VEDIC CHRONOLOGY
AND
VEDANGA JYOTISHA.
[ Containing also Chaldean and Indian Vedas and
other miscellaneous essays. ]
BY 8354
LOKAMANYA
BAL GANGADHAR TILAK, B.A., LL.B.
Author of the "Orion" or "Researches into the Antiquity
of the Vedas", "The Arctic Home in the Vedas",
"Gita-Rahasya" &c. &c.

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श आ इ ई उ ऊ ए ऐ
a aː i i u uː rī rī e āi

लो ओ ऒ : क ख ग घ क
o au m h k kh g gh h

च छ ज झ जट ठ ड ढ ण
ch chh j jh n t th d dh n p ph b bh m

व र क ब व श ष स ह ख ङ
y r l v sh sh s h l k h

क jō
Lokmanya

Bal Gangadhar Tilak
VEDIC CHRONOLOGY.

PART I.
VEDIC CHRONOLOGY

CHAPTER I.
INTRODUCTION.

The ancient Indian literature is divided into two sections—Vedic and post-Vedic—and the chronological sequence of events in the latter can now be pretty accurately determined by referring to the date of Buddha, the invasion of Alexander the Great, the inscriptions of Ashoka, the Shaka era, and a number of other archaeological facts recently discovered. But when we go back to the Vedic literature, the oldest portions of which admittedly depict the most ancient Aryan civilization of which any records have been left, we find no such land-marks; and in their absence the method at first adopted by Western Sanskrit Scholars to ascertain the antiquity of the Vedic Civilization was necessarily vague and arbitrary. On the face of it, the Vedic literature is divided into four strata or layers—Chhandas, Mantra, Bráhmaṇa, and Sūtra; and it is evident that each of these stages of development must have lasted, at least for a few centuries before it passed into the next. Taking, therefore, these layers for the basis of his calculation, and assuming, at the lowest, 200 years for each stage of development, Prof. MaxMuller,
in his History of Ancient Sanskrit Literature, roughly fixed the age of Vedic civilization at 800 years before Buddha, or at 1200 B.C. The moderation here exhibited, was no doubt unobjectionable, even from a sceptical point of view. But it hardly corresponded with facts; and many other Vedic Scholars even then considered this estimate as too low, and assigning 400 instead of 200 years for each successive stage of development, carried back the antiquity of the Vedic culture to 2400 B.C. This was the general opinion about the antiquity of the Vedic civilization before the publication of my ‘Orion’ and Dr. Jacobi’s essay ‘on the age of the Rigveda,’ in 1893, in both of which the antiquity is carried back to about 4500 B.C. on the strength of astronomical statements contained in the Vedic literature.

Indian astronomy was one of the first subjects which attracted the attention of Western Scholars after the existence of Sanskrit literature became known to them in the last quarter of the 18th century. There are a number of learned and critical articles in the first Volumes of Asiatic Researches by Sir W. Jones, Colebrooke, Devies and other scholars on the special and important features of Indian Astronomy, e.g. the lunar zodiac and its antiquity, the Indian and the Arabic divisions of zodiac, the precession of equinoxes, etc., etc.; and so far as we know, there is hardly anything subsequently published, which surpasses these dissertations either in the breadth of view or the soundness of judg-
ment exhibited therein. Even the Vedânga Jyotisha, that small tract on Astronomy appended to the Vedâs, and which is the oldest astronomical work in Sanskrit, did not escape their attention; and, though many verses in it were then obscure, yet it was clearly seen that the position of solstices mentioned therein carried us back, roughly speaking to about 1100 or 1400 B.C. But all the works, examined by these scholars are post-Vedic, and help us little in ascertaining the antiquity of Vedic Civilization. The Vedânga Jyotisha, is certainly the oldest astronomical work now extant; but now that it has been fully deciphered one can easily see that it cannot be the first work of its kind. It must have been preceded by others of its kind; but as these are not now available, we must search the Vedic books themselves for any astronomical data that enable us to ascertain the age of Vedic literature. This was not done till some years later as the attention of early scholars was engrossed in discussing certain side issues which were raised at the time.

The French astronomer Bailey, in his treatise on Indian and Oriental astronomy, published in 1786, had assigned a very high antiquity to the Indian Science; and it was to refute this view that Bentley published his "Historical view of Hindu Astronomy" in 1823. Bentley endeavoured to ascertain the age of the Indian astronomical works solely by comparing the astronomical statements therein 'with the positions calculated backwards by means of modern astronomical
tables and assigning to the said astronomical treatise such time as when the difference between the two was the smallest possible; and by a reckless use of this method he was led to the preposterous conclusion that many of the ancient astronomical Siddhántás, were in reality composed or fabricated, as Bentley thinks, in the times of Azabar the great, in order to impose upon the emperor a false notion of their importance and antiquity. He did not stop here, but attacked Sir W. Jones, Colebrooke and other scholars for maintaining the opposite view. This drew forth a sharp reply from Colebrooke who clearly showed how Bentley's method, used exclusively by itself, was utterly unreliable. As Bentley's view is now generally rejected by all scholars, it is unnecessary to go further into the details of the position maintained by him. In spite of its faults, his work however contains some ingenious suggestions which we shall notice later on. It is enough to state here that side by side with this controversy, there was also raised and discussed another important question—viz., whether the Indian astronomical methods, described in these post-Vedic works were borrowed from the Greeks wholesale or whether the Indian astronomers, who had already a science of their own, improved it by such hints received from Alexandria, as two civilised nations, when they come in contact, are generally glad to receive from each other in the interest of scientific progress. Colebrooke held the latter view; and Rev. Burgen, who translated the
Sūrya Siddhānta while he was a missionary at Ahmednagar in our Presidency, is of the same opinion. But Prof. Whitney, who edited and published the translation with notes under the auspices of the American Oriental Society in 1860, has not a word to say in favour of the Indian Astronomers, whom he considers incapable of originating any scientific theory, or making any even tolerably accurate observations. He has therefore come to the conclusion that the Indians were wholesale borrowers in this respect. The prestige which Whitney enjoyed on account of his great learning and scholarship unfortunately contributed to render, for sometime, his judgment acceptable, in preference to that of Colebrooke. But it has been shown by Shankar Balkrishna Diksit, a practical Indian astronomer possessing a wider acquaintance with the whole of the Indian astronomical literature, in his important work on the "History of Indian Astronomy" published in Marāthi in 1896, that Whitney's view is simply the result of his prejudices, that it is entirely opposed to a number of astronomical facts disclosed in the Indian Siddhântâs, and that Colebrooke has said utmost that can be said on the subject. In support of Diksit's rejoinder, we may further mention the fact, overlooked by Whitney and his followers, but noticed by Plunkett in his work on "Ancient Calendars and Constellations," published in 1903, that in contrast with the praise bestowed by Garga on Yawanas—evidently Greeks—for their
proficiency in astrology, we find, the Greek writers of the first century of the Christian era, holding a very high opinion about Indian Astronomy; and that in the life of Apollonius of Tyana, his biographer represents him as learning many things from the Sages of India, especially matters of astronomy. This shows that there was borrowing on both sides and that Whitney’s bias against the ancient Indian astronomers was entirely unfounded.

The whole of the above discussion was related and confined only to the post-Vedic astronomical works. But the next question that arose necessitated an inquiry into the astronomical statements contained in the Vedic Works themselves. In 1840 and the following years, the well-known French astronomer, J. B. Biot, published a number of articles in the *Journal des Savants* (subsequently also published in the form of a separate book in 1859), in which he endeavoured to prove that the Indian system of Nakshatrās must have been borrowed from the Chinese, because in the first place the antiquity of the Chinese system was fully authenticated by reliable ancient texts, going back to 2357 B.C. when the vernal equinox was in Mao (i.e. Indian Kṛittikās), and secondly because from the practical astronomical point of view the stars in the Chinese system of Sicon (Nakshatrās) were mathematically best suited for the purpose for which they were used, viz., to observe meridian passage of equinoctial and solstitial points, as well as that of certain circum-
poalr stars. These stars, he maintained, were originally 24 in number to which 4 more corresponding to the two solstitial and two equinoctial points of the time were added, in about 1100 B. C., thus increasing the total number of Sicon to 28. Most of these stars are the same in the Chinese and the Indian system; but they were unsuited to measure the equal distances between the successive daily positions of the moon, which is the purpose for which they were used in India. Biot, therefore, concluded that the priority of discovery must belong to that place, where the system is found to be best suited to the use made thereof, viz., to China; and that Indians must have borrowed the same at some later date and used it awkwardly for their purpose. The authority, which naturally belonged to the opinion of so great an astronomer as Biot led some Sanskrit scholars of the time to adopt his view, and we find it accepted, though in a somewhat modified form, even by Whitney in his edition of the translation of Sûrya Siddhânta published in 1860. Prof. Alfred Weber, however, clearly saw the weakness of Biot’s position resting as it did, on the supposed antiquity of the Chinese texts; and the so called convenience of astronomical observation of the time. With great diligence and learning he, therefore, collected all the astronomical statements contained in the various Vedic works, and published in 1860 and 1862 his two essays on “Die Vedisohen Nachrichten Von der Naxatra” (the Vedic accounts of the Nakshatrás). In the first.
of these he showed how the supposed antiquity of the Chinese texts was unwarranted by historical facts and in the second conclusively proved that the ancient existence of the Indian System of Nakshatras, with the Krittikas at their head, was fully borne out by passages in Vedic works of undoubted antiquity. This was the first time that the astronomical statements contained in the Vedic Works were collected; and so complete is this collection that only a few Vedic texts bearing on the same subject have been since discovered. If Weber had gone further and arranged and co-ordinated the texts collected by him he could have easily perceived that the series with the Krittikas (Pleiades) at the head was not the oldest of its kind and that the Vedic works expressly refer to a still older system of Nakshatras with Mrigshiras (Orion) at the head. But it is not uncommon that a Collector of materials sometimes misses to grasp their true significance, as was the case with the great Danish astronomer, Tycho, whose numerous observations formed the basis of the laws of planetary motion subsequently discovered by Kepler, his successor. Weber had the same low opinion about the capacity of Hindus to make any, even the crudest celestial observations, as was held by Whitney; and though he established the priority of the Indian system of Nakshatras over the Chinese, he was, in consequence, led to believe, on almost imaginary grounds, that neither the Indians, nor the Chinese, nor again the Arabs, whose system of Manazil (Nakshatras) resembles the
Indian and the Chinese in many points, were the original discoverers of the system; but that all of them must have borrowed it from some still unknown West Asian, possibly Babylonian source. Prof. Max Muller, in his preface to the fourth volume of the first edition of the Rigveda, published in 1862, contested this view and rejected it as groundless. But he was not qualified to make further research in this matter; and Whitney who was so qualified was prevented by his prejudices from diving deeper into the question, though he clearly saw, as observed by him in his essay on "The Lunar Zodiac" published in 1874 in the second series of his "Oriental and linguistic Studies," that Weber's "theory was no better than a suspicion, perhaps not even worth finding expression as such," or "of a character to compel belief" and that there was no reason "to impugn either the candour or the good sense of any one who might refuse to be won over to a like belief."

But if Weber's theory was thus admittedly a mere suspicion it was clearly an error of judgment to refrain, on that account, from critically examining and co-ordinating the Vedic texts, with a view to ascertain which was the oldest system of Nakshatras disclosed by them. For the speculative question about the origin of the Lunar zodiac cannot be solved satisfactorily without first determining the fact whether the Krittikā series was the oldest known in India or whether it was preceded by another beginning with Mrigashiras. It is to be regretted, therefore, that Weber's or Whitney's
authority diverted, for some time at least, the attention of Western Vedic Scholars from this kind of investigation. But the ultimate discovery of truth is hardly, if ever, prevented by such mishaps. On the contrary we might even say that the path to such discovery often lies though such errors and the progressive elimination thereof. Thus when later researches and discoveries in the Babylonian antiquities failed to bring to light any of those grounds, for the Mesopotamian origin of the Nakshatra System, grounds, which Weber and Whitney fondly believed the future would disclose, Thibaut, writing on the subject in the Journal of the Asiatic Society of Bengal in 1894, expressly stated that the theory of the Babylonian origin of the Indian Nakshatra system must, in consequence, be given up; and a year earlier, that is, in 1893 H. Jacobi, who in the meanwhile was prosecuting his investigation into the Rigvedic Calendar, almost simultaneously but independently came to the conclusion to which I had already arrived, viz; that in the days of the Rigveda the Vernal equinox was in Mrigashiras or Orion, and that the Vedic texts, properly interpreted, clearly referred to a Nakshatra Series older than the one beginning with the Krittikas at its head, thereby carrying back the antiquity of the Vedic civilization to the fifth millenium before Christ.

Such is the history of this discovery in the West. In India the course of events which led to it was different. The Vedic texts collected by Weber were-
not unknown to our old Pandits and the rate at which the equinoctial points retrograded is also so accurately recorded in the ancient astronomical Siddhántás, that those who would not give any credit for accurate observations to the Hindus, e.g. Whitney, are obliged to account for it, as found by a lucky hit, since even the Greek estimate thereof is far wide of the mark. But it was a fixed article of faith with these Pandits that the Vedas were anádi (beginning-less) being handed over orally from generation to generation, from time immemorial, and in consequence these Vedic texts were never used for any chronological purpose. The introduction of Western education, and with it the Modern historical and critical methods, in our schools and Colleges, have altered this state of things. Those who were educated in these methods, and especially those who had any opportunity to serve in government observatories, were the first to note that Indian almanacs, which, till then, were prepared according to the astronomical tables based on the ancient Siddhántás and practical works like Grahadághavà were faulty and defective, inasmuch as the calculations given therein did not fully correspond to the actual time of occurrence of such astronomical events, as the eclipses are the true positions of the planets. And as these almanacs were intended for the timely performance of religious, domestic ceremonies and public festivals it soon became evident to many others that a reform in them was needed. Thus soon after 1850, the late Prof. Chattre, in Poona,
Chintāmanī Raghunāthācharyā in Madras and Pandit-Bapudevshāstri in Benares came to publish new almanacs mostly based on the British Nautical Almanac. But when such reform was undertaken a controversy soon arose as to whether the tropical or the sidereal sphere should be adopted. Indian division of the zodiac into 27 parts, called divisional Nakshatras, starts from a fixed point in the ecliptic; so that these (divisional) Nakshatras represent fixed successive positions of the ecliptic each extending over 13°, 20′, and the star after which the division is named, called also the junction star; is situated, not necessarily in the centre, but somewhere between the boundary lines of each division. This is the sphere adopted and described in all the ancient astronomical siddhāntas. Now Indian lunar months are named after the fixed Nakshatras at or near which the moon is full during that month; e.g., the month is named Chaitra or Kārtika according as the full moon in the month is found to be near the star Chitṛa or the Kṛittikās respectively; and the rule is older than Pāṇini. The Indian lunar month thus becomes tied down to a fixed star, or a fixed divisional Nakshatra portion of the ecliptic. But the winter and summer solstitial points as well as the equinoxes on which the seasons depend never remain fixed in the ecliptic. They have a slow backward motion, so slow that it amounts only about fifty seconds a year or one degree in about 72 years. This is known as the precession of the equinoxes, and it causes
the seasons to sweep over the whole circle of the ecliptic once in 26,000 years in round numbers. The seasons must, therefore, also sweep through all the Indian lunar months, once in that period. Thus if the lunar months Chaitra and Vaishākha corresponded with the season of spring (Vasanta) at any time, this season in course of time is bound to fall back in the preceding lunar months. But, if instead of tying down the divisional Nakshatrās to a fixed portion of the ecliptic, we count our Nakshatrās (divisional) from the moveable solstices or equinoxes, the lunar months, named after them, would never cease to correspond with the seasons at first represented by them. By adopting this moveable zodiac the names of the months will have no connection whatever with the fixed stars; in other words, they will be simply arbitrary or conventional. But some astronomical reformers amongst us advocated this course instead of making the seasons shift back through all the months in 26,000 years. On our side Lele, Modak and Shankar Balkrishna Diksit were its chief advocates and they termed themselves Sāyan-Vādis or Sāyanists, the word Sāyana denoting a preference to the precessional motion (Ayana) of the Solstices. On the other the majority of astronomical scholars,—e.g. Chhatre, Bapudevshāstri, and now Pandit Sudhākar Dwivedi—were of opinion that we should abide by the fixed zodiac mentioned in the Siddhāntas and adopt a sidereal sphere, accounting from a fixed point. These are called Nirayana-Vādis or Nirayanists. But if the fixed,
zodiac is to be retained it was necessary to show how the problem about the shifting of the seasons is to be solved. The motion of equinoxes existed in the ancient times also, and it was naturally supposed that some kind of solution of this difficulty must be found in old works; and if this be found, it will serve as a precedent for us to follow, for great is the value of a precedent in a question which is not purely astronomical but involved important religious issues. The ancient Vedic Books were therefore searched and it was found that corresponding to the different positions of the equinoxes, the Nakshatra Series began with different Nakshatras; and that the months which corresponded with the seasons e.g. Vasanta (spring) were also different in old days. For instance the series of Nakshatras began neither with Ashwini or with Bharani, in old times, but with the Kr̤ittikās and previous to it with Mrigashīras. While the Vasanta season is said to comprise either Chaitra and Vaishākha, or in its stead, Falguna and Chaitra. We shall discuss the full significance of these facts later on. Our object at present is simply to show how the Saṅgama and Nīrāyanam controversy directed the attention of Indian scholars to these facts; and as all engaged in this controversy had a thorough knowledge of astronomy, they did not fail to perceive the importance of these facts from a chronological and antiquarian point of view. But it took some time before the facts were correctly interpreted. Krishna shāstri Godbole, writing
on the subject of the antiquity of the Vedas, in the second and third Volumes of the Theosophist, in 1882 (subsequently published as a separate pamphlet) at first believed that when Mårgashirsha was said to be the first month of the year — AgraMåyani — it was the first vernal month and consequently referred to the time the autumnal equinox, not the vernal, was in Mrigashiras, thus carrying back the Vedic Antiquity to something like 19,000 B.C. That this was not the right way of interpreting these facts was however at the same time perceived by others. For instance, Narayan Aiyengar and Prof. Rangâchârya, in the Madras Presidency, were of opinion that these texts referred to the time when Mrigashiras (Orion) corresponded with the Vernal and not the autumnal equinox, and the former tried to explain several Vedic myths on this hypothesis, in his "Essays on Indo-Aryan Mythology". By this time I too had arrived at the same conclusion by stricter process of reasoning, and in 1892 I sent my essay entitled "Orion or Researches into the antiquity of the Vedas" to the ninth oriental congress held in that year and subsequently published it, with some modifications, in 1893.

Thus it was that Jacobi and myself, working independently arrived at the same result almost at the same time. It was not to be expected that the discovery would pass unchallenged by Vedic scholars, who had hitherto believed that the antiquity of the Vedic civilization could not be proved to be higher than
2400 B. C. But there were some whose literary studies had made them regard this limit as too low; and they welcomed our discovery. Thus Bulher, Barth and Winternitz in Europe and Bloomfield in America expressly declared that they were, in the main, satisfied with the arguments advanced in proof thereof; while Whitney (in the proceedings of the American Oriental Society for March 1894), Oldenberg (in Zeitschrift D. M. G. Bd. 49), and Thebaut writing in the Indian Antiquary (Vol. XXIV pp. 85 f) attempted to show that the theory was untenable and unsound. From time to time Jacobi replied to these adverse criticisms. But these replies as well as the other writings on the subject as scattered over different periodicals are not easily accessible to all. I have, in the following pages, therefore, endeavoured to sum up the whole controversy, thus recasting, revising, enlarging, and bringing up to date, the matter contained in my *Orion*. Our conclusions have already been generally accepted by Indian Scholars and the theory is fairly gaining ground in Europe as will be seen from Prof. Louis de la Valle‘c Poussin’s recent book *Le Vedisme*. The present attempt, will, it is hoped, make it still more acceptable inasmuch as the proofs thereof will be now exhibited in a clear light.
VEDIC CHRONOLOGY.
CHAPTER II
THE VEDIC CALENDAR.

As the method we propose to follow in this book is closely connected with the ancient Calendar, we give here in brief, the leading features thereof. Man naturally measures time by means of the yearly, monthly and daily movements of the Sun, the Moon—with her varying phases—and the fixed stars in the blue vault over his head. Modern astronomy has now most accurately ascertained the periods of these movements. We know, for instance, that the interval between two successive new moons (or two successive full moons) is 29 days, 12 hours 44 minutes and 2.37 seconds. This is called the Synodical lunar month and is the one generally used in practice. There is, however, another revolution of the moon called the Siderial lunar month, as it measures the time which elapses between two successive arrivals of the moon at the same fixed star, and this is now known to be equal to 27 days, 7 hours, 43 minutes and 11.5 seconds. In other words the Synodical lunar month is longer than the Siderial by 2 days, 5 hours, 0 minute, and 51.37 seconds. Like the moon the yearly revolution of the sun is also two-fold. The time which passes between its two successive arrival at the same fixed star is equal to 365 days, 6 hours, 9 minutes, and 9.6 seconds and is called the Siderial Solar year. But owing to a slow retrograde
motion, known as Precession of the equinoxes — which is described in the next Chapter — the Sun arrives at the equinocial or the solstitial point every year sooner by 20 minutes and 19.9 seconds than the above period. This is termed the Solstitial or the Tropical Solar Year. It consists, in consequence, only of 365 days, 5 hours, 48 minutes, 49.7 seconds. The difference appears, at first sight, to be very small. But 20 and odd minutes, accumulated for centuries, produce, as will be seen later, serious disturbances in the reckoning of time. Another motion of the Sun, which is of still greater importance to us, is his regular rising and setting, the interval between which we call a Civil Day. It is, however, found that all days are not of equal length, being longer in summer and shorter in winter. By the term "day" an astronomer therefore understands the average length of the days during a year and divides this average length in 24 equal hours. The periods of the revolutions of the sun and the moon given above are according to this average standard.

When the periods of the solar and of the lunar revolutions thus became definitely known, it was not difficult to perceive that they were incommensurable between themselves; that is, none of them was contained in the other an exact number of times. It is, therefore, impossible to frame a Calendar that will, without any the smallest correction, hold good for all times. The present Christian Calendar attempts to do this by arbitrarily settling its days and months in total disregard of the moon, and
keeping as close as possible only to the solstitial solar year by inserting leap days at certain definite intervals. But even this arrangement is not perfect, since the year, so regulated, is bound to deviate from the true tropical year by about one day in every three thousand years. The correction thus needed is no doubt very small. But it is obtained by sacrificing the moon and a Calendar which dispensed with the moon altogether is utterly useless for regulation of religious sacrifices, ceremonies and festivals most of which depend on the position of the moon in the heavens. The Calendar which was adopted in India in ancient times, and which, with some modifications and additions, is still in force is, therefore, luni-Solar in character, the days and the months being determined by the moon and the year by the sun. It was observed that the moon took about 29\frac{1}{2} days to complete her synodical revolution, while the sun returned to the same fixed star in about 366 days. But though the period of 29\frac{1}{2} days thus constituted the natural measure of a month, in practice it was necessary to make the month contain an integral number of days; and this number being fixed at 30, it was necessary to adjust this month of 30 civil days with the lunar month of 29\frac{1}{2} days. This could only be done by omitting a day in every two months, and the question naturally arose as to what that day should be, so that the two halves of each month might terminate, as closely as possible, with the full and the new moon in that month. Nor was this
the only adjustment needed. The yearly rotation of seasons depends entirely on the position of the sun in the heaven, for instance the rains commence and cease only at a definite period of time in the solar year. And as religious sacrifices were required to be performed also at the proper season, it was necessary to secure the correspondence of the lunar months with the solar year. A year was divided into twelve months. But 12 lunar months ($12 \times 29\frac{1}{2}$) made 354 days, while 12 Civil months ($12 \times 30$) amounted to 360 days only. Both of them thus fell short of the Solar year of 366 days, the former by 12 and the latter 6 days in a year; and this difference had to be adjusted by inserting additional (intercalary) days or months at the proper time. But a Calendar so regulated, cannot be expected to be permanent. In the first place the periods of the solar and the lunar revolution, on which it was based, were only rough approximations, the solar year being too long by 17 hours, 50 minutes and 50.4 seconds and the lunar month being too short by 44 minutes, 2.87 seconds according to the modern estimates given above. From time to time further corrections were, therefore, necessary, and in the case of the moon this time could not have been very long as the recurrence of the full and the new moon, which could never be mistaken, served as a proper check for the purpose. But not so with the sun. It is true that the seasons are regulated by the position of the sun in his yearly course. But this position does not recur after an absolutely fixed number of
days every year. It has a slow backward motion causing, thereby, a retrogression of the seasons which though insignificant each year, amounts to several days in the course of centuries, and it was impossible not to notice the fact of this disturbance, when it amounted to several days, though the cause of it might remain undiscovered. Another correction in the calendar was thus needed, in course of time, and the history of these corrections gives us the data necessary for ascertaining the antiquity of the Vedic civilization. This history cannot be ascertained from the modern Indian astronomical Siddhântâs, which are not only silent on this subject but introduce many new features in the Calendar. For our purpose we must turn to works which are admittedly older than these Siddhântâs, and these works we shall examine here in brief, referring the reader, for further details to the first part of S. B. Diksit's excellent book on the "History of Indian Astronomy" previously referred to.

