

## Bhaskaracharya, the Great Astronomer of Maharashtra

Bhaskaracharya , as one of verses found in a manuscript of *Lilavati* , was a learned person well-versed in 8 grammars , six schools of medicine , six of the logic , the five of mathematics , the four Vedas , the three treatises on gems , the two schools interpreting the Vedas and the ultimate in learning , i. e. the Vedanta philosophy . But he was to be remembered by the posterity for something that was unique in him; his contribution to the sciences of astronomy and mathematics. India contribution to these two sciences has been tremendous, unique and amazingly far ahead of times, as compared to West Asia and post -Renaissance Europe. Very conspicuously it was noticed in 5th century C. E., when Aryabhata wrote his pathbreaking *Aryabhatiya* , a theoretical treatise on mathematics and astronomy that revolutionized the ideas the solar system , the Sun and the stars that appear to going around the earth which is , he said for the first time spherical in shape , and the role of the Sun and the Moon and the planets in computing time. The successive astronomers, like Varahamihira (early 6th century C. E. ), Brahmagupta ( born 598 C. E. ) , Bhatta Utpala ( mid 10th century C. E. ) improved further and made their valuable contribution after scrutinizing the contemporary understanding of the sciences in and outside India. Bhaskaracharya reached the peak, with his two well known works, *Siddhāntaśiromaṇi* and *Karaṇakutūhala*. To have a rough idea of what Bhaskaracharya knew well ahead of his times, it should sufficient to mention that he quite accurately arrived at the value of 'pi ' , knew the law of gravitation and explained satisfactorily the phenomenon of objects falling from sky to the earth, and that the atmospheric cover around the earth was 12 yojanas (i. e. about 150 km.). His contributions in mathematics, algebra and trigonometry are equally surprising. His work *Siddhāntaśiromaṇi* is divided into four sections , viz.

- i. Lilavati
- ii. Bijaganita
- iii. Grahaganita, and
- iv. Goladhyaya .

The first section that deals with arithmetic's gives very simple methods to solve, and must have been quite popular a text book as the large number commentaries (about twenty) on it show. There are other works like *Bhaskaravyavahara* , *Bhaskaravivahapatala* , *Sarvatobhadra* that are also attributed to him. But it is his own commentary entitled *Vasnadhyaya* on his own *Grahaganita* and *Goladhyaya*, and another work *Karaṇakutūhala* that form his significant contribution. He wrote his first work when he was 36 years old (i.e. in 1150 C. E.), while *Karaṇakutūhala* was written in 1183 C. E. The treatise composed in 10 chapters, gives very prescribes very easy methods off calculating the movements of planets and thus very useful in writing an almanac (panchanga).

Bhaskaracharya was born in an accomplished family known for the achievement of its members in the field of literature, arts and sciences. The Patan inscription (dated Shake 1128 = 1207 C. E.) of Soideva , a Nikumbha chieftain ruling from there , opens with three verses in praise of Bhaskaracharya , who had become a legend by then ,and describes the lineage of the astronomer starting with the most famous of his ancestors , Trivikrama , the very emperor among the poets. His son was the learned ('Vidyapati') Bhaskarabhatta , who adorned the court

of the legendary Bhoja Paramara, (1020-1047 C. E.) at Dhara, (Dhar in present Madhyaradesh). His own father , poet Maheshvaracharya , 6th in the line , was an authority on astronomy. Karanashekhara and Pratishtavidhidipika Laghuphalam are the works and a commentary on Laghujataka of Varahamihira , are to his credit. Bhaskaracharya's brother, Shripati , also seems to have settled in the Seunadesha ( present Nasik -Khandesh area ) , as inscriptions of the former's grandson Changadeva ( Shake 1128 = 1207 C. E.) and grand nephew Anantadeva ( Shake 1144 = 1222 -23 C. E. ) are recovered from Patne and Bahal ( both near Chalisgaon , in Jalgaon district ) . Both , possibly one after another , were royal astrologers in the court of Singhanadeva of the Yadava family , who by then had acquired the status of an emperor ( Chakravarti ). Anantadeva carried on the family tradition of contributing to the astronomical science by writing a commentary on a section of the famous Brahmasphutasiddhanta, and on the Brihajataka of Varahamihira , Changadeva had become the royal priest at Patne and also royal astrologer in the court of Singhanadeva. The family had definitely their roots at Pattanapura ( Patne , near Chlisgaon ) , as Changabeve's father and Bhaskaracharya's son , Lakshmidhra was invited to the Yadava court in the time Jaitrapala ( 1193-1210 C. E. ) while he was at Pattanapura.

