Chapter I
ALBERUNI'S LIFE AND WORK

Abu Raihan Muhammad Ibn Ahmad, popularly known as Alberuni, was born on the 3rd of Dhu'l-Hijja, A.H. 362, corresponding to 4th September, A.D. 973, in the suburb of the old town of Kath (near modern Khiva in Uzbek S.S.R.). Khiva was then the capital of Khwarizm, the present boundaries of which fall in Kara Kalpakaya A.S.S.R., and it is as a result to this association that Alberuni is sometimes also called al-Khwarizmi. There need be no controversy about the Alberuni's year of birth for he himself had once referred to it in a letter to one of his friends, al-Razi. According to this reference his year of birth was A.H. 362.1 The actual month, day and time however remain obscure, but Abu Ishaq Ibrahim b. Muhammad al-Ghasanfar al-Tabrizi, has remarked that he was born in the morning of Puchahenbe (Thursday), the 3rd of Zilhij.2

Little is known of his ancestry and parentage, excepting the name of his father. The meagre information which is available shows that he came from a rural Iranian stock. He was left an orphan at a very early age3 and seemed to have passed his life

3 loc. cit.
as a bachelor. He attained the ripe age of more than three-quarters of a century and died in Ghazna on Friday, the 2nd of Rajab, A.H. 440, corresponding to the 11th of December, A.D. 1048. Some writers fix the date of death as the 3rd of Rajab, A.H. 440 A.H. (the 13th of December, A.D. 1048), while some, for instance Max Mayerhoff, reckon it as A.D. 1050. Imam Fasil al-Sarakhsi, a pupil of Alberuni, has mentioned in his own handwriting on the margin of one of Alberuni's book the time of Alberuni's death as Friday, the 2nd of Rajab, A.H. 440, after 'isha (early hours of the night). In the same book in someone else's handwriting there is an insertion that Alberuni died at the age of 77 years and 7 months. Yaquut in Mu'jamul Adba is certainly wrong in taking A.H. 403 as the year of his death, for there is undisputable historical evidence that A.H. 407 was the year when Mahmud Ghaznavi invaded Khwarizm and that in that year Alberuni was in the court of al-Ma'mun Khwarizmshah. In fact, most of his books about India were written after the annexation of India to the Ghazni empire. It is certain that he was alive at the time of the death of Mahmud Ghaznavi (A.H. 442) and not only witnessed the accession of King Mas'ud to the Ghaznavi throne but also wrote the monumental work al-Qanun al-Mas'udi between A.H. 421 and 427 for the pleasure of the new king who had been one of his greatest benefactors. The error in Mu'jamul Adba may have been committed by the copyist.

As for the slight difference between the 2nd or 3rd of Rajab, the latter seems to be more plausible as lunar-days are counted

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4 Nadvi, op.cit., p. 257.
from the lunar rise and by that reckoning Alberuni must have
died on the 3rd of Rajab after the moon had arisen to mark the
beginning of a new lunar day.

The term 'Alberuni' appended to his name should, according
to an old Arab practice, refer to the place of his original
residence or the place of his birth. But a controversy has
arisen for there is no town known as Birun or Berun anywhere
near or far from Khwarism. Alberuni's biographers have indulged
in much speculation and some of them,\(^5\) old as well as modern,
have gone so far as to suggest that 'Birun' was a town in Sind.
Alberuni's great love for India and Indian literature gave
support to such speculations. In fact, these writers mistook
Birun for Nirun which did exist in Sind.\(^6\) The mistake seems
to be due to the fact that in the Persian and Arabic scripts a
of slight displacing of the dot/nu makes it read as be.

The fact is now established that the word 'Biruni' actually
meant 'outside' and was adopted because Abu Rayhan had spent
the major part of his life outside the place of his birth, i.e.,
Khwarism. Sam'ani in his book Kitab al-Ansab, written about a
century after the death of Alberuni, put an end to this
controversy by saying that 'Beruni' in this context means 'from
outside Khwarism'. Yaqut has also endorsed this view. That
Alberuni was a native of Khwarism is proved by his own words in

\(^5\) vide Ibn Abi Asib'ah in Tahqat ul-Atba' and Shahrnuri in
Akhbar ul-Nihama'.

