A NEW THEORY OF ANCIENT INDIAN CHRONOLOGY

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INTRODUCTION.

Dr. Girindrashekhar Bose published about a year ago in Bengali *Purāṇapraveśa*,[1] an 'Introduction to the Purāṇa', in which he claims to have discovered the key to the chronological system of the Hindus. If his theory is sustained, it will completely revolutionise the chronology of Indian history and would carry back the authentic history of India to the sixth millenium before Christ. The theory is so important and is of such great interest from a statistical point of view that we shall first try to give a summary of the author's leading arguments.

HISTORICAL CHARACTER OF *purāṇic* LITERATURE.

The *Purāṇas* in eighteen versions and with many subsidiary commentaries form a major branch of Sanskrit literature. It is admitted that all the versions are not equally old ; even in the same version there are different strata. Dr. G. Bose's work is mainly based on three important texts, the *Viṣṇu*, the *Vāyu* and the *Matsya*, which are generally accepted to be the oldest and the most authentic. The *purāṇas* are usually considered to be mythological in character. In the new theory on the other hand it is insisted that they represent an authentic historical tradition. The contents of the *purāṇas* support this interpretation. According to the *Vāyu* (4.10) the traditional subject matter of the *purāṇas* consists of creation (*sarga*), destruction (*pratisarga*), dynasty (*vaṃśa*), chronology (*manv-antara*) and history of important persons (*vaṃśānucarita*). Ancient India was divided into a large number of kingdoms and each important kingdom had its state chronicler. The *sūtas*, the traditional compilers of the *purāṇa*, used to collect the chronicles from different *māgadhas* (chroniclers), and compiled them in the form of *purāṇas*. According to the ancient Hindu view, there were cycles of births and deaths of civilisation, and the object of compiling the *purāṇas* was to preserve the history of these cycles permanently. By making the *purāṇas* an integral part of the religious tradition of the people they were preserved more securely than if they had been recorded in stone or copper inscriptions. In order to make the narrative interesting, very obvious exaggerations and mythological amplifications were introduced, so that many supernatural stories have now become mixed up with the original historical narratives.

The *purāṇas* have been compiled and edited many times. In doing this the compiler tried merely to record events without any attempt at explanation. On this view, contradictory statements can be easily explained. Where different versions are available, it is the duty of the compiler to record all the versions as historical data.

In the case of important *purāṇas*, the names of successive editors are preserved ; each of them brought the narrative up to date in his own time. This explains the *bhaviṣya* portion which is called 'future history'. Although the names of successive editors are given, the actual narrative is usually continued in the name of the original compiler. For example Parāśara was the first compiler of the *Viṣṇu Purāṇa*. Events occurring after his time were incorporated in the *purāṇa* by successive editors, but as the narrative was still continued in the name of Parāśara, subsequent additions were called future history ; this is simply a technical device to distinguish later additions.

The language of the *purāṇas* is modern and not archaic or old. This is sometimes advanced as an argument against their authenticity. As Dr. Bose points out, this objection is quite absurd; histories of ancient Greece or Rome written in the English language cannot be rejected because of the modernity of their language.

RULES OF INTERPRETATION.

The *purāṇas* are written in a popular style full of mythological stories. The obvious purpose was to make them sufficiently interesting to be repeated from one generation to another. But there is some system underlying the exaggerations. Some of these rules of interpretation are quite obvious. In describing natural events or catastrophies it is usual to imagine the influence of a particular god. This is purely figurative, for example, where one would write in English 'it rains', the traditional Hindu form would be 'Varuṇa (the god of rain) is sending down rain'. Another useful rule to remember is that a great hero is usually deified in the course of time, and is finally identified with a star. For example, Indra was a human being and a hero originally, became a god in a later age, and was finally identified with the sun. The epithet 'man' or 'human' is reserved for those belonging to the family of Manu; other dynasties are known by the name of *devatā, asura, gandharva, nāga, yakṣa*, etc., which gradually took on the character of supernatural beings in later ages. The *asura* and the *devatā* were nearly related and friends; in fact in one place (*Viṣṇu* 5, 1) it is stated that the *asuras* were created first, and then the *devatās* etc.

But there are inconsistencies and contradictions in the narrative in many places. In most cases, however, simple explanations are available which confirm the substantial authenticity of the records. For example, two or more persons with the same name but living in different times have got mixed up in some cases. Another source of confusion is the use of nicknames for the kings. In earlier times most of the kings or important persons were known by their nicknames; this explains why two different names are sometimes given in different versions for a king in the same serial place in the genealogical table. The *purāṇas* also preserve different versions which are sometimes contradictory. Fortunately there is often a definite indication. The audience state that they wish to hear a certain portion again, and a different narrative follows. This is clearly a technical device to indicate alternative versions.

THE DIFFERENT SCALES OF TIME.