The oldest work on the Vedic Calendar, that we now possess, is a small tract, called the "Vedânga Jyotishâ" in two recensions, one belonging to the Rig.–and the other to the Yajur-Veda. Its preservation is due to the fact that it is included amongst the six appendices to the Veda (Vedângas), which along with the Vedic works are learnt by heart by our priests. The tract was known to Sir William Jones, Colebrooke, Davis, Bentley, and other Scholars of the time and its text was published so early as 1834 by Captain Jervis at the
end of his "Indian Metrology". But neither these scholars nor Weber, who published the text again in 1862, was able to interpret more than a few verses therein and in consequence the important astronomical statements embodied in these verses did not receive the recognition they deserved. Whitney, for instance, considered that the tract was "filled with unintelligible rubbish" and "left us quite in lurch as regards the valuable information" about the nature of adjustments resorted to in the Vedic Calendar to make the lunar and the solar year correspond with each other. But thanks to the labours of more recent workers in the field—especially of S. B. Diksit, Barhaspatya (Lala Chottelal) and Pandit Sudhākar Dwivedi,—the difficulties of interpretation have been well nigh completely overcome, and we are now in a position to thoroughly grasp the scheme of the Vedic Calendar set forth in this ancient book. In fact Diksit has already given an outline of the scheme in his above mentioned work on the History of Indian Astronomy. It will be seen therefrom that the Vedāṅga Jyotisha starts with the data that in a period of five solar years, that is, in $366 \times 5$ or 1830 civil days the sun makes five complete revolutions of the Zodiac and that in the same time there are 62 lunar (Synodical) and 67 lunar (Siderial) months. This makes the duration of the Synodical lunar month equal to $29\frac{1}{2}$ days and that of the Siderial lunar month equal to $27\frac{3}{4}$ days. The quinquennial concurrence of the lunar and the solar time here
assumed is only approximately true, not rigidly correct; and the daily motions of the sun and the moon, on which the calculations are based, are all mean or average motions, being regarded as constant and not, as is actually the case, varying each day. But this has enabled the 'Vedânga Jyotisha' to frame such rough and ready practical rules, as could be easily worked out by a Vedic priest, and having a knowledge of elementary arithmetic but unacquainted with astronomy, for determining the requisite age (tithi) of the moon and the place (Nakshatra) both of the moon and the sun on a particular day in the period (Yuga) of five years. We might even say that this is the main object of the book and that it does not pretend to be a treatise on astronomy as it was then known. It introduces at regular intervals, two intercalary lunar months, one in the midst and one at the end of a Yuga of five years and ordains that every 62nd lunar day (tithi) should be omitted in order to make the different reckonings of time—Sāvana (Sacrificial or civil), Chandra (lunar), Nakshatra (Siderial) and Soura (Solar)—correspond with one another. It is expressly stated that the winter solstice in those days occurred when the sun, the moon and the asterism of Dhanisthâ were together; and this Nakshatra is therefore taken as the first point of the celestial sphere which is evidently sidereal and not, as supposed by Bentley, tropical in character. Starting from this first point the zodiac is divided into 27 equal parts each named after the principal Nakshatra
conatined therein. But to exactly state the mean positions of the sun and the moon in these divisional Nakshatras it was necessary to sub-divide; and consequently we find each of the above divisional Nakshatra further divided into 124 parts to define the position of the moon on each day of the Yuga of 5 years. The author of the 'Vedāṅga Jyotisha,' whosoever he may be, had no knowledge of the gradual retrograde motion of the solstices or the equinoxes. He, therefore, takes the seasons as fixed and gives rules for finding out when each of them commenced and ended. Thus winter or the Śrishira season commenced with the winter solstice in Dhanishtā and was followed by Vasanta (spring) and Grishma (summer); the last ending with the sun at the summer solstice; while the other three seasons, viz. Varsha (rains), Sharad (autumn) and Hemant (cold) were comprised in the southern passage of the sun, that is, from the summer to the winter solstice. Considerable skill and ingenuity is shown in reducing the arithmetical work to a minimum in order to make the rules as simple as possible, and especially in devising such a conventional serial arrangement of the 27 Nakshatras that the numerical order of the Nakshatra in this series may indicate the exact yearly position of the sun in Amshas (sub-divisions) of that Nakshatra at the end of each lunar fortnight. But we need not go into these details. Suffice it to say that the word rāshi, which occurs in this book, and which was formerly believed by some scholars to-
denote a zodiacal sign and betraying thereby a foreign influence, is now found to be used not in that sense at all, but only in the sense of "number" or "quantity" in general; and consequently all conjectures about the date of the book based upon this misconception must be set aside as groundless.

Such, in brief, is the scheme of the Vedic Calendar disclosed by the oldest tract on the subject. But as the astronomical elements on which it was built up were only approximately true and further approximations were accepted to simplify the rules, it was not to be expected that the scheme would remain in force for more than two or three generations without any further modifications or corrections; and as pointed out by S. B. Diksit, we do find such modifications introduced in later times. For instance, we find a new 12 years' cycle of Jupiter introduced at about the same time, doubtlessly to secure a still greater coincidence of the lunar with the solar time than a five years cycle would do; and in the Pitāmaha Siddhānta, as epitomised by Varaha Mihira in his Pancha-Siddhāntika, rules for omitting a tithi (tithi-Kshaya) or introducing an intercalary month are given in a slightly modified and more correct manner. But we are not here concerned with these later developments of the Vedic Calendar. We have to see what kind of Calendar was used in the time of the Brāhmaṇas and the Vedic Sanhitās; and for this purpose we may well make the "Vedāṅga"
"Jyotisha" as our starting point and see what elements of the system contained therein are found in the older Vedic Works.

This work has been done by S. B. Diksit in the first part of his work on the history of Indian astronomy, referred to above. He has shown that in the Brähmaṇa period of Vedic literature the nature of the Calendar was substantially the same, as we find it in the "Vedāṅga Jyotisha". Thus the list of Nakṣatras given in the Taittiriya Sanhitā (4.4.10), Taittiriya Brāhmaṇa (1.5.1.; 3.1.1-2.; and 3.4.4-5.) and even in the Atharva Veda Sanhitā (19.7) is the same as in the 'Vedāṅga Jyotisha,' with this difference, however, that whereas Dhanisthā is the first in the 'Vedāṅga Jyotisha,' the series in the Brāhmaṇa and the Sanhitās always begins with the Kṛttikās. (INCOMPLETE.)
SYNOPSIS
OF
VEDIC CHRONOLOGY.
(PRELIMINARY SKETCH.)

CHAPTERS
(I to IX)
with Appendixes.
VEDIC CHRONOLOGY.
CHAPTER I.
INTRODUCTION.

1. Importance of the subject.
2. Hindu view — Eternal.
   Shastric view — Yugarambha.
4. Astronomical —
   (a) Colebrooke, Bentley, Hastings, Deivis, Jones.
   (b) Biot (Journale des Savounts).
   (c) Weber, Whitney, Max Muller.
   (d) Jacobi, Tilak, Oldenburg, Thebaut (Grandness), Whitney, Barth, Bulher (Indian Antiquary), Bloomfield.
   (e) Indian Astronomers — Bapudev Shastri, Chhatre, Raghnath, Modak, Lele, Ketkar, S. B. Diksit, Rangacharya, Narayan Iyengar, Tilak, Bombay Calendar Conference, Pandit Sudhakar, Krishna Shastri Godbole etc.

(Captain Jervis published Lagodha Jyotisha in his "Indian Metrology" in 1834.)
Asiatic Researches started 1793 (vol. of 1798 astronomy hints only—page 404.)

Bailey; 1787—"Taite'de l'astronomie Indieane et Orientale."

Colebrooke; Davies. Bentley, 1823. Colebrooke's reply to Bentley, 1826.

CHAPTER II
MEASUREMENT OF TIME
(VEDIC CALENDAR)
(ASTRONOMICAL)

General astronomical discussion regarding the measurement of time. Day, night, month, seasons, year, eras, cycles, Kali, Precession of the equinoxes, Motions of the Earth—yearly and daily, the Sun, the Moon etc. Vedic Calendar published by Captain Jervis at the end of his "Indian Metrology" 1834. Weber 1862, Thibaut 1877, Godbole 1882, Diksit 1896, Barhaspatya 1906, Sudhakar 1907.

Detailed explanation of the consequences of the precession of equinoxes and the Nakshatra system. Equating the lunar and the solar year:

\[
\begin{array}{c|c|c|c}
D. & H. & M. & S. \\
Lunar Month (Siderial) & 27 & 7 & 43 \quad \text{II}.5 \\
Lunar Month (Siderial, from New Moon to New Moon) & 29 & 12 & 44 \quad 2.87 \\
& & & = 29.530589 \text{ days}. \\
\text{Solar year (Siderial) } & 365 & 6 & 9 \quad 9.6 \\
\text{(Tropical) } & 365 & 5 & 48 \quad 49.7 \\
\text{The difference } & 0 & 0 & 20 \quad 19.9 \\
\end{array}
\]
The annual retreat
of the equinoxes = 365 - 6 - 9 - 9.6

Time taken by the
sun to describe this
arc of the ecliptic = 20 - 19.9

Solar Siderial year = 365
Lunar Synodical year 354 - 8 - 48 - 34.44

The difference = 10 - 21 - 20 - 35.16
<table>
<thead>
<tr>
<th>Name of the Book.</th>
<th>Com. of Uttarāyāna (Winter Solstice)</th>
<th>Nakṣatra of Winter Solstice</th>
<th>Com. of Daśāṅgīyāna (Summer Solstice)</th>
<th>Nakṣatra of Summer Solstice</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Varāhamihira.</td>
<td></td>
<td>उत्तराराद्धा (अर्ध)</td>
<td></td>
<td>पुनर्विषु</td>
<td>(Mentions older posi) V. E. at the end of रेवति.</td>
</tr>
<tr>
<td>2 Vedāṅga Jyotiṣa Verse 5.</td>
<td>माष शुक्ल १ (अमान्त मास)</td>
<td>अविष्ठार्थम OR वचिष्ठा.</td>
<td></td>
<td>आश्भवकषीर्य</td>
<td>V. E. in 10 भरणी</td>
</tr>
<tr>
<td>3 Shankhyana Brāhma. 19-2, 3 and श्रील 13.19.1</td>
<td>माष व. १० (पोखिमान्त मास) that is माष शु.</td>
<td>″</td>
<td>″</td>
<td>″</td>
<td>See Weber p. 345 note 4. &amp; p. 353.</td>
</tr>
<tr>
<td>4 Garga</td>
<td>माष शुक्ल १</td>
<td>अवििार्थम</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7 श्रील</td>
<td>माष शु. १५</td>
<td>वनिष्ठार्थ</td>
<td>माषार्थम</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8 मैत्रीपणिनिदू 6.14</td>
<td>″</td>
<td>″</td>
<td>″</td>
<td>″</td>
<td>See Aiyer's V. Era</td>
</tr>
</tbody>
</table>
CHAPTER III
THE YEAR BEGINNINGS.

1 According to seasons.
2 According to solstices.
3 Devayāṇa and Pitriyāṇa — Description of—Shat. Brah.
4 Sacrificial.

CHAPTER IV
VEDANGA JYOTISHA.

1 Equinox in Revati —
   Intermediate stage in M.B.
2 Winter Solstice in ब्रह्म.
3 Winter Solstice in बलिष्ठा.

Authorities—Vedāṅga Jyotisha, Parashara, Vasistha, Garga, Mahabharata, Baudhayana, Varaha Mihira, Sushruta, Maitrayani Upanishad (older).

( VIDE: TABLE No. I )
CHAPTER V
THE KRITTIKAS

1. Krittikas head the Series मुख्यक्रमान्तः.

2. Devanakshatras begin with Krittikas.


7. विशाखा- चैत्रमौ. Other nations also reckoned with Kritt. in the east. Alberum Hermes African note. Chinese.


मघातु सप्तसंख्या पाससं दक्षिणायने (दानं तुर्वां)
अवन मघा में Atharva Veda; M.B. अनु. ८८.१२.

Vasistha II.40.

माघी च पौर्णिमासीयं &c. in M.B. अष्टमेव ८५.६, p.167.
CHAPTER VI
MRIGASHIRAS.

(1) आप्रहायणी, (2) फालुनी पौर्णिमासी, (3) माहपद, rainy season —आद्वकाल Manu 3.259, Vassa of Jains and प्रवणि Per. आषाढ़ रामायण, (3) Parsi Calendar, (5) Mula, Jyestha. (Weber's error).

Prajapati running over to Rohini.

Other confirmatory evidence:—

1 Chaturmasya. 2 Dhruva Polar star. 3 शिष्यमुख्ययावग—Ketkar. 4 Names of planets मधामू etc. Bentley.
5 आषाढ़ राष्ट्रीय month, 6 Ram. Nakshatras. 7 रोहिण शंकाभेद
8 Chaldean Inscriptions.

(12) पुष्य पूर्ण. Ram. Nakshatras.

Gopath Br. (I. 19) मुख्यमूर्त कुष्ठ पूर्ण
Shankhyayan (5'1) " "
Taitt. Br. 1.1.2.8 " "
Shata patha 6.2.2.18 " "

__________________________
Simply कालुनी पौर्णिमासी मुख with distinguishing between उत्तरे and पूर्वे

Taitt. Sanhi. VII. 4.8 मुखसंवतस्त्रय.
Tandya Br. V. 9.
Shatap. Br. VI. 2. 2. 18
Kathak. Sam. 8. 1 अत्तूनामुखे.
CHAPTER VII
VEDIC TEXTS

1. Marriage of Surya Sāvitri (द्वादश ज्वलं)
2. पर्जीन्युद्ध महिषं
3. भानवतो शोधितारं
4. Vrishākapi hymns.
5. Weber's view that N. were unknown in Vedic times. फल्युनी, अश्वाचिक names.
6. Dhruva Star.

अरुणसय इमे बाणा: नेमे बाणा शिवांशिन: ॥
कृतसति मम गाँधाणि माथमसे गवाभिमि ॥
भीमसर्वे १२०.६४ 
पौष
मनेर्कह पांडवानु सर्वानु भारद्वाज ग्रहितात्। 
शिखिरे कंपमाना वै कुशागाव इव अभि ॥
ह्रूणपर्व १५५.६-७ व्रष्ण
ग्रहनेनासवधानां। नरानामलमयेश्वरं।
कृष्णि स्वादति मांसानि। माथमसे गव। इव ॥
शान् १३९.८८

तैषी अमा । तैषी पौण्यि। ॥
माथी अमा। माथी पौण्यि। ॥
फाल्युनी अमा। फाल्युनी पौण्यि। ॥

and so on.
CHAPTER VIII.

TRADITIONS AND MYTHOLOGY.

1. Orion Tradition.
2. Prajapati and his daughter.
3. Vritra and Namuchi.
4. The Moon and Rohini.
5. Krittikas M. B.

CHAPTER IX.

1. Continuous change and withdrawal; precession of seasons.
2. The period beyond all this: A Aditi period.
4. Different periods.
5. Conclusion.
APPENDICES.

I Chaldea and India.

II (A note on मधासु गावो हन्वते.)

माधमासे कवादिव Mahā Bhārata (भैरवं Ad. 120. V.64 p. 356; and शांतिपर्व Ad 139. V. 88, p. 333):

अवृद्धिः इति राजा: नेमे राजा: दिखविन:।
कुङ्कुमाति मम गामानि माधमासे कवादिव II

(भैरवं-पर्व)

गुहलेहाराक्ष्यहानं नराशायमल्यमेंवसं।
कुङ्कुमाति मांसानि माधमासे गवा इव II

(शांति-पर्व)

This shows that in मधासु गावो हन्वते (Rig-Veda) we must understand मधा to mean माधी पौर्णिमा or lunar position in मधा and not solar. The same conclusion follows firstly because marriages are not celebrated when the sun is in मधा, for then the moon to be full must be in चावन and so the month would be भावन, and no marriages are celebrated in भावन. Secondly फाल्गुन is a month of marriage; but if we interpret फाल्गुनीययुः च उपत्ते to mean a solar नक्षत्र the moon to be full must be in भावन and the month will be भावन which again is not a marriage.
month. Thirdly, as it is a marriage between शोभ (masculine) and सूर्या (feminine) we must take it to refer to the full moon night; when the moon is the brightest and the sun invisible—hence सूर्या as feminine.

If the passage be so interpreted, as it must be, for reasons given above, then it confirms the statement फल्गुनी पौष्पपिपासी संक्तसरस्य प्रथमा राशि: in the Brahmanas.

Two interpretations possible:—(1) सूर्य-नक्षत्र or (2) चंद्र-नक्षत्र.

I सूर्य-नक्षत्र—so that Surya is in मधा and फल्गुनी successively.

Pros.—(a) If we take भाद्रपद क्रम 30, then the sun and the moon are together.

(b) The fortnight preceding is Pitri-paksha when the sun is at the end of Maghā or the beginning of Purvā फल्गुनी.

(c) The condition that फल्गुनी is a विवाहनक्षत्र is satisfied.

(d) द्वादश शहर in मंदूक सूक्त corroborate.

(e) पर्जन्वृद्ध महिंष is satisfied (Rig. 9.113.3.)

(f) फल्गु = नक्षत्र because figs were ripe when सूर्ये in फल्गुनी.

(g) Sāvitri श्रत commences in Rainy season.
II. In the case of चंद्र-नक्षत्र we take (a) माघी पौर्णिमा
and (b) कालुनी-पौर्णिमा.

Pro:—(a) कालुनी पौर्णिमासी संवत्सरस्य प्रथमा रात्रि:।
(b) मधासु गायो हन्यते। कलुनीशु च उक्तेत। माघमासे
गवाभव। M.B.

c) कलुनी is a विवाहनक्षत्र (lunar.)

d) As it is a marriage of चंद्र, the moon must
be a full moon and Surya dark or invisible,
shrouded or veiled.

Cons:—(a) Feast is not properly explained. माघ
is not a festive month.
(b) the Sun and the Moon are not together on
a पौर्णिमा day.

(INCOMPLETE.)
Points of Difference between Greek and Hindu Astronomy.

1. The System itself—Greek partly heliocentric, Hindu entirely geocentric.
2. Names of Planets different in each.
3. Periodical revolutions and distances of the planets different.
4. Hindus use signs, Greek chords.
5. Hindu calculating method algebraical, Greek geometrical.
6. शीघ्र व मंदःकम् Epicycles, motions of apsides.
7. Week days.
8. Zodiacal Signs. Naksatras
9. Vikshepaksas = Inclination to the ecliptic.

Similarities between Vedanga Jyotisha and Surya Siddhanta.

1. Yuga—At beginning सूर्य and चंद्र are together in Vedang Jyotisha and all planets in सूर्यसिद्धान्त.
2. The four time-measures सावन, शैव, चंद्र and नाष्ट्र.
3. Calculations for the whole yuga.
NOTE
ON THE INTERPRETATION OF
THE
VEDANGA JYOTISHA.
(CRITICISM AND SUGGESTIONS.)
MANDALAY; 15-5-14. By B. G. TILAK.
NOTE
ON THE INTERPRETATION OF
THE VEDANGA JYOTISHA.
(CRITICISM AND SUGGESTIONS.)

Small as it is, the Vedanga Jyotisha is the oldest tract on Hindu Astronomy, and its importance, from a historical point of view, especially of the position of solstices recorded therein, did not escape the attention of early Sanskrit scholars, like Colebrooke, Sir William Jones and others. The tract appears in two recensions,—the Rik. or the one belonging to the Rig-veda, and the other to the Yajurveda. Of these the first was published by Captain Jervis, at the end of his Indian Metrology, so far back as 1834, and the late Prof. Weber brought out in 1872 a critical edition of both the recensions, with various readings collected from the manuscripts then available to him. But the corrupt state of the text, as well as the enigmatical nature of the rules contained therein, made the work—except a few simple verses—quite unintelligible; and some scholars even doubted the antiquity of the astronomical statements embodied in it. Dr. Thibaut, in his essay on the Vedanga, which appeared in the Journal of the Asiatic Society of Bengal in 1877, was the first to decipher a few of the difficult verses, and among others who followed him, the name of the late Shankar
Balkrishna Diksit deserves to be specially mentioned. Mr. Diksit, in his important work on *The History of Indian Astronomy*, written in Marathi and published at Poona in 1896, has not only explained more verses of the Vedanga than any of his predecessors, but has given us for the first time a lucid account of the principles and the methods of calculation adopted in the Vedanga, together with an outline sketch of the quinquennial calendar based upon it. Whitney's reproach that the Vedanga was "filled with unintelligible rubbish," was thus proved to be entirely groundless. But still about 12 verses remained unexplained; and the credit of explaining these for the first time, undoubtedly belongs to Lala Chhote Lal (nom de plume Bárhaspatyah), an executive engineer in N. W. P., who published his valuable essays on this subject, first in the *Hindustan Review* in 1906, and subsequently, with certain additions and corrections in a book form in 1907. But in a task beset with so many difficulties, no finality, as Bárhaspatyah himself acknowledges, was to be expected; and we, accordingly, find Mahâmahopâdhyâya Sudhâkar Dwivedi, the well known learned Pandit of Benares, endeavouring to improve upon Bárhaspatyah's defective explanations, in what he calls his own (Sudhâkar) Bhâshya on the Vedanga, published in a pamphlet form, along with Somakara's Bhâshya, in 1908, at the Medical Hall Press, in Benares. Bárhaspatyah, in reply, has attempted to defend his own interpretation of the text, and the controversy has
unfortunately assumed a somewhat personal aspect; in N. W. P. We are not, however, concerned with this aspect of the question. It is true that Pandit Sudhākar has not succeeded in giving us a more rational or simple explanation of the Vedāṅga verses, except mostly by making ingenious but radical changes in the traditional text. But still his work has a value of its own, especially in drawing our attention to the weak points in Bārhaspatya’s work; and subsequent critics have to see whether these defects cannot partially, if not wholly, be removed without any violent amendment of the text. This is what the present note attempts to do, especially in the case of the nine verses mentioned in the preface to the Sudhākar Bhāshya, as those wherein the Pandit considers Bārhaspatya’s explanations as seriously defective. Not that there are no more points of difference between them. But these being of minor importance are not discussed in this note. To avoid constant repetition of full names I have, in the sequel, used the letters B and S to denote Bārhaspatya and Sudhākar or their works mentioned above, while the Rīk and the Yajus recensions of the Vedāṅga are indicated by the letters R and Y respectively.

The astronomical elements on which the Vedāṅga bases its calculations are only approximately true; and we shall see later on how in the case of the moon, at least, a correction was provided for, when the error became too obvious to be neglected. We might,
however, generally say that the Vedāṅga lays down rules to calculate first the fortnightly, and then from it the daily position of the sun and the moon from these approximate mean data. The positions to be thus determined are two-fold. First we determine the position of the sun and the moon, in space, that is, amongst the celestial Nakshatras (a) at the end of each parvan and (b) tithi. But a parvan or a tithi hardly ends with a Nakshatra. We have, therefore, secondly to ascertain the time when the sun or the moon first enters into (a) the parvan-, or (b) the tithi-nakshatra. In other words we have to ascertain not only the Nakshatra at the end of a parvan or tithi, but also the time elapsed between the entry of the sun or the moon into that Nakshatra and the end of the required parvan or tithi. The first is done by ascertaining the Nakshatra amshas and the second by determining the daily Kaśī in the case of the Moon, and in the Sun's case the daily amshas or the hour angle amshas as B calls them. The Vedāṅga provides rules for all these purposes. Of these the first and the principal one directs us to find the Sun and the Moon's parvan position, or their Nakshatra amshas, at the end of any given parvan, and is contained in the following verses:—

भाषा: स्त्राणैः कार्यः पक्षः द्वादशकोट्टरः ||
एकादशगुणस्याऽऽनुसरे सुवेशः वैदिक वदि || R-10; Y-15.

