



WINGS WITHOUT FORCE TO WORK THEM.



LOCOMOTIVE ENGINE.

SCIENCE IN NINETEENTH-CENTURY CHILDREN'S BOOKS

The University of Chicago Library



THE BLAST FURNACE.



THE PLANE MIRROR.





“I don’t know what I may seem to the world, but, as to myself, I seem to have been only like a boy playing on the sea shore, and diverting myself in now and then finding a smoother pebble or a prettier shell than ordinary, whilst the great ocean of truth lay all undiscovered before me.”

—Attributed to ISAAC NEWTON
by Andrew Michael Ramsay in Spence’s *Anecdotes* (London, 1820)

SCIENCE IN NINETEENTH-CENTURY CHILDREN'S BOOKS

An Exhibition Based on the

ENCYCLOPAEDIA BRITANNICA HISTORICAL COLLECTION

OF BOOKS FOR CHILDREN

in The University of Chicago Library

Held during the Celebration of

The University's Seventy-fifth Anniversary Year

AUGUST THROUGH OCTOBER 1966

HARPER MEMORIAL LIBRARY

The Encyclopaedia Britannica Collection of Books for Children, from which the books in this exhibition and catalogue were selected, was presented to the University of Chicago Library by Encyclopaedia Britannica, Inc., in 1945. It is the principal historical collection among a number of collections in the University Library devoted to children's literature.

The core of the collection was originally gathered by Mr. Henry C. Friedman of Chicago and subsequently was acquired by the Encyclopaedia Britannica. Today, after further growth, the collection contains approximately 7,000 volumes. Although the titles are broadly representative of most forms of past children's literature and reflect some of Mr. Friedman's special interests such as juvenile books about Abraham Lincoln, the major emphasis of the collection is on American and English books printed during the nineteenth century. Within this wide range are included toy-books; books illustrated by Walter Crane, Randolph Caldecott, and Kate Greenaway; the numerous works of such prolific writers as Jacob Abbott and Horatio Alger; and the "bloods" and other boys' books of the latter part of the century. Many of the "classics" of that age are to be found interspersed with more typical and perhaps more widely read books.

There are nostalgic memories here for those who grew up with some of these books, and there is enchantment for those coming upon them for the first time. For everyone, the collection is an unusual and highly suggestive resource for the study and understanding of the social and cultural currents of the last century.

Mrs. Patricia Pond of the Graduate Library School has explored one aspect of the world of the nineteenth century in assembling, from the riches of the Encyclopaedia Britannica Collection, this exhibition of scientific books for children.

If the beginnings of the modern scientific era can be traced to the Renaissance and the work of Copernicus, Galileo, and, later, Newton, the beginnings of scientific books for children can be traced to the eighteenth-century moral and didactic tales of Arnaud Berquin, Thomas Day, Sarah Trimmer, John Aikin, and Maria Edgeworth.

In the eighteenth century, the sciences consisted of Natural History—the study of plants, animals, minerals, and other “natural” objects—and Natural Philosophy—the study of nature in general. Engineering and technology were part of Mechanical Science or the Mechanic Arts. The first scientific books for children appeared near the end of an era of emphasis on mathematics and the physical sciences and at the beginning of an era in which biology and geology were increasingly being used to discover new facts about the universe and its origins. For most persons in the eighteenth century and much of the nineteenth century, however, the final explanation of the universe was to be found not in the sciences but in the revealed truths of religion.

The one hundred books in this exhibit not only indicate some of the variety available to American and English children but also illustrate the relation of these books to contemporary scientific and technological advances, the attitudes toward these developments, and the prevailing philosophies and methods of teaching science in the nineteenth century.

Although the volume of research in the physical sciences was far greater in the nineteenth century than in the preceding century, the effect of advances in the physical sciences was much less evident in popular literature and popular thought than the advances in the biological sciences. This is illustrated by the children’s books in the

Encyclopaedia Britannica Collection. Well over half of the science books are on the biological sciences. An emphasis on the biological sciences was also typical of nineteenth-century educational thought. Educators felt that an understanding of the concepts of science, especially concepts in the physical sciences, was far beyond the ability of the child, who, at best, was only capable of learning some simple facts of science and classifying scientific objects on the basis of external characteristics.

Many popular methods of education are reflected in the science books in the exhibit. Books of the late eighteenth and early nineteenth century attempted to involve the child in the learning process through a method of instruction using conversations or dialogues with a parent or tutor. The question-and-answer method was a typical one used in the early schools, and school readers employed this method of presenting scientific information. The early-nineteenth-century emphasis on interpretation of scientific phenomena shifted to an emphasis on description and classification of scientific objects typical of the Object Teaching method, popular from 1850 to 1880. The Nature Study Movement of the late nineteenth century developed, in part, as an outgrowth of the Object Teaching method, but also as a reaction against this method, which stressed classification and memorization. In an attempt to make the "dry" facts of science more interesting and understandable to the child, a plethora of anthropomorphic nature stories appeared. The influence of the Nature Study Movement with its emphasis on the biological sciences rather than the physical sciences continued well into the twentieth century.

Several attitudes toward science were typical of nineteenth-century popular thought. Depending on one's point of view, science could be viewed as a source of salvation and moral behavior by introducing man to the wonders of God's Creation; as a source of increased knowledge of the world, especially through the use of the experimental method; as a source of continuing progress, particularly technological progress; or as a source of conflict with revealed religious truth. The first two attitudes are predominant in the science books in the exhibit. There is some reflection of the view that science is the mainspring of progress, but much less than one might expect to find. Little outward evidence that science might be a source of conflict with established religions appears, although the writers of these nineteenth-century books may have harbored such an uneasy feeling.