\(^6\) Ibn Naqal in his map has located Nirun in Sind.
Tahdid, wherein he says, 'After that day in-between A.H. 364-65 [at the time of computing the maximum altitude of the village, west of Jayhun], disturbance broke out between the two lords of Khwarism, and the work had to be stopped, because I had to take shelter, and I then sought safety by emigrating from the fatherland'.

As far as the pronunciation is concerned, it should be pronounced Beruni with a long "e" and not Biruni. Alberuni himself on the autographed MS Istanbul, Fatih 3386 (Al-Tahdid) has clearly vocalised the Be with a fath giving the pronunciation Bairuni. This seems to be the correct pronunciation because Persian lexicographers pronounce the word B-e-r-u-n-n (meaning 'outside') with a yai majhul. It is also quite proper to suggest that the hyphen between Al and Beruni should be dropped, not only for the sake of convenience, but also to make it as one word.

Alberuni's Personal Habits

It is quite evident from his own writings as well as from the accounts of his biographers that nothing was more dear to Alberuni than the pursuit of learning. He had dedicated his whole life to this purpose. He remained a bachelor all his life probably for the same reason. It is not very clear from his writings as to which particular sect of Islam he belonged, but

his being under the Shiite influences of Iran and his own admiration and adoration for 'Ali it may lead one to think that he was inclined towards Shiism. The point need not detain us here for Alberuni never let his religious beliefs interfere with his pursuit of learning. He was extremely tolerant and had great respect for other religions. He takes a rational view of even those Hindu thoughts and customs which were quite contrary to his own faith.

Historical records do not reveal much about Alberuni's personal habits and character, the only exception being Yaqut's Mu'ajjamul Adba', where Alberuni is described as a man of noble habits, outspoken and a puritan in his actions.\(^9\) We are told by Shahrzori that Alberuni was short-statured, olive skinned, with a protruding belly and sporting a long white beard.\(^10\)

**Education and Training**

From an early age Alberuni had a lust for learning. He was endowed with a critical mind, and a burning spirit which was always alive to sort out, judge and correlate facts, with an uneasy realisation that the world is varied and immense and there is in it a good deal to learn. This was how he reacted towards the 'unknown'. He sought knowledge from every possible quarter, irrespective of the barriers of caste, creed, religion and language. He was never tired of learning and even in his

\(^9\) Yaqut, Mu'ajjamul Adba', Vol. VI, p. 312.
\(^10\) Nadir, op.cit., p. 263.
death-bed, he did not relinquish his search for knowledge. An
episode in this connection is worthy of mention. Abu’l Hasan
'Ali bin 'Isa al-Walwalji went to Alberuni when he was in a
critical condition and nearing death. In spite of his condition,
Alberuni enquired from him as to what he had earlier said
regarding a certain astronomical problem. al-Walwalji eyed
him with awe and considering Alberuni’s condition, wished to
avoid the question. Alberuni’s reaction was spontaneous: 'Is
the knowledge of this problem not better than my leaving the
world without knowing it'? al-Walwalji reluctantly re-stated
the whole problem to him. He had barely left his threshold,
when he got the word that Alberuni was dead.11 This clearly
shows the importance which he attached to learning. Yaqut
reports that there were only two days when he would leave his
study and would come out of his house. These two days were
Nauros and Mahrjan, when he procured the daily necessities of
life.

Another characteristic of Alberuni, which helped him a
great deal in expanding the horizon of his knowledge was his
thoroughness. Whatever the subject, once he touches it, he
probes it with the thoroughness of a master mind. 'I do not
think it right to pass by a subject of which I have only a
smattering', he writes, 'and I shall not postpone speaking of
it until I shall have thoroughly mastered it.'12 And for this

12 Alberuni, Kitab al-Hind, Ed. and Tr. Sachau, E. (New Delhi,
reason he sometimes wandered into uncharted realms which lay beyond his ken but he never turned back. Books he would collect from far-off places where these were supposed to be found; scholars he managed to have for himself from distant lands who could acquaint him with fresher subjects. There are instances on record when Alberuni is restless for many a year over the acquisition of a particular book. It was for about forty years that he had searched Manichaens' book Safar us-Aasar, and ultimately when he got it, it was the happiest day of his life — it was like water to man dying of thirst.