The most important contribution of Dr. G. Bose is concerned with the chronological system of the *purāṇas*. There are many different scales of time, but in every system the concept of a *yuga* is fundamental. The literal meaning of *yuga* is 'conjunction', and, as such, 'a cycle'. Anything which recurs periodically may be called a conjunction and the interval a *yuga*. The interval may therefore be of different magnitudes.[2]

Different scales were naturally adopted for different purposes. *Catur-yuga* or *yuga* is simply general name for one complete interval. There is first of all a short *yuga* of

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[2] Starting with '*nimeṣa*' (the time taken to pronounce a short vowel which is roughly about one-fifth of a second) the different units of time are built up systematically, usually in multiples of 30 (or of its factors). Thus 15 nimeṣa=1 kāṣṭhā; 30 kāṣṭhā=1 kalā etc. The standard scale may be written in a condensed form in the following way:—

nimeṣa (×15)=kāṣṭhā (×30)=kalā (×30)=muhūrta (×30)=ahorātra (×30)=māsa [=month] (×6) =ayana (×2)=varṣa [=year=12·months].

For larger units we start with *catur-yuga* and derive 1 *manu-kāla*=71 *catur-yuga*, and also *catur-yuga* (×2000)=brahma-ahorātra (×360)=brahma-varṣa (×100)=brahma-āyus. The highest unit was about $3 \cdot 1 \times 10^{14}$ ordinary years in one system or 10^{16} years in a different version. The scale therefore starts from *nimeṣa* (a fifth of a second) and covers a total interval of the order of 10^{14} or 10^{16} years.

5 years, and a *kalpa* of 1000 *yuga* or 5000 years. Then there is a *manu-kāla* of 71 *catur-yuga* (or simply 71 *yuga*). Each *calur-yuga* (or *dharma-yuga*) is divided into four unequal portions: *kṛta* or *salya*, *tretā*, *dvāpara* and *kali* in the proportion of 4 : 3 : 2 : 1. There is also mention of a historical *yuga*, 30 of which go to complete a *kalpa*. The author's main contribution consists in establishing a rigorous numerical correspondence between all these different systems. I shall now give a summary of his theory.

<h3 style="text-align:center">ASTRONOMICAL BASIS OF FUNDAMENTAL UNITS.</h3>

The ancient Hindus were familiar with four different kinds of months :—the *sāvana* month of 30 sun-rises ; the solar month depending on the apparent motion of the sun ; the lunar month from one new moon to another ; and a stellar month equivalent to the passage of the moon over 27 stellar divisions. In five solar years there are thus exactly 60 solar months, 61 *sāvana* months, 62 lunar months and 67 stellar months. The point is emphasised that 5 years is the lowest common multiple of all the four months, and the author suggests that this is the real reason for accepting 5 years as the standard interval or the short *yuga* which is explicitly mentioned at many places in Hindu chronology.

The unit of 5 years is however not adequate for all purposes, and a larger unit was required. It is desirable that the large unit should be a multiple of 5. The sun and the moon are the two most important objects in the sky, and one lunar year consists of 355 days while the solar consists of 366 days ; the conjunction of the beginning of a lunar and solar year will therefore be repeated at intervals of 355 years which is also a multiple of 5. Dr. Bose suggests that this is why 355 years was accepted as the larger unit of *yuga*. This unit of 355 years is according to Dr. Bose the unit known as a *manu-kāla*. This accords perfectly with the fact already mentioned that 1 *manu-kāla*= 71 *yuga*=71×5 years=355 years.

The internal consistency of the scheme is striking. Starting with the four different months, the least common measure is five years ; this is the smallest interval of cyclic repetition and is adopted as the definition of the ordinary *yuga*. The next larger astronomical cycle is given by 355 years as the common multiple of the lunar and the solar years ; 355 is also a multiple of 5. This is the larger scale for the *yuga*, which is equal to a *manu*, and is 71 times the lower unit of 5 years. The occurrence of such an unusual number as 71 in the chronological scale is thus explained in a most convincing fashion.

<h3 style="text-align:center">CONCORDANCE BETWEEN DIFFERENT ERAS.</h3>

Once this is accepted, a logical and consistent ordering of various other units used in the *purāṇa* becomes easy. For example, 1 *kalpa*=1000 *yuga* or 5000 years. This makes 1 *kalpa* approximately=14 *manu* which also is explicitly mentioned at many places.

The small *yuga* of 5 years, the *manu* of 355 years and a *kalpa* of 1000 *yuga* or 5000 years were not however sufficient. Other intervals of time larger than the smaller *yuga* of 5 years but smaller than the *manu* of 355 years were required. The historian used the natural ratio between days, months and years for this purpose. One *kalpa* of 5000 years consists of 60,000 months. Now 30 days make a month ; dividing 60,000 months by 30 we therefore get a subsidiary unit of 2000 months, which is extensively used in the *purāṇa* chronicles.[a]

We have already mentioned that one *kalpa* consists of 5000 years. Now 14 *manu* (14×355)=4970 years or approximately one *kalpa* ; 14 *manu* thus fall short of one *kalpa*

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[a] Again, six months make one *ayana* or one half-year; multiplying 2000 by 6, we get 12,000 months, as another large unit. This number 12,000 is next used for constructing an ascending series of units in terms of 12,000 ordinary years, and then 12,000×12,000 years to give the larger *yugas*. fashion.

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by 30 years. There are altogether 15 boundaries in each group of 14 *manu* ; allotting 2 years to each boundary or *manu-sandhi* we shall get one *kalpa*=14 *manu* together with 15 *manu*-boundaries. In this way the *manu* (of 355 years) was also made to keep step with the *kalpa* (of 5000 years).

