The Tercentenary of the Royal Society

The oldest learned society, through meetings, grants, and publications, encourages scientific inquiry.

D. C. Martin

"I know not whether any of your learned body have attain'd the ancient boasted Art of *multiplying* Gold; but you have certainly found the Art of making it infinitely *more valuable*.

"You may easily bestow your Favours on Persons of more Merit: but on none who can have a higher Sense of the Honour, or a more perfect Respect for your Society and Esteem of its excellent Institution."

Thus wrote Benjamin Franklin from Philadelphia on 29 May 1754 to the president and council of the Royal Society, who had just awarded him the Copley medal, the society's highest medal award. Three years later Franklin was, "on Account of his Curious Experiments and Observations on Electricity," elected a fellow of the society. He later served as a member of the council and took an active part in the work of some of the society's committees.

The Royal Society was already nearly 100 years old when this tribute from so versatile a genius was made. That the American Philosophical Society's objects were so close to those of the Royal Society shows clearly how well acquainted Franklin was with the work of the London Society. The first contacts with the North American continent, however, go back to the very beginnings of the society, for numbered among the original fellows was John Winthrop, governor of Connecticut (1660–1676), who was well acquainted with Robert Boyle, John Wilkins, and Henry Oldenburg and other founder fellows of the Royal Society; after 1660 he corresponded with the new society, sending specimens for its collections. In 1741 Cromwell Mortimer, secretary of the society, in a dedication of the 40th volume of the *Philosophical Transactions* to John Winthrop, fellow of the Royal Society, a grandson of the governor, wrote that, but for the ending of the civil war, Boyle and others "out of esteem for the most excellent and valuable Governor, John Winthrop the younger, would have retired to this new born colony and there established that Society for promoting Natural Knowledge which these gentlemen had formed, as it were, in embryo among themselves, but which afterwards receiving the Protection of King Charles II obtained the style Royal, and hath since done so much honour to the British Nations as to be imitated by the several European Princes who desired to be esteemed the Patrons of Learning."

The Foundation

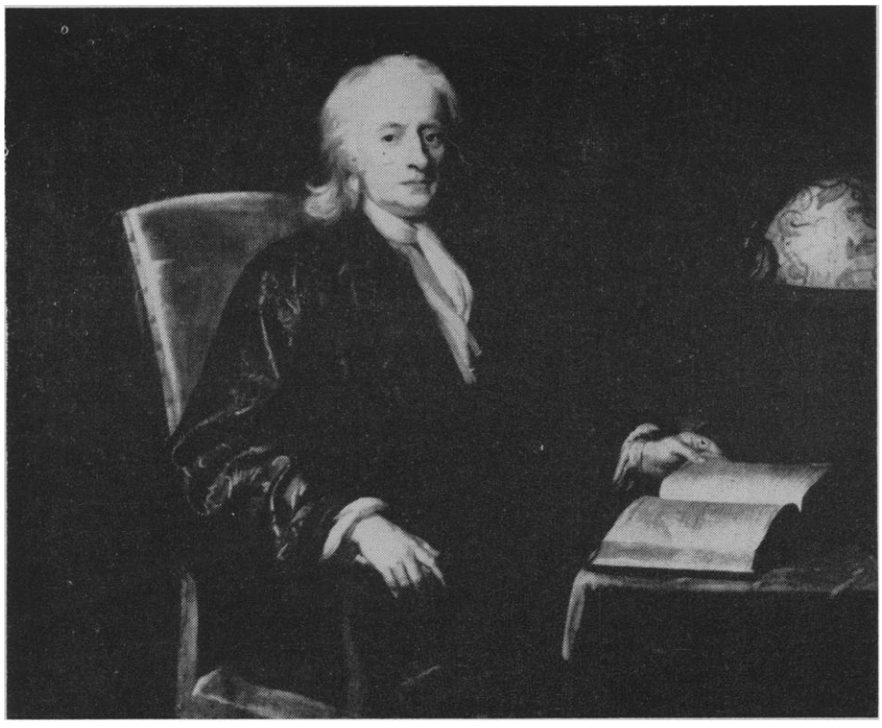
The decision to found "a Colledge for the promoting of Physico-Mathematicall Experimental learning" was taken on 28 November 1660 by a group of natural philosophers meeting in Gresham College in the City of London, after a lecture given by Christopher Wren. The idea had been in the air for some time, but it is this formal step, which is the true beginning of the corporation now known as the Royal Society of London for the Improvement of Natural Knowledge, that is being commemorated this year in London. Within a week "Sir Robert Moray brought in word from the Court that the King had been acquainted with the designe of this Meeting. And he did well approve of it and would be ready to give encouragement to it." The royal charter incorporating the society was granted on 15 July 1662.

