwood and Bentley, Etruria, Staffordshire, England, ca. 1775. Wedgwood invented several types of pottery still known under his name and made portrait medallions of Franklin and many of their mutual friends. Fogg Art Museum, Harvard University (1943.1217)

142. Wedgwood and Bentley, *A Catalogue of Intaglios* (London, 1779). Wedgwood's work as an extremely skilled artisan made him a wealthy gentleman. Houghton *EC75.W4168.779c

143. Earthenware vessel for chemical experiments, possibly 18th century. Once he was successful and wealthy, Wedgwood had time for philosophical endeavors. He became a member of Birmingham's Lunar Society. CHSI 4813

ANNE-LOUISE BOIVIN D'HARDANCOURT BRILLON DE JOUY was the accomplished wife of one of Franklin's neighbors near Paris. They shared a love of music, and Brillon wrote a "Marche des Insurgents" to celebrate American victory over Britain at the battle of Saratoga.

144. Scissor spectacles, gilt brass, French, ca. 1790-1810. Franklin and Brillon were devoted correspondents (and gossips) who discussed everything from science to fashion. David Fleishman, MD, www.antiquespectacles.com

145. Benjamin Franklin, *The Works of Benjamin Franklin* [ed. Jared Sparks] (Philadelphia, 1836-40). For Brillon, Franklin wrote several bagatelles, short amusing essays on philosophic topics. In one printed in this volume, he recommends looking on the bright side of life, advising her to ignore the ugly leg (or fact) and rejoice in the handsome one. Houghton*89-34, vol. 4

CADWALLADER COLDEN was a New York physician and scientific theorist. He was Franklin's first important scientific correspondent. Their letters examined heat, ocean currents, circulation of the blood, the nature of perspiration, and gravity.

146. Cadwallader Colden, *Explication des premieres causes de l'action dans le matiere* (Paris, 1751). Colden's *Explication of the First Causes of Action In Matter; and the Cause of Gravitation*, an attack on Newton, first appeared In 1745. It was widely translated and reviewed (negatively) in Europe. Houghton *EC7.M366.Eh751ca

JOSEPH PRIESTLEY, yet another Birmingham-based "Lunar Man," was a minister and man of science.

147. Electrical battery of four Leyden jars, English, ca. 1805. Priestley did important electrical and chemical experiments; he and Franklin compared their electrical findings. CHSI DW0024

148. Joseph Priestley, *The History and Present State of Electricity* (London, 1767). In this work (figure 29), Priestley published the first full account of Franklin's kite experiment. Houghton *AC7.F8545.Zz767p - Gift of Benjamin Franklin, 1772

149. Glass tubing for chemical experiments, belonging to Priestley and used in his Pennsylvania laboratory. After Franklin's death, Priestley's religious and political radicalism made him unwelcome in Britain. He fled to Pennsylvania. CHSI 0096

THOMAS JEFFERSON admired Franklin greatly and used him as an important contact in the republic of letters.

150. Thomas Jefferson to Benjamin Franklin, Aug. 6, 1787. In this letter, Jefferson introduces Franklin to an American with medical interests. Houghton bMS Am 1583 (40)

151. Graphometer, a surveying instrument, Benjamin Martin, London, ca. 1738-1777. Franklin's very last letter was to Jefferson and discussed maps and U. S. borders. CHSI DW0511

