# NEW LIGHT ON OUR NUMERALS.

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*Introductory Note.*—It is interesting to see how much new light is constantly being thrown upon chapters in the history of mathematics which have always been more or less obscure. We know, for example, with reasonable certainty the original habitat of our numerals; we know approximately the century in which they were perfected; we have rather positive information as to the century in which they first appeared in European manuscripts; and we are well advised, through the work of Mr. G. F. Hill, as to their variations in form for the last thousand years. It is true that we do not know when or where the zero of our system was first conceived, although we now have some valuable information as to the one that was used by the Mayas, nor do we know the origin of six of the primitive forms of the digits. Furthermore we do not know with any certainty the date of the first appearance of our numerals on the Mediterranean littoral, but we are not without hope that all this information will sometime be forthcoming, at least to some degree.

Our hope that such further knowledge is not beyond our reach is strengthened by a discovery recently made by M. F. Nau, no report of which seems as yet to have appeared in English. Because of the importance of this discovery, I have asked Mr. Ginsburg to make it known to the readers of the BULLETIN and to supplement the simple statement of the discovery by searching out such information as is available concerning the interesting scholar and teacher, Severus Sebokht, in whose writings the first positive trace of the numerals, outside of India, is found. This he has done, and his article is to my mind particularly valuable because of these features: (1) It shows us that these numerals reached the Arab lands a century earlier than was formerly supposed; (2) it shows that the zero was probably not in the system as then mentioned, showing at least that its value was not generally comprehended in the seventh century and possibly confirming the impression that the symbol had not yet been

invented; (3) it reveals something of the life of a man hitherto unmentioned in the histories of mathematics.

It is to be hoped that this valuable information may prove of such interest to readers that Mr. Ginsburg may be encouraged to tell American scholars, in the near future, something of Sebokht's notable contributions to the study of the astrolabe.

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THAT our common numerals are of Hindu origin seems to be a well-established fact,* and that Europe received them from the Arabs seems equally certain, but how and when these numerals reached the Arabs is a question that has never been satisfactorily answered. It is the object of the present article to call the attention of students of the history of mathematics to newly discovered evidence† showing that the Hindu numerals were known to and justly appreciated by the Syrian writer Severus Sebokht who lived in the second half of the seventh century; that is, about a hundred years before the date of the first definite trace that we have hitherto had of the introduction of the system into Bagdad.‡ It will also be shown, on the basis of such information as is available respecting his life and works, that Sebokht was in the most favorable position for getting information of this kind, and that he furthermore had in his possession the most powerful means for the propagating of such knowledge.

Severus Sebokht of Nisibis, bearing the title of bishop, lived in the convent of Kenneshre on the Euphrates§ in the time of the patriarch Athanasius Gammala (who died in 631) and his successor John.‖ He distinguished himself in the studies of philosophy, mathematics, and theology, and in his time the convent of Kenneshre became the chief seat of Greek learning in western Syria. Of his astronomical and geograph-

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* Smith and Karpinski, The Hindu-Arabic Numerals, Boston, 1911.

† By the French orientalist M. F. Nau in the *Journal Asiatique*, series 10, vol. 16 (1910).

‡ Smith and Karpinski, The Hindu-Arabic Numerals, p. 92.

§ W. Wright, Short History of Syriac Literature, London, 1894, pp. 137–139.

‖ Sebokht took part, together with the Jacobite patriarch Theodorus, in a public dispute against the Maronites in the year 659. We have also a letter written by him in the year 665. From these details we may conclude that he flourished in the beginning of the second half of the seventh century. (M. F. Nau, in the *Journal Asiatique*, series 9, vol. 13, p. 60.)