In the place of गुणस्याऽऽ द B reads ṛगुणस्याऽऽ; and adopting this reading B has on the whole correctly interpreted
the first half of the verse, though his अनुवर्त is a little strained; while as regards the second half, his interpretation is both laboured and defective. S tries to improve by changing स्योन: into केन्द्रोऽ, अण्टका: into इण्टका: and taking द्वादशक to mean a year of twelve months. But with all these changes, the verse does not give us the parvan amshas of both the sun and the moon, but only of the latter, while the reading केन्द्रोऽ: renders the words इण्टवा यदि at the end of the verse entirely superfluous. S's interpretation cannot, therefore, be considered as satisfactory; at any rate it is not an improvement on B's. Both have, in my opinion, unfortunately missed the true meaning of जन in this verse, and that is the main cause of the laboured construction adopted by one and the bold emendations proposed by the other. जन does not here signify 'minus' as B takes it, nor is it necessary to be altered into केन्द्रोऽ: as S has done. जन literally means 'less' or 'remaining'; and when we take out a number or its complete multiples from another what remains may very well be called जन, not absolutely but relatively to the first number, because it must always be less than the latter. Thus, in the present case, जन means the remainder after one or more dozens (द्वादशक) are taken out of a given number of Pakshas; and in this sense it exactly corresponds with the English word 'odd', in the phrase 'a thousand and odd'. The Vedânga divides a given number of Pakshas into so many dozens and so
many odd, e.g., 93 = 84 + 9 = 7 dozens (द्वादशकं:) and 9 odd (ञनः); and then calculates Nakshatra amshas first for the dozens and then for the remaining, or the अष्ट्-pakshas as it calls them. One operation is thus split into two subordinate parts in order to cut short the labour of arithmetical calculation. For, as the amshas at the end of a dozen pakshas are found to be always equal to 8 or the corresponding multiples of that number, (if we omit the complete Nakshatras, that is, the multiples of 124 amshas from the total), it is obviously easier to get the amshas at the end of any dozen pakshas multiplying the dozens by 8, than by multiplying by 11 the total number represented by the said dozens. But in this case it is necessary to say how the amshas for the pakshas in excess of a dozen, i.e., the अष्ट्-pakshas are to be counted; otherwise the rule would remain incomplete, that is, inapplicable to any given number of pakshas in general. Taking all these things into consideration and changing पक्षादशं into पक्षादशं, I would, therefore, read the verse as follows:—

भाषा: स्थूलशिक्षाकार: कायां: पक्षादशकोदृता: ।
एकादशमुण्डोन: सुलोकस्थं चेतना यदि ।

and without any strained अन्वया translate:—“the (parvan) Nakshatra amshas should be made by (that is, counted) groups of eight, (each) arising out of (each) dozen (द्वादशक) pakshas, and by (adding to it) the eleven-fold of the excess remaining (ञन); and again
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half (the nakshatra-amshas i.e. 62) in the case of the bright (paksha), if the moon's amshas therein are required." The first three lines of the verse give a general rule, which is applicable both to the Sun and the Moon, while the last line states, by way of an exception, the change necessary to be made therein if the Moon's amshas, at the end of a bright fortnight, are alone required. For example, suppose, we have to find the Nakshatra-amshas at the end of 93rd parvan. Here 93 = 7 dozens and 9 odd (guna). Therefore the amshas are equal to $7 \times 8 + 9 \times 11 = 56 + 99 = 155$, or, deducting 124 therefrom, 31 only. These are the parvan-amshas in general. But 93rd is a bright paksha; and if the Moon's amshas alone are required, we must add 62 to the above result; for then the Moon is in opposition to the Sun, that is, 43½ Nakshatras apart, or if we compare the Nakshatra-amshas only, she has 62 more amshas than the Sun. A complete table of the parvan-amshas for all the 124 pakshas of a Yuga can thus be very simply constructed by the short and simple rule contained in this single verse. It is unnecessary to give here the reasons on which this elegant rule is based; for they are fully explained both by B and S, and also by Mr. Diksit before them. There is no difference of opinion as to the main object of the rule. What is the meaning of अन, and how to interpret the verse so as to give us a plain rule are the only points in dispute; and the course I have indicated, I believe, be found less objectionable than any
hitherto proposed. The traditional text is only slightly altered, while the rule is made not only complete but also as comprehensive as possible without straining the ordinary meaning or the construction of the words in the text.

The parvan amshas of the Sun and the Moon being thus determined, the Vedanga makes them the basis of calculations for finding the rest of the lunar and solar positions mentioned above. Thus the next verse in the Rik recension tells us how to calculate, from the parvan-amshas so ascertained, the time in kalas of the Moon's entry into the last parvan Nakshatras. The method followed is the same as in the last verse. The required time in kalas at the end of a dozen pakshas is first determined and then we are directed to make certain additions thereto in order to find the required kalas at the end of any remaining odd or unna-paksha. The verse is as follows:

काया: भांशाष्टकस्याने कर्षा एकात्रविशिष्टि:।
उनस्याने द्विसत्वीयब्रह्मवेद्यन्तमिति:॥ र. ११; य. १९॥

The word भांशाष्टकः clearly refers to the process of calculating the बलमश्च as given in the previous verse; and, thus interpreted, the first half of the verse plainly directs us "to substitute ऋ kalaś in the place of a group of eight Nakshatra-amshas." The word कर्षा, further, shows that we are here dealing with the case of the Moon; and since, as stated in the previous verse, a group of eight Nakshatra-amshas, is to be taken for each,
dozen pakshas, the first half of the verse practically lays
down the rule that “to find the time (in kalās) of the
Moon’s entry into the last parvan Nakshatra at the end
of a dozen pakshas, one has only to substitute 19 kalās,
in the place of every group of eight Nakshatra-amshas
which correspond to the required dozen pakshas.” B
has rightly interpreted this part of the verse, after
making the necessary correction of altering मासायाणका
into मांसायाणका. He has also shown that the rule is
derived from or based on a sound mathematical reason-
ing. At the rate of 1809 Nakshatras in 124 pakshas of
a Yuga the Moon traverses \(175\frac{6}{11}\) Nakshatras in
a dozen paksha; and since she takes one day and seven
kalās to move through a Nakshatra (R. 18; Y. 39), it
will be found that to complete 175 Nakshatras she
requires 177 days and 19 kalās of the 178th day. In
other words the time of the Moon’s entry into the
176th or the last parvan Nakshatra at the end of a
dozen pakshas is 19 kalās of the corresponding parvan
day; and similarly if the number of pakshas be two
dozen, the number of kalās would be \(2 \times 19\) or 38,
and so on. But having once missed the true meaning
of जन B has unfortunately failed to follow up this
course in interpreting the second half of the present
verse; and S is led to radically alter the whole verse
to suit his guess about its contents. He cannot make
anything out of the verse except by artificially interpret-
ing अष्टका to mean 4, and changing जनसंभिता: into इन-
the word in the latter case being taken to mean the number 12. When one must resort to such artifices to make a verse intelligible, one may, I think, very well suspect that he has missed its right meaning. The rule obtained by after so many changes, does not again give us the time of the Moon's entry into the last parvan Nakshatra; but only enables us to convert the Nakshatra-amshas into kalas thereof, which is quite besides the purpose in view. In my opinion the second half of the verse is supplementary to the first; and that after stating the rule for converting bhamsas into kalas at the end of a dozen pakshas, the Vedanga proceeds to deal with the case of pakshas in excess thereof—the pakshas as it calls them. How the second half of the verse should be interpreted according to this view, will be seen from what follows:

In the Rik. recension this second half of the verse is thus given:

and I think it is the correct reading. The Yajus text has and, adopting it, both and consider as a Numeral adjective qualifying or : understood, though eventually they differ widely in their interpretations. At the first sight this seems to be the proper construction of the verse; for, according to Sanskrit grammar, numerals like are declined in the singular number, even when they are in apposi-
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...tion to a plural noun. The same grammar, however, teaches us that these numerals are used also to denote independent numbers, and that the plural form is not only correct, but necessary when the speaker wishes to indicate "many or several groups" thereof. For instance, if we want to denote "several groups of twenty", विषयं: is the proper form to be used. Without supplying कळा: or कामा: as understood, I would, therefore, take त्रिपति: as an independent numeral in accusative plural, governed by the verb ज्ञातु: and qualified by the adjective अनन्यं: used here not in the nominative, but in the accusative case. This construction is at once simple and natural. It is necessary further to note that in contrast with स्थाने कामा: in the first half of the verse, we have, in the second स्थाने ज्ञातु: evidently meaning that here त्रिपति:s are not to be substituted for (कामा:), but added to something else. Thus the line means that "one should raise up, that is, increase (the figure) in the place of ज्ञ: by (as many) seventy-two's (as are) equal in measure to the ज्ञ: (number)." For example, suppose we wish to ascertain the time (in Kalās) of the Moon's entry into the last Nakshatra at the end of 18 pakshas. Here 18 is equal to one dozen plus six (ज्ञ: pakshas. The Kalās at the end of one dozen pakshas, are equal to 19 according to first half of the verse. What remains is to find out the number of kalās, required to be added to the...
above result on account of the six additional (अन्य) pakshas. For this purpose the Vedânga now directs us to raise up the जन Number, here equal to 6, by as many 72's as are equal to the जन Number itself, that is by $6 \times 72$ in the present case. We thus get $6 + 6 \times 72$. But $6 + 6 \times 72 = 6 (1 + 72) = 6 \times 73$; or generally $n + 72n = 73n$. Therefore the rule practically comes to mean that the अन्य number should be multiplied by 73. The result, be it remembered, does not give us the number of the required kalas. It is only the first, or the preliminary step in the calculation required to be made for that purpose. The Moon traverses 1809 Nakshatras in 124 pakshas, that is, $14\frac{73}{124}$ Nakshatras during one paksha. Or one may say that over and above $14$ complete Nakshatras she traverses a fraction of a Nakshatra equal to 73 amshas per paksha. Therefore, in a given number of अन्य pakshas, this fractional part of a Nakshatra or the मधेय of the Moon, as it may be fitly termed, would, in amshas, be equal to 73 multiplied by the said number of the pakshas. This is exactly the rule contained in the half verse under consideration. The next step is to derive the Moon's required kalas from this result. But before we pass on to it, it is necessary to examine a little more closely, the nature of the मधेय thus ascertained.

The moon passes from one Nakshatra into another in succession. Therefore the time of her entry into a particular Nakshatra is the same as the time of her-
arrival at the end of the previous Nakshatra. Thus, in a single paksha the Moon traverses $14$ complete Nakshatras and a fraction of the $15$th, equal to $73$ amshas; and so the time of her entry into the last or in this case the $15$th Nakshatra, is the same as that of her arrival at the end of the previous $14$ Nakshatras. But though the fractional part in excess of $14$ Nakshatras may thus be neglected in this case, yet in the case of the second and the subsequent pakshas it must be taken into account, for the accumulated fraction then gives rise to additional complete Nakshatras. For example, the Moon traverses $2 \left(14, \frac{73}{124}\right)$ or $28$ Nakshatras and $146$ amshas in two pakshas. Here $146$ amshas are equal to $1$ Nakshatra and $22$ amshas. Therefore the Nakshatras completely traversed by the Moon during two pakshas is not $2 \times 14$ or $28$, but $29$. So the time of her entry into the last Nakshatra at the end of the second paksha is equal to the time of her arrival at the end of $29$th and not the $28$th Nakshatra; and so on in the case of succeeding pakshas. In short, we must multiply $73$ by the number of pakshas, see how many complete Nakshatras are contained therein and add the latter to the corresponding multiple of $14$ to find out the complete Nakshatras traversed by the Moon at the end of a given number of pakshas. This is the main object for which the मूः is calculated. Or we may obtain the same result in a different way. $73$ is equal to $62 + 11$; and $62$ amshas are equal to half a Nakshatra. Therefore we may say that in addition to
14 Nakshatras the Moon traverses $\frac{1}{2}$ Nakshatra + $11$ amshas in the first paksha. For the second paksha this excess will be doubled, that is, it will be equal to $1$ Nakshatra + 22 amshas; for the third tripled or $1\frac{1}{2}$ Nakshatra + 33 amshas and so on. These results are embodied in the following table*. As the number of amsha-pakshas is always less than a dozen, the table need not be calculated for more than $11$ pakshas.

The figures in first part of column 3, that is in column 3 (a), show the number of additional Nakshatras, arising out of the भ्रेष्ठिय in each case. Thus for the first paksha the भ्रेष्ठिय does not amount to a complete Nakshatra; for the second it gives rise to one complete Nakshatra; for the fifth (omitting one half) to 2 complete Nakshatras and so on. Or, generally speaking, we may say that the number of complete Nakshatras arising out of the भ्रेष्ठिय is equal to the integral part of half the number of pakshas; e.g. for the fifth pakshas, it is equal to 2, the integral part of $2\frac{1}{2}$; and so on. There is, however, an important exception to this rule. If the amshas given in column 3 (b) exceed 62 or half a Nakshatra, these amshas, when added to half the Nakshatra in column 3 (a) may increase the number of the complete Nakshatras. For example take the 7th paksha. Here half of 7 is $3\frac{1}{2}$ and this is the figure entered in column 3(a) opposite to the 7th paksha. But the number of amshas given in column 3 (b) is 77, or half a Nakshatra plus 15 amshas. There-

* Vide Table II p. 59.
<table>
<thead>
<tr>
<th>No. of သမ ပါးအိမ်</th>
<th>The corresponding မီးဗာ in multiples of 73.</th>
<th>The same မီးဗာ in Nak- စောင် အိမ်များနှင့် အမီးများ.</th>
<th>Remarks.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>(1 \times 73 = 73)</td>
<td>(1)</td>
<td>(11)</td>
</tr>
<tr>
<td>2</td>
<td>(2 \times 73 = 146)</td>
<td>(1)</td>
<td>(22)</td>
</tr>
<tr>
<td>3</td>
<td>(3 \times 73 = 219)</td>
<td>(1\frac{1}{2})</td>
<td>(33)</td>
</tr>
<tr>
<td>4</td>
<td>(4 \times 73 = 292)</td>
<td>(2)</td>
<td>(44)</td>
</tr>
<tr>
<td>5</td>
<td>(5 \times 73 = 365)</td>
<td>(2\frac{1}{2})</td>
<td>(55)</td>
</tr>
<tr>
<td>6</td>
<td>(6 \times 73 = 438)</td>
<td>(3)</td>
<td>(66)</td>
</tr>
<tr>
<td>7</td>
<td>(7 \times 73 = 511)</td>
<td>(3\frac{1}{2})</td>
<td>(77)</td>
</tr>
<tr>
<td>8</td>
<td>(8 \times 73 = 584)</td>
<td>(4)</td>
<td>(88)</td>
</tr>
<tr>
<td>9</td>
<td>(9 \times 73 = 657)</td>
<td>(4\frac{1}{2})</td>
<td>(99)</td>
</tr>
<tr>
<td>10</td>
<td>(10 \times 73 = 730)</td>
<td>(5)</td>
<td>(110)</td>
</tr>
<tr>
<td>11</td>
<td>(11 \times 73 = 803)</td>
<td>(5\frac{1}{2})</td>
<td>(121)</td>
</tr>
</tbody>
</table>

*Note that the amshas in column 3 (b) correspond to the နီး- ပါးအိမ် only. If the total amshas at the end of a given number of pakshas be required, we must add to these the amshas at the end of the previous dozen pakshas. Thus the amshas at the end of 18 pakshas (or 1 dozen plus 6 pakshas) will be equal to 8 amshas for the dozen plus 66 amshas for the 6 နီး- ပါး- အိမ်; and so on.*
fore this half when added to the half in 3½, will make one complete Nakshatra; and the total complete Nakshatras arising out of the मान्य in this case are, therefore, not 3 but 4. Similarly in the case of the 9th and the 11th paksha the number of additional Nakshatras arising out of the मान्य is 5 and 6 respectively and not 4 and 5. So far as the योग pakshas alone are concerned these exceptional Nakshatras arise out of the मान्य in the case of the 7th, the 9th and the 11th योग paksha only. But as observed in the remark column, we have to add to the amshas in column 3 (a) the amshas at the end of the previous dozen pakshas; and then the said exceptional cases may occur oftener. For example take the 17th paksha. Here we have one dozen plus five जन pakshas, and though the amshas for five योग pakshas are 55 only, yet when 8 amshas of the previous dozen are added to it we have 83 amshas, or half a Nakshatra, and one amsha. This half of a Nakshatra when added to 2½ Nakshatras in column 3 (a), makes three complete Nakshatras in all. Therefore although the complete Nakshatras arising out of the मान्य for five pakshas is 2 (one half in 2½ being omitted), yet for 17 pakshas the number of completed Nakshatras is 3 and not 2. Briefly stated, we may say that (1) the number of complete Nakshatras, arising out of the मान्य is generally equal to the integral part of half the number of योग-pakshas. But (2) an increase in the number of complete Nakshatra may take place when the number of amshas for the योग-paksha
(at the rate of xi per paksha) either by themselves, or together with the amshas of the previous dozens (at the rate of 8 per dozen) exceed 62. This increase is generally never greater than one Nakshatra but in rare cases, e.g. in the 19th paksha, it may be equal to 2 Nakshatras. We can now see why the Vedânga has given a separate rule for calculating the moon's amsha. The figures given in column 3 (a) and 3 (b) are practically the same as would be obtained by the application of the general rule for counting the amsha's of the Moon at the end of a given paksha, laid down in the verse मम (R. 10; Y. 15) discussed in the beginning of this note.

In column 3 (b) we have successive multiples of xi, or in other words एकादशमुष्कोऽ; and half a Nakshatra, which requires to be added in the case of a bright paksha (मुक्तेश्वर etc.) will be found to be so added in the case of all uneven pakshas in column 3 (a). For the उमा-pakshas commence after a dozen and so all the uneven उमा-pakshas are bright. But there is an important difference between these two results. The verse मम (स्थः etc.) gives us only such amshas as are in excess of the completed Nakshatras; while by calculating according to the rule जनशयने-दिव्यताति: etc., we get the whole of the amsha, that is, the complete Nakshatras arising out of it, as well as the amshas in excess thereof. And as both these are required to be known for the purpose in hand, it was necessary to give a separate rule for calculating the entire amsha of the Moon.
Let us now see how the Vedāṅga derives the number of the required Kālds from this भृशा. Immediately after the above verse, the Rik recension has the following:—

श्रेष्ठी भृशायो द्विवसंवायाणंतहुद्वादशत्वानुद्वैखण्ड्म्।
भार्षेभिके चायत्ते परेर्दे ह्रावुत्तमेकः नवक्करवेत्सम्॥ R.12; Y.27.

This order of the verses is not, however, preserved in the Yajus text; and both B and S have, in consequence, been led to interpret this verse independently. In their opinion it gives us a rule for finding the number of days, (B. Lunar; S. civil) required by the Sun to traverse one complete Nakshatra; and that the word चतुर्दश means the 14th day thereof. The word चृशा in the first half of the verse literally means "having a third (चृशा)," "possessed of a third in addition" or, algebraically expressed, \( a + \frac{1}{3} a \), and not three-fourths as B interprets it. S saw the difficulty and got over it by altering it into चृशा. Both have again to interpret भृशा to mean the remainder of a day, and not of a Nakshatra (अ) as it naturally means. As for the second line S changes it radically and B thinks that ह्राई in ह्रावुत्तमेकं is the locative of ह्राई which is believed by him, means a nycthemeron in the Vedāṅga. But this meaning of ह्राई is so unnatural that without a special definition to that effect, it cannot, in my opinion, be accepted, even as a convention. Besides it is not necessary to strain the meaning in this way; and where it seems to be necessary I would adopt the reading अ instead, as Diksit and others have done in Y.31, 37 and 38. Finally the rule
obtained after using all these artifices and emendations is both incomplete and superfluous. Incomplete because it admittedly involves an error of about 16 kālās if B's, and 137/9 daily amshas if S's, interpretation be accepted. Superfluous because in another place (R. 18; Y 39) the Vedāṅga tells us that the Sun takes exactly 13 2/9 days to traverse a Nakshatra, and when we thus have the exact rule, there is no necessity of giving the same rule in an incomplete form. Both B and S have tried to answer this question in their own way. But the reasons adduced are so lame, that one is led to think, therefrom, that both B and S have put forward these interpretations, because nothing better suggested itself to them. B has even a lurking suspicion that his interpretation may be open to improvement. But if we follow the cue suggested by the order of these verses in the Rik recension, and interpret the present verse as containing the second part of the rule for finding the Moon's kāla, in continuation of the first part contained in the ne जनस्याने द्विधस्यति: etc., above discussed, we meet with no such difficulties. Taking अश्विनी to mean "one and one third" and making it qualify both मध्येष and दिवसांशभाग, I would, therefore, translate the first half of the verse thus:—"Four-thirds (14, one and one-third) of मध्येष, and of the दिवसांशभाग (will be equal to the kāla at the end) of the 14th (pāksha), the fractions (मिन्द्र) being kept aside (that is, neglected)." What is meant by मध्येष is already explained. The meaning of दिवसांशभाग, as well
as the reason of the whole rule will be seen from the following explanation.

We have shown above that at the end of a given number of āna-pakshas, the Moon will have traversed (1) complete Nakshatras equal to 14 times the number of pakshas plus (2) Nakshatras equal to the integral part of half the number of āna-pakshas, and (3) under certain condition there is a chance of having one or rarely two more additional Nakshatras. The first half of the present verse deals with the first two cases and the second half with the third of them. The Moon, according to the Vedāṅga (R. 18; Y. 39), takes one day plus 7 kāls, to do a Nakshatra; and at this rate, 14 days plus $14 \times 7 = 98$ kāls are required to traverse 14 complete Nakshatras. But since we have here to find the expired time on the last day only, we omit the completed days from the above result and take into account only the fractional 98 kāls, or the fractional parts of a day in that result. Thus, so far as the first of three above-noted cases is concerned, we may say that at the end of each of the given āna-paksha, the number of Moon’s kāls will be $= 14 \times 7$ or $98$ only. But the माशेष at the end of a paksha is $= 73$; and $73 + \frac{1}{8} \times 73$ is $= 97\frac{1}{8}$ or only a fraction less than 98. Therefore instead of beginning a second operation for finding the kāls in question, we can derive the same from the माशेष, previously ascertained, by adding its third to it. This involves an error of $\frac{3}{8}$ of a kāl per paksha; but this small fraction may be neglected for the sake of
ease and convenience. The केष्म with its third (अंशी),
or, in other words, the four-thirds of the केष्म thus repre-
sents the number of काल्दस at the end of the given जना-
pakshas, so far as the completed Nakshatras at the
rate of 14 per paksha are concerned. But out of the
केष्म there also arise other complete Nakshatras equal
to the integral part of half the number of pakshas; and
the काल्दस for these must also be computed. This is
done by taking four-thirds of the दिवसांशभाग for each of
the said Nakshatras. दिवसांशभाग with reference to the
Moon means the seven काल्दस or the fractional daily
parts in excess of a day (दिवस) required by her to move
through one complete Nakshatra. Thus, if there be one
additional Nakshatra arising out of the केष्म, the fractional
part in excess of a day would be 7 काल्दस only, and so on
in proportion; and, properly speaking, this fractional
part of a day must alone be added to the result pre-
viously obtained. But the Vedांga asks us to take four-
thirds of 7 or, omitting fractions, 9 काल्दस instead, with
a view to compensate for the error introduced in our
operation by taking 97½ for 98 in the first case.
Practically we have thus to take nine and not seven
काल्दस. Some may prefer to interpret दिवसांशभाग in itself as
meaning nine, as the Sun traverses 9 amshas per tithi.
However, since we are speaking here of the Moon, I pre-
fer to take, अंशी with दिवसांशभाग and thus make it equal
to nine. Combining these two parts of the rule, we
can easily calculate the time of the Moon's entry into
the last parvan Nakshatra at the end of any paksha, when no further additional Nakshatras arise out of the
मश्रेष्ण. Thus if the given number of pakshas be 14, we
split it into one dozen and two १ना. For the dozen we
have १५ kāls. For the two १ना the मश्रेष्ण is २ × ७३
= १४६, four-thirds of which is = १९४ (the fractional part
being omitted). In addition to this we must take four-
thirds of दिव्यसांख्य; and since half of two (१ना) is one,
there is only one additional Nakshatra, and in conse-
quence only one दिव्यसांख्य, the four-thirds of which is ९
(omitting fractions). Therefore the total number of
kāls at the end of the १४ pakshas is = १५ + १९४ + ९ =
२२२. Similarly for the १६th paksha we take १५ kāls
for the dozen and proceed for the ४ १ना-pakshas as
follows. The मश्रेष्ण for ४ १ना-pakshas is = ४ × ७३ = २९२;
and its four-thirds = ३८९. In addition to this we must
take four-thirds of the दिव्यसांख्य; or in the present
case ९ × २. Therefore the total number of kāls at
the end of the १६th paksha is= १५ + ३८९ + १८ = ४२६.
And so on for other similar pakshas.