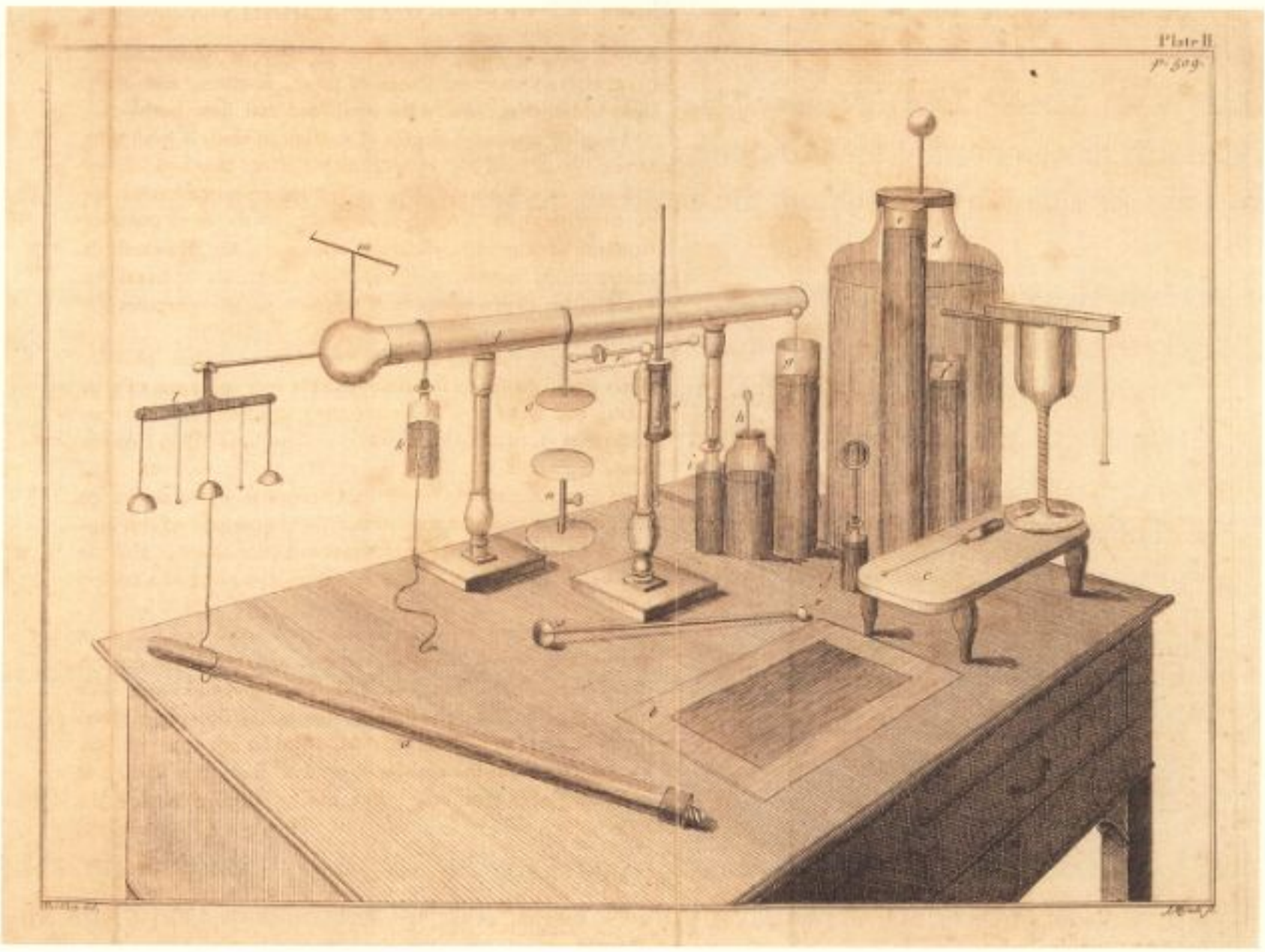


Figure 29. Joseph Priestley, *The History and Present State of Electricity* (London, 1760), illustration (item 148). Reproduction courtesy of Houghton Library.

152. Pantograph, John Prince, Salem, Massachusetts, before 1792. Another surveying instrument. Franklin and Jefferson both thought that the sciences, including the production and use of scientific instruments, could strengthen the new United States. CHSI 0065

HENRY HOME, LORD KAMES, a moral philosopher, was one of the many Scottish luminaries whom Franklin met on his first visit to Edinburgh.