A comparison of these books on science with the great number now

available suggests that the child and his ability to comprehend science in its broadest sense are no longer underestimated or limited by social and religious mores. There is no longer any need to mask scientific facts or concepts behind a story, for the simple reason that science and its manifestations have become a part of the child's everyday life.

THE BEGINNINGS OF SCIENCE BOOKS FOR CHILDREN

Based on the educational theories of Locke and Rousseau, the moral and didactic tales which appeared in the second half of the eighteenth century first provided children with a substantial body of scientific information on the world about them. Still popular in the early nineteenth century, these little books, moralistic as they were, usually focused on children rather than adults as main characters and further capitalized on children's interests with descriptions or pictures of familiar animals.

1. PLINIUS SECUNDUS, A.D. 23-79. *The Boys' and girls' Pliny, being parts of Pliny's natural history*. New York: G. P. Putman's, 1885. A selection of the information on animals from the thirty-seven books of the original *Naturalis historia*, an encyclopedia of the whole of known science in the first century A.D., parts of which served for years as a required Latin text in the schools. The editor claims to have eliminated the unsubstantiated facts on animals which marred the original work, where there was little distinction between lions and unicorns, the phoenix and the dove.

2. JOHAN AMOS COMENIUS, 1592-1670. *Orbis sensualium pictus: hoc est omnium principalium in mundo rerum, et in vita actionum, pictura et nomenclatura . . . Comenius's visible world; or, A Nomenclature, and pictures, of all the chief things that are in the world, and of men's employments therein*. New York: T. & J. Swords, 1810. (1st Am. ed. from the 12th London ed.) Generally considered to be the first picture book for children, its author, Comenius, a famous Czech educator, is also credited with introducing the study of nature into the schools. Parallel columns in Latin and English provide identification of terms from Natural History, Natural Philosophy, and the Mechanic Arts, systematically illustrated and numbered.

3. *The New-England primer*. Philadelphia: J. Crukshank, 1791. First published in Boston in 1749, editions of this famous American textbook were still available as late as 1833. Designed as a reading text, many woodcuts illustrating animals and plants familiar to children were included in the various editions.

4. THOMAS BEWICK, 1753-1828. *A General history of quadrupeds*. Newcastle upon Tyne: S. Hodgson, R. Beilby, and T. Bewick, 1791. Although designed for adults, not children, English and American children of the late eighteenth

and early nineteenth centuries must have enjoyed the wealth of excellent illustrations of animals by a master of the technique of wood engraving. The text, based on actual observation of animals, is more accurate than many of the popular natural histories of the period.

5. MARY TRIMMER. *Illustrated natural history of the most remarkable quadrupeds, birds, fishes, serpents, reptiles, and insects. Abridged and improved from the works of Mrs. Mary Trimmer and others. Particularly designed for youth in the United States.* New York: Kiggins and Kellog, 1854. This natural history for children, first published in 1825, is a double example of plagiarism. The author borrowed her pseudonym from one of the most famous of the English didactic writers, Sarah Trimmer, and the illustrations and some of the text from Thomas Bewick's natural histories.

6. SARAH TRIMMER, 1741-1810. *The Robins; or, Domestic life among the birds. With Anecdotes of other animals.* New York: C. S. Francis, 1846. A nineteenth-century American edition of an authentic and famous book by Sarah Trimmer, originally titled *Fabulous Histories* (1786). Morality takes precedence over science as two small children observe the activities of a family of talking robins. Mrs. Trimmer is careful to warn real children not to consider the book as "containing the real conversation of birds (for that is impossible we should ever understand)."

7. LOUIS JAUFFRET, 1770-1850(?). *Visits to the menagerie and the botanical garden at Paris; being an introduction to natural history and botany, for the instruction of young persons.* London: R. Phillips, 1804. An account of six imaginary visits to the actual menagerie and botanical garden in Paris. Several folded engravings are included. Sarah Trimmer took exception to the "moral powers, pious affections, and foresight attributed to animals" by the author.

8. JOHN NEWBERY, 1713-67. *The Newtonian system of philosophy, adapted to the capacities of young gentlemen and ladies, and familiarized and made entertaining by objects with which they are intimately acquainted. Being the substance of six lectures read to the Lilliputian Society by Tom Telescope, A.M. and collected and methodized for the benefit of the youth of these kingdoms . . .* London: T. Carnan and F. Newbery, 1770. First published by the famous English children's book publisher at the Sign of the Bible and the Sun in 1761, later editions were available in the United States. The fictional but lively Tom Telescope, described as "a young gentleman of distinguished abilities," delivered his lectures on Newtonian mechanics and Natural History as a diversion from the gambling engaged in by the little gentry at an English country house. Several engravings and woodcuts illustrating scientific instruments are included.

9. THOMAS DAY, 1748-89. *The History of Sanford and Merton.* New York: C. S. Francis and Others, n.d. One of the most famous of the early moral and didactic tales for children, first published in three volumes between 1783 and 1789. Much of the liveliness of children is absent from such prigs as Tommy Merton and the more rugged Henry Sanford, whose tutor, the worthy Rev.

Barlow, fills their days with nature walks and their heads with a miscellaneous assortment of scientific facts and pious moralizings.

10. ANNA LETITIA BARBAULD, 1743–1825. *Lessons for children from four to five years old*. Philadelphia: B. F. Bache, 1788. Printed in large size type, this first American edition of a famous 1778 reading text for use in the home includes a few changes from the English edition to make its examples of natural history and scientific objects fit the American scene. Simple facts about the bee, the butterfly, the caterpillar, snow, hail, rain, and signs of spring are included.

