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ON THE VIEWS OF BIOT AND WEBER  
RESPECTING THE RELATIONS OF THE  
HINDU AND CHINESE SYSTEMS OF ASTERISMS;

WITH AN ADDITION, ON MÜLLER'S VIEWS RESPECTING THE SAME SUBJECT.

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IN the sixth volume of this Journal was published a translation, with an elaborate commentary and exposition, of the *Sūrya-Siddhānta*, one of the most ancient and authoritative text-books of the Hindu science of astronomy. The work soon after received a generally appreciative and gratifying notice, running through several numbers of the *Journal des Savants* (Paris, Aug.—Dec., 1860), at the hands of the eminent physicist and philosopher, Mons. J. B. BIOT, who, after his name had been identified for considerably more than half a century with the history of French science, has since (Feb. 3rd, 1862) died, at the great age of 87 years, active, laborious, and prolific to the very end, still claiming a place in the working ranks of the present generation, not less than in their grateful regard and admiration, as the last survivor of a band of giants in intellect whose achievements shed lustre over the first half of the nineteenth century. In the series of articles referred to, M. Biot takes up anew the discussion of the Chinese origin of the Hindu system of *nakshatras*, or lunar asterisms—a question first opened by him as long ago as 1840. This discussion it is the principal object of the present paper to continue, with reference also to the views recently set forth upon the same subject by Prof. A. WEBER, of Berlin: but, before entering upon it, I must ask permission to reply briefly to the unfavorable judgments passed by M. Biot upon certain portions of the translation and commentary of the *Siddhānta*, in the course of his prevailingly com-

mentary review. In craving this liberty I think myself justified by the consideration of the great weight of authority attaching to the publicly expressed opinions of one so universally known and honored: I am unwilling to allow our work to lie under his partial condemnation without some explanation and protest with regard to points in which I think he has misunderstood it, or judged it too harshly, and thus has done us unintentional injustice. Were he yet living, such explanation might be addressed to himself privately, leaving it to him to do us more public justice if he saw fit; but, as that is now impossible, we can only make our counter-plea before the public, and turn the case over for their final judgment.

The first matter which calls forth M. Biot's disapprobation, and upon which he lets fall a heavy burden of censure, returning to it once and again in the course of his articles, is the introductory note prefixed to our work, wherein the translator sets forth the manner in which he was led to undertake the translation and comment of the Hindu treatise, and the considerations which, in his view, rendered the execution of the task desirable, and even indispensable. He rehearses the works of those who had earlier treated of the Hindu astronomy, and points out that, notwithstanding their acknowledged value, they contained but a partial and fragmentary exhibition of the subject, while nothing had up to that time appeared which showed the Hindu science in its *ensemble*, displaying its garb as well as its substance, holding up its superstitions, its fanciful theories, its absurd hypotheses and assumptions, in the same light as its groundwork of observed fact and its mathematical form. In all this, the reviewer sees only an arrogant and reprehensible attempt to exalt the value of the work offered by depreciating its predecessors: it betrays, to his apprehension, a misunderstanding of the real value which a translation of the treatise could now have—a value purely philological and historical, and not at all bearing upon instruction and positive science. Now nothing could have been farther from the minds of the translator and those associated with him than this overestimate of their own labors and underestimate of those of others, which M. Biot reprehends so severely, and if the preface appears to breathe such a feeling, they must regret that it should be so unhappily expressed as seriously to misrepresent them. But they hope the generality of those who shall read the introductory note will find that M. Biot has misjudged its spirit; and they are even confident that his error will find its antidote in the translation which he himself, with entire good faith, offers of the passages to which he takes exception. It was not the duty of the translator to set forth in detail, and with lengthened eulogy, the merits of those who had gone before him, but only to present

the considerations which justified him in taking up the subject anew, and in this particular way, notwithstanding all that they had done. He would not think of disputing an item of the praise which M. Biot, in his defense of previous writers, feels called upon to award to their works; he would only ask that M. Biot should allow the truth of his counter-allegation, that those who wished to understand the Hindu astronomy in its entirety—and especially in its historical and philological aspects, as distinguished from its scientific—were in pressing need of such a guide to its comprehension as a complete translation and annotation of one of its principal treatises would furnish. If the commendations which M. Biot, with the utmost kindness and liberality, afterwards bestows upon the work itself are at all merited, he who undertook it cannot fairly be accused of overweening self-estimation for claiming that there was both room and call for such a work.

Our reviewer expresses his decided preference for such an arrangement of the matter composing the volume as should give the translation of the Siddhânta text in unbroken continuity, leaving the exposition to follow after in a mass. I cannot think that this preference will be shared by many of those who shall have occasion to consult and use the book. Considering the want of continuous and orderly arrangement in the treatise—to which M. Biot himself calls attention, illustrating it at some length—and the obscure and elliptical character of the text, which is in great part quite unintelligible without the aid of a commentary, it is probable that ninety-nine persons out of a hundred would prefer to have each connected passage immediately followed by its own explanation, as is the case in our work. This is the method usually followed—and, so far as I know, with universal approval—in the publication of original Sanskrit texts with their commentaries: as for instance, in all the editions of the astronomical text-books, including that of the Sûrya-Siddhânta itself. The few persons who shall wish to entertain themselves by a continuous perusal of the pure Siddhânta text may well enough be called upon to take the slight additional trouble of sometimes turning over more than one leaf to find the next passage, for the sake of the many whose convenience will be consulted by the mixture of text and comment.