153. Henry Home, Lord Kames, *Essays on the Principles of Morality and Natural Religion* (Edinburgh, 1751). His learned yet unpretentious Scottish friends gave him, Franklin claimed, "the densest Happiness I have met with in any Part of my Life." Houghton TP 2055.1.30 - Bequest of Thomas Palmer, 1820

DAVID HUME and Franklin shared a reputation for charm and an agreeable nature—little wonder that they became friends.

154. David Hume, *Essays, Moral and Political* (Edinburgh, 1742). Franklin and Hume shared an interest in moral philosophy and enjoyed arguing with each other. Hume teased Franklin for his habit of making up new words. Houghton *EC75. H8823.742eb

155. David Hume to Benjamin Franklin, Edinburgh, Feb. 7, 1772. The two friends gossiped avidly, as in this 1772 letter about mutual acquaintances, one of whom is planning to go around the world with Captain James Cook. Houghton bMS Sparks 49.3 (198)

156. David Hume, white-glass-paste medallion by James Tassie, London, ca. 1775. Tassie was one of a growing number of artisans who made portrait medallions of famous people, including many Franklin knew. He had a friendly rivalry with Josiah Wedgwood. Fogg Art Museum, Harvard University (1943.1096)

EDMUND BURKE, an Anglo-Irish politician, was sympathetic to American colonists' protests against Great Britain, and he and Franklin remained friends even after 1776.

157. Edmund Burke, *A Philosophical Enquiry into the Origin of Our Ideas of the Sublime and Beautiful* (London, 1770). In this important contribution to aesthetic theory, Burke argued that terrifying spectacles (like storms) inspired a sense of wonder and beauty. Houghton Phil 8402.14 B

158. Edmund Burke, white-glass-paste medallion by William Tassie, London, 1797. Fogg Art Museum, Harvard University (1943.1090)

JOHN WINTHROP, a descendant of the first governor of Massachusetts, taught mathematics and natural philosophy at Harvard College. Franklin was his steady correspondent and patron.

159. Universal microscope and accessories in sharkskin case, Benjamin Martin, London, ca. 1765. Franklin helped Winthrop restock Harvard's cabinet of scientific instruments after a devastating 1764 fire at the college. CHSI 1218

160. Gregorian reflecting telescope, Benjamin Martin, London, ca. 1760-1770. The Transits of Venus (1761 and 1769) provided rare opportunities for American astronomers such as Winthrop to be part of a major international collaboration. Observations of the movement of Venus across the sun, made from several places on earth, supplied data to help calculate the distance between the earth and sun. Franklin helped get astronomical instruments from London to America for the observations. CHSI DW 0810

161. John Winthrop, *Two Lectures on the Parallax and Distance of the Sun* (Boston, 1769). Winthrop was the only American astronomer to observe both Transits of Venus and gave these lectures about the 1769 event. Houghton Astr 1907.69*

ERASMUS DARWIN was yet another talented Birmingham resident and another of Franklin's friends in the Lunar Society.

162. Culpeper-type microscope, Matthew Loft, London, ca. 1724-1747. Darwin closely studied plants and animals and theorized about their evolution. His grandson, Charles Darwin (also the grandson of Josiah Wedgwood), was the proponent of the theory of evolution. CHSI 1180

163. [Erasmus Darwin], *The Botanic Garden, Part II. Containing the Loves of the Plants* (Lichfield, 1790). Darwin made much of Swedish botanist Carolus Linnaeus's observation that plants reproduced sexually. In Darwin's poem, the plants seem to be having sex all the time. It was an image of sociability gone wild! Houghton *EC75.D2593.789b pt.2a - Bequest of Lucy Osgood, 1884

JOHN JEFFRIES (Harvard AB 1763) was an American-born physician and anatomist. Unlike Franklin, he was a British loyalist who fled the American Revolution and settled in England. He became an "aeronaut" in the 1780s, when balloons were a new and

Figure 30. Pocket botanical microscope and case, GEORGE ADAMS, with additions by W. S. Jones; owned by John Jeffries (item 164). Reproduction courtesy of the Collection of Historical Scientific Instruments.

exciting invention in Europe. When he and a Frenchman crossed the English Channel in a balloon in 1785, Jeffries delivered to Franklin the world's first airmail letter, a message from Franklin's estranged loyalist son, William.