The division of each *dharma-yuga* into *kṛta, tretā, dvāpara* and *kali* reveals a compromise between the decimal and the duo-decimal systems of counting. The proportion of *kṛta: tretā: dvāpara: kali* in the ratio of 4: 3: 2: 1 is fundamentally of a decimal type. In order to fit in with the duo-decimal system two boundaries with one-tenth of the respective interval were added on either side of each division. Thus *kṛta* (0.4+4.0+0.4=) 4.8 ; *tretā* (0.3+3.0+0.3=) 3.6 ; *dvāpara* (0.2+2.0+0.2=) 2.4 ; *kali* (0.1+1.0+0.1=) 1.2 give a total of 12.0.

We can now enumerate the different scales of time. We have the small *yuga* of 5 years (=60 solar months), and 1 *manu* of 71 small *yugas* (=355 years), which are both based on astronomical cycles. The conventional *kalpa* consists of 1000 small *yuga*= 5000 years=60,000 months ; from which are derived on a semi-astronomical basis two other units of 2000 months and 12,000 months. The unit of 2000 months yields 30 historical *yugas* in each *kalpa* (of 5000 years or 60,000 months). The *kalpa* was also divided into 14 *manu* or 355 years together with 15 boundaries of 2 years each. Finally the decimal and the duodecimal systems were combined in the *dharma-yuga* by the addition of 8 boundaries in the following way :—*kṛta*=(2000+20,000+2000=) 24,000 months or 2000 years ; *tretā*=(1500+15,000+1500=) 18,000 months or 1500 years ; *dvāpara*=(1000+10,000+1000=) 12,000 months or 1000 years ; *kali*=(500+5000+500=) 6000 months or 500 years. The simplicity and logical consistency of the above scheme is almost perfect. The compromise between the decimal and the duodecimal systems introduced a little artificiality which was however smoothed out in an elegant manner. Such wonderful internal harmony can scarcely be explained by chance coincidence, and we believe that Dr. Bose has succeeded in establishing this portion of his theory beyond reasonable doubt.

STARTING-POINT OF THE SCALES OF TIME.

The next point to be considered is the origin for reckoning the different scales of chronology. Reasons are advanced for believing that *svāyambhuva manu* was the starting point of the chronicle, and that at first the *manu* and the unit of 2000 months were used to reckon the intervals of time. There is also reason to believe that after the first 7 *manu* (=2485 years) this particular scale fell into disuse.

Another era was also used, the *nakṣatra* yuga, a stellar era, which the author considers to be merely a system for specifying the century, in which a particular century is identified by the name of a particular star. Reasons are given for believing that the starting point of the stellar era was taken from the star *Jyeṣṭhā*, which means literally 'the eldest'. This interpretation is corroborated by the saying that 'one hundred kings pass away in one complete stellar *yuga* of 27 stars', or, according to Dr. Bose, 27 centuries. This gives an average interval of about twenty-seven years for each generation which is fully corroborated by the calculations mentioned below.

THE GENERATION INTERVAL AS A BIOLOGICAL SCALE.

A different kind of check is also possible. Genealogical tables are given in the *purāṇa* in great detail which makes it possible to determine the serial number of each individual in each genealogical series. This furnishes us with a biological interval between two generations, and makes it possible to fix approximately the interval between any two persons in the genealogical series.

The generation interval is of course a statistical unit, and it is only possible to obtain average values. In the case of Bengal *Kāyasthas* (the caste to which Dr. Bose himself belongs) it was found that *paryāya* or generation numbers from 23 to 30 occurred in 1934 among persons between 20 and 30 years of age. Generation numbers 26 to 29 occurred quite frequently, while 23 and 30 were extremely rare. On an average a generation number of 26 in one family may occur at the same time as the number 29 in another family ; this would give 25 intervals and 28 intervals from the starting point for the two families. Assuming that the generation interval (that is, the average interval between successive generations measured say by the average age of the father at which the first son is born) lies between 20 and 30 years, it is possible to make an approximate calculation for the average value of the interval. In the case of the *Kāyasthas*, 28 × 20 = 560 years gives a lower limit, and 25 × 30 = 750 years gives the upper limit of the total interval from the origin. Taking the mean of 560 and 750 we get 655 years as the average value of the total interval ; and dividing by 2, we have ½ (28 + 25) = 26.5, and thus we get 26.5 years as the average generation interval as a first approximation. Repeating the calculation with limits of 25 and 30, we get 28 years as a second approximation for the average generation interval.[4]

STATISTICAL CALCULATION OF THE GENERATION INTERVAL.