The society still has several direct links with those early days, including the journal book recording the meetings begun in November 1660 and also two magnificent gifts from the King, a mace and the Charter or Signature Book in which King Charles II inscribed his name, followed by the word *founder*. Queen Elizabeth II is the 13th monarch to continue the tradition of royal patronage, and she has graciously consented to open the tercentenary celebrations this year. At the opening ceremony she will be accompanied by H. R. H. Prince Philip. King Gustav VI of Sweden, who was elected a fellow in 1959, will also be present and will be invited to inscribe his name in the Signature Book and to be admitted formally to the society by the president, who will use the three-century-old formula, "I do, by the authority and in the name of the Royal Society of London for Improving Natural Knowledge, admit you a Fellow thereof." These self-same words of formal admission have been used to admit all those fellows whose names are written in this great book. Here we find not only Isaac Newton, Robert Hooke, Robert Boyle, Edmund Halley, Joseph Banks, James Cook, Charles Darwin, and Michael Faraday but also Huygens, Franklin, Mendeleev, Planck, and numerous other distinguished scientists from all over the world.

The First Century

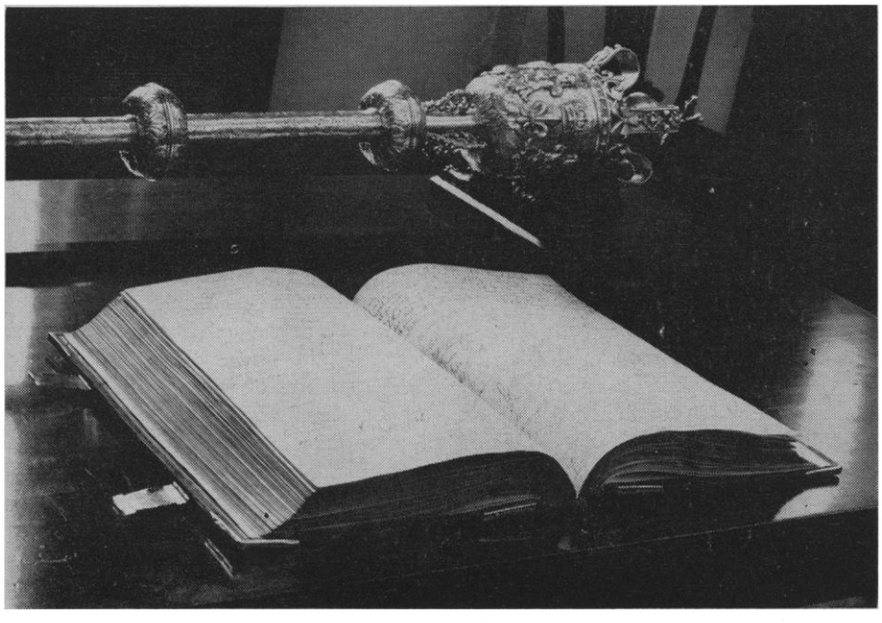
The mid-17th century founders of the Royal Society were men of outstanding merit and foresight, enthusiastically dedicated to the new philosophy of experiment. They believed that the study of nature could only be successfully prosecuted and advanced by means of experimental research and so gave it the highest place as *Domina omnium scientarium*. Within 100 years, fellows had achieved much. Boyle's discoveries had yielded fundamental laws; his assistant Robert Hooke, who had been the first of the society's curators of experiments for the weekly meetings, had, among many acts of experimental genius, constructed his compound microscope and made many new discoveries with it which he described in *Micrographia*, issued in 1665 under the imprimatur of the society. In 1671 Isaac Newton had presented the society with his reflecting telescope, still one of its treasured possessions, and in addi-

The author is assistant secretary of the Royal Society, London.