Of the masters who taught him and grounded him in various disciplines, we have very little knowledge. He named two persons in his book Athar al-Baqiya: one was Abu Nasr Mansur bin 'Ali bin 'Iraq and the other was Mohammad bin Ishaq bin Ustad Bandad Sarakhs. Nadvi is doubtful about the latter being one of his teachers, but Burni considers him as one. The name of a third teacher is given in Yaqut's Mu'ajjamul Adab. He is 'Abdus Samad .Ibin 'Abdus Samad who was taken captive along with Alberuni when Mahmud of Ghaznah conquered Khwarism and was later on slain on the allegation of his being a Kafir.

In Kitab al-Hind a fourth personality emerges as a teacher in the person of one Abu-Sahl 'Abd-Almunim Ibn 'Ali Ibn Nuh At-Tiflisi, on whose instance, Alberuni composed his book Kitab al-Hind. Except for their names, nothing in particular is

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13 ibid., p. 24.
14 Nadvi, op.cit., p. 271.
15 ibid., p. 257.
16 Yaqut, op.cit., p. 311.
known about them. However, it can generally be surmised that he was tutored by these masters in astronomy (the most popular science then) and allied topics. Most of his knowledge, however, he gained through experience and personal initiative.


Alberuni was a multi-linguist. His knowledge of the languages of the world particularly those which were spoken in the vicinity of his native country or those in which the mass of scientific and philosophical literature was available in his times, is unique. He was definitely a polyglot. He knew Persian as it was his mother-tongue and was proficient in Turkish not only because it was the language of his Turkish speaking country (Khwarism) but also because it was the language of the Turkish monarchs of Ghaznah under whose tutelage he lived from his 44th year (1017 A.D.) onwards. The situation of the native country of Alberuni was such that it lay on the borderland of the ancient Iranian culture and the steppes teeming with Turkish nomads. It was here that an independent and organised dialect 'Khwarismian', a sister of Soghdians whose importance is recently coming to light, was current. It is likely that he might have written the History of Khwarism, in this language and the book is now lost.

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18 The language has been deciphered by W. Hanning of London and A. Frieman of Leningrad. S.P. Tolstoy and V. Minorsky have been impressed by vestiges of its former glories which the land of Khwarism contains. Tolstoy discovered 81 written documents in old-Khwarismian. See S.P. Tolstoy, _In the Footsteps of the Khwarismian Civilization_, 1948 (in Russian).

19 Abul Fasal Behaqi has included certain portions of this book at the end of his book _Farikh-e-Hus'udi_.

He, however, spoke disparagingly of his provincial-tongue:

And I judge by myself; my native language is such that, were science treasured in it, one would feel as astonished as (at finding) a camel in a roof-gutter or a giraffe in a drove of noble steeds.\(^{20}\)

Convinced of the poverty and insufficiency of the Khwarizmian language, he switched over to Persian and Arabic in which all his books are written. Arabic was the lingua franca of the Crescent and the language of the elite in which a mass scientific literature of the West and the East had been piling up, either in the form of translations or original works. As a matter of fact, Arabic had become the inheritor as well as the preserver of the glories of the ancient Greek, Latin, Syriac and Sanskrit literary traditions. In the field of astronomy, mathematics, medicine, theology, religion, philosophy and so on. Arabic authentic translations had already won a place in the world of Arab scholarship.\(^{21}\) The pace with which Arabic was illuminating the minds of non-Arabic-speaking peoples, made Alberuni realize that he could not do without that language. In Kitab al-ażādāna, he himself speaks not only of this linguistic change-over but also of the difficulties which he had to encounter:

'... I switched to Arabic and Persian but in both of them I (feel like) an embarrassed outsider (dakhil wa mutakallif'). It cannot,


however, be firmly ascertained, as to when this change took place in his life. It must have been quite early, for he soon rose to a high level of scholarship and was able to criticise the phonology and script of the language. In *Kitab as-saidana*, for example, he raised a point of criticism and remarked that 'the Arabic script has an immense defect, namely the similarity of the shapes of the letters and that you are compelled to use dots and vowel-points to distinguish them. For if they are omitted the meaning becomes doubtful.'