A direct statistical determination of the average genealogical interval for the modern Bengali people corroborates the above approximate calculation. In the data collected by the Students' Welfare Committee of the Calcutta University, one of the items recorded was the age of the father at which the first son was born. A portion of these records was examined in the Statistical Laboratory, Calcutta, and it was found that for Brahmans and Kayasthas the average age at which the first son was born was 27.16 ± 0.19 years, with a standard deviation of 5.75 years (n = 403). The average generation interval at the present time is thus just about 27 years for Brahmans and Kayasthas in Bengal. Dr. Bose found that from the beginning of the first *Manu* to Bṛhad-bala for 181 generations

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[4] The generation interval may be easily calculated in the case of royal families. For the Mogul emperors from Bābar (birth 1483 A.D.) to Bahādur Shāh (1643 A.D.) with six intervals in the direct line, we have an average of 26.7 years. It is worth noting that the 'generation interval' is quite different from the 'average period of reign'. Beginning with the reign of Humāyūn in 1530 A.D. to the end of the reign of Aurangzeb in 1707, the average period of reign is 35.4 years; or from Humāyūn (1530) to the end of the reign of Bahādur Shāh (1712), it is over 30 years. It will be noticed therefore that the 'average period of reign' in the case of the Mogul emperors is much greater than the 'average generation interval'. In fact the two things must be clearly distinguished, and the author has done a great service in pointing out the mistake made by well-known historians like Vincent Smith and F. Pargiter in using the average period of reign to test the chronicle in the *purāna*. In the case of England, for example, from William the Conqueror (1066 A.D.) to Edward VII (died 1910 A.D.), we have a total period of 844 years for 37 rulers, which gives an average period of reign of 22.8 years. This is about 5 years less than the average generation interval. The reason is clear. In the case of direct succession from father to son (as in the case of the Mogul emperors), the average period of reign is likely to be considerably greater than the average generation interval. On the other hand, when the succession is continually interrupted (as in the case of the English kings), the average period of reign is likely to be much smaller. The history of England furnishes clear examples. Beginning from the reign of Richard II (1377 A.D.) to the end of the reign of Queen Mary (1558 A.D.), we have an interval of 180 years for 11 rulers with an average reigning period of 16.4 years. This was clearly due to the fact that the dynastic succession was interrupted no less than six times during this period. On the other hand from the beginning of the reign of King John in 1199 A.D. to the end of the reign of Edward II in 1377 A.D. we have a total period of reign of 178 years for five rulers with an average period of 35.6 years, which is not surprising in view of the fact that the dynastic succession was not once interrupted.

the average 'reign interval' was 25.3 years. This fits in quite well with a value of 27 years for the generation interval.[5]

THE FIVE SCALES OF TIME.

We thus have four definite systems of reckoning time:

(1) the *manu* of 355 years,

(2) the historical *yuga* of 2000 months,

(3) the *kalpa* or *dharma-yuga* of 5000 years divided into four unequal periods (*satya* or *kṛta, tretā, dwāpara* and *kali*) in the ratio of 4 : 3 : 2 : 1,

(4) the stellar centuries, and

(5) Finally, in the case of a large number of important families, we have the genealogical series, which may be converted into a kind of average (or statistical) time scale on the basis of an average generation interval of about 27 years.

Fortunately, the ages of several important characters are mentioned in more than one scale of time, which makes it possible to test the author's theory very rigorously.

LINK WITH CURRENT ERAS: THE CORONATION OF KING NANDA.

The coronation of Nanda is mentioned as a fundamental point of reference in the *purāṇa*, and two important intervals are given very definitely. The interval between the birth of Parīkṣit (which occurred in the year of the great battle of *Mahābhārata*) and the coronation of Nanda is 1015 (or in a different version 1050) years, and the interval between the coronation of Nanda and the end of the Andhra dynasty is given as 836 years. One single link with any of the current eras is required to complete the whole system. In the Indian calendar the *kali-abda* (5036 in 1935) is the oldest current era. According to the *purāṇa*, Nanda was the greatest emperor of India after the battle of *Mahābhārata*; even Yudhiṣṭhira did not have a wider dominion. The importance attached to the coronation of Nanda in the chronology of *purāṇa* is further supported by its having been adopted as a fundamental point of reference for later history. It is stated in the *purāṇa* that Nanda was an incarnation of Kali. It is highly probable that a definite era was started from the year of the coronation of Nanda.

At this stage Dr. Bose introduces the plausible assumption that the current Kali-era of the Indian calendar is intimately connected with this hypothetical Nanda-era, is in fact simply the Nanda era with the addition of 27 centuries, the traditional stellar cycle of 100 kings. On this assumption, subtracting 2700 years from the current Kali years 5036, we get 2336 Nanda era. Subtracting the Nanda-year 2336 from the Christian year 1935, we get (1935-2336=) 401 B.C. as the date of the coronation of Nanda according to the *purāṇa*. In the opinion of Vincent Smith, Nanda became a powerful king about 413 B.C. approximately. The agreement is striking.

It is now possible to reconstruct the whole of Indian chronology in correspondence with the Christian era. The reconstructed chronology is shown in the form of a chart.

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[5] In England the age of the mother at which the first daughter is born has increased slightly from 28.9 years in 1861-70 to about 30 years in 1910-12. (C. R. Rich: The Measurement of the rate of Population Growth. *Journal of the Institute of Actuaries*, Vol. LXV, 1934, p. 43). I may also mention that in a sample survey of middle-class Hindu families in Calcutta conducted in March, 1936 we found that the average age of the father at the birth of the first child was 26·7 ± 0·2 years for 420 families.

VERIFICATION OF THE THEORY.

We have already mentioned that in several cases the time is given in more than one system. A list is given below in which the date as reconstructed by Dr. Bose with the help of the average generation interval is given in column (3), and the actual time mentioned in the *purāṇa* in column (4).

