

A NOTE ON THE AHARGAṆA AND THE WEEKDAYS AS PER MODERN SŪRYASIDDHĀNTA

A K BAG*

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The paper aims to re-examine the correctness of JD numbers for Kali, Varāhamihira and Brahmagupta epochs.

Key words : JD numbers, Brahmagupta epoch, Kali epoch, Varāhamihira epoch.

INTRODUCTION

There is a criticism by Chandra Hari in a personal communication (dated 11 Feb. 2002) on my earlier paper¹ that the JD (Julian day) number used in the paper for Kali, Varāhamihira and Brahmagupta epochs are wrong and they should be one less from the corresponding numbers assigned in the paper. I will show here that whatever JD numbers I have mentioned against these epochs are correct, though the reference of JD numbers was not the main focus of my paper.

My major emphasis in the paper, of course, was to obtain Kali, Varāhamihira and Brahmagupta epochs from the modern *Sūryasiddhānta* epoch including verification of weekdays as per statements made in Siddhantic texts. Casual mention of JD numbers for these epochs was also made to have a relative idea of the Christian dates for these epochs. However I shall take the problems one by one and show that my results agree well with what I have said and there is no need for any correction.

(1) The counting of Julian days (JD) was started on Monday mean midnight (GMT), January 1, 4713 BC. Here JD number = 0. As to who introduced this date and how it was introduced is beyond the scope of my paper and is not of much relevance to the context.

*Indian National Science Academy, Bahadur Shah Zafar Marg, New Delhi-110002

(2) The Kali epoch in the Indian midnight (*ardharātrika*) day system falls on Thursday -3101 AD (3102 BC), Feb. 17 (ended) Ujjayini Mean Midnight (UMT). Obviously the Friday starts from 17-18 Feb. midnight in this system. In the morning (*audayika*) day system, the Thursday in question would end on Friday morning. The Kali epoch in this system obviously starts on 18 February, - 3101 AD, Caitra, Friday UMT 6 AM. The JD number for 18 Feb. - 3101 AD morning was given as 588466 in my paper. The KA (*Kali ahargaṇa*) = 0 since it starts from here. The private communication says that this JD number is wrong and it should be 588465. In this connection it may be of interest to note that there was no need for such a reference to JD number in the Siddhantic period, for it used mainly Śāka and other Indian eras. In recent times we have been following the Christian era, obviously the importance of reference from Indian to Christian era i.e., JD number has become a necessity for relative understanding. Let us however for the time being accept the JD number 588466 for Kali epoch as correct for argument sake and examine the other results.

(3) The Varāhamihira epoch was started on Tuesday, Caitra 1, 427 Śāka (22 March 505 AD). The KA number² = 1317124, the JD = 1905590 are mentioned in my paper. The JD number for this epoch is mentioned one less i.e., 1905589 in the private communication. To test whether this JD number is correct or not, let us divide the number 1905590 by the number of days in a week i.e., 7, when it leaves the remainder 1. Since the JD number started on Monday, the remainder 0 indicates Monday, and the remainder 1 Tuesday. This satisfies the statement made by the Siddhantic texts that the Varahāmhira epoch started on Tuesday. Obviously the correct JD number for Varahamihira epoch is 1905590. The JD number = 1905590, as indicated in the communication, is wrong since the number when divided by 7 leaves a remainder 0, which means the day of the week is Monday contradicting the statement.

(4) The Brahmagpta epoch was started on Sunday, Caitra 1, 587 Śāka (March 23, 665 AD). The KA number = 1375565 and JD number = 1964031, are given in my paper. The JD number in the private communication is as usual one less i.e., 1964030. As before, when the JD number 1954031 is divided by seven, it leaves the remainder 6, which means the weekday starting from Monday is Sunday. This also agrees

with the weekday of the Brahmagupta epoch nullifying the JD number mentioned in the communication.

DISCUSSION

(1) If the results are followed carefully, it may be seen that the problem lies in the JD number for Kali epoch.

For, JD (for Kali epoch) = JD number (for Kali epoch) + KA (for Kali epoch) = 588466 (here KA = 0, since it starts from here).