11. JOHN AIKIN, 1747–1822, and ANNA LETITIA BARBAULD, 1743–1825. *Evenings at home; or, The Juvenile budget opened*. New York: Harper, n.d. (Rev. ed. from the 15th London ed.) Contains 101 selections from the six-volume miscellany for children written by John Aikin in collaboration with his sister, Mrs. Barbauld. It includes much scientific information together with the famous story, “Eyes and No Eyes,” which contrasts the scientific habits of observation of young William with those of his friend, Robert.

12. ARNAUD BERQUIN, 1747–91. *The Blossoms of morality; intended for the amusement and instruction of young ladies and gentlemen*. Philadelphia: W. W. Woodward, 1798. An example from the French school of moral and didactic writing for children. In the section entitled “The Book of Nature,” Berquin calls children’s attention to the “book of nature which is constantly open to the inspection of everyone and intelligible even to those of tenderest years.”

13. MARIA EDGEWORTH, 1767–1849. *Harry and Lucy, being the first part of Early lessons*. Philadelphia: J. Johnson, 1805. A friend of Thomas Day, Maria Edgeworth far exceeded him in the ability to describe real children rather than wooden puppets and, at the same time, interest her young readers in the study of natural history, mechanical contrivances, inventions, and scientific apparatus.

SCIENCE AS A SOURCE OF SALVATION AND MORAL BEHAVIOR

From nature to nature’s God: this was the dominant theme of the early science books for children. Nature study was closely allied to a child’s religious training and frequently formed a part of it, as indicated, for example, by the large number of Sunday School publications on scientific subjects. The objective of religious training was evident in most of the science books for children published during the first half of the nineteenth century, but by the 1880’s there was only occasional evidence of this objective. Throughout the century a humane attitude toward animals was stressed in children’s books.

14. JOHN BIGLAND, 1750–1832. *A Natural history of animals*. Philadelphia: J. Gregg, 1828. “The study of nature is the basis of religion,” declares the

author of this natural history especially written for children. Animals are classified according to visible resemblances in order to avoid burdening the memory with "artificial systems and scientific descriptions." Twelve engraved color plates are included.

15. HENRY ALTHANS, 1783-1855. *Scripture natural history; with reflections designed for the young*. New York: Lane & Tippett, 1848. (From the 3d London ed.) An illustrated Sunday School publication describing thirty-three animals mentioned in the Bible, together with a list of scriptural references and some pious reflections.

16. *The Youth's cabinet*. Boston: E. O. Libby, 185-. (Vol. III. *Insects*.) The Preface declares that "no creature on earth, however insignificant it may appear—even the meanest, ugliest insect—is beneath our notice or study. Had they been useless, God would never have created them." In spite of the religious motivation, this is a straightforward introduction to entomology, with detailed illustrations of the parts of insects.

17. HUGH CRAIG, ed. *Johnson's household book of nature, containing full and interesting descriptions of the animal kingdom, based upon the writings of the eminent naturalists Audubon, Wallace, Brehm, Wood, and others*. New York: Henry J. Johnson, 1880. A popularized natural history designed to appeal "to all who seek to be led from the contemplation of Nature to Nature's God." This was originally issued in thirty-two semimonthly parts, each part containing two chromolithographs and twenty-four pages of text.

18. WILLIAM A. ALCOTT, 1798-1859. *The House I live in. Part first. The Frame, for the use of families and schools*. Boston: Lilly, Wait, Colman & Holden, 1834. A physician, educator, and editor of juvenile magazines, Alcott firmly believed that "no branch of natural science is more apt to lead us to look through Nature up to Nature's God than physiology." In this simplified book on the subject, Alcott substituted descriptive terms from the building trades for scientific terms.

19. *The Invisible fluid; or, Our own atmosphere*. Boston: Massachusetts Sabbath School Society, 1847. One from a series of Sunday School publications in which Alexander and his mother discuss scientific subjects. Here the subject is the earth's atmosphere, "one of God's beautiful and simple contrivances for maintaining life and health on earth." If the atmosphere can remind one of God's love, Alexander's mother reminds him, atmospheric disturbances should also remind sinners of God's wrath.

20. *A Dark morning; or, Eclipses*. Boston: Massachusetts Sabbath School Society, 1849. The eclipse of October 9, 1847, prompts Alexander's mother to remark, "I never watch an eclipse without being reminded of John Bunyan's valley of the shadow of death," but such moralizing does not prevent her from teaching her son many facts about eclipses.

21. *The Brilliant wanderer; or, What is a comet*. New York: Lane & Scott, 1849. After describing famous comets, Alexander's mother reminds him that his

his home in heaven is fixed, sure and everlasting, not uncertain like that of wandering comets.

22. *Glimpses of the wonderful: a series of instructive sketches for the young.* Philadelphia: G. Collins, 1858. Many wonders of nature and technology are described and illustrated in this miscellany from magnified specimens of blood to the internal workings of a steam engine, but "one wonder is so great as to put others into shade: God."

23. *The House of the soul.* Philadelphia: American Sunday School Union, n.d. Eyes become windows, the tongue, "the organ of the soul," in this Sunday School publication. As an introduction to anatomy and physiology, it is long on moralizing and short on scientific information.

24. LUCY E. GUERNSEY, 1826-99. *Jenny and the insects.* Philadelphia: American Sunday School Union, 1857. Jenny's insect friends are more than willing to engage in a series of fact-filled and moralistic conversations. Several full-page, colored illustrations are included.