Portrait of Sir Isaac Newton.

tion he had been persuaded to publish his fundamental work on the nature of light and the gravitational theory of planetary motion. The society had published in 1687 Newton's great book, the *Principia*, described by Laplace as "pre-eminent above any other production of human genius." From 1703 to 1727 Newton had been president and had added even greater luster and renown to the society. Hans Sloane, a great natural historian who had made valuable collections that were later to become the basis for the British Museum collections, had succeeded Newton in the presidential office. Huygens, Malpighi, Leibnitz, and Leeuwenhoek had all been elected fellows and had made outstanding contributions toward the creation of the new scientific age. Henry Oldenburg had begun, in 1675, production of the *Philosophical Transactions*, using the medium of the press to communicate the new knowledge, and so established the world's senior scientific journal. Edmund Halley had made great contributions to astronomy and had undertaken voyages to make the first magnetic chart of the oceans. This, then, was the institution which had earned the "perfect respect" of Benjamin Franklin.



Two of the Royal Society's greatest treasures—the silver gilt mace presented by Charles II in 1663 and the Charter Book, prepared soon after the incorporation of the society in 1662. The Charter Book contains signatures of most of the society's fellows, from the beginning to the present day. The mace, symbol of authority, is still placed in front of the president at every meeting of the council or of the society.

Scientific Expeditions

Shortly after Franklin's election the society, following Halley's example, sponsored a number of scientific expeditions, notably those of Captain James Cook. Cook began his last voyage in July 1776 in the *Resolution* and the *Endeavour*, to explore the islands and coasts of the Pacific. He was at sea when the War of Independence began, and Franklin, then American envoy in Paris, issued an instruction to all American captains and commanders of ships to spare and aid "that most celebrated Navigator and Discoverer, Captain Cook," describing his mission as "an Undertaking truly laudable in itself, as the Increase of Geographical Knowledge facilitates the communication between distant Nations, in the Exchange of useful Products and Manufactures, and the Extension of Arts whereby the common Enjoyments of human life are multiply'd and Science of other kinds increased to the benefit of Mankind in general."

Beside me as I sit in my room at the Royal Society there is an interesting link with Captain Cook in the form of a clock made by John Shelton to the order of the society in 1760. It is ticking out the last hours of its second century and keeps perfect time. Shelton's clock was sent to St. Helena in 1761 to measure, by the period of oscillation of a pendulum of fixed length, the force of gravity at St. Helena for comparison with measurements made in Greenwich. On its return journey it was used for gravity measurements at Cape Town. In 1763 John Harrison's marine chronometer was tested by it, and in 1766 it was used in North America by Charles Mason and Jeremiah Dixon in demarcating the line between Pennsylvania and Maryland which bears their names. The clock was recalled by the society to

be sent with Captain Cook in H. M. S. *Endeavour,* to be used in observations of the transit of Venus in June 1769 from King George's Island (now better known as Otahete) in the Pacific Ocean. Later this clock was used by Nevil Maskelyne on the Scottish mountain Schiehallion in his observations of the deflection of a plumb line caused by the attraction of mountains, and in 1819 it was taken to the Arctic by Edward Sabine, who was the astronomer in Parry's expedition.