But the matter does not end here. The case of
further extra Nakshatras arising under certain
circumstances, that is, the ३rd of the above noted
cases, is yet to be provided for; and this is done by the
second half of the verse. The traditional reading of this
half verse is:—

भूभूविके चाभिगते परेऽऽन्व द्वाबुद्मैः कवैशिवैः ॥
The last line is obviously a little corrupt. I, therefore,
read श्रावणमेक and नवकैरवेत्य for नवकैरवेत्य; or in the latter case we may also read नवकैरवेत्य, the meaning being the same in either case as श्रावणमेक has the same sense as बिद्ध to know. Thus read the verse means—“And when the next amsha amounts to half a Nakshatra or more the two (united) is said to be one, and should be counted (lit. known) by a group of nine (kālds).” A reference to the Table II, given before, will clearly show, what is meant by the rule. In the column 3 (a) of that table we have the number of Nakshatras arising out of the part and in the next part of the same column, that is, in 3 (b) we have the amshas in excess thereof. The word प्र in the verse refers to these amshas; which, as previously stated, may also be calculated by the general rule कादशगुणयोनि मुक्षेड्व एत्या. (R. 10; Y. 15). So long as these amshas are less than 62 there is no chance of their affecting the number of Nakshatras in column 3 (a) of the table, whether that number be an integer, or an integer plus one half. But such is not the case when the amshas are equal to or exceed 62. We are, therefore, told that when these amshas are equal to or exceed 62, they must be united with the previous Nakshatra number after thus blending the two into one and the kālds should be calculated at 9 per each of the complete Nakshatras so obtained. For instance let the number of pakshas be 19, or one dozen plus 7. Here we take 19 kālds for
the dozen; and proceed to calculate the kāḷās for the seven aṇās as follows:—The मन्द्रेष्य for seven aṇās is
= 7 × 73 = 517, the four thirds of which is
= 517 + 170 = 681 (omitting fractions). The number of
additional Nakshatras is \( \frac{1}{2} \times 7 = 3 \frac{1}{2} \); and according
to the general rule one would get only 3 additional
complete Nakshatras. But the amshas corresponding
to the 7th aṇā are 77, or half a Nakshatra plus 15.
Therefore, combining this half a Nakshatra with the
previous 3\( \frac{1}{2} \) we get 4 complete Nakshatras. This at
the rate of 9 kāḷās gives us 9 × 4 = 36 kāḷās. The
total number of kāḷās at the end of 19th paksha is thus
= 19 + 681 + 36 = 736; or deducting 603 kāḷās of a
complete day = 133. To state the result fully the
time of the Moon’s entry into the last parvan Nakshatra
at the end of 19 pakshas is 133 kāḷās of the parvan day.
Another example of the application of the rule is
where the amshas of the aṇā-paksha, are by themselves
less than half a Nakshatra but exceed it when combined
with the amshas at the end of the previous dozen
pakshas. For example, suppose the number of pakshas
be 17 or one dozen plus five aṇā. Here for the dozen
we take 19 kāḷās. For the five aṇā the मन्द्रेष्य is
5 × 73 = 365, the four-thirds of which is
= 365 + 121 = 486 (omitting fractions). The Nakshatras
arising out of the मन्द्रेष्य are one half of five aṇās, or 2\( \frac{1}{2} \)
only; and the amshas corresponding to five aṇā are
55 only, [See Table II column 3 (b)], One may thus
suppose that there are only two completed Nakshatras:
in this case. But the **amshas**, at the end of previous one dozen **pakshas**, are $= 8$; and $8$ added to $55$ makes $63$, or one **amsha** more than half a **Nakshatra**. Therefore adding this one half to $2\frac{1}{2}$ we get $3$ complete **Nakshatras**, which, at the rate of $9$ **kalās** per each, give us $27$ **kalās**; and the total number of **kalās** for the $17$th **paksha** are $19 + 486 + 27 = 532$. Or suppose that we require the time of the Moon's entry into the last **parvan** **Nakshatra** at the end of $92$ **pakshas**. Here $92$ is equal to $7$ dozens $+ 8$ **ūnas**. The **kalās** for $7$ dozens are $= 7 \times 19 = 133$. The **kalās** for $8$ **ūnas** is $73 \times 8 = 584$, the four-thirds of which is $584 + 194 = 778$. The extra completed **Nakshatras** will ordinarily be one half **ūna** **pakshas** or $4$. But the **amshas** for the $8$th **ūna** are $= 88$, with $8 \times 7 = 56$ for the previous dozens; and the two added together become equal to $144$ **amshas** or $1$ **Nakshatra** and $20$ **amshas**. Therefore we must here take $5$ completed **Nakshatras** and their **kalās** would be $5 \times 9 = 45$. Thus the total number of **kalās** is $= 133 + 778 + 45 = 956$, or deducting $603$, equal to $353$ only. Therefore the Moon in this case will enter the last **parvan** **Nakshatra**, after $353$ **kalās** of the **parvan** day have elapsed.

I have discussed at some length the meaning of the last two verses, because their right significance, according to my view, has not, as yet, been pointed out by any one. But though the explanation be lengthy, yet the rule itself, as will be seen from the examples above worked out, is quite simple. We first count the **kalās**
of the dozens at the rate of 19 per dozen and then proceed to deal with excess \( \text{una} \) pakshas. The rule for the latter purpose may be generalized as follows. If \( x \) be the number of \( \text{una} \) pakshas let \( a \) be equal to integral part of \( x/2 \); Then \( 73x \) will be the \( \text{mashek} \) and \( 4/3 \times (73x) + 9a \) will represent the \( kal\text{ās} \) at the end of the given \( \text{una} \)-paksha, provided that when the amshas corresponding to the \( \text{una} \) paksha either by themselves, or combined with the amshas for the previous dozen, are equal to or exceed half a Nakshatra, the value of \( a \) will receive a corresponding increase. We have noticed above the Vedāṅga artifice of taking four-thirds of 73 instead of 98, and compensating for the error by taking four-thirds of 7, that is, 9 instead of 7, to calculate the \( Kal\text{ās} \) from the \( \text{mashek} \) previously determined. The following table will show to what extent the result so obtained deviates from the one calculated strictly according to the accurate Vedāṅga elements. In column 1 is given the value of \( x \) or the number of the \( \text{una} \) pakshas; in column 2 the value of \( a \), as well as the increase it receives under the circumstance noted above. Column 3(a) gives the value of \( \text{mashek} \) or \( 73x \), and 3(b) of \( 9a \); and their total is given in column 3(c). Column 4 gives the number of \( kal\text{ās} \) if we take 98 instead \( 4/3 \times 73 \) and 7 instead 9, or calculate according to the formula \( 98x + 7a \); and the last column shows the error introduced, the sign + or - respectively showing that the calculated result is greater or less than the actual by the number following that sign.
<table>
<thead>
<tr>
<th>The value of ( z ) or the No. of ( 89 ) pakshas.</th>
<th>The value of ( a ) with its increase.</th>
<th>The number of ( k\alpha)s according to the Vedânga rule: ( \frac{4}{3} \times 73^2 + 9a = \text{Total} , k\alpha)s.</th>
<th>The value of ( 98 , x + 7a ).</th>
<th>Difference between ( 3c , &amp; , 4; ) or error + or -</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0</td>
<td>( 73 + 24 = 97 )</td>
<td>0</td>
<td>97</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>( 146 + 48 = 194 )</td>
<td>9</td>
<td>203</td>
</tr>
<tr>
<td>3</td>
<td>1</td>
<td>( 219 + 73 = 292 )</td>
<td>9</td>
<td>301</td>
</tr>
<tr>
<td>4</td>
<td>2</td>
<td>( 292 + 97 = 389 )</td>
<td>18</td>
<td>407</td>
</tr>
<tr>
<td>5</td>
<td>2</td>
<td>( 365 + 121 = 486 )</td>
<td>18</td>
<td>504</td>
</tr>
<tr>
<td>6</td>
<td>3</td>
<td>( 438 + 146 = 584 )</td>
<td>27</td>
<td>611</td>
</tr>
<tr>
<td>7</td>
<td>3+i</td>
<td>( 511 + 170 = 681 )</td>
<td>36</td>
<td>717</td>
</tr>
<tr>
<td>8</td>
<td>4</td>
<td>( 584 + 194 = 778 )</td>
<td>36</td>
<td>814</td>
</tr>
<tr>
<td>9</td>
<td>4+i</td>
<td>( 657 + 219 = 876 )</td>
<td>45</td>
<td>921</td>
</tr>
<tr>
<td>10</td>
<td>5</td>
<td>( 730 + 243 = 973 )</td>
<td>45</td>
<td>1018</td>
</tr>
<tr>
<td>11</td>
<td>5+i</td>
<td>( 803 + 267 = 1070 )</td>
<td>54</td>
<td>1124</td>
</tr>
</tbody>
</table>
The table is calculated for the ṇa-pakshas only; and to get the actual results, the amshas as well as the kalas at the end of the previous dozen pakshas will have to be added to the figures in the Table. But the latter does not affect the error, except when the value a is increased thereby, in which case the error would increase by 2. For example, this will happen when the number of the total pakshas is 17; because in that case 8 amshas of the previous dozen when added to 55 of the five ṇa give rise to an additional Nakshatra, thus increasing thereby the value of a by 1. If we except these cases, the error, as will be seen from the above Table, never exceeds 4 kalas, being actually zero in three cases. But taking the worst or the exceptional case noted above, the error may, at best, in a few cases, be equal to 6 kalas. My interpretation of the above verses, cannot, therefore, be objected to, on the ground of this error, especially, as the only alternative interpretations hitherto suggested, involve a much larger error, and give a superfluous rule in addition. It should further be noted that the error in the number of kalas grows to 4 in the 9th and 10th ṇa pakshas for the compensating term becomes a little too much in these cases. But soon after, that is, at the end of the 12th paksha, we make a new start with the kalas of the next dozen pakshas, which are not affected by this error. In other words, the error is thus corrected at the end of every dozen pakshas or soon as it grows to 4 kalas.
The next verse in the Rik. recension closes this subject in the following manner:—

पक्षात्संधिमायं तद्रुतमिति निरिरिते

नन्दकेरस्तोऽसः स्याहूनाशं ह्वयथिकेन तु || R. 13.

The first half of the verse does not occur in the Yajus recension and the second is only partially reproduced in Y. 16. The preceding verse चेति भरोषयो etc., gave us a rule for finding the time of the Moon’s entry into the last Nakshatra at the end of the 14th pakshas and recorded the changes to be made therein in certain exceptional cases. Now the present verse informs us that “from the 15th paksha and onwards one should indicate that (which is so calculated) as the (कलेव) elapsed (at the time of the Moon’s entry into the last parvan Nakshatra)”. In other words the complete rule is to be applied to all the pakshas after the 14th. The rule and its application being thus fully stated, the second half of the verse briefly states the rate of increase involved in these operations. अन्त यो, is evidently a mistake for अन्तियो; and making this correction I thus translate the second line:—“Nine is the increment in amshas, and additional two, that is, XI is the increment for the अम्ब (pakshas).” Here we may take 9 as referring to the increase in solar amshas per day, or better still to “the group of nine” mentioned in the previous verse (R. 12). But the अम्ब eleven obviously refers to एकादशमुण्डोन: in Rik XI (Y. 19); and it is not fair in my opinion to twist the meaning of ह्वयथिकेन.
and make it seven instead of eleven. It is true that in Y. 16 we have क्रन: सत्सुणो भवेत्—the अमा is seven-
fold. But there it refers to a different matter alto-
together, viz., to the calculation of the Moon’s position
in time and gives us the increment for the odd (क्रन)
tithis, in excess of 15 tithis or a paksha (R. 21; Y. 21).
The Rik and the Yajus verses undoubtedly refer to the
same general subject, viz., of increments. But they
need not be identical on that account. The Yajus omits
to mention the increment in the case of the अमा
pakshas, while the Rik does not give us the अमा
amshas in the Moon’s case. That is the difference
between the two; and whatever its cause may be, we
should leave it as it is, without labouring to seek a
correspondence of the two by distorting the ordinary
meaning of words. For, not only in this, but in other
respects also, the two Vedāṅga texts, if taken singly,
are found to be incomplete. I am also of opinion that
in Y. 16, the reading आवापल्लमुजेंलङ्गवत् is preferable
to आवापल्लमुजे द्वौस्यात् (b) or खुस्यात्, as S would have
it. It refers to the increment of half a Nakshatra
in the case of a bright or the uneven paksha after the
heliacal setting of the Moon. (R. 11; Y. 15). E’s
interpretation of Y. 16 and the Rik verse now under
consideration (पञ्चग्राश्च etc.) is, no doubt, highly
ingenious. But unfortunately it is not consistent with
the natural meaning and construction of the verses;
while the idea of rejecting quarters of the whole circle
of 124 daily amshas, seems to me to be more imaginary
than real. Nor can I accept S’s emendation of \textit{वञ्जीकेन} into \textit{वञ्जिकेन}. Both have had again to give up the natural meaning of the words \textit{पञ्जालंश्रवत्}. But there is nothing strange in these make-shifts; for such were needed to make the verses intelligible so long as it was not perceived, that Rik 10-13 (both inclusive) formed a connected set of verses, and that though the Yajus text did not show it, the original order of the verses was happily preserved for us in the Rik text.

To ascertain the time of the Moon’s entry into the last parvan Nakshatra at the end of any given number of pakshas when the said number is not exactly divisible by twelve, is a rather complex operation and, therefore, the subject could not be finished in a single verse. But not so with other cases. After determining the time (in \textit{kala}s) of the Moon’s entry into the last parvan Nakshatra, the next step is to ascertain the time of her entry into the successive Nakshatras on the successive tithi days. This is a simple operation. The Moon takes one day and 7 \textit{kala}s to do a Nakshatra. Therefore if the time of her entry into the last parvan Nakshatra is known, we have simply to add 7 \textit{kala}s to it to find the time of her entry into the next Nakshatra, on the next tithi day, and so on. This rule is given in the following verse:

\begin{quote}
\textit{व्य: पवैमात्स्यक्षारतासु सम्प्रभुत्वा तिथिम्।}
\textit{प्रक्षिपैः क्लाकमूहर्ता विचारायादानकी: क्ला:} \textit{॥ र्षी 21:य.21.}
\end{quote}

The verse is correctly interpreted by \textit{B} and also by
Mr. Diksit before him. S tries to improve on this, but his refinements are, in my opinion, uncalled for. I quote the verse here, not for the purpose of discussing its meaning; but more to point out that the words पौर्णिमादानकला: at the beginning of this verse distinctly presuppose a rule for finding the kaliśas of the Moon's entry into the last parvan Nakshatra, and that no such rule is to be found in the Vedāṅga, unless the verse अङ्की मक्षे, etc. (R. 12; Y. 17) be interpreted in the way proposed by me above.

Hitherto we have discussed the verses giving rules for ascertaining three lunar positions, viz, (1) her parvan position in space, (2) the time of her entry into the last parvan Nakshatra, and (3) that of her entry into the tithi Nakshatra. Her tithi position in space, or in other words, her tithi Nakshatra has now to be ascertained. The verse which gives a rule for the purpose is contained not in the Rik but only in the Yajus text. It runs as follows:—

तिथिमेकाञ्चायस्यस्य पौर्णिमाव्यतिरितिः।
विन्यम्भस्मृतेन तिथिमेकाञ्चायस्यस्य विन्यमतिः || Y. 20.

Grammatically there is no flaw in the verse, and read straight off, it means.—"One should indicate the tithi Nakshatra by multiplying the tithi by 11, adding (to it) the Nakshatra aṃshas of the parvan, and dividing (the sum) by the total number of the Nakshatras (that is, 27)." B seems to have translated it correctly. But his explanation shows that he has misunderstood the rule as
well as its reason. S was, therefore, justified in looking for another explanation; but, as usual, he tries to improve only by ingeniously changing एकादशाभ्यतां into अक्षताभ्यतां and even then he is unable to show that the verse gives us the exact number of amshas of the tithi Nakshatra in question, for his result falls short by 9/15 of an amsha per tithi. He has also to interpret सहस्रायुष्मण as meaning 124 instead of 27 as it naturally means. If we, however, disabuse our mind, of the idea that the rule gives us the amshas of the tithi Nakshatra and not merely the Nakshatra itself, all these difficulties at once disappear. The Vedânga divides a Nakshatra into 610 kalas of which the Moon traverses 603 in a civil day, or 593⅔ in a tithi. Leaving the deficiency to be separately collected, the Moon, we might safely say, changes her Nakshatra on every tithi day; for, as the number of tithis does not exceed, error would never amount to a full Nakshatra in such a calculation rough as it is. If the Moon’s parvan Nakshatra be known, we have, therefore, simply to take the next Nakshatra for the next tithi and so on. The rule is simple enough. But simple or otherwise, it has to be derived from the parvan amshas, according to the method, generally followed in the Vedânga; and this is what the present verse directs us to do. The Jâvâdi list of Nakshatras in the Vedânga is so framed as to secure a constant equivalence between the amshas and the Nakshatras at the end of each parvan (R. 15; Y. 17). If the parvan amshas are less than 27 they directly indicate the
parvan Nakshatra in the Jāvādi order, while if the amshas are greater than 27, the remainder left after dividing them by 27, will indicate the parvan Nakshatra according to the Jāvādi list. Now as a necessary result of the principle adopted in framing the Jāvādi list, the Nakshatras taken in their natural order are separated by 11 places in the Jāvādi list. Thus Aswini is in the first place in the Jāvādi list, Bharani in the 12th, the Krittikās in the 23rd, Rohini in the 34th, or deducting 27, in the 7th place; and so on. This explains the reason of the present rule. For the parvan amshas, calculated according to R. 10 (Y. 15) and divided by 27, when they exceed that number, indicate the Moon's parvan Nakshatra according to the Jāvādi list. But on the next tithi day the Moon is in the next Nakshatra and so on in succession; and successive Nakshatras are represented in the Jāvādi list by successive multiples of 11, divided by 27 when the multiple is greater than it. Therefore, if we add 11 per tithi in succession to the parvan amshas, the sum of both divided by 27, when it exceeds that number, will represent the successive tithi Nakshatra of the Moon.

It is needless to say that the Vedāṅga generally indicates the Nakshatras by a reference to the Jāvādi list, and when such is not the case some express word is used to mark the exception, as in the verse next here-in-after discussed.

So far we have examined the verses containing rules for determining the Moon's various positions. Let us
now see how the Vedânga determines similar positions of the Sun. Rik. 10 (Y. 15), explained in the beginning of this note, enables us to determine the parvan position or the bhâmshas of the Sun at the end of a given parva and the following Yajus verse tells us how to find, therefrom, the tithi position of the Sun:—

एकादशमिरम्यस्य पवीणि नवभित्तिष्ठिम्।

युगलाच्च सपर्य स्थादृष्टमानावैं नमातू।॥ Y. 25. ॥

"Multiply the (number of the elapsed) parvans by 11 and the (current) tithi by 9. What is obtained by their sum, together with the (number of) parvans, would be current solar Nakshatra in (natural) order (from Shravisthā)." The late Shankar Balkrishna Diksit was the first to explain this verse. But B, not being previously acquainted with Mr. Diksit's book, tried to give a different explanation. Upon this, S, following Diksit, pointed out the defective character of B's explanation and the latter has now acknowledged it. There remains, therefore, little to be said in this connection; except that B, in my opinion, justly objects to S's (or rather Diksit's) explanation of युगलाच्च in the second half of the verse. युग, used as a numeral, may mean 2 or 4, but not 124; nor is it necessary to twist the meaning in this way, when the ordinary sense of "addition" suits the context very well. No one need tell us that in dealing with the Nakshatra-amshas, one must reject complete Nakshatras, or in other words, any multiples of 124, when the total amshas exceed that
number. But if a Vedânga authority is needed for the purpose it will be found in Y. 12, as will be shown later on. Another fact to be noted, as expressly observed by S, is the propriety of the words सप्त and कमातु. It is not the amshas (divided by 27 if necessary), that here indicate the Nakshatra according to the Jâvâdi list, as in the case of the previous verse. But it is the number of parvans increased by the number of complete Nakshatras arising out of the amshas, that now indicates the Nakshatra, and that too, not in the Jâvâdi but in the natural order beginning with Shraviṣṭhā. As the Sun changes his Nakshatra once in 13½ days, we have in this case to calculate the change in the Nakshatra amshas only. The rule for determining the daily time-amshas at the end of a tithi, or in other words, for finding the time of the day when a tithi ends, is given in R. 20 (Y. 22). But, as there is no dispute about its meaning, it is not necessary to discuss the verse in this place.

The next question is to find out the time elapsed between the Sun’s entry into the last Nakshatra and the end of a parvan or tithi. According to the usual method of the Vedânga we expect to find two verses dealing with the subject—one for the parvan and the other for the tithi calculation. But in the present case one rule is sufficient for both these purposes. The Sun takes 13½ days to traverse a Nakshatra of 124 amshas; or, in other words, the Sun moves through 9 Nakshatra-amshas in a single tithi (R. 24, Y. 42). Therefore the
Nakshatra-amshas of the sun divided by $9$ will at once give the tithi-periods elapsed since his first entry into the said Nakshatra. I use the words tithi-periods advisedly. For a tithi does not generally begin with the Sun's entry into a Nakshatra; and all that we are entitled to say is that the quotient obtained by dividing the solar amshas by $9$, represents periods of time, each of which is equal in length to a tithi. But it is not convenient to measure time, in this case, by such tithi-periods. We have to convert them into days. This can be done as follows:—We know from the Vedânga that whereas a day contains $124$ amshas, a tithi contains only $122$; or that one tithi is equal to one day minus $2$ daily amshas. Therefore, the above mentioned tithi periods will be equal to as many days minus daily amshas equal to double the number of the said tithi-periods. Expressed algebraically, if $n$ be the number of amshas traversed by the Sun at a particular time, then $n/9$ is the number of the tithi periods elapsed between the Sun's entry into the Nakshatra and the time in question; and that $n/9$ tithis are $= n/9$ days $- 2n/9$ (daily) amshas. For example, the Sun's Nakshatra amshas at the end of the $11$th parvan are $121$; therefore the time elapsed between his entry into the last parvan Nakshatra and the end of the said parvan is $= 121/9 = 13\frac{4}{9}$ tithi-periods or $13\frac{4}{9}$ civil days minus $26\frac{8}{9}$ (daily) amshas. Or we may proceed to calculate in a slightly different way. We know that the Sun traverses $124$ amshas (one Nakshatra) in $13\frac{5}{9}$ days. Therefore, by a simple rule
of three we can directly obtain the time, in days, required by the Sun to traverse 121 amshas. The result is the same in either case. B and S both agree that, in one form or another, this rule is contained in the following verse:

शूर्यक्षेत्रानु सर्वसीधिभविषयः क्षेषद्विर्मयस्य दिनोपयुक्तः।
तिरियुक्ता मुक्तिदिनेषु कालो योगो दिनीकायस्य तद्द्वारः॥ Y. 26॥

But they differ widely in their detailed explanations. B takes क्षेषा to mean the whole quotient including the remainder, though the word ordinarily denotes the remainder only. He has further complicated the problem by making it too general. He thinks that the Vedanga here gives us a rule for finding the elapsed time not at the end of a parvan or tithi but generally at any time during any tithi day. His interpretation of दिनीकायस्य is, however, at once simple and reasonable. S proceeds differently. He rightly understands क्षेषा to mean the remainder and not the whole result as B does. But, supplying a lot of his own words, he interprets the verse to mean:—"Divide the solar amshas by 9, double (the whole including the remainder), the difference (क्षेषा) (after subtracting the latter, in amshas, from the former as days) is the time in days elapsed." Here we have not only to supply all the words bracketed, in a somewhat artificial manner, but, if the verse be so interpreted, the second half of the line becomes perfectly redundant, as the interpretation gives us, at once, the whole formula, viz., \( n/9 \) days.
minus $2n/9$ amshas. $S$ tries to get over this difficulty by altering the reading of the second half and showing that this part of the verse refers us to some other rule for finding out the time previous to the Sun's entry into the Nakshatra under consideration. This, in my opinion, cannot be regarded as satisfactory. We naturally expect to find निपादशकेन एते, made a part and parcel of the rule for ascertaining the time of the Sun's entry into the given Nakshatra; and this expectation is defeated if the first half of the verse is made to yield the whole formula as $S$ has done. The course adopted by $B$ is certainly more preferable to this. But, as shown above, $B$'s explanation is not also free from defects. Under these circumstances I would suggest the following modification thereof. I would first restrict the scope of the rule. The Vedânga calculates the Sun's amshas only in two particular cases:—(1) at the end of a parvan (R. 10, Y. 15) and (2) at the end of a tithi (Y. 25). There is, therefore, no reason to suppose that the word सूर्यविजयान्त in the present verse refers not to either of these two cases, but to a still more general one.