Obviously, JD (for Varāhamihira epoch) = JD (for Kali epoch) + KA (for Varāhamihira epoch) = 588466 + 1317124 = 1905590.

and, JD (for Brahmagupta epoch) = JD (for Kali epoch) + KA (for Brahmagupta epoch) = 588466 + 1375565 = 1964031.

This shows that there is no confusion in JD number for Varāhamihira and Brahmagupta epochs. The problem only lies in the JD number for Kali epoch.

(2) Let us now examine the JD number for Kali epoch whether it is 588466 or 588465. The JD number for 17 Feb.,–3101 AD which follows a midnight day system (GMT) has three components, (A) JD number for -3100 AD, *i.e.*, 588783 days, (B) JD number for -1 AD, *i.e.*, 365.25 days and (C) JD number for 17 Feb., *i.e.*, 48 days. Obviously JD number for 17 Feb. –3101 AD could be obtained from the expression (A–B+C) *i.e.*, (588783–365.25 + 48) = 588465.75. This suggests that the JD number for the beginning of 17 Feb., which began on 16-17 Feb. midnight, is 588465. When the number 588465 is divided by 7, it leaves a remainder 3, indicating that the day in question, counting from the starting of Julian day (*i.e.*, Monday), is Thursday. Obviously Thursday started on the 16-17 Feb. midnight and the Friday started on 17-18 Feb., midnight-3101 AD. The JD number for the beginning of Friday on 17-18 Feb.–3101 AD midnight is obviously 588466.

CONCLUDING REMARKS

In the Siddhantic (*ardharātrika*) midnight system, the Kali epoch started will the end of Thursday *i.e.*, beginning of Friday, 17-18 Feb.

midnight, –3101 AD and in the (*audayika*) morning day system, the day in question started the next day morning *i.e.*, 18 Feb., –3101 AD. at 6 AM UMT. It may be noted that Ujjayini's longitude being $75^{\circ} 43'$ E with reference to Greenwich (0°), the time difference is about $5^{\text{h}} 3^{\text{m}}$. It means that what is Ujjayini 18 Feb., –3101 AD Friday morning (6 AM) in the *Audayika* system is roughly 17-18 Feb., –3101 AD midnight ($12^{\text{h}} 57^{\text{m}}$) in JD system in Greenwich. There is of course some marginal error, but there is no apparent contradiction in accepting the same JD number *i.e.*, 588466 for 18 Feb. –3101 AD. We have already shown that the day begins with Friday. In case weekday differs, there is also a suggestion for adding or subtracting one day to get the exact KA number in the Siddhantic texts. So is also in JD number. One should not think that it is a conversion from one system to another. It is a corridor through which one can enter into Christian epoch from the Indian system and vice versa. It is possibly for this reason that P.C. Sengupta³, the wellknown authority in the field of Indian astronomy had accepted the JD number for Kali epoch as 588466 on Friday, –3101 AD Feb. 18, UMT 6 AM. I have shown that my results of Varāhamihira and Brahmagupta epochs including their JD numbers agree very well with this number as well as the week days prescribed in the texts. Even Chandra Hari's conversion of KA to Christian date used in his papers agrees very well from the general rule I have enunciated in my another paper 4. Hence there is no justification or scope for a change of JD numbers for Kali, Varāhamihira and Brahmagupta epochs.

NOTES AND REFERENCES

1. Bag, A.K., "Ahargaṇa and the Weekdays as per Modern Sūryasiddhānta", *IJHS*, 37.1-2 (2001) 55-63.
2. KA number-1317124 for Varāhamihira epoch is printed correctly in p. 61 and wrongly in p. 63 in my earlier published paper.
3. Sengupta P.C., Introduction to *Siddhāntaśekhara* of Śrīpati, ed. Babuaji Misra, Part II, p. ix, University of Calcutta, 1947.
4. Bag, A.K., "Luni-Solar Calendar, *Kali Ahargana* and Julian Days", *IJHS*, 38.1 (2003) 17-38.