COMPARISON OF RECONSTRUCTED AND PURĀNIC DATES.

Generation Number (1)	Name and Date (2)		Reconstructed by Dr. Bose (3)			As mentioned in the Purāṇas (4)		
		B.C.	*Yuga*	*Manu*		*Yuga*	*Manu*	
1	Svāyaṃbhuva	5958	1st,	1st,	*kṛta*		1st,	*kṛta*
84	Dakṣa-pracetas	3884	13th,	6th,	*tretā-sandhyā*	13th,	6th,	*tretā-sandhyā*
87	Vaivasvata	3814	13th,	7th,	*tretā*	13th,	7th,	——
99	Karandhama	3590	15th,	7th,	*tretā-mukha*	——		*tretā-mukha*
105	Bali	3477	16th,	8th,	*tretā*	——	8th,	
106	Māndhātar	3458	16th,	8th,	*tretā*	15th,	——	*tretā*
111	Tṛṇabindu	3300	17th,	8th,	*tretā*	17th,	——	*tretā*
125	Sagara	2958	19th,	9th,	*tretā*	19th,	——	*tretā*
141	Mūlaka	2458	21st,	10th,	*tretā-dvāpara Sandhi*	21st,	——	*tretā-dvāpara Sandhi*
151	Rāma	2124	23rd,	11th,	*dvāpara*	24th,	——	*tretā*
181	Bṛhadbala	1416	28th,	13th,	*kali-sandhyā*	28th,	——	*kali-sāndhyā*

The agreement between Dr. Bose's reconstruction and the *purāṇic* date strongly supports the author's theory. There are only two discrepancies. Rāma according to the new calculations occurs in *dvāpara* and in 23rd *yuga*, against *tretā* and 24th *yuga* as mentioned in the *purāṇa*. Dr. Bose has shown that there were three different persons with the same name, Rāma, two of whom had occurred in *tretā*. The hero of the *Rāmāyaṇa* on the other hand must be located in *dvāpara*. Owing to a confusion between the different Rāmas, the son of Daśaratha was placed by mistake in *tretā* instead of in *dvāpara*. The discrepancy between the 23rd and the 24th generation is due to an entirely different cause, namely the statistical uncertainty in the actual duration of the generation interval in particular cases. In this particular case, according to Dr. Bose's calculations (using an average value of 25 years or 300 months for the generation interval), the time of Rāma is 22 historical *yugas* and 1000 months from the beginning of the scale. This falls short of the 24th *yuga* by only 1000 months. The discrepancy thus amounts to 1000 months in 150 generations, or only about 6 months per generation interval. Remembering that the average value of the generation interval is not determinate within a year, it is clear that the discrepancy may be easily ascribed to the uncertainty inherent in a calculation of a statistical nature. Similarly the only other discrepancy in the case of Māndhātar (15th of 16th *yuga*) comes to about 15 months per generation interval and is statistically negligible.

Having established the general chronological scheme Dr. Bose has worked out tables for the important royal families. I have no time to consider these results in detail. Considering that the total period covered is of the order of 5000 years, I shall merely observe that the internal consistency is remarkable.

A Summary of Dr. Bose's Theory.

Dr. G. Bose's theory may be now summarised in a schematic form.

(I) *The fundamental assumption that the* purāṇas *represent an authentic historical chronicle.*

(II) *The internal consistency between the five different scales of time as revealed by (a) numerical and (b) statistical analysis.*

(i) The two fundamental units are the astronomical cycles of 5 years and 355 years (with that very unusual number 71 as their ratio). One thousand *yugas* of 5 years each gave the *kalpa* of 5000 years. The longer cycle of 355 years gave the earliest historical unit of time, namely the *manu-kāla*. Dividing the kalpa of 5000 years by 355 we get the 14 *manv-antaras* plus 15 *manu*-boundaries of 2 years each.

(ii) We also have 30 as the measure of the conventional month in terms of the natural unit of one day. Dividing the *kalpa* of 5000 years or 60,000 months by 30, we have the historical *yuga* of 2000 months.[6]

(iii) The *dharma-yuga*[7] is later than the *manu*, and shows clearly a kind of logical division of the entire *kalpa* primarily on the basis of an arithmetic progression of 1, 2, 3 and 4 with a total of 10. An elegant compromise with the duo-decimal system was effected by attaching one tenth of each interval as a boundary to each of the main epochs. We thus get $0.4+4.0+0.4=4.8$ for *kṛta* ; $0.3+3.0+0.3=3.6$ for *tretā* ; $0.2+2.0+0.2=2.4$ for *dvāpara* ; and $0.1+1.0+0.1=1.2$ for *kali*.

(iv) In later times the method of reckoning by centuries was introduced, with the convention that each century would be identified by the name of a particular star. It was recognised that one complete stellar cycle of 27 stars or 2700 years corresponded to the time of 100 kings or 100 generations, giving 27 years as the average duration of a generation.

(b) The generation interval (measured by the average age of the father at the time of birth of the first son) supplies a biological (and statistical) unit of about 27 years.

(III) *Two plausible assumptions regarding the starting point of* purāṇic *chronicles and the link with the Christian era.*

(a) The origin of *purāṇic* chronicle is located at the beginning of *svāyambhuva-manu*.