164. Pocket botanical and universal microscope, George Adams with additions by William and Samuel Jones, London (figure 30). This microscope, which Jeffries acquired in 1789, attests to his broad scientific interests. CHSI 1001

JAN INGENHOUSZ, a Dutch physician, lived much of the time in London, where he met Franklin.

165. Jan Ingenhousz, *Experiments Upon Vegetables* (London, 1779). Ingenhousz did experiments with plants which demonstrated that they emitted a form of air, later called oxygen. It was the first evidence of photosynthesis. Franklin deemed it "the greatest discovery made in Europe for some time past." Houghton *NC7. In430.779e

JOSEPH BANKS, an aristocrat and naturalist, accompanied Captain James Cook on his first voyage through the Pacific Ocean. Franklin and Banks took opposite sides

during the American Revolution but agreed that science was above national differences. Banks greatly admired how Franklin had forbidden the American rebels' ships from attacking Cook's ships during his third and final voyage, which set out during the War for Independence.

166. Benjamin Franklin to Sir Joseph Banks, Passy, Nov. 21, 1783. In this letter, Franklin excitedly relates the construction, ascent, and passage of a hot-air balloon, "larger than that which went up from Versailles" in an earlier test. The topic allowed the two friends to re-open a lively correspondence that the war had impeded for many years. Houghton fMS Am 1310.1 (4)

167. Sir Joseph Banks, jasperware medallion by Wedgwood and Bentley, Etruria, Staffordshire, England, 1775. Banks would become president of the Royal Society of London, England's oldest scientific institution. Fogg Art Museum, Harvard University (1943.1199)

ANTOINE-LAURENT LAVOISIER and ANNE MARIE PIERETTE LAVOISIER (née PAULZE) were pioneers in modern chemistry. Mme. Lavoisier assisted her husband in his experiments and made drawings to record their findings.

168. Antoine-Laurent Lavoisier, *Traité élémentaire de chimie* (Paris, 1789). Lavoisier and Joseph Priestley are both credited with the discovery of oxygen. In fact, Lavoisier challenged many of Priestley's findings. Somehow, Franklin managed to stay friends with both men. CHSI QD28.642 1789

169. Benjamin Franklin, *The Works of Benjamin Franklin* [ed. Jared Sparks] (Philadelphia, 1836-40). In a letter of 1785, published in this volume, Franklin thanks Mme. Lavoisier for a copy of *Méthode de nomenclature chimique*, to which her husband had contributed. Houghton *89-34, vol. 6

170. Pedometer in the form of a pocket watch, William Fraser, London, ca. 1785, owned by Lavoisier. Lavoisier would have bought or received this device at about the time Franklin left France to return home to Philadelphia. CHSI DW0619

171. Scissor spectacles of the kind the Lavoisiers or their French guests would have worn in the salon, mother-of-pearl and silver, French, ca. 1790-1810. Franklin was a regular guest of Mme. Lavoisier's salon, which included many French men of science. His simple spectacles set him apart from the fashionable French. David Fleishman, MD, www.antiquespectacles.com

(172-176). Chemical apparatus of the type used by Lavoisier and Priestley

172. Set of nested weights, Henry Neale, London, ca. 1686-1709. CHSI DW0418

173. Three eudiometers, possibly English, ca. 1780-1800. Used to collect and measure gases, which could be combined by an electric spark if desired. CHSI 0029, 0030a, 0033b

174. Pneumatic trough for water bath in which eudiometers stand, English, ca. 1780. The eudiometers would be filled with water and inverted in the water-filled trough. Gases would bubble through tubing into the glasses and displace the water in them. CHSI 3738

175. Apparatus to measure the specific gravity of gases, Pixii Père et Fils, Paris, ca. 1825-1835. CHSI 0036, 0037

176. Earthenware retort supported in a woven straw ring, European, 18th century or earlier. CHSI 1998-1-0048 and 1997-1-1900b