From 1778 to the Present

Joseph Banks, who was aboard the *Endeavour* with Cook, later became president and held this office from 1778 to 1820. In addition to making contributions of his own in botany he did a great deal to encourage advances in astronomy, meteorology, and geodesy. During his presidency Henry Cavendish and James Watt made discoveries about the composition of water, Herschel discovered Uranus, and Volta sent the society accounts of his discoveries in the field of electricity. The brilliant Humphry Davy steered the society's affairs from 1820 to 1827.

The listing of a few names will show that the great tradition established in the first half of the society's existence has been maintained and even enhanced. Michael Faraday, John Dalton, Clerk Maxwell, Lord Kelvin, J. J. Thomson, Lord Rayleigh, Lord Rutherford, and William Bragg are among those who have made great contributions in the physical sciences. Charles Lyell, Joseph Hooker, Charles Darwin, Thomas Henry Huxley, Lord Lister, Charles Sherrington, and Alexander Fleming are among those whose contributions in biology have not only brought material benefits to mankind but have also altered his philosophy of life.

The Fellowship Today

In the mid-19th century the society took steps to revise its election procedure so that only those with significant scientific attainments in original work became fellows. From this time onward scientists predominated in the fellowship, and the society began to assume the character it has today. Since this is a purely private and nongovernmental body, the fellows themselves determine who shall join them. The annual election of 25 fellows and four foreign members is quite the most important of the annual activities. About 300 candidates, all British subjects or citizens of Eire and each proposed by at least six fellows, are first carefully considered by one or more of the eight sectional committees, dealing, respectively, with mathematics, physics, chemistry, engineering sciences, geology, botany, zoology, or physiological and other medical sciences. Each committee makes nominations, and thereafter the council, with the help of elaborate machinery for appraising the qualifications of those with borderline or general claims, selects 25 names for the fellowship. These selected names are then submitted to the fellowship, which makes the election. Foreign members, at the rate of four each year, are similarly selected by the council and voted into the society by the fellows. On 1 April 1960 there were 614 fellows; most of these reside in the United Kingdom, but there are 24 in Canada and 19 in the United States. Of the foreign membership of 63 on 1 April 1960, 21 members reside in the United States, 11 in Sweden, seven in France, seven in Germany, five in Switzerland, and less than five each in Denmark, the U.S.S.R., the Argentine, Austria, and Belgium. Of 51 Nobel laureates in the society, 23 are fellows and 28 are foreign members. Special statutes, used sparingly, make possible the election of royal persons and individuals who have rendered conspicuous service to the cause of science or whose reputation in other fields is such that their election would be of signal benefit to the society. Thus, King Gustav VI of Sweden, the Duke of Edinburgh, and Sir Winston Churchill are fellows. In all, the fellowship constitutes an influential body dedicated to the cause of science.

A facsimile of Newton's original reflecting telescope. [Science Museum, London]

Publications and Meetings

As a learned society, the Royal Society is concerned, first, with encouraging the search for new knowledge. This it does principally through its publications and meetings. Last year it published nearly 300 papers in its *Philosophical Transactions* and *Proceedings*, each issued in two series, *A* and *B*, the former relating to the physical sciences and the latter to the "B" or biological sciences. At the weekly meetings original work is presented and discussed, sometimes in the form of new papers, sometimes as lectures on special topics of current concern to the society. In recent months space research, IGY results, stellar evolution, and the biology of the South Temperate Zone have been among the discussion-meeting topics. On these occasions world leaders in the subject under discussion are invited to London to participate.

In addition to the journals reporting original work, the society issues annually the *Biographical Memoirs of Fellows of the Royal Society*, consisting of authoritative statements on the life and work of recently deceased fellows and constituting a highly valuable source of historical scientific information. Each year, also, the society publishes a *Year Book* and usually two issues of *Notes and Records of the Royal Society*. The latter publication consists of records of current events and interesting historical notes about the society's past. For the tercentenary celebrations two books are being specially prepared—*The Royal Society, Its Founders and Origins*, edited by Sir Harold Hartley, and *A Brief History of the Royal Society*, by Professor E. N. da C. Andrade. Both are interesting and valuable modern evaluations of their subjects. Happily, too, the society is able in this tercentenary year to publish the first three volumes of *The Correspondence of Isaac Newton* as a tribute to its greatest fellow.