(b) The *kali*-era of the current Hindu almanac is assumed to have started from the coronation of Nanda with the addition of a stellar *yuga* of 27 centuries. This gives 401 B.C. as the date of the coronation of Nanda.

(IV) *Certain rules of interpretation based on a definite theory of the nature of* purāṇic *literature.*

Dr. G. Bose believes that the *purāṇic* chronicle was deliberately merged with the religious literature of the Hindus for secure preservation by the mechanism of traditional repetition from generation to generation. In order to make the chronicle interesting, various obvious exaggerations and allegorical devices were used, without, however, destroy-

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[6] It may be noted that this represents almost exactly the time covered by seven generations on an average, and is extremely suitable for use in chronicles of human dynasties. This epoch probably came into use after it had been observed that continuous dynastic history usually failed to go beyond seven generations.

[7] This system was peculiar to *Bhārata-varṣa* (India) and was not used in the other countries mentioned in the *purāṇa*. · (Viṣṇu, 2.3.19).

ing the substantial historical accuracy of the narrative. Various inconsistencies and discrepancies have crept in, most of which can be easily reconciled with the help of certain rules of interpretation.

COMMENTS AND SUGGESTIONS.

Part I, the assumption of the historical character of purānic literature, is of course indispensable. Parts II and III also, I think, have been established by Dr. G. Bose with reasonable certainty, and furnish a numero-statistical framework for his theory. In the case of eleven important historical characters, whose ages are mentioned in more than one system of the reckoning of time, there is a satisfactory agreement between the dates calculated in accordance with the present theory and the dates as actually given in the purāṇas.

With regard to Part IV (Rules of interpretation) however I believe certain modifications would be useful. Stimulated by Dr. Bose's work I have recently glanced through the pages of the *Viṣṇu-purāṇa*. The chronological scheme given by Dr. Bose was not only helpful, but was distinctly illuminating. I gathered however an impression that so far as historical tradition is concerned the material is distinctly heterogeneous. Owing to shortness of time I shall simply state a few suggestions in this connexion, leaving it to a future occasion to work them out in greater detail.

A MODIFIED THEORY OF PURANIC LITERATURE.

(1) The *ādi-* (or proto-) purāṇa represents the original historical chronology embellished possibly with theories of creation and destruction. The *manu* era was originally used in these chronicles and the earliest layer probably represents the period roughly from 6000 B.C. to 2500 B.C.

(2) This *ādi-* (or proto-) purāṇa was gradually converted in a later age into the *madhya* (or meso-) purāṇic layers. Much of the earlier matter was transformed into oblique statements without losing however the obvious historical implications. The *dharma-yuga* and the historical *yuga* of 2000 months were probably introduced at this stage and replaced the *manu* system which gradually fell into disuse. It is also possible that breaks in the dynastic succession or gaps in historical narratives were deliberately fused or twisted to fit into the original proto-purāṇic system. It is not unlikely that this middle layer started from about 2500 B.C. (the time of disappearance of the *manu* era) and continued down to the end of the first *kalpa* (c. 1000 B.C.) or even later to the time of Nanda (400 B.C.).

(3) There is a third layer consisting of the *navya-*(or neo-) purāṇas which are of much later origin (possibly from about the time of Nanda, 400 B.C.), and which represent definitely the traditions associated with cultistic revivals in post-Buddhistic times. A great deal of new matter in the form of religious stories and other popular legends were incorporated for propagandist and cultistic purposes. The exaggerations and the supernatural legends in the neo-*purāṇic* layer have no necessary connexion or foundation in historical facts, and must be clearly differentiated from the transformations in the meso-*purāṇic* layers which on the whole represent the original historical chronicle.

The proto-*purāṇic* layer is simply a chronicle of facts ; it has no story interest, neither is there any desire to glorify the power or benevolence of any particular god. Droughts, earthquakes, revolts, anarchical disruptions interrupt the chronicle in a haphazard manner only because they had actually happened in fact. The story interest becomes more important in the *madhya* or meso-*purāṇic* portions, while in the *navya* or neo-*purāṇic*

layers the religious motive is dominant and the narrative is mostly concerned with the praise (or special pleadings in favour) of particular gods.

I do not know whether these views will be acceptable to Dr. Bose. I do not think therefore it will be useful to pursue this topic any further at this stage. I shall now give a summary of the reconstructed chronology of India restricting myself to what I consider to be the purely historical portion of the narrative.

GEOGRAPHICAL NAMES.

It is first necessary to consider certain plausible rules of interpretation of geographical names. Dr. Bose believes that Ilāvṛta-varṣa, which was known a little later by the name of Svarga, and was the original home of the ancient Hindus, was situated somewhere to the north-west of India. This was the country of the *devas*. The people who emigrated to India and were called the descendants of *Manu* probably originally belonged to the same group. The king of Ilāvṛta-varṣa or Svarga was known as Indra. In India, the land to the north of the Vindhya range was known as Martya or Pṛthivī, the kingdom of King Pṛthu. Between Svarga or Ilāvṛta-varṣa and North India or Pṛthivī was the region called Antarīkṣa, possibly comprising the northern portion of Kashmir and Afghanistan, the southern portion of Turkestan, and Tibet. To the south of the Vindhya was Pātāla, which itself was divided into 7 regions ; the lowest or southermost division of which was the land of mediterranean fire, which strongly suggests Java and Bali. In later times the geographical names Svarga, Pātāla etc. took on mythological meanings.

