PREFACE.

In offering to the Public a fresh Translation of the Elements of Euclid into Bengali, it is hardly necessary to make an apology. Up to this time a complete school Edition of the Elements has not been presented to the Bengali student, and the portions of Euclid which have been published, were one and all translated from the English version of Playfair, who it is well known took great liberties with the text of the Greek Geometer.

In this Edition the Bengali rendering has been given from the text of Dr Simson, which is regarded as the authorized English version of the Elements.

The science of Geometry was not unknown to the ancient Hindus. The work of Brahma Gupta and Bhaskaracharya contain a system of Arithmetical mensuration, together with the properties of right-angled triangles, the method of finding the area of a triangle, of which the three sides are given and the ratio of the diameter of a circle to its circumference. The circumference of the circle is given by Bhaskaracharya as bearing to the diameter, the proportion of 3927 to 1253 or exactly that of 3·1416 to 1. Braham Gupta takes the proportion of the square root of 10 to 1, or 3·16 to 1. The close approximation of Bhaskaracharya, who lived (according to Colebrooke) in the 12th century, could not have been derived from any intermediate communication with Europe, where
the true ratio was not known till after the 19th century.

When Jahangir was the reigning sovereign of India, the Elements of Euclid were translated into Sanskrit by Pandit Jagannath. He does not acknowledge that his work is a translation from a different language. But it appears from internal evidence that his rendering was from an Arabic version of Euclid's Elements. In the Preface, it is stated that, "in order to please his sovereign, Dvija Samart Jagannath undertook to compose a work on the science of Lines. One who studies this wonderful science, will acquire a knowledge of the properties of angles and figures. This science was dictated by Brahma to Bisvakarma (the Indian Vulcan). Thus, by tradition, it had come down to the nether world. In these later times, this science, through neglect and disuse, has ceased to exist. With the permission of Raja Jaya Sinha, I republish it to the world for the entertainment of the Mathematicians."

The Elements of Euclid, or as much of that work as is contained in Hutton's course of Mathematics, was again translated into Sanskrit, by Professor Yegadhyan of the Calcutta Government Sanskrit College, in the year 1839.

Under the patronage of the Government of Bengal, the first six Books of Euclid were translated into Bengali from the text of Playfair, in the year 1849, by the Rev K. M. Banerjea.
Another edition, consisting only of the first three Books, was published in 1860 under the superintendency of Babu Bhudev Mukhopadhyay, then Head Master of the Hugli Normal School, who adopted with a few verbal changes, Rev Mr Banerjea’s Bengali text, and added a few notes and exercises, chiefly selected from Mr Pott’s Edition of the Elements.

About four years ago, Babu Kali Kumar Das of Dacca, published a Bengali version of the fourth, the sixth, and portions of the eleventh and twelfth Books of Euclid, together with the Algebraical demonstrations of the propositions in the fifth Book.

In the year 1868, Babu Harish Chandra Chakravarti of Nuddea reprinted the first Book of Bhudev’s Euclid, with the addition of a few notes from Dr Lardner’s edition of the Elements.

There is another little work on Geometry, which, though not a translation of Euclid, should not here be passed unnoticed. The treatise referred to displays considerable ingenuity. It was written by the late Ram Kamal Bhattacharya of the Calcutta Normal School, and published with an English Translation, after his death.