He knew Arabic very well, as if it were his mother tongue. Besides Arabic and Persian, he was acquainted with Syriac, Hebrew, Greek and Sanskrit. In his scholarly dissertations he quoted profusely from the works of the Greek masters such as Aristotle, Plato and Ptolemy, which is an indication of his acquaintance with the Greek language. Some authorities, however, doubt this scholarship in that language, for a large number of the works of the Greek masters were already available in Syriac and Arabic. Nadvi, for example, does not credit him with a knowledge of the Greek language and suggests that whatever knowledge of Plato and Ptolemy he possessed, was through the translations available in Syriac or Arabic. This statement, however, does prove that Alberuni had a knowledge of the Syriac language, and in this connection we may quote Alberuni's own words:

The Christians have a book called *Pushshaq Shamash* (i.e., *Commentary of Names of Syriac*) which is also

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22 Krenkow, op.cit., p. 195.
known by the title Chahar Namah because each word is given in Greek, Syriac, Arabic and Persian. I acquired a copy of it in the Syrian script and in it are none of the defects which lead to misunderstanding and for this reason I have copied most of its contents (into Arabic script).  

As for Alberuni’s familiarity with the Greek language, again we cannot do better than quote Alberuni to find out the truth:

I … acquired the following two books: the Book of Herbs, very useful with pictures, and the Kunash of Oraibasios in which against all medications the names are written in Greek letters and I copied them because I had confidence in them.  

It is common knowledge that Alberuni was a perfectionalist, indeed a perfectionist to the core, who seldom would rely on second hand sources, which may often suffer from grave demerits. Again and again he pointed out that ‘corruption(s) ... occur in our Arabic writing, more particularly at a period like ours, when people care so little about the correctness of what they copy’. Furthermore, he was alarmed to find out during his studies the fact that translators did not discharge their responsibilities properly and ‘instead of translating indulge in wild conjecture and mingle together different theories in an uncritical manner’,  

25 ibid., p. 196.  
27 ibid., p. 163.
like 'Abdullah Ibn al-Mukaffa') add something to the text 'with the intention of raising doubts in the minds of people'. There are many such examples where 'people are not free from the suspicion of having altered the text', and, of course, this must have compelled Alberuni to turn to the original sources, and may be even to the Greek sources.

An interesting aspect of Alberuni's knowledge of languages has come to light only recently. During the Samanid dynasty in Central Asia, a distinct language known as Dari (فارسی داری) was current as the official language of the state and was spoken in Balkh, Bokhara, Khwarizm and Eastern Iran. Dari attained the stature of a literary and scientific language. In fact, the credit of galvanizing this language goes to two outstanding scholars of the Middle East, Abu'l 'Ali Ibn Sinah and Abu Raihan Alberuni. The latter, it is understood, had originally written in Dari his well-known work Kitab at-Tafhim li avai'1 sema'at at-tanjim in 420 Hijra (1029 A.D.) and then translated it into Arabic in the same year.30

... Alberuni knew Sanskrit well. Sachau, who examined all the Sanskrit sources which Alberuni has quoted in extenso in his

29 loc. cit.
Kitab al-Hind and other works, has opined that his working knowledge of Sanskrit was wide and practical. Although Alberuni had to face formidable difficulties in learning the language,\(^{31}\) he soon overcame them and translated many original Sanskrit works into Arabic\(^{32}\) and also the other way round. It is sometimes asserted that Alberuni greatly relied on pundits as interpreters and collaborators and it was through them that he gained the knowledge of the ancient classical works of the Hindus. Alberuni does speak of his informants,\(^{33}\) and a heavy reliance on pundits may have been characteristic of the early stages in his acquaintance with the Sanskrit language. It is certain that he acquired a solid base in Sanskrit and his acquaintance with this language became so sound and profound that he could read by himself such books as Vayu, Aditya and Matsya Puranas\(^{34}\) and critically examine their contents in his Kitab al-Hind.\(^{35}\)

It is not untrue that he shows inexactness in the pronunciation of some Sanskrit words and the bulk of his word forms show that these are not based on what may have been the pronunciations in Western Punjab or the Gangetic Plain in about 1,000 A.D., but are rather a 'spelling pronunciation'.\(^{36}\) Moreover, he exhibits a certain amount of inconsistency in his own pronunciation of


\(^{34}\) ibid., Vol.I, p. 130

\(^{35}\) ibid., Vol.I, pp.130-31; 168, 217; 229-30; 232-33; 244-46; 251; 256; 258; 261-63; 271; 284-86; 325; 368. Vol.II, pp.62; 63; 101-2; 142-44; 245.