THE RECONSTRUCTED CHRONOLOGY OF INDIA.

The traditional chronicle of Ilāvṛta-varṣa starts with the first or *svāyambhuva-manu* in 5958 B.C. For more than one thousand years the emigrants to India, the descendants of *Manu*, continued to be the subjects of the kings (or Indra) or Ilāvṛta-varṣa. King Veṇa in the 44th generation (4919 B.) was the first chief to rebel against the Indra (king) of Ilāvṛta-varṣa (or Svarga), but the first real independent king of India was probably Pṛthu of the 45th generation in *vaivasvata-manu* (4895 B.C.). For a long time Svarga was a place of pilgrimage for the descendants of Manu. At one time, one of the kings of Svarga closed the old route in the north, from when it became difficult to reach the original home of the Hindus. The practice of going to Svarga continued up to the time of Yudhiṣṭhira (of the *Mahābhārata*, c. 1400 B.C.) who himself went there by a second route probably through the present Badarīnārāyaṇa and Mānasa-sarovara.

A great earthquake occurred in the time of Dhundhumāra about 3608 B.C. ; the place of occurrence of this great earthquake is described as a sandy place near the sea, from which one may surmise it to be somewhere in Sind. A great flood is mentioned to have occurred after the *cākṣuṣa-manu*, that is, a little after 3800 B.C. An earlier flood had apparently occurred between 5242 and 4884 B.C.

The time of Māndhātar is given as 3458 B.C., and of Paraśu-rāma 2598 B.C. From the story of Sagara, there is some reason to believe that a very big canal reaching possibly to the sea was constructed in the time of Sagara and Bhagīratha (about 2900 B.C.),—which was possibly connected with the diversion of the Ganges into its present south-easterly channel from some northerly course.

The hero of the *Rāmāyaṇa* is placed in 2100 B.C., and the birth of *Kṛṣṇa* in 1458 B.C., with the great battle of *Mahābhārata* in 1416 B.C. About the same time there was possibly another severe earth-quake which twisted the city of Hastināpurī (modern Delhi), and might have been connected with the diversion of the channel of the Jumna.

MANU	HISTORICAL YUGA	DHARMA YUGA	STELLAR YUGA NAME	OLD	NEW	DATES & EVENTS
						6058 B.C.
		KRTA	JYESTHA	1	18	5958 B.C. — Starting point of the Chronicle (Beginning of kalpa) (5958 B.C.)
I	1		MULA	2	19	
			PURVASHARHA	3	20	Vassals of the kings (Indra) of Ilavrtavarsa (or Svarga)
	2		UTTARASHARHA	4	21	
II	3		SRAVANA	5	22	
	4		DHANISHTHA	6	23	5500 B.C.
	5		SATABHISHA	7	24	
			PURVABHADRAPAD	8	25	
			UTTARABHADRAMA	9	26	
III	6		REVATI	10	27	5000 B.C. / 4958 / 4919 B.C. — A great flood (circa 5000 B.C.)
			ASVINI	11	1	(44) King Vena—the first revolt against Indra (4919 B.C.)
IV	7		BHARANI	12	2	(45) King Prthu, probably the first independent king of India (4895 B.C.)
	8		KRITTIKA	13	3	
			ROHINI	14	4	
	9		MRIGASHIRA	15	5	
V			ARDRA	16	6	
	10		PUNARVASU	17	7	
	11		PUSHYA	18	8	
			ASLESHA	19	9	
VI	12		MAGHA	20	10	4000 B.C. / 3658 B.C.
	13	TRETA	PURVAFALGUNI	21	11	
			UTTARFALGUNI	22	12	3889 / 3814 B.C. — (84) King Daksa-pracetas (3889 B.C.)
VII	14		HASTA	23	13	(87) King Vaivasvata (3814 B.C.)
			CHITRA	24	14	(88) King Iksvaku (3795 B.C.)
	15		SVATEE	25	15	3600 B.C. — A great flood (circa 3700 B.C.) / A great earthquake (circa 3600 B.C.)
			VISAKHA	26	16	3458 B.C.
VIII	16		ANURADHA	27	17	(106) King Mandhatar (3458 B.C.)
			JYESTHA	1	18	
	17		MULA	2	19	King Dusmanta (3405 B.C.)
IX	18		PURVASHARHA	3	20	(117) King Hariscandra (3169 B.C.)
			UTTARASHARHA	4	21	3000 B.C. / 2958 B.C. — Manu era falls into disuse (3100 B.C.)
	19		SRAVANA	5	22	(125) King Sagara (2958 B.C.)
	20		DHANISHTHA	6	23	(129) King Bhagiratha—diversion of the Ganges to the South (2833 B.C.)
X			SATABHISHA	7	24	
	21		PURVABHADRAPAD	8	25	
			UTTARABHADRAMA	9	26	2458 B.C.
	22	DWAPARA	REVATI	10	27	
XI	23		ASVINI	11	1	(148) King Raghu of Raghuvamsa (2225 B.C.)
	24		BHARANI	12	2	(150) King Dasaratha (2158 B.C.)
			KRITTIKA	13	3	2124 B.C. — (151) King Rama of Ramayana (2124 B.C.)
	25		ROHINI	14	4	2000 B.C.
XII			MRIGASHIRA	16	5	
	26		ARDRA	16	6	
			PUNARVASHU	17	7	
			PUSHYA	18	8	
XIII	27		ASLESHA	19	9	1458 B.C. / 1416 B.C. — Krsna and (181) King Brhadbala (1458 B.C.)
	28	KALI	MAGHA	20	10	The great battle of Mahabharata (1416 B.C.) : Birth of Pariksit (1416 B.C.)
			PURVAFALGUNI	21	11	
	29		UTTARFALGUNI	22	12	
XIV			HASTA	23	13	
	30		CHITRA	24	14	1000 B.C. / 958 B.C. — End of first Kalpa (958 B.C.)
		(SECOND KRTA)	SVATEE	25	15	
			VISAKHA	26	16	
			ANURADHA	27	17	
			JYESTHA	1	18	
(VAIVASVATA)			MULA	2	19	
			PURVASHARA	3	20	401 B.C. — Coronation of Nanda (401 B.C.) (1015 years after birth of Pariksit)
			UTTARASHARA	4	21	
			SRAVANA	5	22	
			DHANISHTHA	6	23	
			SATABHISHA	7	24	0 B.C. / A.D. — 43
			PURVABHADRAPAD	8	25	
			UTTARABHADRAPAD	9	26	
			REVATI	10	27	435 A.D. — End of Andhra dynasty (435 A.D.)
			ASVINI	11	1	
			BHARANI	12	2	
			KRITTIKA	13	3	

