The new buildings were estimated to cost £180,000. The hospital was therefore appealing for a sum of £120,000. The grant by the Rockefeller Trustees, he added, was a great tribute to the hospital and a noble gesture of international good will. If the appeal were successful the hospital would be enabled to build modern laboratories, lecture and teaching rooms, operation theaters with x-ray room attached and surgical and medical wards for special cases under research observation. It was also desired to provide private nursing rooms for pay-patients of moderate means and a new nurses' home.

DISCUSSION

AMERICANS AND THE ROYAL ASTRONOMICAL SOCIETY

THE development of American astronomy has an international side, and therefore, the biography and the history of science can profit by the study of its relation with organized astronomy abroad. In this connection, the publications, minutes of meetings and the files of the Royal Astronomical Society, London, founded in 1820, are not without interest.

In the list of associates of the society, an honor given to foreign astronomers, Nathaniel Bowditch is the first American, elected in 1829. The proposers were weak in details:

Astronomical Society of London

We, the undersigned, having a personal knowledge of and being acquainted with the works of Professor [Nathaniel—filled in with pencil] Bowditch of Boston in Connecticut, U. S. Author of a treatise on Navigation and translator of the Mécanique Céleste into English which he is now publishing with notes believe him to be a person eminent in the [field?] of Astronomy, and therefore propose and recommend him as a proper person to become an associate of the Astronomical Society of London.

Witness our hand this 13th day of February 1829.

W. H. Shirreff
J. F. W. Hershel
J. South.

Proposed March 13, 1829.
Elected May 8, 1829.

Ferdinand Hassler was elected the following year, having been proposed by J. L. Tiarks, Edw. Troughton, Richard Sheepshanks, F. Beaufort, Francis Bailey, Davies Gilbert and J. South. He had attracted their attention by his work on the Coast Survey, his publications on trigonometry and a "popular system" of astronomy.[1]

But the council reported with regret to the society on February 14, 1834, that no steps have been taken in America to encourage the science of astronomy, and that the hope expressed by the president, Francis Bailey, in 1825 had been disappointed. There should be a public observatory.[2] By 1847 the council had reported that the apathy no longer prevailed.[3] They were especially delighted with the equatorial telescope, with a 12-inch aperture, that Cincinnati had acquired. They followed closely the work at the Naval Observatory and Harvard. At a meeting on December 14, 1849, the president and astronomer royal gave an oral statement "On the Method of observing and recording Transits, lately introduced in America. . . ."[4] He said:

The Americans of the United States, although late in the field of astronomical enterprise, have now taken up that science with their characteristic energy, and have already shown their ability to instruct their former masters.

As R. A. Sampson writes, it is the decade 1840 to 1850 when American observatories and workers come definitely into the society's field of view.[5] W. C. Bond was made an associate in 1849, and soon was joined by his compatriots: B. Peirce, A. D. Bache, O. M. Mitchel, S. C. Walker, Maury and Brunnow.[6] In the early years, and up to 1856, an associate was recommended for election not only in recognition of his past achievements, but also in the hope of his future service. He was to cooperate with the society, and thus, official positions counted for much.

In 1858, 7 out of 52 associates were American; in 1901, 14 out of 43; in 1934, 20 out of a list of 45. From the origin of the society I count 59 American associates. The interchange of ideas, of course, is also forwarded by Americans on the List of Fellows.

The list of the Americans to receive the high honor of the society's gold medal is given below. Professor G. P. Bond was the first to receive it. Bond had visited Europe in 1851 and 1863, and had become known to the council by his "Annals of the Astronomical Observatory of Harvard College," volume III. Special mention was made to his application of photography to astronomical observations.[7]

G. P. Bond	—1865
Simon Newcomb	—1874
Asaph Hall	—1879
B. A. Gould	—1883

[1] Mss. certificate.

[2] *Monthly Notices of the Royal Astronomical Society*, v. 3, p. 30; *Memoirs of the R.A.S.*, v. 2, p. 25.

[3] *Monthly Notices*, v. 7, 225–226.

[4] *Monthly Notices*, v. 10, p. 26.

[5] "History of the R.A.S.," London, 1923, by various writers. The statement, p. 105, that Bond is the first American Associate is not correct.