25. CATHERINE P. TRAILL, 1802-99. *Adventures of little Downey; or, The History of a field mouse.* London: Dean & Munday, 185-. This book from the pen of a prolific writer of children's stories includes a strong plea for a humane treatment of animals, however small they may be. Mrs. Traill based the story of Downey on childhood observations of a real field mouse.

26. JAMES GREENWOOD. *The Purgatory of Peter the cruel.* London: G. Routledge, 1868. Peter, a young man who delighted in torturing insects, loses consciousness in an accident and imagines himself to be transformed into the very insects he has tormented. After his imaginary life in the insect world, Peter reforms.

27. ANNA SEWELL, 1820-78. *Black Beauty, his groom and companions.* New York: F. Miller, 1892. First published in 1877 and called "the *Uncle Tom's Cabin* of the horse," this became the most popular of all the nineteenth-century books stressing humane treatment of animals.

28. ANNE VIRGINIA PATTERSON. *Dickey Downy, the autobiography of a bird.* Philadelphia: A. F. Rowland, 1899. A nature story protesting the use of birds and their feathers on ladies hats, told by a very articulate bobolink.

SCIENCE AS A SOURCE OF KNOWLEDGE ABOUT THE WORLD

Far from remaining only the handmaiden of religion in the nineteenth century, science was gradually challenging religion as the primary source of truth about the universe. Children's science books increased in numbers throughout the period, but since much of science was thought by educators and scientists alike to be beyond the compre-

hension of children, there was a tendency to stress breadth rather than depth of scientific information. In an effort to appeal to children's interests, writers used a variety of methods of presentation, some of which tended to destroy much of the scientific value of their books. Illustrations improved as crude woodcuts were replaced by wood engravings and lithographs. If the content and illustrations in children's science books were not always accurate, some of the books provided children with a key to accurate information through descriptions of the scientific methods of observation, classification, and experiment.

29. FRANCIS L. HAWKS, 1798–1866. *Natural history; or, Uncle Philip's conversations with children about tools and trades among inferior animals*. New York: Harper, 1835. "He knows but little of the mind of a child who is not aware of the facility with which a fact is impressed upon it," the author asserts. His book contains facts by the hundreds and good illustrations of insects and insect homes.

30. JULIA COLMAN. *The Boys' and girls' illustrated bird book*. New York: Carlton & Porter, 1857. Julia Colman's statement from the Preface, "This little book makes no pretensions to originality or to depth of scientific research," typifies a point of view held by many writers of early science books for children.

31. JANE TAYLOR. *Wouldn't know thyself; or, The Outline of human physiology designed for youth of both sexes*. New York: G. F. Coolidge, 1858. Most nineteenth-century physiology books for children were written to encourage habits of temperance. This one, in question-and-answer form, is typical.

32. JOHN A. PARIS, 1785–1856. *Philosophy in sport made science in earnest; being an attempt to illustrate the first principles of natural philosophy by the aid of popular toys and sports of youth*. Philadelphia: Lea and Blanchard, 1847. (From the 6th London ed.) An example of an attempt to capitalize on children's interests to teach principles of physics. The book is dedicated to Michael Faraday, and the Appendix containing scholarly notes on subjects in the text is addressed to "parents . . . and those advanced in science."

33. C. WILLIAMS. *Child's natural history of beasts*. Philadelphia: H. C. Peck & T. Bliss, 1856. A tiny book, measuring $2\frac{1}{2}$ by 3 inches, designed to capture a child's interest by its size and its subject.

34. MARY H. HOWLISTON. *Cat-tails, and other tales*. Chicago: Flanagan, 1895. The author claims that this collection of anthropomorphic science stories, in which magnets talk and the Fairy Mercury lives in a thermometer, would be useful in directing a child "to the more intelligent observation of the phenomena about him."

35. ELIZABETH CHAMPNEY, 1850–1922. *In the sky garden*. Boston: Lockwood,

Brooks, 1877. Dedicated to the famous American astronomer, Maria Mitchell, these fables of astronomy were "written in the hope of interesting the small people and leading them to a study of . . . more fascinating truths." In spite of the author's intentions, these fables seem more apt to confuse than help children interested in astronomy.

36. ARABELLA B. FISHER, 1840-1929. *The Fairy-land of science*. New York: D. Appleton, 1888. The world of science is filled with "wonder working fairies" in these ten lectures for children, first presented in 1878. Many simple experiments and demonstrations are included in the text.

37. CHARLOTTE M. TUCKER, 1821-93. *Fairy Frisket; or, Peeps at insect life*. London: T. Nelson, 1879. Fairy Frisket finds her long-lost brother, Know-A-Bit, and through the use of fairy pomatum, which gives one the power to inhabit the body of animals, she learns much about insect life.

38. *Great picture A,B,C gallery of animals*. Albany: Fisk & Little, 184-. Exotic animals abound in animal A,B,C's. Here the letter "O" is illustrated by an orang-outang instead of the more common ox, and the text confuses the habits of alligators with those of crocodiles. Illustrations are hand-colored.

39. MAYNE REID, 1818-83. *The Boy hunters; or, Adventures in search of a white buffalo*. Boston: Ticknor, Reed, and Fields, 1853. Exotic animals and exotic adventure: these were the ingredients in the boys' adventure stories which became popular in the second half of the nineteenth century. In writing this story, Reid notes that "neither plant nor tree, bird nor mammal, has been pressed into service beyond the limits of its geographic range."