Left margin: 9958 B.C. ... ONE KALPA = 5000 YEARS ... 958 B.C.

The first *kalpa* was completed in 958 B.C. from when the modern period started, according to the *purāṇa*. The Pradyota dynasty of five kings reigned from 881 to 753 B.C., and was succeeded by the Śiśu-nāgas, 10 kings from 753 B.C. to Mahānandin in 444 B.C. At this time Mahāpadma Nanda established a great empire and was annointed emperor in 401 B.C. The Nanda dynasty was succeeded by the Mauryas, the Śuṅgas, the Kaṇvas and the Andhras, and the chronicle ends in 435 A.D. with the death of Puloman, the last of the Andhras.[*]

The *manu* era was probably the earliest and was originally brought from Svarga (or Ilavṛtavarṣa); it fell into disuse after the *vaivasvata-manu* or the seventh manu. The *dharmayuga* and the scale of 2000 months were used practically throughout the chronicle. But the stellar era was introduced much later, possibly after the great battle of *Mahābhārata* (c. 1400 B.C.)

CONCLUSION.

One point is worth stressing. It must not be imagined that there are no contradictions or inconsistencies in the *purāṇa*; but in many cases such inconsistencies and exaggerations are more apparent than real and can be explained easily. The inner core of historical narrative is often overlaid with symbolical and mythological decorations some of which were deliberately introduced to make the narrative interesting and some of which were unintentional accretions.

The main argument of the new theory is two-fold. One which is purely numerical and statistical in character is concerned with the reconstruction of the different eras. The other consists of certain reasonable rules of interpretation of a psychological and symbolic nature. The internal consistency of the chronological portion is such as to exclude beyond reasonable doubt the possibility of chance coincidence. The psychological and symbolic portion naturally is more open to criticism. But here also the way in which the different portions fit together, especially if we keep the three layer (proto-, meso-, and neo-*purāṇic*) character of the material in view, is such as to give them considerable plausibility. Finally the obvious contradictions, inconsistencies and confusion of names are all features which one would expect in an authentic and genuine tradition. Such inconsistencies in fact would be difficult to explain on the theory of deliberate forgery.

The great importance and the far-reaching effect of the new theory will be easily realised from the above summary. With the recent discovery of a highly developed civilisation in the Indus valley going back to the fifth or sixth millenium B.C., it cannot be said that the chronicle of ancient India as given in the *purāṇa* is intrinsically improbable. It is true that external evidence is as yet almost entirely lacking, but the internal evidence is so consistent that it would be clearly unscientific to dismiss the new theory without giving it a most searching examination. If the present theory is sustained, it will completely revolutionise current ideas regarding the chronology of ancient India. It is to be hoped that Dr. Bose will soon publish an English version of his theory, and thus make it available to scientific workers outside Bengal and India.

21 December, 1935.

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[*] The following dates in later times given by Dr. Bose deserve serious consideration by historians : Nanda as viceroy in 403 B.C.; coronation of Nanda 401 B.C.; end of Nanda dynasty including minor chiefs 303 B.C.; Maurya dynasty, ten kings, from Candra-gupta 315 B.C. to Bṛhad-ratha 178 B.C.; Suṅga dynasty, ten kings, from Puṣpa-mitra 178 B.C. to Deva-bhūti 66 B.C.; Kaṇva dynasty from Vasu-deva 66 B.C. to Su-śarman 21 B.C.; Andhra kings from Sipraka 21 B.C. to Puloman 435 A.D.