The society maintains a library of some 150,000 volumes, specializing in collections of the periodical publications of sister national academies and works on the history of science and mathematics. Adorning the walls of the society's rooms in Burlington House is a fine collection of portraits of scientists, many of them by famous artists.

Some Current Activities and Public Duties

The council of the society, the membership of which is carefully regulated to maintain an appropriate balance of scientific interests, is thoroughly representative of the fellowship of Britain's most authoritative scientific body. It is assisted in its work by more than 100 committees or subcommittees, covering a very wide range of scientific activities. Some are concerned with research appointments made possible by benefactions from donors anxious to further scientific advance; some, with scientific

The library of the Royal Society at Burlington House.

expeditions; and a new one, with support for school teachers who wish to do research.

The esteem in which the society is held has resulted in its being asked to undertake many duties, some of them by the government. Thus, the society administers parliamentary grants-in-aid for scientific investigations, publications, and international relations; it is responsible for the scientific program of the National Physical Laboratory; and it is a custodian of the standard yard and standard pound. Over 100 of its fellows serve, in the society's name, on other bodies, including the governing bodies of universities, schools, and research organizations of all kinds and many government committees. The president is consulted on practically all senior scientific appointments in the government service, including, by act of Parliament, all new members of the senior research councils for agriculture and medicine and the Department of Scientific and Industrial Research.

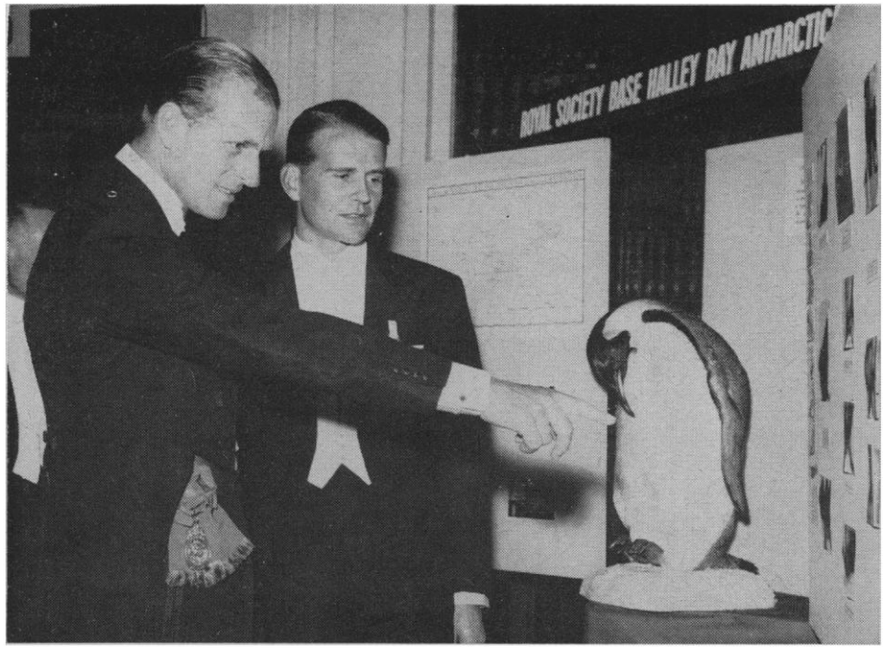
The author at his desk in Burlington House, London, headquarters of the Royal Society. Shelton's clock stands behind him at the right.

International Relations

From its beginning the society has had the most friendly relations with scientists in foreign countries, and this relationship continues, not only directly with sister academies and societies overseas but also through the International Council of Scientific Unions (ICSU) and its scientific unions, to which the Royal Society adheres on behalf of Great Britain. In the work of the special committees of ICSU for the International Geophysical Year, antarctic research, space research, and oceanic research, British national committees of the Royal Society all play an active role. Professor Sydney Chapman, the international president for the IGY, was the first chairman of the British National Committee which coordinated the British IGY program. As part of the British program the Royal Society's IGY Antarctic Geophysical Station on the coast of the Weddell Sea was set up, on the shore of Halley Bay, named after Edmund Halley who was so prominent a pioneer in geophysics.