The next step is to ascertain the meaning of the word दिनोपमुक्ति in the second line, or its synonym मुक्तिकिन in the third. In my opinion दिनोपमुक्ति does not here mean “the total time elapsed” as $S$ interprets it, nor do I understand how $B$ translates it as “the total of the Sun's motion (in the equinoctial circle) per lunar day.” (Perhaps, he means “the total motion calculated at so
much per lunar day ")". The word appears to me to be here used in a somewhat technical sense. The relation between a tithi and a civil day is usually expressed in the Vedânga not in the form of a fraction \(\frac{15}{12}\) as we should now do; but by mentioning along with the tithi the two (daily) amshas not covered by it. In other words, these two amshas belong not to the tithi, but to the day on that tithi; and may properly be termed the दिनोपमुख्ति (that is the day enjoyed, or day covered parts) of, or with reference to the tithi in question. Thus 15 tithis have a दिनोपमुख्ति of 30 daily amshas; and in stating the relation of 15 tithis to 15 days the Vedânga simply mentions this दिनोपमुख्ति side by side with the number of days, it being understood that it is to be subtracted from the days, to find the exact corresponding time in question. Such, at any rate, seems to me to be the method followed in the present verse; and taking तिथि: for तिथि: in the third line, I would interpret the verse as follows. The first line is quite simple. It asks us to "divide the solar Nakshatra amshas by 9." The integral quotient at once gives us the number of tithis or rather the tithi-periods. But as the Sun's Nakshatra-amshas are not always completely divisible by 9, there will generally be left some remainder; and as a fraction of a tithi is not generally spoken of as 'a tithi' it is necessary to say how the remainder is to be dealt with. The second line tells us what to do in such a case. "Multiply the remainder by two and it will be the दिनोपमुख्ति," not by itself alone but, says the-
third line, "together with the दिनोपमुक्ति of the tithi". The word 'tithi' does not here mean the current tithi of the day. It means the "tithi (periods) represented by the integral quotient"; and as the दिनोपमुक्ति of a tithi (in daily amshas) is equal to double the tithi (number), the Vedânga here practically asks us to double both the integral quotient and the remainder. But it is done in such a way as to elucidate the reason of the rule along with it. The word कङ्कः in the third line may be construed with दिनोपमुक्ति, or it may be taken with the fourth line to denote the total number of days elapsed. The meaning of the whole verse is not altered thereby. We have thus obtained the दिनोपमुक्ति of the integral and the fractional tithi periods. But without knowing the corresponding number of days the answer is incomplete. The last line of the verse, therefore, tells us how to find the total number of days corresponding to this दिनोपमुक्ति. It says that "the sum (that is, दिनोपमुक्ति in amshas plus the given number of solar amshas) is the time (in days) since (the sun's entry into) the Nakshatra, at the rate of eleven (amshas) per day". B has correctly explained the reason of this procedure. The दिनोपमुक्ति is equal to twice the number of tithis; and the solar Nakshatra amshas are equal to nine times the same number. The sum of the two (considered as numbers only) when divided by 19 (2 + 9), will, therefore, give us the number of tithis (fractions included), which is the same as the
number of days; and, taken along with the दिनोपति previously ascertained, we get a complete answer to our question. This is practically equivalent to saying that the whole quotient (including the fractional remainder) represents the total number of days corresponding to the दिनोपति. But the Vedānga seems to have followed the indirect method in order to keep the uninterrupted continuity of the arithmetical operation. The final result obtained is thus the same as that obtained by S or B. In fact the interpretation here proposed is only a modification of B's. But, in my opinion, it enables us better to keep by the natural construction and the meaning of the words in the text. Whether it actually does so or not, is for others to decide.

There is a verse in the Yajus text of the Vedānga (Y. 12), which has been interpreted nearly in the same way both by B and S. S does not include it among the nine verses mentioned by him in the preface to his Bhashya, as wrongly interpreted by B; while on the other hand B has observed that S, in putting forward a different interpretation of this verse, has simply sought "to draw a distinction without a difference". But as I have to propose a new interpretation altogether, it is necessary to examine, in this place, B's as well as S's interpretation thereof. The traditional text of the verse is as follows:

इत्यद्य प्रचाले नेतृ पादे पादस्किलाश्च नैकिक।
भागान्तोऽवपृःव्यांशानु निदिशेदभिधि यदि ॥ Y. 12।
Both \( B \) and \( S \) read अभिक वदिर for अभिको वदिर in the last line. But this is not absolutely necessary as even without this correction the words will have the same sense if we can construe वदिर अभिक: (भाग:) स्यात् (तद्विव) निर्दिष्ट:।

The real difficulty does not lie in the last line, but in the first word of the first line. The rest of the verse is simple enough and -read straight off may be thus translated:— "दृढः if a parvan is at a páda. A páda is thirty and one (amshas). One should indicate the excess, if any, after dividing the amshas by (all) the bhāgās (amshas) themselves." Here we naturally expect दृढः to tell us what one should do "if a parvan is at a páda." Or, in the terminology of grammar, दृढः appears to be the consequential clause depending on पर्व वेट पादे. But there is no such verbal form as दृढः or even दृढः in Sanskrit; and, therefore, nothing can be 'milked' out of it so long as the word stands as it does. हेय suggests the idea that something in neuter gender is here "to be abandoned or omitted." But what of हु prefixed to it? Some suppose that the parvan itself is to be abandoned. But such is never the case in practice. In case of अभिकत we may say that the मात or two parvans are abandoned, that is, not included in the usual reckoning; but a single parvan is never so omitted. \( B \) skillfully tries to get out of the difficulty by changing दृढः into दृढः and supposing, that the amshas here spoken of are not the (parvan) Nakshatra-amshas, as the context plainly suggests, but the parts (amshas) of
a day, he thus construes the verse:—परेण पादे दृढ़ैं चेतृत् (पादं) अवपृण्य अधिकं अंशान् निदिशेत्। पादं भागाङ्गना शैक्षिका विष्णुत् स्थान्।

He himself translates it as follows:—“If the (hour angle of the) parvan is not less than a quarter (of the equinoctial circle), the (latter) must be deducted from the former; and should the parvan exceed a quarter the remaining amshas be adopted. A quarter contains thirty one parts (bhāgās or amshas).” Now in the first place दृढ़ैं is an unusual word; and secondly it means “difficult to be abandoned” and not “less than” as B understands it. अधिकं अंशान् is again ungrammatical.

But these are not the only defects in B’s construction of the verse. His anvaya is extremely far-fetched and laboured. If the verse is read in its natural order we expect भागाङ्गना and अंशान् to go with अवपृण्य; and अधिकं with निदिशेत्. But B changes all this and tells us to take भागाङ्गना with विष्णुत्, अवपृण्य with पादं understood (as if the author could not have said पादाङ्गना instead of भागाङ्गना), and अंशान् with निदिशेत्. The meaning of the verse, obtained after so much labour, is also not satisfactory. We are told that in the days of the Vedāṅga a nycthemeron (day and night) of 124 amshas was divided into 4 quarters of 31 amshas each, and what is still more important, the reckoning of the daily time stopped and recommenced at every quarter of 31 amshas, somewhat as we now do at 12 noon and 12 midnight. Therefore, the present verse of the Vedāṅga asks us to deduct a quarter or 31 amshas when the
amshas of a day exceed it and name only the excess. Thus if an event happens after midday we are not to say that it occurred at 40 or 50 amshas of the day but $40 - 31 = 9$ or $50 - 31 = 19$ amshas only. This meaning seems to be so out of place that one may very well ask if there be an example of it in the Vedânga. Yes, answers B; and points to his interpretation of Y. 16. But B's interpretation of Y. 16 is unfortunately as far-fetched as that of the present verse. So, at best, we have a doubtful rule, supported by an equally doubtful example. One may, however, fairly say, that if the verse is not otherwise intelligible, there is no alternative, but to accept B's meaning strained though it may be. This seems to be the view taken by S, who practically follows B, only proposing to read योहैय instead of B's दुहैय, first because perceiving the right meaning of दुहैय he saw that it was not the suitable word and secondly because he might have felt that some express authority was needed to hold that the amshas, mentioned in the verse, were the amshas of a day and not of a Nakshatra. B in reply calls this a specious emendation at once "artificial and unnecessary;" and so it might be, though I think otherwise, if B's interpretation is on the whole to be accepted. But taking a hint therefrom, I proposed to read दुहैय for the meaningless and impossible दुहैय and interpret the whole verse in an entirely different way. The verse thus read will stand as follows:

चूहैयरसने चेत पादे पादरिष्णचतु सैकिका।
भागादनाध्यपुमयाधानं निदिष्णद्विघुटि यदि॥

And taking the amshas to mean, as the context shows, the Nakshatra-amshas of a parvan, I thus explain the verse:—"A day, a nycthemeron should be abandoned or omitted." When? "If a parvan is at (that is, ends in) a pada." What is a pada? "A pada is thirty and one (amshas)," says the second line. How are the (parvan) amshas to be counted? "One should indicate the excess, if any, after dividing the amshas by (all) the bhagas (amshas) themselves (that is, by 124)." The anvyaya of the whole verse thus becomes quite simple and natural; and an important rule is obtained therefrom. The second part of the rule requires little explanation. One need not go in search for an example to illustrate it. It is the actual procedure followed in calculating the parvan amshas according to the Vedânga. As directed in R. 10 (Y. 15) we multiply the number of parvans by 11, and then dividing the result by 124 (the total number of amshas in a Nakshatra) take the excess (without omitting quarters) to represent the Nakshatra-amshas at the end of a parvan. The rule had, however, to be given somewhere in the Vedânga, and the second half of the verse gives it to us in plain words. When the parvan amshas so calculated are equal to 31,—and this happens only once in a Yuga, viz, at the end of the 93rd parvan,—a civil day (a nycthemeron) is to be abandoned or omitted from our reckoning. In short, it is an extra or leap or intercalary day. This is the plain meaning of the verse; and the following explanation will disclose the importance and the necessity of this
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correction in the Vedânga calendar. The idea of
omitting a day is not a new device of the Vedânga
Jyotisha. As shown by me elsewhere, it is the basis of
the Utsarginam ayanam, and is expressly mentioned in
the Taittirlya Sanhitâ VII.5.7.1. In the case of yearly
sacrificial sattiras like the Gavâm ayanam, the vishuvat
or the central day was also always omitted in counting
the 360 days of the sacrificial year.

The astronomical elements on which the Vedânga
rules are based, represent only the mean (मध्यम)
motions of the Sun and the Moon. But the Sun’s or
the Moon’s actual (सुकुट) position in the celestial
sphere is not generally the mean, but a few degrees in
advance or behind it. Besides this the Vedânga mean
motions themselves are again not exact but only
approximately correct. The Sun does not complete
exactly five revolutions in a Yuga of 1830 days; nor is
the number of lunar pakshas therein exactly equal to
124, as the Vedânga assumes it to be. At the rate
of five revolutions per Yuga of five years, a solar
siderial year becomes, according to the Vedânga,
exactly equal to 366 days, whereas according to
modern more accurate observations the same contains
365.25636...... (or roughly 365.4) days. This yearly
error would amount to about one lunar month in 39.7,
or, in round numbers, 40 years altering the Sun’s
position amongst the fixed stars by a month in advance.
It is impossible that this could not have been noticed;
and the late Mr. Krishnashastri Godbole thought the error was probably corrected by omitting one inter-calary month in 40 years, that is, once in 8 Yugas; while Mr. Diksit believed that 35, instead of 38, inter-calary months were inserted in 95 years, that is, in 19 Yugas. But whatever the method adopted might be, it was not necessary to speak of it in a book, professedly devoted only to the preparation of a five years (Yuga) calendar (R. 32; Y. 5). In other words, it did not fall within the scope of the Vedânga Jyotisha and there is nothing surprising if Vedânga gives us no rule on the point. Not so with the Moon. The Vedânga lunar month (of two lunar pakshas) contains $\frac{1830}{6}$ or 29.5161290... days; whereas the average length thereof, according to modern research, is $= 29.5305887...$ days. The Vedânga month is thus shorter than the more accurate modern mean by $0.144597...$ of a day, which is equal to 20.82 minutes, $= 8.719...$ (Vedânga) katâs or $= 1.793...$ amshas of a day, (a day being made of 124 amshas as in the Vedânga). The error for a parvan or a paksha would be half of this; and at this rate it would amount to a day after 138 pakshas (69 lunar months), or about 53.8 (or in round numbers 54) ghatis (nâdikas) in a Vedânga Yuga of 124 pakshas. In a calendar prepared according to the Vedânga rules, the calculated full and new Moons would, therefore, fall behind the actual nearly by a day towards the end of a Yuga; and the Yajnikas, for whom the Vedânga rules were intended, could not have failed to mark it as they must
have carefully watched the full and the new Moon, as actual celestial phenomena, owing to their sacrificial importance. Here was an error which the Vedânga calendar was bound to notice; for otherwise all the calculated full Moons for the rest of the Yuga would go wrong, thus rendering the calendar entirely useless. All the students of the Vedânga are, therefore, of opinion that this error must have been somehow or other provided for, though they have not been able to discover the specific way. As the error amounts to about 54 ghatiś that is, six ghatis less than a day, per Yuga Krishnashâstri Godbole thought that one more day was added to the second intercalary month of a Yuga, and that this correction was omitted at the end of every tenth Yuga to compensate for the excess of 6 ghatis included therein, (See page 32 of his pamphlet on The Antiquity of the Vedas, 1882). He went even so far as to predict that his suggestion about these corrections "would be found to be true as the careful study of the Vaidik and the post-Vaidik works would advance". The late Mr. Shankar Bâlkrishna Diksit, writing on the same subject, in his History of Indian Astronomy (p. 92), has further observed that though the Vedânga Yuga was made to consist only of 1830 days for facility of arithmetical calculation, yet the full Moon must have been determined by actual observation, or in other words, the Yuga practically consisted of 1831, instead of 1830 days." (the italics are mine). The interpretation of the present verse, proposed by me above, is thus in
full accord with the anticipations and observations of the previous students of the Vedânga.

The necessity of intercalating a day in a Yuga being thus established, the next question is as regards the exact time when the intercalation should be made. Krishnashâstri thought a day was probably added to the second intercalary month. But a little consideration would show that this could not have been the case. It was not a question merely of a day less or more in a Yuga, so that the extra day might be inserted at any time. The intercalation was needed to set aright the full Moon night; and the proper time for intercalating would be soon after or just when the calculated mean full Moon was observed to fall back a day earlier than the real paurnima, which must have been watched as an actual phenomenon. Here we must, therefore, compare the Vedânga mean full Moon with the one actually observed at the time. This cannot be accurately done, as there are no records of such observations; and it is doubtful if the best modern lunar tables would enable us to correctly ascertain the exact moment of the commencement of the actual phenomenon of the full Moon which occurred three thousand years ago, more especially as the exact date of the Vedânga Jyotisha still remains uncertain. But a good approximation can be made by comparing the Vedânga mean full Moon with the same, calculated according to the more accurate mean motion determined by modern research. According to the Vedânga a paksba contains
14 days (Nycthemera) and 94 amshas (one day being = 124 amshas); while according to modern research the average length of a paksha is 14.7652943... days, which converted, for comparison's sake, into amshas is equal to 14 days and 94.896 amshas (one day = 124 amshas). Thus the Vedânga mean paksha is shorter than the real mean paksha by .896 of a day; and the end of each Vedânga parvan would occur earlier than the real mean by .896 amshas of a day or by nearly 10 minutes or 4 kâlás, as stated previously. This difference accumulates as the number of pakshas increases and in course of time the calculated Vedânga full Moon must fall back in proportion. This is shown in the following table.* As the full Moon paksha is always represented by an uneven number in the Vedânga, these alone are noted in the table.

It is not necessary to consider the pakshas previous to 81, as the difference between the two results does not affect the number of the full Moon nights therein. The 81st is a bright paksha; and the pakshas, as well as the full Moon period thereof, end according to the Vedânga, when 1195 days and 50 amshas of the 1196th day from the beginning of the Yuga are elapsed. The 1195th night is, therefore, the mean full Moon night according to the Vedânga. But, according to the modern mean, the 81st paksha ends when 1195 days and 122 amshas (omitting fractions) of the 1196th day are elapsed, that

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* See Table No. IV, p. 96.
# Table IV

<table>
<thead>
<tr>
<th>Serial No. of the pakshas.</th>
<th>Days and amshas at the end thereof according to the Vedânga.</th>
<th>The same according to the modern mean rate.</th>
</tr>
</thead>
<tbody>
<tr>
<td>----------------------------</td>
<td>-------</td>
<td>--------</td>
</tr>
<tr>
<td>81</td>
<td>1195</td>
<td>50</td>
</tr>
<tr>
<td>83</td>
<td>1224</td>
<td>114</td>
</tr>
<tr>
<td>85</td>
<td>1254</td>
<td>54</td>
</tr>
<tr>
<td>87</td>
<td>1283</td>
<td>118</td>
</tr>
<tr>
<td>89</td>
<td>1313</td>
<td>38</td>
</tr>
<tr>
<td>91</td>
<td>1342</td>
<td>122</td>
</tr>
<tr>
<td>93</td>
<td>1372</td>
<td>62</td>
</tr>
</tbody>
</table>
CRITICISM AND SUGGESTIONS.

Is, only last 2 amshas of the 1195th night are covered by the mean full Moon. In other words, the calculated Vedânga mean full Moon now falls back not exactly one night but 2 amshas less; and as yet there was, therefore, no necessity of intercalating a day. The 83rd paksha, or the next mean full Moon night ends, according to Vedânga, after 1224 days and 114 amshas of the 1225th day are elapsed; that is, the Vedânga mean full Moon lasts till 52, (114-62), amshas of the 1225th night. The real mean full Moon, on the other hand, lasts till 64-2 amshas of the 1226th day, and therefore it begins at 2 amshas of the 1225th night. Practically the Vedânga mean and real mean full Moon may, therefore, be said to occur on the 1225th or the same night; and the same is the case with the 87th and 91st paksha. The error in the two mean full Moons causes, for the first time, a change of one full night at the end of the 85th paksha; but we may leave this case also, out of our consideration, since the actual place of the Moon in the heaven is not exactly the mean one, but differs from it by a few degrees on either side. There thus remain two cases, viz., of the 89th and the 93rd paksha, wherein, according to our mean calculations, the real full Moon falls on the night next to the Vedânga calculated one. Thus, in the case of 89th paksha, the Vedânga mean full Moon falls on the 1313th night, while the real mean full Moon begins 13 amshas later, so that it falls on the 1314th night; and same is the case with the 93rd paksha. The Vedânga mean full
Moon falls on the 1372nd night and ends by the evening of 1373rd day, so that not a trace of it falls on the 1373rd night according to the Vedânga, while the real mean full Moon occurs entirely on that night. Of these two cases the Vedânga has selected the latter for intercalation, either because it was a Vishuval day, and it was an old practice to omit it in counting the days of the sacrificial yearly Sattras or, what seems more probable, because in these days it was at the end of the 93rd pakhsha that the error was, by actual observation, found too great to be any longer neglected, a fact which our calculations of the mean full moons is not likely to disclose to us; or it may be that no correction was made until one full moon was, as a matter of fact, actually observed to go wrong by a day. In any case the above calculation, of the mean full Moon though it is, sufficiently accounts for the selection of the end of the 93rd pakhsha for intercalating a day in a Puga. According to the Vedânga calendar, it is the full Moon day of Kârtika in the fourth (anuvatsara), or what may now be called the leap year, of a Puga. A glance at the table of parvan-amshas given in Mr. Diksit's book (pp. 77-78) will show—or it may be determined otherwise—that out of 124 pakhshas of a Puga only one—that is, the 93rd—ends in 31 amshas. There is, therefore, no ambiguity caused by the parvan being defined by mentioning its general amshas only, as the Vedânga here does. It has been already pointed out that it was necessary to omit this correction every
fifth Yuga. But as this part of the rule did not fall within the scope of five years' calendar, like the solar corrections above mentioned, it might not have been included in the Vedāṅga.

But though the calendar may thus ostracise day, assigning no tithi or Nakshatra to it, the priest has to perform some sacrifice even on this outcast day; and one naturally asked what Nakshatra should be assigned to this day, for sacrificial purposes, especially as the tithi (lunar) Nakshatra changed from day to day. There are two courses open in this case, either (1) to treat this extra day as a part of the preceding parvan, or (2) to assign to it the Nakshatra in which the Moon may actually be observed to be on this day. These two courses are, in my opinion, described in Y. 14 by way of a corollary to the preceding verse as interpreted by me. The verse runs as follows:

śrū: pādārīḥ nīpāṭaśāsthitāḥ ṛṣayekeṇaḥ: hūte śṛṣṭītām. 

I adopt the manuscript reading pādārīḥ for pādārīḥ of Somakar and deleting the anusvar in śṛṣṭī take śṛṣṭisāṁśeṇ as one word or read śṛṣṭe: instead. Thus corrected, the verse means:—“After the (last) pāda (of the previous parvan), the first, the second and the third (pādas) of the Tripadya (the pratipada) would, for sacrificial purposes, be in the same position as the (actual) Nakshatra of the Moon (on that day). Others, however,
(think) that the five (pādas—the last of the parvan and all the four of the Tripadyā) should be included in the parvan." B has for the first time correctly pointed out the meaning of Tripadyā, as well as the practice of Yāgniks, "to regard the last quarter of the parvan and the first three quarters of the pratipad as forming the Yagyakāla (sacrifice time)." These are exactly the four pādas mentioned in the first half of the present verse. But B takes the verse as referring to any pratipad in general; and, adopting the reading पादाधि: for पादाधि:, he divides the pratipad into 8 praharas or pādārdhas and assigns 3 to the pratipad and includes the remaining 5 in the parvan. But I fail to see how the remaining five pādārdhas of the pratipad can, in this case, be said to be included in the parvan, unless parvan be taken to mean the whole of the next fortnight. We have also to change कृत्ते into श्र्य: make कृत्ते govern स्थिति in the accusative case instead of अन्ध: in the genetive as it should naturally do, and finally suppose that a rule-laid down in express terms only for the Moon’s conjunction (इद्धि: साम्बेन—as B interprets it) is to be extended also to the full-Moon parvan. S follows B in general, but makes some further changes in the first half and interprets साम्बेन to mean कालेन which is quite unnatural. These difficulties are avoided if we take the verse as referring to the pratipad, at the time of intercalation, and not to any pratipad generally. But everything depends upon how we interpret Y. 12.
The last of the nine verses wherein \( s \) seriously differs from \( B \) is contained only in the Rik recension. It is as follows:

\[ \text{र्युः रमिन्दिश्वेत्} \\
\text{सूर्यान् मासान् चपमस्तान् विधान्भांद्रमसानूतून्} \| \text{R. 19.} \]

There is not much difference of opinion about the meaning of the second half of the verse. \( B \), and Mr. Diksit before him, have interpreted it to mean—"Solar months multiplied by six should be known as so many lunar \( \text{रितूस} \)." But the statement is, as pointed out by Mr. Diksit, only approximately true; for, according to the Vedânga, there are 67 lunar (siderial) months (Y. 30) and consequently \( 67 \times 6 \) and not \( 60 \times 6 \) lunar \( \text{रितूस} \) in 60 solar months of a \( \text{युग} \). \( S \), therefore, changes \( \text{सूर्यान्} \) into \( \text{व्याहौन्} \) and interprets the line thus:—"The lunar \( \text{रितूस} \) are six times the (number of) lunar siderial months." This makes it a pure definition without instituting any comparison between the lunar \( \text{रितूस} \) and solar months; and the objection, noted by Mr. Diksit, no longer exists. But this is not of much consequence. The real dispute is about the meaning of the first half of the verse and especially of the words \( \text{गुणाभ्यस्तानू} \) and \( \text{प्राप्तिपालनू} \) therein. \( \text{प्राप्तिपालनू} \) literally means "attached, or affixed to the east," and \( \text{गुण} \), used as a numeral, ordinarily denotes \( 3 \); \( \text{गुणाभ्यस्तानू} \) thus meaning "multiplied by three." But \( B \) takes \( \text{गुण} \) to mean \( 8 \) in this place, and \( \text{अभ्यस्त} \) to signify "heaped over each other " or, in
other words, "added to each other." With the help of these distortions he thus translates the first half verse,
—"the 8th (group of stars) from Shravishtha should be designated the equatorial (lit. the east-affixed) Nakshatra." The eighth Nakshatra from Shravishtha is the Krittikas, and B, in support of his interpretation, quotes the now well-known passage from the Shatapatha Brahmana (II, i. 2. i.3) which states that "The Krittikas never deviate from the East." But I fail to see the relevency of the quotation. Whether the Krittikas were or were not then regarded as the eastern stars is not the point at issue. We have, here, to see whether the supposed reference to the eastern position of the Krittikas in the Vedanga follows from the natural interpretation of the present verse; and this question cannot, in my opinion, be answered in the affirmative. S was, therefore, right in seeking for another explanation; but the alternative proposed by him is not less objectionable. Taking the word dha, in prabhavilama, in its technical sense viz., and as denoting the part of the celestial zodiac in contact with eastern horizon at particular time, he interprets the Verse so as to give us a rule for finding the hastakala, from which the dha may then be subsequently determined. But one may fairly ask that if the ascertainment of dha be the real subject of the verse, why is only a subsidiary and not the main rule given. Besides, S has to change guna into gana and then taking m understood
before गम eventually to interpret it to mean भगव = 27. अविष्काराम् has again to be understood in the sense of "the rising of Shravishṭhā." Of course, S has given us a mathematical demonstration of the rule which he thus derives from the verse. But a mathematical proof, howsoever rigorous it may be, is of little value if the meaning proposed does not naturally follow from the verse. Mr. Diksit has not translated the first half of the verse. But in several places of his book he has thrown out certain suggestions regarding its meaning, which deserve to be noticed. He has shown that before the introduction of Rāshis and along with it the twelve Lagnas, the number of Lagnas was nine, each consisting of three Nakshatras, (pp. 97, 99 and 519). If so, one may interpret the verse as meaning that "one should indicate the lagnas by the (successive) multiples of three (counted)from Shravishṭhā," without straining the meaning of any word therein. But even this meaning is merely conjectural; and in the absence of any further accurate information about the number and meaning of lagnas in the pre-Rāshi period of Hindu astronomy, Mr. Diksit was right in leaving this part of the verse unexplained. The Vedāṅga rules were intended for ordinary priests; and it is not reasonable to assume that they were originally expressed in any but the simplest language and in the simplest manner, consistent with the nature of the subject. True that the Vedāṅga has long been a conundrum to us. But this was due partly to its present fragmentary character, partly to the corrupt state of
the text and its technical nature and partly to our ignorance of the ancient astronomical methods. Thanks to the labours of Thibaut, Diksit, Bṛhaspatya and others, these difficulties have been almost overcome. But, still, if a verse in the Vedāṅga fails to yield any intelligible meaning, except by violating the natural construction and meaning of the words used, we may be sure to have missed its true import; and the safest course to follow in such case is simply to record our suggestions, if any, and to leave the verse to be finally deciphered by future workers in the field, rather than try to give, by hook or crook, to our work a semblance of completeness it has not really attained. For, inspite of the great progress already made, the last word on the Vedāṅga is, in my opinion, yet to be uttered.
A MISSING VERSE
IN
THE SANKHYA KARIKAS.