40. J. D. WILLIAMSON. *A Peep at the museum: wherein are exhibited curiosities from the earth, the sea, and the air*. Philadelphia: G. Collins, 1858. No museum this, but an account of strange adventures of man and beasts: lions and tigers, crocodiles and boa constrictors, complete with "elegant engravings."

41. JAMES GREENWOOD. *Wild sports of the world: a boy's book of natural history and adventure*. London: S. O. Beeton, 1862. As the title suggests, this is a book in which natural history is as important as hunting adventures. Much information on the structure and habits of big game animals is included, plus maps showing the habitat of these animals.

42. MARY T. MANN, 1806-87. *The Flower people*. Boston: J. R. Osgood, 1875. In the second half of the nineteenth century, talking plants and animals were often used by authors to convey scientific information. In this book by the wife of Horace Mann, twelve flowers tell little Mary of their origins. The illustrations, some in color, are more decorative than useful.

43. GERTRUDE E. HALE. *Little flower people*. Boston: Ginn, 1889. "A water fairy enabled the author to know what her little field and woodland companions were saying and doing," and, as a result, she produced this anthropomorphic introduction to botany for children.

44. *Woodland cottage, or, Henry and Emma Acton's conversations to their*

children, on the animal and vegetable world. Salem: J. M. Ives, 1835. A typical example of the "conversation" as a method of presenting miscellaneous scientific information in children's books.

45. R. BARNARD. *Every youth's book; or, Interesting conversations on arts and sciences, for the use of schools and families.* New York: Collins Brothers and A. V. Blake, 1844. This book of conversations on the mechanic arts and science for "the older child who is just entering on the busy world" includes specially designed plates illustrating windmill gears, building scaffolding, steam engines, and other subjects explained in the text.

46. MARY A. SWIFT. *First lessons on natural philosophy for children.* Hartford: Belknap and Hammersley, 1847. A simplified introduction to physics in question-and-answer form. Mary Swift based her questions on simple machines, gravity, capillary action, suction, sound, color, and heat.

47. *The Youth's miscellaneous sketch book: a compilation of useful and amusing extracts from various authors.* Boston: C. L. Adams, 1829. A collection of miscellaneous information for school use including many definitions of scientific terms.

48. *The Wonders of home: in eleven stories.* London: Grant and Griffith, 1852. Object teaching, a mid-nineteenth-century reform in the teaching of science, utilized objects familiar to children as a basis for beginning scientific study. These stories about common household objects are illustrated with colored engravings showing the manufacture of several of the objects mentioned in the text.

49. JACOB ABBOTT, 1803-79. *Learning about common things; or, Familiar instructions for children in respect to the objects around them, that attract their attention, and awaken their curiosity, in the earliest years of life.* New York: Harper, 1857. Jacob Abbott, one of the most prolific nineteenth-century American writers for children, was best known for his Rollo Books and Franconia Stories, but he also wrote many textbooks. This object study book includes questions and answers on substances, seasons and the sky, the human body, animals, plants, art, and modes of transportation. Over 120 illustrations are included.

50. JANE ANDREWS, 1833-87. *The Stories Mother Nature told her children.* Boston: Ginn, 1894. A collection of stories on the growth of plants and animals and the formation of minerals by one of the most popular and most imitated of all the nature story writers.

51. SARAH H. STEVENSON, 1843-1909. *Boys and girls in biology; or, Simple studies of the lower forms of life, based upon the latest lectures of Prof. T. H. Huxley.* New York: D. Appleton, 1886. Straightforward talks to children on simple plants and non-vertebrate animals: fungi, green and flowering plants, the amoeba, hydra, lobster, and butterfly. The uniformly excellent scientific illustrations were drawn by one of Huxley's students.

52. ROBERT S. BALL, 1840-1913. *Star-land; being talks with young people*

about the wonders of the heavens. Boston: Ginn, 1892. Ball, the Royal Astronomer of Ireland and author of several scholarly books on astronomy, originally presented the six lectures reprinted in this book as part of a series of juvenile lectures at the Royal Institution of Great Britain. Well illustrated.

53. ANDREW LANG, 1844–1912. *The Animal story book*. New York: Longmans-Green, 1896. Andrew Lang, the compiler of the popular “color fairy books,” insists that the animal stories in this book “are all true, more or less.” He also apologizes for omitting “a chapter of a very earnest sort” on animal instinct and reason. Such levity would hardly have been tolerated in animal stories published a century earlier!

54. *Book of the atmosphere*. Boston: Lilly, Wait, 1833. Many of the “familiar explanations of some properties and phenomena of the atmosphere” offered to the readers of this little book were scientifically inaccurate even for the period in which the book was published. Some of the illustrations bear no relationship to the text, while others, a diagram of a water pump, an air pump, and a barometer, are described in the text.

55. *First steps to the natural history of birds*. London: Darton and Clark, 1841. Excellent pictures of birds illustrate a text which includes many anecdotes about birds but little scientific information.

56. EMILY TAYLOR, 1795–1872. *Conversations with the birds*. Salem: W. & S. B. Ives, 1850. A small boy learns many facts about birds through a series of conversations with them. The hand-colored, full-page illustrations are primarily decorative, but the smaller black-and-white drawings of parts of birds are well done.

57. *A Museum and panorama for instruction and amusement of our young friends*. Philadelphia: J. Weik, 185–. A picture book containing excellent double-page colored plates of dogs, primates, lions, tigers, birds, fish, and crustaceans.

58. *A Book about animals*. London: Religious Tract Society, 1852. A moralistic introduction to domestic, woodland, and biblical animals, with six plates by the famous color printer, Kronheim.