Notwithstanding M. Biot's objections, I cannot see that we took an unwarranted liberty in modifying in our translation the titles of some of the chapters. These titles are no integral parts of the treatise, and are found to vary somewhat in different manuscripts; and they are in a few cases so palpable misstatements of the contents of the chapters to which they are appended that a translator can hardly prevail upon himself to leave them unaltered. Thus, for instance, M. Biot, in his sketch

of the contents of the Siddhânta, following the guidance of the manuscript titles, informs us that the fourth chapter treats of lunar eclipses, and the fifth of solar: which is entirely erroneous, since the fourth chapter has as much to do with solar as with lunar eclipses, nearly all its rules being essential to the calculation no less of the former than of the latter; while the fifth chapter deals merely with the element of parallax, as entering into the calculation of a solar eclipse. We have not failed to give the manuscript title of every chapter, in text and translation, and, if we modified it, to explain the reason of the modification; and this ought to relieve us from reproach, unless our modifications were for the worse, and not for the better.

In objecting to the Sanskrit index appended to our work, on the ground that it is imperfect, not making reference to every case of the occurrence in the treatise of each word indexed, M. Biot palpably confounds the duty of a translator with that of an editor. We did not publish any text of the Siddhânta, and no obligation could rest upon us to furnish an index to the text: our Index was rather an index to the notes; although in these we had, in fact, been careful to mention, and to explain, so far as we were able, every technical term which the treatise contained, besides many others, found in the native commentary upon it, or in other kindred works. To refer under each word even to all the verses of the translation where it happened to be cited in parenthesis, alongside of the English word or phrase chosen to represent it, would have been of no avail, since it was likely to have occurred in the text in twice as many other passages, in the translation of which it did not appear. M. Biot complains that under *liptâ*, for example, he is referred to chapter i., verse 28, note, where the word is not used in the text, while he finds various verses to contain it to which no reference is made. But the note referred to does contain the statement that *liptâ* is the precise synonym of *kalâ*, 'a minute of arc,' and that, while the two are employed interchangeably in the text, the former occurs much more frequently than the latter. If the authority of the translators cannot be accepted upon a point like this, if they must give a complete set of references to the original text in order to enable the mathematical reader to judge whether, after all, *liptâ* and *kalâ* do not mean two different things, then their work is not fit to be studied, and had better be laid aside altogether. They have furnished an index by the aid of which one who has a certain degree of confidence in their ability to execute properly the task they undertook may make use of their translation and notes: any other belongs to him to provide who shall study the original text, and by it shall set himself to test and correct their work. Nor does M. Biot's distrust stop short of this last step; he essays in a single point, by way of example, to

convict their translation of inaccuracy, and to correct it. We are mistaken, he says, in rendering the word *bha* sometimes by 'asterism,' as if it were the synonym of *nakshatra*, since it really means only 'a fixed star in general.' Now if we had presumed to criticize one of M. Biot's formulas, pronouncing it mathematically unsound, he would doubtless have thought that we were overstepping our proper limits, and, by dealing with matters which he understood better than we, exposing our criticisms to discomfiture and ridicule. But he, in his turn, when laying to our charge a gross mistranslation, himself knowing not a word of Sanskrit, should have been very careful to see that his accusation was justly founded. In point of fact, it is entirely baseless: for *bha*, which originally, like *nakshatra*, meant simply 'star, shining heavenly body,' is in the Siddhânta employed both in this its general etymological sense, and with the specially restricted meaning of '*nakshatra*, lunar asterism.' It even much more often receives this latter meaning than *nakshatra* itself (which is comparatively a rare word, occurring but six times in the Siddhânta); a conspicuous and unequivocal instance might have been found by M. Biot at viii. 1, in the very introduction to the chapter on the *nakshatras*. Moreover, it is not infrequently applied to designate the signs of the zodiac, or the arcs of thirty degrees into which the ecliptic is divided; and only the connection, or the requirements of the case, can determine which of its three different senses it bears, and which must be substituted for it in making the translation of any given passage.

It is, of course, a legitimate matter for difference of opinion how far, in translating a work of science from a language with which scientific men are entirely unfamiliar, its technical terms should be translated. Respecting such of them as have technical correspondents in the language of the version, there would be, indeed, little or no question: others would be more doubtful. But we had so strong a sense of the inconvenience and perplexity arising from the frequent introduction, into a text intended for other than philological readers, of terms which are without known meaning, and, even if laboriously learned and made somewhat familiar, yet possess no power to suggest to the mind their significance, and require always an effort of the memory to recall the thing they designate, that we laid down for our guidance the principle that every term in the Siddhânta for which a tolerably accurate and not too tedious English equivalent could be found, should be uniformly rendered by that equivalent. At the same time, for the benefit of those scholars who were familiar with and preferred the Sanskrit terms, we scattered them with great liberality through our version, putting them in parenthesis after the words chosen to represent