In all the Editions of Euclid, noticed above, the Translators, Editors, and Compilers have chosen to use in the demonstrations, sometimes the language of Algebra and sometimes that of pure Geometry; and not seldom what may be termed a mixture of both. This is, perhaps, not the fittest place to enter into
a lengthened discussion on the vexed question, whether
the use of Algebraical signs and symbols should be
the proper medium of communicating the truths of
pure Geometry. On the one side, it is affirmed that
"Symbolical demonstrations are shorter and save
time," that it is but pedantry to adhere in this age to
the phraseology of the ancient Geometer which is
characterized by proximity and in which "the formalities
and paraphernalia of rigor are so ostentatiously
put forward as almost to hide the reality." On the
other side, it is urged that "attempts at abbreviations
have caused endless confusion," that "the use of symbols
may be looked upon as repugnant to the rigor and
strictness of Geometry," that the ideas annexed to
symbols make them unfit for use in this science and
that the highest authorities on these matters have con-
demned the use of Algebraical language in Geometry,
Sir Isaac Newton observes that "Equations are expres-
sions of Arithmetical computation, and properly have
no place in Geometry, except so far as quantities truly
Geometrical (that is lines, surfaces &c.) may be said to
be some equal to others. Multiplications, Divisions
and such sort of computations, are newly received into
Geometry, and that unwarily, and contrary to the first
design of the Science. For whosoever considers the
construction of Problems by a right line and a circle
found out by the first Geometricians, will easily per-
ceive that Geometry was invented that we might ex-
peditiously avoid, by drawing lines, the tediousness of
computation. Therefore these two sciences ought not to be confounded. The ancients did so industriously distinguish them from one another that they never introduced Arithmetical terms into Geometry: and the moderns by confounding both, have lost the simplicity in which all the elegance of Geometry consists.” Professor De Morgan remarks that “those who introduce Algebraical symbols into Elementary Geometry, destroy the peculiar character of the latter to every student, who has any mechanical associations connected with those symbols, that is, to every student who has previously used them in ordinary Algebra. Geometrical reasoning and arithmetical process have each its own office: to mix the two in elementary instruction is injurious to the proper acquisition of both.”

It must however be regarded as an undisputed fact that the moderns have very much gained in power by the application of Algebra to Geometry, and have arrived at results, which it would have been difficult to obtain, by the application of the method of the ancients. Notwithstanding, it is unquestionable, that the use of Algebraical signs and symbols, may lead beginners to misconceptions and errors, which it would be well to guard against. It is probably owing to these reasons that a symbolical Edition of the Elements, or a symbolical demonstration of the Propositions of Euclid, in the answer papers of the Graduates or Undergraduates, is not at present tolerated in the University of Cambridge.
In this Edition of Euclid, so far as the text is concerned, the use of signs and symbols has been scrupulously avoided. In the notes and exercises, however, no such restriction has been made. At the suggestion of Mr H. Woodrow, late fellow of Cairns College, Cambridge, Algebraical proofs of the Propositions in the 2nd and 5th Books have been given, in addition to Euclid’s Demonstrations.

On account of there being no capital letters in Bengali, considerable difficulty arises in printing mathematical works, and specially a treatise on Geometry. The letters referring to figures may be mistaken for words, and an inflexion added to letters may be taken for an additional letter. It has been observed by the Rev. K. M. Banerjea, the first Translator of Euclid into Bengali, that “The genitive case of nouns is, for instance, formed by the addition of a servile letter (র) to the word inflected; as from rekha (a line)—gen. rekhar (of a line) * * * If the servile letter (র; indicative of the genitive were added, the student might be in danger of mistaking the inflecting servile for a radical; thus কথর might be mistaken for a set of three letters instead of the genitive of কথ.”

In this Edition of Euclid, the difficulty noticed above, has been obviated by the use of types of larger size, when lines, angles and figures have been referred to, and the inflecting serviles have been printed with types of ordinary size, as কথর or গুঢ়র.

Another peculiarity will be observed in this work.
The demonstration of each of the Propositions has been so printed as clearly to shew to the student the successive steps of the reasoning. This method was first of all recommended by Professor De Morgan, and it has since been adopted by Messrs Pott, Todhunter and others.

At the end of each Book will be found copious explanatory notes, and a large number of exercises most of which are selections. Besides, for the purpose of illustration, after each Proposition, at least one Exercise has been given which can be deduced from the Proposition or demonstrated in the same manner as the Proposition itself. These will answer the purpose of *riders* in the Examination Papers; and the fact of their being placed after each of the Propositions will, it is hoped, be a sufficient hint for their solution.

Before closing this preface, the author begs to acknowledge with thanks the material assistance received in the preparation of this work from Pandit Kali Prasanna Vidyaratna, the teacher of Sanskrit and Bengali in the Hugli Normal School.

It only remains to be mentioned that any suggestions or corrections from teachers or students, will be received with cordial thanks.

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