ical works there are a few fragments in a manuscript now in the British Museum.*  These fragments consider such questions as whether the heaven surrounds the earth in the form of a wheel or of a sphere; the habitable and uninhabitable portions of the earth; the measurement of the heaven, the earth, and the space between them; and the motion of the sun and the moon.  His treatise on the plane astrolabe was published with a French translation by M. F. Nau in the *Journal Asiatique*, series 9, volume 13.  Sebokht also wrote a short treatise on eclipses, in which he ridicules the then accepted belief in a celestial dragon as the cause of all such phenomena.†

But the most interesting of Sebokht's writings for the student of history is undoubtedly a fragment of a manuscript‡ published by M. F. Nau, in the *Journal Asiatique* (series 10, volume 16, page 225) in which he directly refers to the Hindu numerals. He seems to have been hurt by the arrogance of certain Greek scholars who looked down on the Syrians, and in defending the latter he claims for them the invention of astronomy. He asserts the fact that the Greeks were merely the pupils of the Chaldeans of Babylon, and he claims that these same Chaldeans were the very Syrians whom his opponents condemn.  He closes his argument by saying that science is universal and is accessible to any nation or to any individual who takes the pains to search for it.  It is not therefore a monopoly of the Greeks, but is international.

It is in this connection that he mentions the Hindus by way of illustration, using the following words: "I will omit all discussion of the science of the Hindus, a people not the same as the Syrians; their subtle discoveries in this science of astronomy, discoveries that are more ingenious than those of the Greeks and the Babylonians; their valuable methods of calculation; and their computing that surpasses description. I wish only to say that this computation is done by means of nine signs.  If those who believe, because they speak Greek, that they have reached the limits of science should know these things they would be convinced that there are also others who know something."  This fragment clearly shows that not only did Sebokht know something of the numerals, but

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* Add. 14, 538, pp. 153–155.

† See Notes d'Astronome Syrienne, *Journal Asiatique*, series 10, vol. 16 (1910).

‡ Ms., Syriac, Paris No. 346.

that he understood their full significance, and may even have
known the zero as Rabbi ben Esra did, in spite of the fact
that he, too, speaks of nine numerals.   There are two ques-
tions that may immediately arise: (1) How could Sebokht
have obtained any information about the Hindu numerals?
and (2) What are the chances that Sebokht was instrumental
in introducing the numerals to the Arabian scholars?

The first of these questions may be answered very easily.
Nisibis, the place where Severus lived, was the chief city* of
Mygdonia, a small district in the northeast part of Mesopo-
tamia.   It was situated in a rich and fruitful country, was
long the center of a very extensive trade, and was the great
northern emporium for the merchandise of the east and the
west.   Since the exchange of goods is always accompanied
by the exchange of ideas, it is only reasonable to surmise that
the different systems of numeration were known in Nisibis,
where they could hardly escape the attention of a man like
Sebokht, who would surely have been looking for just such
information.

The second question is more difficult to answer.   It may
be said, however, that the weight of the evidence is in favor of
Sebokht's work being at least one of the agencies by means of
which the knowledge of the numerals was transmitted to the
Arabs.   He was the head of his convent and occupied a com-
manding position in the literature of his country.   He had
many pupils, one of whom, Athanasius of Balad,† was the
patriarch of the Jacobites, while such others as Jacob of Edessa‡
and probably George, Bishop of the Arab Tribes,§ were well
known as translators and polygraphers.   We may be certain
that the knowledge of the numerals possessed on the banks
of the Euphrates by Severus was transmitted by him to his
numerous pupils and through them to other scholars all over
Syria.   Since we know that Syrian scholars were employed by
the caliphs as translators and educators,‖ it would be only
natural that these Syrians should impart to the Arabs, among
other facts relating to the sciences, the knowledge of the Hindu
numerals.

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* See Smith's Dictionary of Greek and Roman Geography.
† W. Wright, Short History of Syriac Literature, pp. 154–155.
‡ Ibid., pp. 141–154.
§ Ibid., pp. 156–159; M. F. Nau in the *Journal Asiatique*, series 10,
vol. 16.
‖ Ernest Renan, Islamisme et la science, p. 9.