Bhaskaracharya was himself a poet, a Vedic scholar, a devotee of lord Krishna and an accomplished teacher, with whose disciples hardly anybody dared to debate , claims a verse in the Patne Inscription. His son Lakshmidhara was a great debater himself. It was no wonder that Changadeva, priest and astrologer of the Nikumbha princes at Pattanapura , wanted to spread the lore and knowledge of Bhaskaracharya .This was accomplished by Changadeva with the help of Nikumbha Soideva in the year 1207 C. E. ( Shake 1028 ) whose royal priest he was and also had become the royal astrologer in emperor Yadava Singhana's court. Changadeva's cousin, Anantadeva grandson of Bhaskaracharya's brother was at Bahal , not very far away from Patne , probably succeeded Anantadeva on the post Changadeva , as his inscription from Bahal of 1122-23 C. E. ( shake 1144 ) shows. He was carrying on his activities of astronomical research independently, as mentioned above .There was a third centre of learning , a royal establishment of one prince Krishna , at Balsane that was also a sacred place (tirtha ) on the bank of river Badari ( present river Burai ) and a group of Shaiva shrines that had an Agamic background . This Royal establishment had come into disrepair, and Mahaluka Pandita , son of Someshvara Pandita , grandson of Padmanabha of Gargya gotra repaired for the use of learned brahmins in 1186 C. E. Father Someshvara is described as a great orator ( Vacaspati ) gand indeed an ornament of the hall of poets ( kavisabha -lankara ) . The next verse describes him further that because of his charming poems people forgot even the first expression of poetry. This royal college of learning ( rajamatha ) was for the residence of ing on the fronts. learned Brahmins and act of piety. The benefactors object can also be guessed from the way he has been described. Mahaluka Pandita was an expert in tmathematics ( ganityamburuhatarani ) euphemistically described as the very Sun to the utlotus of mathematics! All three examples of the centres of learning show that mathematics and astronomy were disc lines that were patronized not only by emperors like Bhoja of Malwa and Yadava Singhana , but also by small but enlightened chiefs like Soideva of Patne and Krishna of Balsne.

### Migration of Shandilya Family to Seuna Country

The ancestors of Bhaskaracharya , as was mentioned earlier lived in Malwa , either at Bhojpur or Dhar , capitals of the emperor , or at Ujjain the famous centre for astronomy. As seen above, we have very clear evidence that Laksmidhara , son of Bhaskaracharya , was invited by Jaitrapala Yadava to his court while he was at Patne . And it was either Bhaskaracharya or his father Maheshvaracharya along with his sons took refuge in the Yadava kingdom. It would be interesting to take review of the history of the Paramara dynasty in this context. Bhoja stands out as towering person amongst them all. His inscriptions are available from 1020 C. E. to 1047 though his presence was quite perceptible right from 1000 C. E. , and died some time in 1055 . An ambitious monarch, his valour matched his ambition ; and at the height of his power ruled a vast empire comprising Malwa , Chitor , Banswara , Dungarpur , Khandesh , Kokan and upper reaches of Godavari. In latter part of his career, it seems he had to pay for his ambition by fighting on all the fronts. And died while he was still on the front. His successor Jayasimha had a worse share of misfortune to face. As a precaution , he had established alliance with the younger brother of emperor Someshvara , the future Vikramaditya the VIth of Kalyani . The wrathful emperor along with the Solanki Karna crushed him to death in a joint attack. It was Udayaditya (1080 -1086 C. E.) , a cousin of Bhoja , and then Jagaddeva who followed and abdicated in favour of Naravman (1094-1128 C. E. ) who died in the prison of Solanki Jayasimha . His successor Yashovarman , who wrested Malwa for awhile , but remained in the hands of Solankis. His successor Jayavarman was replaced on throne forcibly by Hoyasalas and Chalukyas of Kalyani . Ultimately in 1143 C. E. , Malwa was annexed by Kumarapala to the kingdom of Anhilwadatan . Bhaskaracharya was born in 1114 C. E. and passed away sometime in 1184 C.E. If we the state of things in Malwa during this whole period , it would not be surprising , if Maheshvaracharya , father of the illustrious astronomer , crossed the border of Malwa and sought refuge in a small , but more secure kingdom of the Nikumbha prince at Patne . It was probably such considerations that prompted prince Soideva to found school of astronomy in, memory of Bhaskaracharya at this place only .

### Endowments given to the Bhaskaracharya School

Though details about other centres of learning in the vicinity are not available to us, the endowments made by different public bodies and the prince are fortunately noted in detail in the case of the School of Astronomy and Mathematics at Patne , as we call it now . The Marathi portion of the inscription gives the details of donations, granted by various organizations and individuals to the school , after seeking concurrence from the sovereign , in this particular case Chakravarti Singhana . The donations are as follows:

- i. village Odugrama ;
- ii. a potful of oil of the first press of sesames , from every oil mill ;
- iii. a ladle of oil ( every day ? ) from every oil mill ;
- iv. five coconuts , derived from the customers ;
- v. a quarter ( ' giddhve' of seer of grains ) after a sale of cultivated grains worth one ' asu ' to the customers ;
- vi. the ' brahmottara' ( portion of sales tax to be handed over to Brahmins ) ;
- vii. sales tax of 20% ( ' visova' ) be received by the municipality ( nagara ) ;
- viii. sales tax levied by the king ( ' asi- au' ) .

The donations are of three types, viz.

- a) in kind, like the oil , coconuts or the grains ;
- b) By way of taxes , in cash ; and
- c) Through grant of land.

One cannot at present estimate exactly the income of the School of Astronomy, but can observe that it was quite complex system through which the educational institutions were helped by individuals, the municipality / trade guilds and the king and the emperor.

Most important is to observe that the memory of an illustrious astronomer like Bhaskaracharya, could be perpetuated with the concerted efforts not only of the local king Soideva , the trade guilds / the municipality of Patne , and the sanction of the emperor . This also reflects on the contemporary educational system, its relationship with the patron, who is a local prince, the trade guilds/ municipal authorities, whose concerted efforts resulted the creation of the centre of learning and the financial support that it required for its sustenance. The role of the emperor was no small, as it required his seal approval for the donation of land and various grants made in cash and kind. This also reflects positively on the role of even small chieftains that created and supported an environment in creation of three educational centres within a perimeter of something like 100 kilometers. The patrons were Krishna of Balasnaka , and Soideva , Hemadideva and Krishna of Pattanapura . The inscription also sheds light on the contemporary, complex system that governed the grants, and the role played by the guilds / municipal authorities, the local princes and the Emperor.

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