\(^{36}\) Chatterjee, *Al-Biruni Commemoration Volume*, p. 89.
Sanskrit words. Such inexactitudes and inconsistencies are not surprising in the speech of a foreigner who learns from and imitates different sets of people speaking that language and also has a tongue-teeth-palate relationship different from theirs. Alberuni himself admits his difficulties in expressing Sanskrit sounds and remarks, 'Our tongue and uvula could scarcely manage to correctly pronounce them, nor our ears in hearing to distinguish them from similar sounds, nor could we transliterate them with our characters'. Furthermore, he points it out that each Sanskrit word invariably begins with two or three consonants which follow each other without an intervening vowel and makes it more difficult to pronounce. In the times of Alberuni, in Northern India, specially in its western part, two distinct languages were current — Sanskrit and Prakrit — and these were two different styles of a single speech without having a precise and established line of regional demarcation. It was natural for Alberuni to take one for the other. This is why we sometimes find Prakrit pronunciations in his transliterations.

It may be noted that altogether Alberuni has used about 2500 Sanskrit words and this by no means is a small achievement.

In addition to Sanskrit, Alberuni knew some vernacular of Western Panjab, which was then spoken not only in India, but also in and around Ghaznah, where a large Hindu elite and artisan

38 ibid., p. 19.
population had settled down during the Ghasnavi rule in India. Probably it was this language through which Alberuni conversed with his Hindu informants and collaborators. It is also likely that the Indian pandits in this very vernacular speech used to give running translations of Sanskrit works to Alberuni who used to take them down in his own language. 40 However it be, it certainly throws considerable light on Alberuni's capacity to use and work at least in one more Indian language other than Sanskrit.

Political and Social Background

The political situation in the Islamic world, as a whole, had attained a measure of stability with the establishment of a puissant central authority at Baghdad — the Abbasid Dynasty (750-1258 A.D.), but during the Middle Ages local and tribal skirmishes and feuds were quite common in Central Asia. These petty feuds were not of much consequence to the outside world but sometimes they did turn into bloody wars, the aftermaths of which not only affected the authority and the political map of the region but also had a far-reaching effect upon the destinies of those who mattered and were at the helm of affairs. Alberuni's life and work is so intricately interwoven with his immediate political surroundings that a proper perspective of his personality is hard to understand without an understanding of the political situation of his times.

40 loc. cit.
It seems that Alberuni from the very start of his career was attached, or rather was obliged to be attached to the courts of kings in some capacity. He seldom gave any great importance to worldly gains, nevertheless, he was fully conscious of the advantages of money as an instrument in saving a scholar from mental anxieties and worries of daily life. There were occasions in his life when for lack of money he was looked down by his contemporaries as intellectually inferior and suffered great humiliation at their hands. One such experience which he narrates in his Athar al-Baqiya is sufficient to bring home this point. In Rayy, he met a man who was counted among the learned astronomers and happened to discuss with him certain points related to astronomy. Alberuni found that the method used by the astronomer was erroneous and when he pointed it out to the astronomer, the latter disdainfully rejected his contention, not because he found Alberuni intellectually inferior but because he considered himself superior on account of his wealth and riches.

Alberuni, prior to his association with the court of Qabus bin Wasimghir of Jurjan, was poor and in great distress. This reminded him of the Arabic verses of Ahmad b. Faris:

A wise man of by-gone times has said:
'The importance of a man lies in his smallest things'.

I on my part also speak like a wise man, saying:
'The importance of a man lies only in his two dirhams'.

If he has not his two dirhams with him,
In consequence of his poverty he is despised,
So that people's cats piss at him.

42 Alberuni, Chronology of Ancient Nations, p.338.
As stated earlier, Alberuni was obliged to join the courts of kings and princes from time to time. It may, however, not be off the point to emphasise that though he was aware of the worth of money, he did not believe in accumulation of wealth beyond what was needed for bare necessities. There were occasions in his life when he was offered, a fortune, as in the reign of king Mas'ud a huge amount of silver, but he humbly declined the offer. 43