59. *The Illustrated book of natural history*. Philadelphia: H. B. Ashmead, 1859. Popular descriptions and full-page colored illustrations of eight animals are included in each of the four volumes of this folio-size natural history.

60. ABBY A. TENNEY. *Pictures and stories of animals, for little ones at home*. New York: Sheldon, 1868. (Vol. V. *Sea, land, and river shells*.) This book on shells from a six-volume set on natural history contains 124 detailed illustrations. The text, “prepared to interest and amuse,” does not match the illustrations in quality.

61. SELIM H. PEABODY, 1829–1903. *Cecil's book of beasts*. A scientifically accurate, well-illustrated introduction to the natural history of the squirrel, beaver, deer, bat, seal, bear, rhinoceros, kangaroo, antelope, and rat.

62. *The Youth's cabinet of nature, for the year; containing curious particulars characteristic of each month.* New York: S. Wood, 1814. An early-nineteenth-century book stressing observation as the first step in scientific study. Although printed in the United States, English references from the original edition are used throughout the text.

63. *The Young philosophers.* Boston: Bowles & Dearborn, 1827. Lucy and Edward's parents stress the importance of observation and description of scientific phenomena in this series of conversations with their children. As a result of his parents' efforts, young Edward is seized with the desire to become a scientist like Newton or Franklin so that "he might have the satisfaction of doing something that should be of lasting benefit to the world."

64. JAMES RENNIE, 1787–1867. *Alphabet of botany for the use of beginners.* New York: P. Hill, 1833. Systematic classification of plants is emphasized in this botany textbook for American schools, adapted from an English work. Following an introductory section on the parts of plants, different classes of plants are introduced and described according to the Linnaean system of classification. A glossary of botanical terms is also included.

65. SAMUEL G. GOODRICH, 1793–1860. *The Truth finder; or, The Story of inquisitive Jack,* New York: Sheldon, 1864. Samuel Goodrich, writing under his pseudonym, "Peter Parley," introduces his young readers to Jack, "who instead of asking a bushel of questions—was in the habit of observing things and investigating things." In case the example of Jack's observations of insects was not enough to inspire children to emulate him, Goodrich included two final chapters summarizing his views on the importance of self-education. Originally published in 1845.

66. JACOB ABBOTT, 1803–79. *Rollo's museum.* Philadelphia: Hogan & Thompson, 1845. Seven-year-old Rollo, more lively and less moralistic than Goodrich's Inquisitive Jack, collects nature specimens with the help of his friend, James, and then forms a society to organize a museum of curiosities.

67. JACOB ABBOTT, 1803–79. *Rollo's philosophy.* Boston: Phillips, Sampson, 1855. The main design of the four volumes of *Rollo's Philosophy*, Abbott asserts, "relates . . . to their effect upon the little reader's habits of thinking, reasoning, and observation than to the additions they make to his stock of knowledge." Rollo's father and the hired man, Jonas, prove to be great help to Rollo as he attempts to learn about air, water, fire, and sky in his own trial-and-error way.

68. WORTHINGTON HOOKER, 1806–67. *The Child's book of nature. For the use of families and schools. Intended to aid mothers and teachers in training children in the observation of nature.* New York: Harper, 1874. An author of several physiology texts, Hooker emphasizes plant and animal physiology in the first two sections of this work, but in the third section, "Air, Water, Heat, and Light," he includes some simple experiments children can repeat.

69. CHARLES A. FOSDICK, 1842–1915. *Frank, the young naturalist.* Cincinnati: R. W. Carroll, 1867. As "Harry Castlemon," Fosdick wrote several series of

adventure stories for boys. Frank Nelson, a sixteen-year-old "naturalist" whose study and museum are described in the first chapters of this book, is the hero of Fosdick's five-volume "Gun Boat Series."

70. WILLIAM CLARKE, 1800–1838. *The Boy's own book, a complete encyclopedia of all the diversions, athletic, scientific, and recreative, of boyhood and youth.* Boston: Munroe and Francis, 1845. (6th American ed.) An early example of a type of book which became popular in the second half of the nineteenth century. The chapter, "Optical Amusements," includes directions for making a camera obscura, and the chapter, "Chemical Amusements," includes a variety of simple chemical experiments.

71. JACOB ABBOTT, 1803–79. *Rollo's experiments.* Boston: Phillips, Sampson, 1855. Rollo, of *Rollo's Museum* and *Rollo's Philosophy*, learns more about science as he turns his attention to the ways a sundial and hourglass are used to measure time and to the action of a wedge and a magnet.

72. JACOB ABBOTT, 1803–79. *Science for the young; or, The Fundamental principles of modern philosophy explained and illustrated in narratives of travel and adventure by young persons in pursuit of knowledge.* New York: Harper, 1873. John and Lawrence replace Rollo in this science series for older readers. In writing these books on heat, water, light, and force, Abbott acknowledged a debt to European writers "both for the succinct expositions they have given of the results of modern investigations and discoveries, and also for the designs and engravings with which they have illustrated them."

73. THOMAS COOPER, 1805–92. *The Triumphs of perseverance and enterprise: recorded as examples for the young.* London: Darton, 1860. Chapter five of this collective biography, "written to inspire the youthful reader with a glow of emulation," includes biographies of the "scientific discoveries and mechanicians," Humphry Davy, Richard Awkright, Edmund Cartwright, James Watt, Isaac Newton, William Herschel, and Robert Boyle.

74. SAMUEL G. GOODRICH, 1793–1860. *The Life of Benjamin Franklin. Illustrated by tales, sketches, and anecdotes. Adapted to the use of schools.* New York: Collins & Hannay, 1832. A life of Franklin by the author of the Peter Parley books. Chapter eleven contains an account of Franklin's experiments with electricity, but the major emphasis of this biography is on Franklin, the statesman, not Franklin, the scientist.