(1915)
A MISSING VERSE IN
THE SANKHYA-KARIKAS.*

The Sānkhya Kārikās by IshvāraKrishṇa is, in my opinion, the oldest work now available on the Sānkhya philosophy. Some regard Sānkhya-pravachana-Sātras to be older. But if we compare some of the Sātras with the corresponding Kārikās they will be found to be almost the same word for word. Thus, for instance, Sātras i. 140-144 exactly correspond to the 17th Kārika. Now the Sātras are in prose and the Kārikās in the Ārya metre; and as the prose Sātras, when read together, cannot be naturally supposed to make an Āryā, it is but fair to infer that the Sātras are obtained by splitting up a Kārika into so many prose sections. In other words the Kārikās are older than the Sātras.

As an old work on Hindu evolutionary philosophy, the Sāṅkhya-Kārikās have received considerable attention at the hands of Western scholars and have been translated into Latin, German, French and English. The first English translation was by Colebrooke; and this together with the translation of Gauḍapāda’s Bhāṣya and notes etc. was published at Oxford by H. H. Wilson in 1837. This edition is now out of print. But a reprint of the same has been published by the late Mr. Tukaram Tātyā of the Theosophical Society in Bombay in 1887.

Recent Indian editions of the *Sāṅkhya-Kārikās* are more or less a reproduction of the Oxford edition.

It is questionable whether the Bhāṣṭryakāra Gauḍāpāda is the same person as the grand preceptor of the great Shaṅkarāchārya. For, it does not seem probable that an Advaita Vedāntist would care to write a Bhāṣṭya on a Devalī system of philosophy. We learn from Buddhist works that Ishvarakṛṣṇa was the literary and philosophical opponent of the preceptor of the great Buddhist scholar Vasubandhu of about the fourth century after Christ; and the Kārikās with a commentary thereon were later translated into Chinese by Paramārtha. This Chinese translation of the Kārikās with a commentary on it has been now rendered into French by Dr. Takakusu and published in the *Bulletin de l’Ecole française d’Extrême Orient*, Tome iv, 1904, with an able introduction. An essay by the same scholar on the life and date of Vasubandhu is also published in the *Journal of the Royal Asiatic Society of Great Britain and Ireland*, for 1905 pp. 44-53. In this essay Dr. Takakusu assigns to Paramārtha a period from A. D. 499 to 569 and to Vasubandhu from A. D. 420 to 500. Vincent Smith, in his *Early History of India*, 3rd edition, appendix N, p. 328, carries it back still further by about 200 years. But we are here concerned not so much with the dates of these Buddhist authors as with the text of the *Sāṅkhya-Kārikās*; and looking at the question from this point of view we find that the commentary translated into Chinese is not the same as that of Gauḍāpāda. The
point is noticed by Dr. Takakusu in his introduction, where he has also given a tabular statement of the difference between the Chinese and Gauḍāpāda's commentary. The general trend of the two commentaries is of course the same, but the text of each is evidently different. The Chinese commentary is no doubt a translation of an old Sanskrit commentary on the Karikās; but what this Sanskrit commentary was, is still an unsolved question. In the Deccan College Library, there is a Ms. of the Sādhya-Karikās (No. 197 of 1871-72) wherein the commentary is called Māhara-vṛtti. This is more complete than Gauḍāpāda’s Bhasya and it agrees more closely with the commentary translated into Chinese. But on comparing it with the Chinese version in some important places, I find that two cannot be taken as identical. There is a third, and I might say a much more recent commentary on the Karikās viz., the Sādhya-latva-Kaumudi by Vāchaspati-mishra, an edition of which with a gloss, has been published by Paṇḍit Jyeṣṭhārām at the Nirmaya Sāgar Press in Bombay.

Now turning to the text of the Karikās as represented in these editions we find that Wilson's edition contains 72 Karikās in the Āryā metre; and in examining the number and the contents of the Karikās, I have taken this edition as the standard for comparison. Of these 72 verses the last three tell us how Kapila taught the doctrine to Āṣuri (verse 70) and the latter to Pañcachāshikha, and how from him through succession of
teacher and pupil it was learnt by Ishvarakṛiṣṭha (verse 71), who finally condensed it (verse 72) from Śaśṭhiti-
tantra into 70 Āryās or verses. This evidently means
that the main or the doctrinal part of the book (i. e.
excluding the concluding three Āryās) consisted of 70
verses. But on the other hand, if we exclude the three
concluding Āryās there remain only 69. Again if we
look to Gauḍāpāda’s Bhāshya we find that it ends with
the 69th verse, and yet Gauḍāpāda at the end expressly
states that there are 70 Kārikās in the text. Wilson
has noticed this discrepancy. In his comment on the
72nd Āryā he says “we have here in the text reference
to seventy stanzas, as comprising the doctrinal part of
the Sāṅkhya. In fact, however, there are but sixty-
nine.” It might be contended that the number seventy
may be made up by adding the first of the three
concluding Āryās to the previous sixty-nine. But,
observes Wilson, that if the first of the last three stanzas
containing the notice of Kapila (verse 70) were to be
included in the enumeration, it might fairly be asked
“why should not the next stanza at least (verse 71)
making mention of the reputed author (Ishvarakṛiṣṭha),
be also comprehended in it, when there would be
seventy-one verses? The Scholiasts offer no explanation
of this difficulty.” Nor does Wilson give any.

In the Chinese translation by Paramārtha there are
71 Kārikās only. But the sixty-third Kārika in Wilson’s
Edition is omitted in the Chinese. This omission is
evidently an error; for, as observed by Dr. Takakusu,
the verse is found in Sāṃkhya-Sūtras iii. 73, and also
in the Bhāṣya of Gauḍāpāda. If we supply the omission,
the Chinese version will have the same 72 Kārikās as
in Wilson’s edition. Another remarkable fact is that the
Kārikās are calledĀrya-saptati in Sanskrit, and are
denominatedSuvarṇa-saptati (the gold-seventy) in the
Chinese. This further confirms the statement made
above regarding the existence of seventy stanzas in the
doctrinal part of the work.

The Deccan College Library manuscript of the
Māṭhara-vṛtti apparently contains 69 verses only. But
the verses numbered 57, 58 and 59 in Wilson’s edition
are wanting in the body of the Ms. They are, however,
written on the margin together with the Vṛtta, evidently
by some one who corrected the manuscript. This Ms.
must, therefore, be supposed to contain the same 72
verses as in Wilson’s edition.

The Sāṃkhya-Tattva-Kaumudi, a commentary on the
Kārikās by Vāchaspati-mishra, as printed in the Niṃaya
Sāgar Press, Bombay, also contains the same seventy-
two verses.

We thus see that there are in all 72 verses in all the
copies of the Sāṃkhya-Kārikās now available. The last
three of these give us only the line of succession of
teacher and pupil or gurā-parampara as it is called. Thus
the doctrinal part of the book at present contains 69
verses only, whereas verse 72 expressly tells us that
there are 70 verses in the work. No satisfactory solu-
tion of this difficulty has to my knowledge yet been published.

Let us, therefore, see if we can find a clue to this missing verse. The sixty-first \textit{Karika} and Gaḍāpāda's \textit{Bhāṣya} upon it in Wilson's edition run as follows—

\begin{quote}
\begin{verse}
प्रकुटे: सुकुमारतर्यः न किंचिदस्तीति मे मतिभवति ।
या द्वाससीति पुनर्म दर्शनसूपैति पुरुषस्य ॥ ६१ ॥
\end{verse}
\end{quote}

योक्ते प्रकुटे: सुकुमारतर्यः न किंचिदस्तीतिवें मे मतिभवति येन परार्थिए एवं
मतिहिंसता कस्मादहसमनेन पुनर्वेण \textit{द्वाससीति} पुनो पुनर्वेदिनेन नौपैति पुरुषस्या-
\textit{दर्शनसूपैतित्वेष्यं}: तत्त्व सुकुमारतर्यः वर्णविन्य:। इत्यर्थानं कारणं बुविते। अजो(?)
जन्तुप्रत्येकीविनामलोऽसुकुमारातर्यः \textit{तयंके} वेदौति सर्गे नरकभेय वा।
अपर्य लभावकारणिन्द्रं बुवि। केन शुद्धित्वां हसा मयूरः: केन भिन्नितः। \textit{शहार}-
रित्वेलितः। अन्तर साहित्यायेचाय आहुः। \textit{निगृंहतादृश्यतिमये कथं सुगुणत:। प्राजा:}
\textit{जातिरन्तु कथं या पुणवास्मिः दुग्धदेय:। तत्सात् प्रकृतेः भृज्ये।} तत्स शुक्लेन्द्रस्वतत्तन्तुभयं
\textit{शुक्लं एव पटो क्वसिदित शुरुवमु: कणं एवेति।} एवं निगृहु भारतेऽसुकुमारः। अयो लोकका-
\textit{रितिकुण:। समुन्निस्ति: इतिस गम्ये।} \textit{निगृहुं इत्या: सुगुणान्त:} लोकान्त: तस्मादुस्तत्तिति-
\textit{पुष्पे:।} अनेन पुष्पो व्यावहार:। तथा केषानित्वान: काल: कारणमिति: पूर्ण:।}
\textit{काल: पञ्चासित: (?) पञ्चित: भूतानि कार: सहस्रेऽगत:।} काल: \textit{सुमेधु}
\textit{हास्यति कालो हि दुरवित्तम:।} \textit{व्यक्तम (?) व्यक्तमपुरुषाध्य:।} \textit{पदार्थास्तेन कालो-}
\textit{उत्तमोदशित: व्यक्त:। सर्वक्तस्वतः कालस्पर्शित प्रधानमेव कारणं श्वा (?)}
\textit{भावार्थस्वतः तेन: तस्मात् कालो न कारणं नापि लभाव इति।} \textit{तस्मात् प्रकृतिरेव}
\textit{कारणं न प्रकुटे: कारणमिति तत्त्वेष्यं।} \textit{न पुनर्वद्वेदिनेनुमा कारणमिति पुरुषस्य।} अतः प्रकुटे:}
\textit{सुकुमारतर्यः सुभोम्यतर्यः न किंचिदीशरादिक कारणमिति मे मतिभवति।}
\end{quote}

Here the 61st verse clearly states that there is nothing more 'delicate' or 'subtle' (सुकुमारतर्य) than
Prakṛiti, evidently meaning that according to the Sāṅkhya philosophy Prakṛiti is the final cause of the visible world and that there is no other finer, or subtler or ulterior cause. The comparative degree (सुकुमारतर), here used, shows that the writer of the Kārikās must have in his mind some other ulterior causes of the world mentioned by other philosophers. What could these be? There is no stanza in the present text which would elucidate this point. But if we read Gauḍapāda's Bhāṣya, the point is cleared up by mentioning four subtler causes advocated by others, namely, Ishvāra, Puruṣa, Kāla, (time) and Svabhāva (nature). The first two of these being nirguna cannot be the cause of saguṇa world, and the last two being vyakta (visible) cannot precede the avyakta (Prakṛiti). So the Bhāṣya-kāra re-iterates the Sāṅkhya conclusion that there is no finer or subtler cause of the visible world than the Prakṛiti; and then proceeds to the examination of the next, that is, the 62nd verse in Wilson’s edition.

Now as I was reading this Bhāṣya, it struck me that all this discussion about several ulterior causes of the world could not have been inserted in the Bhāṣya by Gauḍapāda on his own responsibility. On the contrary he introduces it by the phrase, तत्र सुकुमारतरः वर्णयति, which means, (he) now describes or explains (what is meant by) सुकुमारतरः. The third personal verb वर्णयति cannot refer to the Bhāṣya-kāra or commentator. Again the enunciation of the different doctrines
regarding the ulterior cause of the world is introduced by such words as \textit{प्रांते, अपरे स्वभावकारणिकै बृवते, तथा केवलचित्कः काळः कारणसितः, नापि स्वभाव हृतः,} and the reply is introduced by the phrase, \textit{अन्त संस्काराचारा आङ्गुः।} (See the underlined words in the extract from the Bhāshya given above.) These phrases, coming as they do after the phrase \textit{तत्त्र सुकुमारतरं वर्णयति,} look like excerpts, or \textit{pratīkās} as they are called in Sanskrit, from the text on which Gauḍapāda is commenting. In other words Gauḍapāda here seems to have before him a verse in the text which explained why \textit{Prakṛiti} was called \textit{sukumārata} in the 61st stanza. It may be noted that in commenting on the 27th \textit{Kārikā} Gauḍapāda while explaining how the variety in the world is produced by \textit{स्वपरिवर्त्यम्} alone, has discussed the same different causes, viz., \textit{Ishvara, Svabhava, Purusha,} etc. But there Gauḍapāda uses no such phrases as \textit{sukumārata} \textit{वर्णयति,} nor is there to be found a systematic statement and refutation of different opinions as here. This leads me to conclude that in the original \textit{Kārikās} there must have been a verse following the 61st and explaining why \textit{Prakṛiti} was therein called \textit{sukumārata}. Taking my cue from the underlined words in the \textit{Bhāshya} above given I would, therefore, reconstruct and restore the now missing \textit{Aryā} as follows:

\textit{कारणस्थिरमेके पुर्यं कालं-परे स्वभावं वा।}\\
\textit{प्रजा: कथं निगुःतो व्यक्तं कालं: स्वभावं।}
The first half of this Āryā would thus give the four causes (subtler than Prakṛiti) mentioned by others, and the second half would contain their refutation in brief; and then तत्र सुकुमारतरः वर्ण्यति in Gauḍapāda's Bhāṣya would be a fitting introduction to it. It may be noticed that पुरुष, here mentioned is निर्गुण पुरुष and that the reply प्रजा: कथं निर्गुणते: holds good equally in the case of ईश्वर and पुरुष; while the reply that व्यक्त cannot be the cause of the अव्यक्त (Prakṛiti) applies both to काल and स्वभाव mentioned in the first half of the proposed Āryā.

The peculiarity of the Sāṅkhya as distinguished from other systems of philosophy is that in their search for a final cause of the visible world the Sāṅkhyas never go beyond Prakṛiti. They recognise neither Ishvara nor anything else as standing behind and controlling the Prakṛiti (Cf. Bhagavad-gītā ix. 10.) The Sāṅkhya-pravacanā-Sūtras i, 92 & v, 2ff. clearly state that Ishvara cannot be proved to be the final cause, and the Sāṅkhya-Kārikās would be incomplete without a similar statement. But the doctrine is not contained in the 69 Kārikās forming the doctrinal part of the present text. Unless, therefore, we supply a verse like the above, the doctrinal part of the Sāṅkhyā Kārikās would be seriously defective, not to mention that one Āryā would be wanting to complete the number of 70 Āryās said to be originally comprised in the book.
I have tried to restore the lost verse from the Bhāshya of Gauḍapāda. But it may fairly be asked if the part of the Bhāshya relied upon is genuine. For this purpose we may refer to Dr. Takakusu’s French translation of the Chinese version of the Kārikās and the commentary referred to above. The Chinese commentary on the 61st verse is more complete than Gauḍapāda’s Bhāshya. It mentions more fully than Gauḍapāda the four causes, viz. Iskvara, Puruṣa, Kāla (time) and Svabhāva (nature), which some believe to be subtler than Prakṛti, and refutes them one by one by the same arguments as used by Gauḍapāda. It is very difficult to judge what exact words were used in the Sanskrit commentary which was rendered into Chinese. In the French translation the adversary’s objection is introduced by the words “On pourra dire” (one might say, corresponding to the पुके शुच्याते and अपरे शुच्याते in Gauḍapāda’s Bhāshya) and to the refutation are prefixed the words “Respondent a tous nous disons” (Repying to all this we say, corresponding to अन्तर सांख्याद्वारा आहूऽ of Gauḍapāda). It seems clear, therefore, that the commentary which was rendered into Chinese by Paramārtha in the early part of the sixth century A. D. was in substantial agreement with the Bhāshya of Gauḍapāda.

I have stated above that the manuscript of Māṭhara-vṛitti in the Deccan College Library agrees more with the Chinese commentary than does the Bhāshya of Gauḍapāda. The Mss. of this vṛitti are very scarce.
The Deccan College Ms. gives the commentary on the 61st verse thus—
If we compare this Vyūtti with Gaudāpāda's Bhāṣṭya on the 61st verse we shall find that both are substantially the same. The phrases तत्र सुकुमारसङ्ग्रहं वर्णयति and हृद्यः कारणमिति etc. occur in both, and even the quotations in support of the adverse theories are almost identical. Still more important are the words सुकुमारस इत्यत्तो वाक्यों: कृत्व: showing that, in the opinion of the Vyūttikāra the passage which follows तत्र सुकुमारसङ्ग्रहं वर्णयति is explanatory of the statement in the 61st verse, viz., प्रकृते: सुकुमारस न विचित्रः etc.. Of course this वाक्यों may be supposed to have been made either by the text-writer or by the commentator. But the phrase तत्र सुकुमारसङ्ग्रहं वर्णयति precludes the supposition that it is made by the commentator. Here we have, however, a new and different explanation of the phrase में मतिर्मयति inasmuch as में is interpreted to mean पुरुषस्य i.e. परमात्मन:। This explanation is more or less Vedāntic. The Sāṅkhyaśas do not recognise परमात्मा and it seems to me that this explanation is an interpolation made by some one who was anxious to interpret the Kārikās consistently with the Vedāntic.
view of पर्मात्मा. Ishvārakṛishṇa was in my opinion a thorough निरीक्षरवादी, that is, recognising nothing beyond पुरुष and प्रकृति. But it seems that, later, attempts were made to explain his Kārikās consistently with Vedānta, as Vijnāna Bhikṣu has done in his Sāṅkhyaśāstra. Ishvārakṛishṇa in the hands of these commentators thus became as Vedāntist, and then it was, I think, that the verse originally following the 61st was dropped and the commentary thereon, that is, the old commentary सुकुमारतरं वर्णिति etc. was tacked on to the 61st verse. When this change took place it is impossible to exactly ascertain; but it must have taken place before the Kārikās were rendered into Chinese. It is noticeable in this connection that the Sāṅkhya-tattva-kaumudi, a commentary on the Kārikās by Vāchaspati-mishra, does not at all notice this lengthy discussion about the several ulterior causes of the world. Vāchaspati-mishra is believed to have lived in the 12th century after Christ.

To sum up. (1) The Sāṅkhya-Kārikās are known as Aryan-Saptati (see verse 72) in Sanskrit and Suvārṇa-Saptati in Chinese. (2) But our present text contains 72 verses, and when the last three are excluded as giving only the गुस्तर्वपरा there remain only 69 verses for the doctrinal part of the book. (3) The Bhāṣya of Gauḍapāda, the मार्गवृत्ति, and the commentary translated into Chinese all contain lengthy and substantially similar discussions on verse 61, explaining why in that verse प्रकृति is called सुकुमारतर. (4) In these discussions,
there are words which indicate that the discussion must have been originally based on a verse in the text, and is not an exposition given merely by the commentators. And (5) an essential characteristic of the Sāṅkhya doctrine will be wanting in the Kārikās if the work be supposed to consist in its doctrinal part of only 69 verses. If we put all these facts together we are led to infer that originally there was one verse between the 61st and the 62nd (in Wilson's edition) and that if reconstructed from what look like excerpts from it in the old commentaries it would run thus—

कारणमीशरमेके पुरुषं काठं परे स्वभावं था।
प्रजा: कथं निरुपणं व्यक्तं: काठं स्वभावं।

I have stated above that it is an essential part of the Sāṅkhya doctrine not to recognise any cause of the world subtler than Prakṛiti: neither Ishvara, nor Puruṣa, nor Kāla (time), nor again Svabhāva (nature); and that the subject is noticed twice in the old commentaries on the Kārikās, once in explaining the 27th verse and again in the commentary on the 61st verse. It is interesting in this connection to note that the Arab writer Alberuni, quoting from a Sāṅkhya book in the form of a dialogue, dwells upon the same essential doctrine of the Sāṅkhya philosophy (Vide Alberuni's India, English trans. Vol. I. pp. 30 and 31, Trubner and Co.). With this independent evidence regarding the characteristic doctrine of the Sāṅkhyas before us, it would certainly be unreasonable to suppose that the doctrine was not mentioned in
Sāṅkhya-Kārikās, as we shall have to do if the doctrinal part of the text is believed to have originally contained only 69 verses found in the existing editions of the Kārikās. Shvetāśvatara Upaniṣad vi. 1, it may be finally mentioned, expressly refers to Svabhava, Kāla and Ishvāra as the three possible ulterior causes of the world and naturally declares the last one, viz., Ishvāra, as being the real cause. The Sāṅkhyaśas reject all these three, and from the remaining two, Puruṣa and Prakṛti, reject Puruṣa as it is nirguna and fix on Prakṛti alone as the final cause of the visible world. If the Shvetāśvatara refers to this discussion, there is no reason why the Sāṅkhya-Kārikās should not have originally contained a similar discussion of the subject.
CHALDEAN
AND
INDIAN VEDAS.

(1917)
CHALDEAN
AND
INDIAN VEDAS.*

One of the most important events of the latter half of the nineteenth century is the discovery of the Chaldean literature as embodied in the cuneiform inscriptions excavated in Mesopotamia and deciphered with great skill, ingenuity, and perseverance by European scholars. These ancient records conclusively show that the country at the mouth of the Euphrates was, so far back as 5000 B.C., colonised by a people of the Turanian race who went there by sea from some distant province, presumably situated in Northern Asia. These people not only developed a civilization of their own in Mesopotamia, but what is to the point, have left there a record of their religious beliefs and culture in the form of brick-inscriptions, which M. Lenormant has aptly described as the Chaldean Veda.