The first meeting of ICSU's committee on space research was held at Royal Society headquarters, and the society's National Committee is giving scientific leadership in Britain's space program. Part of this program is being actively developed in cooperation with U.S. space scientists and involves instrumentation to be flown in a satellite due to

Burlington House, London, from the courtyard. The Royal Society has occupied these quarters since 1873.



The Duke of Edinburgh and Surgeon-Commander D. G. Dalgleish at the Royal Society's International Geophysical Year exhibition.

be launched by a Scout rocket in the United States next year.

The society has played a leading part in the history of ICSU and of its predecessors. It was in 1899 that, along with a group of German academies and the French, Russian, and United States academies, the Royal Society proposed establishment of an International Association of Academies. World War I interrupted the work of this association, but in 1918 the Royal Society took steps to revive it. Shortly after the armistice, the International Research Council was formed in Paris, and Sir Arthur Schuster, foreign secretary of the Royal Society, became its first secretary. In 1931 British representatives proposed certain constitutional changes which resulted in a change of name to the International Council of Scientific Unions. From 1918 until 1958, when the ICSU general assembly met in Washington, successive secretaries of these bodies have been fellows of the Royal Society. In 1958 Sir Rudolph Peters succeeded Lloyd Berkner as president of ICSU. The Royal Society looks forward to welcoming ICSU's general assembly to London again next year, in September 1961.

Relations with North America have always been close. Since Winthrop's admission to the fellowship on 1 January 1662, the roll of fellows has included many from America. Among the earliest were William Penn, founder of Pennsylvania; William Byrd; William Burnet, governor of New York and New Jersey (1720-1728) and of Massachusetts (1728-1729); Cotton Mather; and Elihu Yale, after whom Yale College was named. Benjamin Thompson, Count Rumford, was elected in 1779. Among his subsequent benefactions to the Royal Society was establishment of the Rumford Fund, to provide recognition for research on heat and light. He made a similar gift to the American Academy of Arts and Sciences; the Royal Society's award was to be made for work published in Europe; the academy's, for work published in any part of the American continent.

In June 1937 when Professor L. J. Henderson of Harvard, foreign secretary of the National Academy of Sciences in Washington, was attending a meeting of the Royal Society Dining Club (frequently attended by Benjamin Franklin in his time), he suggested that an annual scientific lecture should be delivered alternately in London and in Washington, by an American scientist invited by the Royal Society and a British scientist invited by the National Academy. The Pilgrim Trust generously promised to provide an annual honorarium for six years. The first Pilgrim Trust lecture was delivered in London by Irving Langmuir in 1938; the second, by Sir William Bragg in Washington in April 1939.

In the dark days of World War II, in March 1941, the president of the Royal Society, Sir Henry Dale, was greatly moved by the sentiment which prompted the American Philosophical Society to send a gift of $10,000 to the Royal Society for the aid of science and learning in Britain. In his message sent with the gift, Edwin G. Conklin wrote, "We make this gift in filial regard for the Royal Society which was the model upon which Benjamin Franklin in 1743 founded 'The American Philosophical Society for Promoting Useful Knowledge in the British Plantations in America' and as evidence of the spirit of friendship and common purpose among men of science in both countries."

Friendly cooperation between the Royal Society and scientific institutions in the United States is nowadays a commonplace. Every month many fellows are in the United States, and the two scientific communities are in constant intimate touch. We are especially pleased that so many American scientists are among those due to participate in our tercentenary celebrations this summer. Friendly encouragement such as this, from so many parts of the world, will stimulate the Royal Society of London to go forward into its fourth century seeking, as ever, to advance "Natural Knowledge" through the methods of scientific experiment.