[6] The obituary notices throughout the *Monthly Notices* are revealing. See especially that of W. C. Bond, v. 20, p. 118.

[7] *Monthly Notices*, v. 25, pp. 125–137. The course of astronomy in the U. S. as it appeared to the British can be followed in presentation addresses and elsewhere in the *Monthly Notices*. Three general indexes are useful.

Henry Draper	—1884
E. C. Pickering	—1886, 1901
S. C. Chandler	—1896
E. E. Barnard	—1897
G. E. Hale	—1904
W. W. Campbell	1906
W. S. Adams	—1917
H. N. Russell	—1921
A. A. Michelson	—1923
F. Schlesinger	—1927
R. G. Aitken	—1932
V. M. Slipher	—1933
Harlow Shapley	—1934

The dates may offer material for speculation on the part of the reader. The contacts, outside the realm of the organizations, as for example, the interesting correspondence of Sir David Gill and Simon Newcomb, are another and longer chronicle.

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THE FIRST KNOWN LONG MATHEMATICAL DECLINE

WHILE mathematical attainments have usually been preserved and increased from generation to generation there have also been periods during which not only no important progress was made but many of the earlier achievements were temporarily forgotten. The earliest known such long period relates to the ancient Babylonians and started about 2000 B.C. According to the recent volume 3, page 25, of the favorably known "Geschichte der Elementar-Mathematik," by J. Tropfke, there was a period of 1,500 years during which no cuneiform texts are now known which include the solving of equations. In particular, the known solutions of quadratic equations, which are however restricted to the determinations of only one root according to most students of the subject, originated during two periods of time about the year 2000 B.C. and 200 B.C., respectively.

There is still considerable uncertainty in regard to the mathematical attainments of the ancient Sumerians and the ancient Babylonians, but enough has recently been discovered to show that our histories of mathematics which were published about a dozen years ago are in need of many modifications as regards ancient mathematics. In particular, the quadratic equation was treated on 27 pages in the preceding edition (1922) of the volume to which we referred in the preceding paragraph, while 68 pages are devoted to the same equation in this volume and much of this increase is due to the recent discoveries by O. Neugebauer and others in regard to the mathematics of the ancient Sumerians and the ancient Babylonians.

It should not be inferred that the first known mathematical decline started from a high state of mathematical attainments. The later attainments of the ancient Greeks were of a much higher order than those which had been reached by the ancient Sumerians and the ancient Babylonians. General methods for solving the quadratic equation represent the peak of this early advance, and these methods were then only partially understood since the number concepts had not yet been developed so as to include complex numbers. Even the ancient Greeks failed to reach a sufficiently high mathematical advance to master the solution of the quadratic equation, although they got much further in this direction than their predecessors. Their work, too, was followed by a long mathematical decline, which was again followed by an advance. The latter reached a sufficient point to really master the solution of the quadratic equation as it is now taught in our high schools.

Until recently the study of the civilizations preceding that of the ancient Greeks required very meager mathematical knowledge, but the recent discoveries relating to the mathematics of the ancient Babylonians and the ancient Egyptians have effected a considerable change in this direction. It is now necessary to know fully the difficulties involved in the solution of the quadratic equation in order to evaluate the intellectual advances made by the ancients before the times of Greeks. From the standpoint of modern mathematics this is still meager, but it is a great advance beyond the fundamental operations with positive rational numbers. In particular, it has recently been discovered that such rules in multiplication as − times − is plus, and − times + is minus were already used by the ancient Babylonians.

There has been considerable discussion in regard to the question whether the ancient Babylonian mathematics preceding the long decline in question should be regarded as extending into algebra. Since no generally accepted definition of the term algebra now exists it is clearly impossible to decide this question in a satisfactory manner. One of the most senseless efforts to distinguish between arithmetic and algebra appears in Webster's "New International Dictionary" (1938) under the entry "algebra" in the following words: "The essential difference between arithmetic and algebra is that the former deals with concrete quantities while the latter deals with symbols whose values may be any out of a given number field."

Even the ancient Babylonian arithmetic which preceded the noted long decline dealt mainly with abstract numbers according to their extant literature. One of the chief objectives of pre-Grecian mathematics was the development of methods to perform the fundamental operations with respect to number aggregates composed of the positive rational abstract numbers. It