* A lecture on this subject was delivered by the late Lok. B. C. Tilak in the hall of the Bombay Presidency Association Rooms at the Appollo Punder, Bombay, on 6 December 1904, in connection with the Graduates' Association Lecture Series, under the Presidency of Mr. K. R. Kanna; while this article was contributed by him to the Bhavdārkar Commemoration Volume with some additions up to date nearly 13 years later i. e. in July 1917.
This ancient civilization at the mouth of the Tigris and Euphrates gradually spread northwards and was the parent of the Assyrian civilization which flourished about 2000 years before Christ. It is believed that the Hindus came in contact with Assyrians after this date, and as a natural result of this intercourse Hindu culture was largely influenced by the Assyrian. Thus Rudolph von Ihering, starting with the theory that the original Aryan home was in an uncultivated mountain district in Central Asia, has, in his work on the *Evolution of the Aryans* (Eng. trans. by Drucker, 1897, pp. 11, 223–4), come to the conclusion that the Aryans were originally a nomadic race unacquainted with agriculture, canals, navigation, stone-houses, working in metals, money transactions, alphabet and such other elements of higher civilization, all of which they subsequently borrowed from the Babylonians. But this conclusion is not accepted by other scholars, who think that von Ihering has gone too far in the matter. It is, however, still believed that in the matter of magical charms and formulae, cosmography, cosmogony, astronomy and chronology the Hindus were more or less indebted to the Babylonians, and that this borrowing was the result of an intercourse between the two races at a date later than 2000 before Christ.* When it was, therefore pointed out that the word *mand* in the phrase *saod mand hiranyayd*

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* For a summary see the article on *Hinduism* in Hastings' *Encyclopaedia of Religion and Ethics*, Vol. VI. p. 688f.
(Rv. VIII. 78. 2) corresponded with Latin \textit{mina}, the Greek \textit{μετρα} and the Phœnician \textit{manâh}, and it must therefore have been borrowed by the Indians from the Babylonians, and that, if so, a later date must be assigned to the \textsc{Rigveda}. Professor Max Muller declined* to accept the inference and contended that the word might be of Aryan origin and that it might, as interpreted by Sāyana, mean 'ornaments' or 'beautiful appendices'. For Professor Max Muller believed, and rightly, that the \textsc{Rigveda}, the oldest of the Vedas, cannot be assigned to a date later than 2000 years before Christ. The learned Orientalist was aware that the word \textit{mand} was to be found not only in the Babylonian but also in the Accadian tongue. But he seemed not to have realised the importance of this fact; for in that case, the Accadian being a still older language, it was not necessary to assign a later date to the \textsc{Rigveda} even if the word \textit{mand} (cf. Kanareses and Marâthi \textit{mâna}, \textit{Eng}-

lish corruption 'maund') was found to be of foreign origin.

In my \textit{Orion or the Antiquity of the Vedas}, I have shown that Vedic culture or civilization can be carried back as far as, if not further than, 4500 B.C., when the Vernal equinox was in Orion. This makes the Vedic and the Chaldean civilizations almost contemporaneous, and it is not unnatural to expect some intercourse either by

land or by sea between the Chaldean and the Vedic races even in those ancient times. No evidence has, however, yet been adduced to prove the existence of an intercourse between these two races in the fourth or fifth millennium before Christ by tracing Vedic words or ideas in the Chaldean tongue, or vice versa. If this evidence is discovered the existing theories about the inter-relation between these two oldest civilizations will have to be greatly modified or revised. But without going so far into the subject I wish in this essay to confine myself to the words and ideas which I have found common to the Chaldean and the Indian Vedas, stating at the same time what little has been done by the previous scholars in this direction.

Professor A. H. Sayce, in his *Hibbert Lectures*, 1887, pages 137–138, observes that in an ancient list of Babylonian clothing *sindhu* is mentioned as a name for muslin or woven cloth, and that it corresponds to the *shadin* of the Old Testament and the *σεμόν* of the Greeks. The learned Professor has further stated that this ‘muslin’ or woven cloth must have been called *sindhu* by the Accadians (Chaldeans), because it was exported from the banks of the Indus (*Sindhu*) to Chaldea in those days (cf. the word *calico* from *Calicut*). He has further noted that this intercourse between the two countries must have been by sea, for had the word passed by land, i.e. through Persia, the initial *s* of the word would have become *h* in Persian mouths.
Here then we have two words: *mand* borrowed by the Vedic people from the Chaldeans, and *sindhu* borrowed by the Accadians or Chaldeans from the Indians, proving either that these races were neighbours to each other even in Vedic times or that the Chaldean traders had made their way to the mouth of the Indus or to the Western coast of India, each people borrowing from the other according to necessity.

More recently, the excavations made in Asia Minor during the summer of 1907 have brought to light documents which contain the terms of a treaty between the king of Hittites and the king of Mitani (Northern Mesopotamia), of the time of circa 1400 before Christ. In these treaties the deities of both these nations are invoked; and among the Mitani gods Hugo Winkler has found the names of Mitra, Varuṇa, Indra and Nāsatyas or Ashvins, one and all of which are Vedic deities. It is, therefore, quite clear that in the fourteenth century B.C. and earlier the rulers of Northern Mesopotamia worshipped Vedic gods. The names of these rulers, it is true, appear to be Persian and not Vedic. But it does not affect the conclusion that Vedic culture and worship were known to and had influenced the Mesopotamian rulers in the fourteenth century before Christ.*

This takes us back to B.C. 1400 or 1500. But we can go still further back and show, that the intercourse

between Chaldea and India existed from a time far anterior to the reign of the Mitanic kings. M. Lenormant has justly observed that while the Aryans worshipped the good and beneficent deities in nature, the Mongolians (to which race the Chaldeans belonged) always tried to propitiate the malevolent spirits; and hence while sacrifice formed the main feature of the Vedic religion, magic and sorcery was the main characteristic of the religion of the ancient Chaldeans. Not that there were no Chaldean hymns to the sun-god, but even these were used for magic purposes.*

This shrewd generalisation of the French savant at once enables us to lay our hand upon the Atharva Veda, if we wish to find any parallels to the Chaldean magic formulæ in the Vedic literature. The Vedic religion is very often called the tr̥yī-dharma or the religion based only on the three ancient and older Vedas. The Atharva Veda finds no place amongst these three, and there is an old tradition that in point of importance and authority the Atharva does not stand on a par with the Rig, the Yajus and the Sāman. Historically speaking it is now further ascertained that the Atharva Veda is much more recent than the three other Vedas. But though comparatively younger, we must at the same time remember that even this recent Veda must be placed at least some twenty-five centuries before Christ in as.

much as it is mentioned by name and cited in the Brāhmaṇas and the Upaniṣhads.∗

If we therefore discover any names of Chaldean spirits or demons in the Atharva, it could only mean that the magic of the Chaldeans was borrowed, partially at least, by the Vedic people prior to the second millennium before Christ, and that this could not have been done unless the Chaldean people were either the neighbours of Vedic tribes or traded with them even in those ancient days.

Now let us take for comparison Atharva Veda v. 13.

It is a hymn against snake poison; and verses 6, 7, 8 and 10 therein (omitting the accents) run as follows—

असिितः तैमातत्स्य क्षोधोपदक्ष्य च।
साधसाह्सप्तैः मन्नोरव ज्यामिति ठनो। वि मुरुकामि रयो। इव। ॥ १६॥
आलिंगी च बिलिंगी च पिता च माता च।
विद्य व: सर्वो तो कन्यसात: कि करक्षय। ॥ ७॥
उष्मुलङ्गा दुहिता जाता द्रस्तिक्षन्या (र. 7, वनस:।)
प्रतिक्षु कुदुधीणां सर्वासारसं विषयं। ॥ ८॥

……………..

ताशुङ्ग न ताशुङ्ग न पेत्तमासि ताशुङ्गम्।
ताशुङ्गेनारसं विषयं। ॥ १०॥

The verses have been translated into English by Bloomfield, † Whitney, Griffith and other scholars; but

∗ Bloomfield’s Introduction to Atharva Veda in S. R. E. Vol. XLII.
† In the S. R. E. series vol. XLII, p. 28—

I release thee from the fury of the black serpent, the.
none of them has attempted to explain the derivation and meaning of the words printed in black in the original and italics in the translation. Their very sound betrays, to a Sanskrit reader, their foreign origin. But hitherto not only commentators but even translators have failed to explain their true import or origin. The word Taimāṭa again occurs in Atharva Veda V. 18. 4; while Āligi, Viligi and Urugūlā do not again occur in the Atharva Veda. According to Kaushika Sūtras these hymns are recited while performing certain manœuvres in the process of removing the snake poison. But the Sūtras do not give any information regarding the origin of the above mentioned words. Griffith says that Taimāṭa and Ayodaka (waterless) are some unidentifiable

Taimāṭa the brown serpent, the poison that is not fluid, the all-conquering, as the bow-string (is loosened) from the bow, as chariots (from horses).  6.

Both Āligi and Viligi, both father and mother, we know your kin everywhere. Deprived of your strength what will ye do? 7.

The daughter of Urugūlā, the evil one born with the black—of all those who have run to their hiding-place, the poison is devoid of force. 8.

Tābuvaṃ (or) not Tābuvaṃ, thou (O serpent) art not Tābuvaṃ. Through Tābuvaṃ thy poison is bereft of force. 10.
varieties of snakes and that Ālīgi, Vi̯i̯i, and Urugālā similarly indicate some other unknown species of serpents. Whitney considers Taimata as a derivative from Tīmāta, while the word Urugālā is translated by him as "the broad-knobbed one." Ālīgi and Vi̯i̯i (the father and mother) he does not attempt to explain at all. The word asikni, which means black, suggests that Urugālā is a word borrowed from black races (cf. asiknih vi̯i̯aḥ in Rv. VII, 5. 3). But in the absence of any definite knowledge about the magic and sorcery of the black races, it was impossible to trace the origin of these words. The discovery of the Chaldean literature now supplies us with the means of accurately ascertaining the parentage of some of these words. For instance, the serpent Taimata is, I am sure, no other than the primeval watery dragon Ti̯mat generally represented as a female but sometimes even as a male monster snake in the Chaldean cosmogonic legends; and the word Ayodaka in the Vedic text indicates that a land species of the same (as opposed to aquatic) is intended to be coupled with it. Ti̯mat is the well-known Chaldean androgynous dragon whose fight with Marduk is the subject of some of the cuneiform tablets* of the creation legends. As regards Urugālā the word appears as Urugala or Urugula in the Accadian language. Literally, it means "the great (ga³=gula)

city (ürû)”, but is generally used to denote the great nether world, the abode of the dead — a place visited by Istar in her search for her lover Dumuzi or Tamuz. Personified, it means the deity of the nether world, and a female snake can be fitly described as Uru-gula’s daughter.

I have not been able to trace Aligi and Viligi, but they evidently appear to be Accadian words, for there is an Assyrian god called Bil and Bil-gi. At any rate there is no doubt that Taimata and Uru-gala are, in spite of a little difference in spelling, the same as Tidmat and Uru-gala or Uru-gula in the Accadian legends, and that these names must have been borrowed by the Vedic people from the Chaldeans, coming in contact with them either as their neighbours or as tradesmen in those early days. When, the old religion of sacrifice was thus tampered with, and hybrid hymns incorporating foreign magical incantations and formulæ were tried to be introduced in the Vedic literature, it was natural that the Veda which contained these incantations should come to be looked upon with scant respect or even with contempt by the orthodox Vedic community, who must then have regarded the Atharva Veda as a novel departure in their religious observances. There are some other words in the Atharva Veda, especially in the poison and witchcraft 

* Jensen’s Kosmologie der Babylonier, pp. 217–222; Chaldea, S. N. Series pp. 157, 326f, and 367f.
hymns, which on their face appear to be foreign importations. For instance we may cite Tābuvam* in the hymn we are considering and Kanaknakam and Taudīn in Av., X, 4. Again in the word Kimidin which occurs both in the Rig and the Atharva Veda, (Av. VII, 104. 23; Av. I. 7. 1) and which indicates goblins, or evil spirits, is derived by Yāska (VI. 119) from kim idānim "(what now?), and explained by observing that these ghosts were believed to wander about in search of "what is now happening." This derivation is obviously fanciful; and as the word has a foreign ring, I believe that it is a Chaldean word. For Ekimmu and Dimme are Accadian words for spirits and Kimm-dimm may well have been a word compounded from them to express ghosts of all kinds.

It may be further noted that the Kirātas, evidently some non-Aryan tribe, are mentioned as dealing in medicinal herbs in Av. X. 4. 14; and Griffith, in a note to Av. V. 13, 5 interprets Kairāta as a variety of snake found among the Kirātas, the barbarous tribes

* I think Tābuvam is derived from the Polynesian word tabu and means, pertaining to or resulting from tabu, i.e. contact with unclean, unholy, or interdicted thing, in which case the disease or evil requires to be treated with sacred incantations. The exorcist asks whether the poison is or is not of Tābuvam character. For the use of tabus in Babylonia see Thompson's Semitic Magic.
who inhabited woods and mountains and lived by hunting. (the *Kürkäs* of Arrian). It is therefore not to be doubted that the magic and witchcraft hymns in the Atharva Veda do contain some foreign words. But we in India have not the means to thoroughly investigate all of them. We have no library in India, much less an Assyriologist we can refer to or consult for obtaining the requisite information on these matters. The *Mleccha-prasiddhārtha-prāmāṇyādhiḥkaraṇa* in Jaimini’s sūtras (i. 3. 10) shows that even the orthodox *Mimāṃsakas* would not have hesitated to recognise the foreign origin of such words if they had but been able to ascertain it definitely.

The Bible often refers to Chaldea and Babylonia. But no one ever dreamt that the account of creation and deluge in the Old Testament could have been, in the main, borrowed by the Hebrew priests from Chaldean sources. A great sensation was therefore caused in Europe when the Chaldean cuneiform tablets of the creation legend were discovered, their translation published and the Hebrew word *Tēhom*, which is translated as ‘deep’ or ‘waters’ in the first verses of Genesis, Chap. I, was found to be no other than Assyrian *Tammu* or the Chaldean *Tidmat*. Even so late as 1902, Professor Delitzsch’s lectures on *Babel and Bible* (Eng. trans. New York 1903) were received and criticised in the same spirit. But it may now be taken as established that the Biblical stories of creation and deluge together with the institution of sabbath and
even the story of the fall of man by the serpent are all of Chaldean origin. It was further pointed out by Professor Delitzch, the well-known Assyriologist, that the word Jehovah, God's secret name revealed to Moses, was also of Chaldean origin, and that its real pronunciation was Yāhu, and not Jehovah; and this derivation is now accepted even by the compilers of the present Biblical dictionaries. But the matter does not really end at this point. Jehovah is undoubtedly the same word as the Chaldean Yāhu. But we have still to inquire whether the word can or cannot be traced further back. And here we derive great help from the Vedic literature. The word yahu (Zend, yazu), yahua, yahvatu and the feminine forms yahvi and yahvati occur several times in the Rigveda; and Grassmann derives them from the root yah = to hasten or to drive quickly. The Nighantu also tells us that the word yaha means water (Nig. I. 12) or strength (Nig. II. 9); while the adjective yahva (Nig. III. 3; Nir. VIII, 8); means 'great.' Yahua in this sense is applied in the Rigveda to Soma (Rv. IX. 75. 1), to Agni (Rv. III. 1. 12) and to Indra. (Rv. VIII. 13. 24). It is needless to give further quotations. I may only mention that yahua in one instance (Rv. X. 110. 3) is used in the vocative case, and Agni is there addressed as "O Yahua! you are the sacrificer of the gods." This clearly shows that the word was not only familiar to the Vedic sages, but that it was applied by them to their gods to signify their might, power or strength;.
and Griffith has translated it by the English word 'Lord' in several places. Besides, in the Vedic Sanskrit we have several other words derived from the root \( yah \) and so cognate to \( yahua, \) viz. \( yahu, yahun, yahvi \) and \( yahvati. \) It is not, therefore, unreasonable to conclude that \( yahua \) was originally a Vedic word, and though Moses may have borrowed it from the Chaldeans, yet the Chaldean tongue, in which the various other cognate forms of the word are wanting, cannot claim it to be originally its own. Like the word \( sindhu \) the Chaldeans appear to have themselves borrowed it from the Indians in their mutual intercourse at some remote period of antiquity.

We might say the same about the Chaldean word \( Apsu, \) or \( Amsu. \) It is written as \( Zu ab \) and read as \( Amsu. \) It denotes the primeval chaos or watery abyss, and is represented as the husband of \( Tiamat. \) Marduk had therefore to fight with them both to rescue the powers of light from their clutches. Dr. Jensen * has critically examined the various meanings of this word in the Chaldean literature. But it is unnecessary to go into these details; for the word and its denotation are well established in usage. It is the primeval abyss from which the gods of light have to be rescued by Marduk for the benefit of mankind. This conquest of Marduk over \( Apsu \) and \( Tiamat \) is celebrated in a Chaldean Epic which is now available in translation.†

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* In his *Kosmologie der Babylonier*, pp. 243-253.
† See Sayce’s *Höbert Lectures*, pp. 379-384; Jensen’s
I have shown above that the word Tiamat occurs in the Atharva Veda, and that it must have been borrowed from the Chaldean. Such is not however the case with Apsu, the husband of Tiamat. In the Rigveda we have not only the word Apsu in several places, but the main features of the Tiamat-Marduk struggle are also to be found in the Vritra-Indra fight so fully described in the Vedas. I have shown elsewhere * that Indra’s fight with the Vritra was for the release of captive waters, and that after the fight these waters, till then enveloped and hemmed in by Vritra, the Vedic Tiamat, were set free, by Indra, to flow (sartare). † For this very reason Indra is described in the Rigveda as Apsu-jit. ‡ It is usual to explain the compound word

* See Arctic Home in the Vedas, Chap. IX, pp. 233-296.
† Rigveda i. 32. 12. Curiously enough the same phrase occurs in the Chaldean Creation Tablet No. 4, line 140, where Marduk after defeating Tiamat, is said to have ordered her (Tiamat’s) waters, which were not coming out, to come forth. The line is so rendered by Dr. Budge; but Jensen, following the Hebrew tradition, translates it to mean “ordered the waters not to come forth” (Kosmologie der Babylonier, p. 288). Vedic tradition and phraseology both support Dr. Budge’s rendering and I prefer it to Jensen’s. Prof. Sayce (Hibbert Lectures, 1887, p. 383) follows Dr. Budge, and Jastrow (Babylonia and Assyria, p. 438) follows Jensen.
‡ RV. VIII 13. 2; VIII. 36. 1; IX. 106. 3.
Apsu-jit by treating its first member as a locative of $ap =$ water and translate it as meaning "conqueror in waters." But it will be easily seen that in spite of the Vārtika on Pāṇini VI. 3. 18, this is rather a forced construction, and that it is better to take $Apsu$ as a word by itself and translate Apsu-jit as "conqueror of Apsu." The same remark applies to the words $Apsu-ja$ and $Apsu-kshit$ and the like. It may be further noted that the phrase apanam arpanam* also occurs in the Rigveda, and there, apanam, which is an adjective, evidently means "of or relating to Apsu." Similarly the word apanamat is also found in the Vedic literature (Ait. Brāh. VII. 7), and it is there applied to Agni. In this word we cannot take Apsu as a locative of $ap$; and if we have thus a direct authority for treating Apsu as a separate word by itself, there is no reason why we should not take Apsu as a word by itself, and not as the locative of $ap$, in such words as Apsu-jit and Apsu-kshit.

$Apsu$ taken as a separate word, may be derived either from $ap =$ water and $su =$ to beget, or from $psu$, which, according to Nig. III. 7, means shape or form. In the latter case Apsu would mean a shapeless or formless chaos, which is the meaning assigned to it in the Chaldean literature. Anyhow there is little doubt that Apsu in Apsu-jit is the same word as the Chaldean Apsu or Apsu which was conquered by Marduk, the Chaldean Indra. The word is evidently Vedic, but owing to the ignorance of its true significance, the Indian etymologists have treated it as the

* Ṛv. X.55.37.
locative of ap in compounds like apsu-jit. The light thrown by the Chaldean literature on the subject enables us now to rectify the error and understand Apsu-jit in its proper and legitimate sense. Tiamat was the original Chaldean word for the primeval abyss. But when the Vedic word Apsu was borrowed it became necessary to differentiate between the two, and this seems to have been done by making one the husband of the other.

Another Vedic word on which new light is thrown by the Chaldean literature is uru. In the Vedic literature the word occurs several times by itself and also in compounds like uru-krama (RV. I. 90. 9), uru-kshaya (RV. X. 118. 9), uru-gadya (RV. I. 154. 1) and several others. The word uru in these compounds is generally taken as an adjective meaning "wide." Thus uru-gadya is translated by "wide-going" and so on. But it seems to me that if we take uru, as in the Chaldean, to mean the nether world, the above Vedic words can be better interpreted. In the Rigveda uru-gadya is not only applied to Vishnu but also to Indra and Soma. Now we know from the Rigveda that Vishnu and Soma are the deities who helped Indra in the conquest of the waters of Apsu. All these deities can therefore be aptly described as uru-gadya, that is, those who traverse the nether world of waters and conquer, along with Indra, the powers of darkness therein. In other words, we can now take uru-kshaya as a synonym for apsu-kshita and uru-krama as synonymous with apsu-sad or apsu-jit.
The word *uru* appears to have the same meaning in *uru-lokam* in RV. X. 128. 2. But a still more important word is *Uru-ashī* (*Urvashi*), the name of a well-known nymph. Yāska* would have us believe that the word *uru* in *Uru-ashī* means a thigh, and there is an etymological myth which tells us that *Uru-ashī* was born from the thigh of Nārāyaṇa. † But all these strange derivations become unnecessary if we take *uru* in *Uru-ashī* to mean the nether world or its waters as in the Chaldean. *Uru-ashī* would then mean a watery nymph or a nymph of the nether world and can thus be properly described as *ap-saras*. There are a few other words in the Rigveda on which new light may be thrown by the discovery of Chaldean literature. For instance *sinivati* ‡ looks to me like a foreign word, and *tur-pharitā* in that well-known unintelligible verse (RV. X. 108. 6) also wears a suspicious look. I shall not, therefore, be surprised if that verse is found to contain some words of foreign origin. On the other hand *uru* meaning ‘a month’ ‘in the Chaldean language seems to me to be the same word as the Vedic *ritu* meaning ‘a season’ or ‘a month.’

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* Nir. V. 13. † Cf. Kālidāsa’s Vikramorvasīhyā, i. 3.
‡ *Sin bubbali* in Chaldean may mean ‘disappearance of the moon’; and *tur-parattu* may mean ‘son of waters’. *Sindhu-mātara*, sons of ocean, is one of the epithets of Aśvinś in the Rigveda. The word *sinā* appears in Rigveda ii. 302. and there it is said to be brought to or presented to Vṛitra. Can
VEDIC CONCEPTION OF THE WORLD.
(From The Arctic Home in the Vedas.)

Vṛitra Triumphant.

Vṛitra Slain.

1 Varuna's tree in the Nether World.
2 The cosmic waters (stagnant, Chald. APSU) enveloped by Vṛitra.
3 Vṛitra as Serpent (Chald. TIAMAT).
4 The sun in stagnant waters in the clutches of Vṛitra.

5 The sunrise mountains.
6 The sunset mountains.
7 The Cosmic waters set free to move in the Heavens.
8 The sun moving with released waters in the Heavens.
BABYLONIAN CONCEPTION OF THE WORLD.

From JENSI'S COSMOLOGIE DE BABYLONIÆ.

1. Inside of the Heavens.
2. The Earth.
3. The Ocean (pont) round the world.
4. The Ocean (dunce) round the world.
5. The Ocean of Death.
6. The Kingdom of Death.
7. The seven walls of Death's Kingdom.
Lastly I may here mention that we find a very close resemblance between the Chaldean and the Vedic legends regarding the place and movements of cosmic waters, their conquest by the powers of light, viz. by Indra or Marduk, and also between the cosmographic ideas of the two nations, that is those relating to the arrangement of the whole universe, as may be seen by a comparison of the illustrative diagram of “the world according to Babylonish ideas” given by Jensen at the end of his book, and the one given by me in my *Arctic Home in the Vedas* at the end of Chapter IX.* Dr. Jensen has also discussed the sevenfold division of the earth’s continents by the Babylonians, and pointed out its resemblance with the Paurāṇic account of the seven continents.† But I think that the parallel can be carried much further; for I have shown elsewhere that this sevenfold division is to be found not only in the Purāṇas but also in the Vedas.‡ It is really interesting to note that there are not only seven Heavens and seven Hells in the Chaldean mythology, but that the serpent Tiāmat killed by Marduk is sometimes represented as having seven heads, while Indra is called

*σινά here mean the moon? Owing to her waning she may be properly said to be handed over or delivered to Vītra, the demon of darkness.


† *Kosmologie der Babylonier*, pp. 163-184.

‡ Cf. *Arctic Home*, pp. 340f.
Sastra-han or the "Killer of Seven" in the Vedas, * and the closed watery ocean, the doors of which Indra and Agni opened by their prowess, is described as sastra-budhna (seven-bottomed) in Rv. VIII. 40. 5. Again there are indications in the ancient Chaldean literature of a dark intercalary winter month and of the sun-hero being affected with a kind of skin disease or lost for a part of the year, † thus corroborating the theory of a common Arctic home for all. But the subject, howsoever interesting it may be, cannot be discussed at the end of this paper. My object was simply to draw the attention of Vedic scholars to the importance of the comparative study of Indian and Chaldean Vedas by pointing out some words which, in my opinion, are common to both, and which fairly establish the case of mutual, and not merely one-sided, indebtedness between the almost contemporaneous Aryan and Turanian people. What effect it may have on the current theories about the inter-relation between the two ancient cultures must be left for the scholars to decide. When two civilizations are contemporaneous it is natural to expect some borrowings from each other; but when both are equally old it is difficult to see why, supposing the borrowing is proved, one of them alone should be considered to have borrowed from the other and that too only in later times.