75. HENRY MAYHEW, 1812–87. *The Wonders of science; or, Young Humphry Davy, the Cornish apothecary's boy, who taught himself natural philosophy, and eventually became president of the Royal Society. The life of a wonderful boy, written for boys.* New York: Harper, 1863. A biography of the famous English scientist dedicated to his assistant and successor at the Royal Institution, Michael Faraday. Illustrations and diagrams of scientific apparatus Davy used in his experiments are included.

76. MRS. HORACE ST. JOHN. *Boys' life of Audubon, the naturalist of the New World.* New York: Leavitt & Allen, 1871. A romanticized biography of Audubon, "the genius of the woods." Unfortunately, no reproductions of Audubon's prints are included among the illustrations.

Typical of the nineteenth century was a strong belief in the progressive nature of science and accompanying technological developments. Also typical was a sense of awe at the wonders of the new technology. Considering the important application of these developments in industry, agriculture, and transportation, it seems curious to find relatively few children's books illustrating such developments. Perhaps the most obvious evidence of the new technology in children's books is in their format and numbers. Improvements in papermaking, printing, and reproduction of illustrations resulted in a tremendous increase in the number of children's books which could be printed at low cost.

77. WILLIAM MARTIN, 1801-67. *The Parlour book; or, Familiar conversations, on science and the arts. For the use of schools and families.* London: Darton, 1835. William Martin, an English writer who sometimes used Samuel Goodrich's pseudonym "Peter Parley," included descriptions and illustrations of many wonders of technology in this miscellany of facts for young readers.

78. *The World and its wonders; or, A Peep into the works of nature and art.* Philadelphia: J. & J. L. Gihon, 1845. Diagrams of a locomotive and steamboat engine are included in this American publication similar in content to Martin's *Parlour book*.

79. CLARA L. MATEAUX. *The Wonderland of work.* New York: Cassell, 1881. An entire book on industrial technology for young readers. Manufacturing processes for gas, matches, iron and steel, pins, silverware, tools, lumber, furniture, clocks, china, glass, and toys are described and illustrated with many wood engravings.

80. ISAAC TAYLOR, 1759-1829. *The Mine; or, Sketches of the mines of different countries, the modes of working them, and their various productions. Adapted to the reading of American youth.* Philadelphia: Desilver, Thomas, 1837. The eighteenth- and early-nineteenth-century advances in technology are evident in this book on mining, which includes illustrations of the use of steam engines to pump water from mines, railway cars to carry ore, and blast furnaces to reduce the ores.

81. CLARK WILLIAMS. *The Adventures of a cotton tree.* London: Sunday School Union Depository, 1840. The story of the manufacture of cotton from plant to finished cloth. Inventions such as Arkwright's water frame, Hargreave's spinning jenny, and Crompton's mule jenny are explained in the text.

82. JACOB ABBOTT, 1803-79. *The Harper establishment; or, How the story books are made.* New York: Harper, 1855. "I have taken great pains to make all the statements contained in the work in respect to all the structures, machines,

and processes described strictly exact," Abbott states in his introduction to this profusely illustrated book on the printing and manufacture of books at Harper and Brothers publishing firm.

83. ELISHA NOYCE. *The Boy's book of industrial information*. London: Ward and Lock, 1863. Illustrated with 375 wood engravings by the famous Dalziel brothers, this book describes the materials, processes, and machinery used in industry and agriculture.

84. *Little ladders to learning about how things are made, geography and costumes, science and art, city scenes, rural scenes, country employments*. London: G. Routledge, 1869. Almost all the sections of this miscellany include illustrations of raw materials, industrial processes, and manufactured products.

85. JEFFREY TAYLOR, 1792–1853. *The Farm; or, A New and entertaining account of rural scenes and pursuits, with the toils, pleasures, and productions of farming. For young readers in town and country*. Philadelphia: Grambo, 1854. Only the most primitive farm machinery is described and illustrated in this mid-nineteenth-century book on agricultural processes.

86. JULES VERNE, 1828–1905. *From the earth to the moon, direct in ninety-seven hours and twenty minutes: and a trip around it*. New York: Scribner, Armstrong, 1874. A fantastic piece of science-fiction when first published in 1865, this account of an imaginary trip to the moon in a projectile fired by an immense cannon includes incidents remarkably similar to twentieth-century attempts to achieve the same goal: the use of space dogs, projection of a space capsule into orbit, and recovery of the capsule at sea.

87. JULES VERNE, 1828–1905. *A Floating city, and, The Blockade runners*. New York: Scribner, Armstrong, 1875. The first story in this volume, *A Floating City*, is an account of a fictional voyage from Liverpool to New York City in 1867 on the famous steamship, *The Great Eastern*.

88. *The Railroad alphabet*. London: G. Routledge, 1889. A picture alphabet illustrating nineteenth-century railroad equipment.

SCIENCE AS A SOURCE OF CONFLICT

Although the work of Copernicus, Galileo, and Newton had challenged the earlier belief in the earth as the center of the universe, many of the children's books of the nineteenth century depicted man as a unique object of Creation and implied that the works of Creation were designed either for the utility of man or to inspire a feeling of belief in "the Great Architect of Creation." When evidence of fossil remains and the theories of evolution provided further challenges to accepted religious belief in the order and meaning of Creation, little

reflection of the gulf between science and religion was to be found in children's books.