* Rv. X. 49. 8.
† In Gilgames and Istar myths. In Rv. vii. 100.6 Vishnu is said to be affected with skin disease (shipivishthag). Compare Arctic Home, pp. 330–32. See also Plunket’s Ancient Calendars, pp. 4 and 14. The intercalary or the thirteenth month was called sedir, the dark month of sowing.
OPINIONS
OF
WELL-KNOWN ASSYRIAN SCHOLARS
ON
"CHALDEAN & INDIAN VEDAS"

(letter from Dr. A. H. Sayce.)

Queen's College,
Oxford
August 14th, 1919.

Dear Sir,

Very many thanks for your essay on "Chaldean and Indian Vedas", which has interested me greatly. Your association of Tiamat and Urugalla with Tiamat and Urugalla is very attractive. With the latter word it would also be possible to compare the Sumerian *uṣágal* "the great monster" or "serpent."

The discovery of the existence of an Indo-European language, not of the Iranian but of a purely Indian type, in Asia Minor in the 15th Century B.C. has opened up new vistas in philology. When Asia Minor can be properly excavated it is probable that very important discoveries in this direction are awaiting us.

At any rate it is already clear that the languages of Asia Minor and of the Eastern branch of the Indo-Euro-
pean family influenced one another from a very early period, and it is probable that Sumerian also was similarly influenced before the Sumerians descended into Babylonia and founded the civilisation of that country. So we may expect to find much borrowing on both sides.

Believe me to be,

Yours very truly,

A. H. SAYCE.

To

Dr. B. G. TILAK,
Hira Lodge,
60, Talbot Road,
Bayswater,
London, W.
Dear Prof. Tilak,

Many thanks for your paper "Chaldean and Indian Vedas". As far as I have read it, I find it excellent; and I will write you further on the subject later on.

In accordance with your request, I send you the names of Scholars to whom copies might be sent:—

Prof. Stephen Langdon, Reader in Assyrian, Oxford.
Prof. A. H. Sayce, Queen's College, Oxford.
The Reverend Dr. C. J. Ball, Oxford.
Dr. C. H. W. Johns, St. Catherine's College, Cambridge.

Prof. Farbridge, Manchester.

In all probability I shall think of other names by the time I next write to you.

Yours very truly,
THEOPHILUS G. PINCHES.

To
Prof. B. G. TILAK, &c. &c.
60, Talbot Road,
Bayswater, W.
Dear Prof. Tilak,

Herewith I enclose a few notes which I have written upon your paper "Chaldean and Indian Vedas." Some of the points upon which I have touched, you may have already considered, but as I may have put them in a different light, you will probably not be sorry to see them stated again.

It seemed to me to be especially important to distinguish between the non-Semitic Sumerian, the Semitic Akkadian, and the Semitic Chaldean, the two former early, the last-named of late date. It is also of importance to quote the correct form of every word treated.

I am sorry to say that I cannot think of the names of any further British Assyriologists. As to the German Assyriologists, I no longer know who among them are my friends, nor do I know which among them may have survived the hardships of the last five years. Among my French colleagues, however, I should suggest the following:—

Monsieur Fr. Thureau-Dangin, Musée du Louvre,
Paris.

Monsieur le Prof. V. Scheil, Membre de l’Institut,
Paris.
OPINIONS OF WELL-KNOWN ASSYRIOLOGISTS. 149


Monsieur L. Delaporte, 211, Rue de Paris, Clamart (Seine), France. (A real Scholar, and knows it. Full of scepticism with regard to the work of others, but a good fellow). Notwithstanding that he is old, and much occupied, you might send a copy to the following:—

Sir Henry Howorth, K. C. I. E., 45 Lexham Gardens, Kensington, W.

I used to know a Barrister, Mr. Parmeshwar Lall who once studied Assyrian. He returned to India, however, some years ago, and I do not know his present address. Notwithstanding that yours is a country of exceedingly great extent, you may have some means of finding out something about him. I think the subject might interest him (if, as I suppose, he be still alive), and it would not be a bad thing if he found himself able to interest himself in Assyriology again.

Trusting that the enclosed notes will be of use to you,

I am,

Yours faithfully,

THEOPHILUS G. PINCHES.

ENCLOSURE.

For the due realization of your thesis, and the disarming of criticism, it is needful to keep the gentilic nomenclature more distinct.
I notice that you use the word *Chaldean* as a synonym of the generally-received *Babylonian*. This I should feel inclined to avoid, owing to the fact, that the Chaldeans do not seem to have entered Babylonia, or at least to have attained prominence until after the time of Moses. This naturally has a bearing upon the name Yahwah (an older form than Yahweh). It is gratifying to me that my theory, that the name of the great God of the Hebrews is now regarded as having penetrated into Babylonian under the form of Yäwa or Yaawa (=Yahawah). My papers dealing with this subject appeared in the *Proceedings* of the Soc. of Bibl. Archaeology in 1885 and 1892. Fried Delitzsch can only be right in his contention that Yahwah appears in early Babylonian names if his reading be modified from Yahwe to Yahwa, for a later form can hardly have preceded an early one. From what you say, I should feel inclined to advance the theory, that the Aryan Yahve was adopted by the Babylonians and the Hebrews owing to its likeness to their own (perhaps borrowed) *Yahu* (Bab. *Yau*), 'god', which appears in the bilingual syllabaries as a synonym of the common word *ilha*, with the same meaning.

The date of the use of *Yau* by the Akkadians (Semitic Babylonians) is a little before 2000 B. C., and *Yamaa* (which may also be read *ya-a-pa*), occurs about the same date. *Ya(a)ru* occurs in certain names of Jews during the period of the later Babylonian kings (6th-5th cent. B. C.). All the names in question are those of Jews which, in the O. T. end in *Jah* or *jahu* (*yah* or *yahu*).
In my opinion, there is little or no connection between the story of the Creation in Genesis and that of the Babylonians. The latter contains no direct statement of the creation of the heavens and the earth; it has no systematic division of the things created into groups and classes, such as is found in Genesis; it has no references to the days of Creation; and no appearance of the Deity as the first and only cause of the existence of things. Other differences are, the polytheism of the Babylonian account, and the fact that it appears to be merely the setting of the legend of Bel and the Dragon, which was composed for the glorification of Merodach, the patron deity of Babylon. As the Babylonian account has no reference to the days of Creation, there is, in that version, no mention of the 7-day week and the sabbath. That the sabbath appears therein I freely admit, notwithstanding that the word is mutilated and incomplete. The Hebrew sabbath, however, was fundamentally different from that of the Babylonians, which designated the lunar festival when our satellite 'rested' at the full on the 15th of the month. It was, therefore, a monthly sabbath, not a weekly one.

With regard to the Hebrew Creation-story, I will even go so far as to say that, instead of being founded upon that of the Babylonians, it was written to refute it — as a more reasonable statement of the first beginning of things. That the writer of the Hebrew account may have been influenced by the Babylonian idea of the
beginning of things is not only possible — it is also probable, but he really sent forth his version to combat what he regarded as the errors and the superstitions of polytheism. Probably, too, he rejected the Babylonian evolution-theory, which, as a strict monotheist, would be distasteful to him.

In connection with this negative theory of mine, it is worthy of note, that there is no mention of Tiawath (Tiamat) in the Hebrew account. Tehom is the Deep (unpersonified). Tiawath (otherwise Tamthu or Tawthu) is the ocean both personified and unpersonified. Apsu is the Akkadian (Semitic Babylonian) form of the Sumerian Apsu. The Akkadians often lengthened the final vowels when they borrowed words, and sharpened b into p. Another example is sa-bal, ‘mid-rest’, “sabbath”, Akkadian sapattu. The Heb. sabbath is a better reproduction.

Tur purattu would not mean ‘son of water’, but would be a hybrid, meaning ‘the young one of the waterway.’ The Sumerian form would be tur puranunu, ‘the young one of the great waterway’ (the Euphrates), in Semitic Babylonian šīhr Purattu. As far as I know, however, neither of these equivalent expressions occur.

It ought to be noted that uru is a common (or the common) Sumerian word for ‘city’, and uru-gal means ‘the great city’ as the abode of the many spirits of men who have departed, for ‘the dead greatly exceed the living.’
I am afraid that 'the dark intercalary month' does not exist. *Se-dir* is for *Se-gur-tar-dir*, 'the additional (month) of grain-cutting'. It was the sun-god Tammuz who passed the winter-months in the underworld. Merodach descended thither to comfort and bring forth the rebellious gods who had received the grace of his pardon.
EXTRACTS
FROM
A ROUGH NOTE BOOK.

MANDALAY JAIL.

B. G. TILAK.

अंभोजिनी वननिवास विलासमेव ।
हुंसस्य हंति नितरां कुपितो विचाला ॥
नलस्य दुर्गतंगृहमेव विचौ प्रसिद्धाम् ।
दैवत्त्व कैतिसपहुँचती समर्थः ॥

Bharti Haribhadranath Chatterjee

शाला धर्मसंघर्षम च भोम चोधरमाधित्यः ।
युद्धचध्वमनहंकाराः यतो धर्मस्ततो जयः ॥

Mahabharata.
NOTES FROM
HELLEBRANDT'S "VEDIC MYTHOLOGY"


Vol. II:— p. 26—'Uśhas' is originally the first dawn of the new Year. (So Ludwig relying on Krichenbauer.) p. 28—Ekāśṭaka takes the place of Uśhas in the Grihya ritual as new year's night. T. S. VII 4. 8. 1; अन्वी विषाणी T. S. III. 3. 8. 4. cf: A. V. III. 10. 1-8. M. S. II. 13. 10. Sāyana on Rig. V. 62. 2 परिक्षरे—सत्तारि. The words बृहत्ती विषाणी or अन्वी show that it is the first dawn.

p. 29—Uśhas is the first important day of the new year. Shatpath B. VI. 5. 1. 8. And Vasiṣṭha's Hymn Rig. VII. 80—shows the commencement of Uttarāyaṇa (foot note).

p. 30—In ancient Rome the ten months' year was followed by an unholy period of time dedicated to the manes (पितर) .

p. 31—Out of the dark time of the year comes up the new light, return Sūrya, Agni and the disappeared Yajña. This is done by Pitars and नवम्बर (p. 33).
p. 32.—Chand. III. 19. 3 quoted to show that in the morning, songs were usually recited and hence it is छृदङ्गलिः.

p. 33. — The three dawns refer to colours — white, red and yellow according to Hopkins and to चूँदास according to Hellebrandt. (Both wrong).

p. 33 — It seems, therefore, the singing of hymns by the old Indian Kavis, Āṅgiras and Navagvās, who the new night found; and broke the cow-stall, is also the custom of other people — to sing the new year's night.

p. 38. After quoting R. V. 1. 92. 4 which says, "that Uṣṇas broke out of darkness as cows out of their stall" (cf. Rig. IV. 51. 2; V. 45. 1) Hellebrandt observes:—

"Here is a reminiscence of a foregone time and of an earlier Home, interwoven in the Vedic mythological garb. In India, the light of the dawn lasts only for a short time. Already the Atharva Veda speaks, in contrast with R. V., proportionally only seldom of Uṣṇas; (and) the Ritual knows of no special offerings to the (Uṣṇas). The picture of the Rocks or stalls, out of which the dawn-light is freed, can (will) have its origin not in the Indian climate but in a land where the cattle is really shut up; in strong stalls during winter, as the Vendidad 2. 23 (pakhru-maēşhṇ umā naēshṇ). Rock cave, Rock stalls must have been far more secure shelter than (artificially) built stall."
In a place where the shortest and the longest day only differ by a few hours, there is little reason to celebrate the return of light: in the classical (Sanskrit) poetry the subject, so far as I know, has attracted little attention. The utterances of the Rig-Vedic poets regarding the uprising of the year out of winter night, based on ancient times, which could not be well grounded proportionally in the Vedic times, compared well with the driving out of the cattle from its winter stall for the Spring time ".

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Agni. (Volume II. pp. 56-178).

Page 81. — "If we now turn to Rig-Veda: If we have succeeded in proving that the Ūshās denotes not only the dawn-light of any one day, but also of the first day of the new year, whether this begins at the winter solstice or the vernal equinox, then the Vedic poets and families must at least be supposed to be acquainted with renewal of fire at the beginning of the new year. But there are more positive grounds in favour of this assumption. I count amongst them the texts which speak of Agni's living in darkness. It is true that the sun acquires new life every morning and that the faintly burning fire is again revived by the Śraddhā of the Agniḥotri; but this is not sufficient to explain the many turns of Agni's flight, his residence in darkness, his long dwelling in darkness and his release therefrom. Above I have already drawn attention to the contra-distinction between Devayāna and Pitṛyāna,

II
which influenced even the Rig-Vedic world; and have attempted to show the distinction must be taken to hold not in the local meaning of later times, but in the sense of Dakshinayana and Uttarayana. With the end of Devayana expires the service of the Gods and the periods of manes, the ० (Rig. VI. 59. 1.) begins. It may remain undecided whether the whole Pitriyana or only a part of the time, perhaps the last months of the year were assigned to the ritual of the manes; or whether different kinds of measurement (of time) prevailed, one in the Rig-Veda and another in the classical ritual, which performed the Vajpaya etc. in the autumn. The "darkness" has in southern places less significance than in northern; and the representation (of Agni etc.) as a whole might be an inheritance from previous Home under other latitudes; but of the significance of the winter solstice for the Vedic times, there can be no doubt. To this time of Pitriyana, the period of the year, belonging to the manes I assign the words, which speak of Agni’s residing in darkness or the likes. If one takes, for instance, Rig. III. 31,3 ff.; IV. 1. 11 ff.; 2. 17 ff, and asks whether these passages with their implications and hints about the regaining of the Bull, opening of the Rock Stalls, light and darkness, have not for their basis the production of the new fire rather than the Agnihotra of every day; Rig. X. 35, testify—without comparing the readings........................................

Probably the daily Agnihotra was known to the Rig-Veda. Therefore it is often difficult to
distinguish whether the performance of the daily Agnihotra or of the new fire is indicated; for the course of the day is like that of the year in many things. The Brāhmaṇs (books) see even in the daily Agnihotra a Sārya-magic, when they state that without the dawn offerings the Sun would not rise; but I would rather think that great divisions (of time—e.g. Ayanas) and turning points have been of influence on the first origin of such views than daily appearance (phenomena).

(pages 136-137)—Oftener we hear of the anxiety of Gods regarding the falling out of the Sun from heavens; it is the metres and स्वरस् with which they support the wavering at the turning point. It cannot be anything else than a reminiscence of an old sun-turning festival which was accompanied with songs.

Agni’s Flight.

Page 138 ff—The disappearance of the three brothers of: Agni is narrated in T. S. VI 2. 8. 4. "It treats, I think, not of the preparation for a single यज्ञ but of the beginning of the ritual year at the beginning of the Devayāna following the Pitriyāna. The whole narrative has too fixed a character to refer to a single sacrifice." The Indian Mythology has chosen that image of lost or concealed fire, after whom the Gods and the Sages seek, to characterise the end of Devayāna. We can see that from the Ṛg-Veda itself. It speaks of angry Agni (V.2.8). Further the three hymns X.51-53 give the same story. In X. 51. 5 Agni is asked to make the paths Deva-
yāna passable and in X. 124. 1, Agni is said to have lived long in deep darkness (Jyog dirghān). This can be intended only for the new commencement of Vajna and by tamas refers to sacrificeless and dark time.

Pitris called देवशाखा: in VI 59. 1 and Indrāgni are invoked to destroy them, that is, the Pitriyāna is ended. Indrāgni appears here to mean the first new moon in the new year.

Page 145—In VI. 8. 4:—
अपामुपस्वे महिषाकृप्यांतः
विषोराजानं &c.

Apām Upasthe—“un Schoose der Wasser” is the phrase used. But in VI 9. 7:— लम्मे तमसि तस्थिवासेः the word ‘tamasii’ is used instead, showing that ‘Apām Upasthe’ is synonymous with ‘tamasii’. (“पयो देवयज्ञान्त्र” in X. 51. 5; ‘अपामुपस्वे’ in VI. 8. 4; and ‘तमसि’ in VI. 9. 7.) So ‘Pitriyāna’—contrary of Devayāna—‘Apām Upastha’ and ‘Tamas’ are synonymous!

Upon this Hellebrandt observes as follows:—

(Page 146). “The thought that the sun disappears in waters is, in tropical land, only explainable as referring to rain time (cf: rising and setting of the Sun in ocean). If tamasii stands near it, it certainly denotesolum the darkness of the rainy season; but as I have above distinguished it seems probable that in tamas we have inherited a reminiscence of an older time under different skies and that
it denoted originally the winter solstice. The two lines of thought, run into each other so close, that a clearer separation of the two is not possible; and the mixing up of the two was made still more possible as the rainy season stands at the beginning of the Dakshinyana.

(INCOMPLETE)
For revising the book the following new works ought to be consulted:

1. Dr. Geikie—Ice Age (new Edition).
3. Hellebrandt Vedic Mythology (Sane's Translation).
4. Plunket—Ancient Calendar (Dark Winter Month).
5. Strickland's Slavonic Folk Lore 8 Vols.
6. Dr. Wallace—Island Life and Wonderful Century.
7. Man and Glacial Period by G. F. Wright,
   (In Scient. Series—No. LXXII).
8. The Polar Aurora by A. Anjot,
   (In Scient. Series—No. LXXXI).
9. Dr. Wollarton — Prehistoric Antiquities of N. Europe.
10. Logan's Ancient Indian Stones.
11. Dawn of Civilization (translated from the French);
    (Plate Picture of World according to Chaldean Mythology).
12. Warren's Homeric Age.

The following Pamphlets and Articles:

1. Encyclopædia Britannica (Egyptology, Geology).
2. Dharma—a review.
3. Indian Review (Madras).
4. Raṅgāchārya’s letter.
5. Chaldean Mythology (on release of Waters and on waters being released by Moon).
6. Reference from Sat. Brāhmaṇa (to be inserted).
7. Gopath Brāhmaṇa on गवामयनम्.
9. Chaldean Myth of Tamuz (Prof. Sayce, Hibbert Lecture).
10. बाणो बृक्षः Afra. Chittra दानुचित्रा:
11. Bloomfield’s Articles on नवम्मा in Am. O.S.?
12. Mittra Worship.
13. Thebaut’s “Indian Thinker”.
15. The Seven (open Court); also Warren’s Review.
18. Māhābhārata reference of 7 Kṛittikās’ (कृतिका)’s and story of deluge.
(C) Orion or Researches into the Antiquity of the Vedas.

—o—

(Recast with additions.)

This book requires almost to be re-written in order to incorporate new materials made available since 1893 and new results:—

1. Review of Bulher in Indian Antiquary.
2. Review by Whitney in Am. O. S.
3. Dr. Jacobi's Essay in Indian Antiquary.
4. Barth's Review.
12. A letter in "Maratha" on कृतिका with quotations from Atharva Veda, also the name for विषाखा (विचृलै).
Reference from Mahābhārata on शब्द being the asterism of तितु's; and also अभिकीत विवंगता etc.,

17. The Kali Yuga (Madras In. Review.)
18. Thebaut's Criticism (and also Oldenburg's).
20. Whitney's Nakṣatras.
21. Max Muller's Essay (Preface to Ṛig-Veda).
23. मघालु गायो हुन्ते (Note to be written).
25. Jacobi's Antiquity of Vedic Culture.
26. S. B. Diksit's "भारतीय ज्योतिष".
27. Map and Chatterji's Book.

New Chapters.

I. On due east.

After "the Kṛittikās". About Kṛittikās being due east. A refutation of Sudhākar's "दिशमीमोंमा". S. B. Diksit's view.
II. On the vernal equinox.

or

The beginning of the Zodiac.

After “Orion and his belt”. About अग्नि or Aries being the first asterism or sign. The reason why, as given by Plunket from Chaldean Astronomy.

Additions.

Chaldean and Indian Vedas.

1. Lenormant Chaldean Magic.
2. Smith's Assyrian Texts.
3. King's Chaldea.
4. Prof. Sayce's Works (Hibbert Lectures and other Babylonian literature).
5. Prof. Rawlinson's Ancient Monarchies.
6. Bable and Bible.
7. By paths of Bible knowledge Series.
8. Dr. Pinches' Works.
11. Early Babylonian History (New York, 1900).
(E) Books Projected or Suggested.

(Syllabus for future work)

1. History of Hindu Religion — Vedic, Shrauta, Upaniṣhads, Epic, Pāuraṇic, Darshanas, Bhakti, Prehistoric—Other religions, Conclusion.
2. Indian Nationalism, (the story of or the aspects or phases of).
3. Pre-Epic History of India.
4. The Śaṅkara Darshana (Indian Monism).
5. Provincial Administration.
6. Hindu Law.
9. Life of Shivāji.
10. Chaldea and India.

(POLITICAL.)

Chapters :

(1) Introductory.

(2) Vernacular—Chāturvarṇya.

(3) Hindu State and Empire.

(4) Buddhism, Shakas and Renovassance.

(5) Mahomedan Conquest and Empire.
(6) Break up—Marâthâs, Sikhs etc.
(7) British Conquest,
(8) Government by the Crown (Constitution).
(9) Consolidation.
(10) Bureaucracy—its ideals.
     (Comparison of Spanish, Austrian and Russian Bureaucracies).
(11) Progress (two opposite views).
(12) Reconciliation.
(F) The Golden Rule as found in
The Maha Bharata.

"वो यथा वर्तते यस्मिन् तस्मिन्तथा कर्मप्रार्थयन् ।
नास्तिक्यं समवान्त्योति नचाहार्यत्वः विद्धति ॥ (अंशोपव्यान)
उपोगर्भ; १७६; ३०. p. ४१३.

Positive aspect of the Rule
"तत्साधुः प्रभावने भविष्यं यतामना !
तथा च सर्वभूतेऽपि वर्तित्वं यथान्तिनः ॥ said by विदुर;
शास. १६७; ६. p. ३९७.

Negative aspect of the Rule
"यथा वैविविध्यं नेच्छेदलम्यं: कर्मपुपुषः !
न तत्परेऽपि कुर्वत्ती जान्विष्यमालमः ॥ १९ ॥

"तीव्रतं यो: स्वर्ग चेच्छेष्कं सोन्यं प्रगात्येत ।
यथालम्यं चेच्छेत्त तत्वर्थव्यापि विद्यते ॥ २१ ॥
शास. २५८; १९-२१. p. ५९५.

"यावाक्यालम्यं बद्धाः सवावाला परालम् ।
य एवं सत्तं वेदु सोमृतास्य कहते ॥
शास. २३८; २२. p. ५६३.

Compare with—
सर्वभूतस्वामानं सर्वभूतानि चालमनि ।
ईक्षते योगायुक्तम् स्वतं समदर्शनः ॥ २९ ॥ गीता अ. ६.

NOTE THIS PASSAGE:—
(said by युद्धसपति)
"आधामौपयेन पुरुष: प्रमाणमविगंधृतः ।
न तत्र परस्य संदेश्यात् प्रतिकृत्य यदालम् ।
एष प्रक्षेपतो प्रम: कामाद्य: प्रवर्त्ते ॥ अनु. p. ३६१."
“अथापरः प्रकृत्ये परेपु तथापरे प्रकृत्ये परस्मिन्।
तथेष्व तेषपुमा जीवलोकेः वथा घम्मेः निपुणेनोपपदिष्टः।
अनु. १९१, १२. प. ३६१।

“श्रमिन्नु वथा वत्तते यो मनुष्यस्वत्सन्तथा वत्तिर्वियसं स घम्मः।
मायाचारो मायया बाधितव्यः साध्वाचारः साधुना प्रशुपैयः।
सत्यानृतात्वायः शास. १०६, २९. प. २५९।

“सचेष्विन्नु यथेष्व निकृत्या प्रतियोधयेत्।
अथवेत्वर्थमेव यथेष्व घम्मेव निवारयेत्।
शास. अ. ९५-९६. प. २२७।

“घम्मेव निधनं ब्रह्मो न जयः पापकर्मणा।
शास. अ. ९५-९६. प. २२७।

“न पापे प्रतिपापः स्वातः साधुरे व सदा भवेत्।
दन्ते ( छापत्वमायां संतबाद ). प. ५४७

“यदनयेः हितं न स्वात्रात्नः घम् पौशस्यः।
घमन्त्रेत् वा येन न तथा कुञ्जस्य धर्मचन्।
शास. १२५. ६६. प. २९५

This is said in the definition of हित, विनिकृत्योपचरणः वायूः पौष घमः सनालतः।
वन. प. ३३

निकृत्या निकृतिः प्रशा हंतथा इति निकृति:।
न हि निकृतिकं हितं निकृत्या पापसङ्ग्यते॥
वन. प. १३६।

सर्बं व: सुहितसिं घम्मां च हिते रतः।
कर्मणा मनसा वाचा स घमः वेद्य जागहे॥
शास. २६१. ६. प. ५०॥

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