89. *What is a star?* New York: American Tract Society, n.d. Many of John and William Herschel's astronomical discoveries are explained to young Alexander by his mother in this typical Sunday School publication. Such discoveries present few difficulties to Alexander, who does not see man dethroned from the center of the universe but exclaims instead, "How wonderful, mama, that God should give us the Bible, and even condescend to send his Son to save us from hell, if ours is such a tiny world compared to others."

90. JAMES RENNIE, 1787-1867. *Insect manufactures*. London: Society for Promoting Christian Knowledge, 1847. Insects as man's benefactors is the theme of this well-illustrated Sunday School publication by a professor of zoölogy at Kings College, London. It includes descriptions of the "manufacture" of silk by caterpillars, wax and honey by bees, dyes by the cochineal insect, and lacquer by the insect *Coccus lacca*.

91. *Tiny workers; or, Man's little rivals in the animal world. A book for the young*. London and New York: T. Nelson, 1879. More on animal benefactors of man together with a sense of wonder at the marvel of animal instinct. This uses, in part, the dialogue form of presentation typical of early-nineteenth-century books for children but largely obsolete by the latter part of the nineteenth century.

92. *Sand and rock*. Boston: Massachusetts Sabbath School Society, 1849. Peter, a boy of six, is scolded for attempting, on the Sabbath, to discover by scientific investigation whether his house was built on sand or rock. After describing methods of building actual foundations, Peter's mother uses these facts of engineering to provide an analogy between faith built on a firm foundation and faith resting only on shifting sand.

93. HARRIETTE N. BAKER, 1815-93. *Georgey's menagerie*. Boston: Graves and Young, 1864. (Vol. V. *The bear*.) A wise uncle tells young Georgey about bears in this book, one of six from a series describing the lion, elephant, camel, wolf, bear, and deer. The book's dedication page shows a religious motivation: "These small volumes of the natural history of animals whose structure and talents so clearly evidence the being, wisdom, and power of God are dedicated to Francis Davis Baker by his loving mother in the earnest hope that they may lead the tender mind through nature to nature's God."

94. CHARLES KINGSLEY, 1819-75. *Madame How and Lady Why; or, First lessons in earth lore for children*. London: Bell and Daldy, 1870. An introduction to geology by the famous clergyman-author of *The Water Babies* who attempted in his writing on popular science to reconcile the discoveries of fossil remains with the biblical description of Creation in Genesis. Kingsley makes use of two fairies whom he calls Madame How and Lady Why to encourage children to look for the causes of geological change by observing mud puddles and streams, insisting that "the reading of God's book which is

science can do you nothing but good, and teach you nothing but truth and wisdom."

95. CHARLES ROBERT DARWIN, 1809–82. *What Mr. Darwin saw in his voyage round the world in the ship "Beagle."* New York: Harper, 1897. "The most momentous voyage round the world since Columbus": so concludes the anonymous editor of this selection and rearrangement of entries from Darwin's journal of his voyage on the "Beagle" (1831–36). The editor was perhaps correct. Certainly Darwin's *The Origin of Species* (1859), based in part on his observation of plants and animals as official naturalist on the "Beagle," was the most important scientific book published in the nineteenth century. A map of the route of the "Beagle" and some illustrations from the original journal of the voyage are included.

96. LOUIS GAUSSEN, 1790–1863. *The World's birthday: a book for the young.* London and New York: T. Nelson, 1860. These sermons for children by a French biblical scholar were written three years before the publication of *The Origin of Species*, but the English edition did not appear until one year after the publication of Darwin's famous work. A commentary on Genesis, it represents a serious attempt to justify the biblical account of Creation, especially the idea of special creation of species.

97. JACOB ABBOTT, 1803–79. *American history.* New York: Sheldon and Company, 1860–65. (Vol. I. *Aboriginal America.*) In this, the first volume of a multi-volume work, Abbott includes a detailed explanation of prevailing theories concerning the meaning of fossil remains and the origin of unique species of plant and animal life in the Americas. He reassures his young readers that evolutionary theories do "not limit or control the powers of God at all."

98. EDWARD CLODD, 1840–1930. *The Childhood of the world; a simple account of man in early times.* Boston: Shepard and Gill, 1874. An indebtedness to science is acknowledged in this adaptation of evolutionary theory to the history of civilization: "Thanks to the patient and careful researches of men of science, the way is rapidly becoming clearer for tracing the steps by which, at ever varying rates of progress, different races have advanced to civilization, and for thus giving completeness to the history of mankind which the assumptions of an arbitrary chronology would render impossible."

99. STANLEY WATERLOO, 1846–1913. *The Story of Ab; a tale of the time of the cave men.* Chicago: Way and Williams, 1897. Based on the findings of the newer scientific disciplines, paleontology and anthropology, the author of this fictional tale concludes that "man has been, from the beginning, under the never resting, never hastening, forces of evolution."

100. ERNEST THOMPSON SETON, 1860–1946. *Wild animals I have known.* New York: Scribners, 1898. The most popular of the many nature books by the famous Canadian author-naturalist. The idea, stated in the Preface, that man and animals were kin, was, by the close of the nineteenth century, more than just a sentimental idea.

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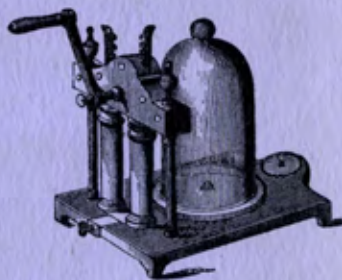
HUMPHRY AND HIS "WONDERFUL LAMP."



CHEMIST.



Caput & Manus.



AIR-PUMP.



MICROSCOPE.