Alberuni started his court-career very early. He was, in the first instance, attached to the court of the rulers of his native country, Khwarism. It is not known when this association came into being, but there are positive proofs that Alberuni lived in Khwarism, under the tutelage of the rulers of 'House of Iraq', upto the age of twentytwo years. In the year 365 A.H./995 A.D. when the last ruler of this 'House', Abu 'Abd Allah Muhammad, was done to death in a war with king Mansun of Jurjania, Alberuni left his native country in search of an opportunity elsewhere. His reminiscences of this court indicate his love and attachment. In an eulogy to the dynasty, he says:

I passed most of the time under the blessing,
Ocupy positions high.
The Al-i-'Iraq nourished me with their milk, and
Among them, Mansur planted me roots. 44

His academic life had a set-back as a result of the assassination of his benefactor, Abu 'Abd Allah Muhammad, but soon after

43 Shahrosori, Akbar al-Nahawa, p.93.
387/997 A.D. he was able to resume his normal work when he found another patron in the person of Shamsul Ma'ali Qabus b. Washimagir, the Ziyarid ruler of the neighbouring country of Jurjan. Shamsul Ma'ali was great patron of science and art and he held Alberuni in high esteem and showered his generosities upon him. Yaqut in his Ma'ajamul Adha', discusses Alberuni's association with the court of Shamsul Ma'ali and points out that the ruler wanted to keep Alberuni for his company and sought his services in his court assuring him that his counsels would always be respected. Alberuni turned down this request. However, during the second tenure of Qabus' accession to the throne of Jurjan, between 388 and 404 A.H., he lost no time in accepting him as his most benevolent patron. Alberuni, of course, did not like the tyrannical and harsh nature of Qabus nor the ruler's habit of showering gifts upon the poets in his court, without listening their verses. Anyhow, he dedicated to Qabus his first great masterpiece al-Athar ul-Badiya 'an al-Qurun al-Khaliya in about 390 A.H./1,000 A.D. and also another work Risala Tajrid al-Shu'a'at. Shamsul Ma'ali Qabus' rule lasted for sixteen years and he was killed in 404 A.H. After the assassination of kind Qabus, Alberuni once again must have felt forlorn. Some authorities suggest, however, that he had left the court much earlier — most

45 Burni, al-Qanun al-Mas'udi, pp. v-vi.
46 Yaqut, op.cit., p. 309.
47 Burni, Al-Biruni, p. 53.
48 Nadvi, op.cit., p. 258.
probably sometimes just after dedicating his work *Athar ul-Baqiya* — in response to an invitation of the then ruler of Khwarism, the Haman Alberuni returned to his native place in about 400 A.H./1010 A.D. and was received by Abul Hasan 'Ali b. Hamun, whose father had overthrown the Al-i-'Iraq dynasty in Khwarism earlier. There are conflicting views regarding the date of Alberuni's return to his native country, but it seems most plausible that Alberuni, who was unhappy in the court of Shamsul Ma'ali on account of his ill-nature left his court some time between 390-94 A.H.

The Khwarismshahi ruler, 'Ali b. Hamun, was a great patron of learning and his court had assembled around him a galaxy of men of learning and science, among whom were Abu Nasr 'Iraq al-Khammar (d. 331 A.H./941 A.H.), Abu Sahl 'Isa b. Yahya Masih al-Jurjani (d. between 403-405 A.H./1012-13 A.D.) and Abu Mansur al-Tha'alabi etc. The honour and respect that Alberuni enjoyed in his court is obvious from an incident that Yaqut refers to in *Mu'aajamul Adba'* Once the ruler happened to pass by the house of Alberuni and desired Alberuni to be called. It took Alberuni some time to come out of the house, but when he did he found that the impatient ruler was about to dismount his horse. Alberuni very politely requested the king not to do so. Whereupon the king read out an Arabic verse:

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al-‘Ilm min ashraf al-vilayat
Yatiyah kul al-vari vilayati. 51

(Learning is the most honourable kingdom, so that every one comes to it and it does not itself go to anyone).

It is opined that Alberuni served the court of Khwarizmshah for about seven years. It appears that the ruler appointed Alberuni his minister. 52 Whether he held any official post in the court of Mamun or not, the ruler from time to time, did seek his advice in official matters and thus Alberuni 'played a political part as a counsellor'. 53 The counsels he gave to the Mamuni ruler 'do not seem always to have suited the plans of king Mahmud at Ghazna, who was looking out for a pretext for interfering in the affairs of the independent Khiva', 54 and who invaded and captured Khiva in the spring of 408 A.H./1017 A.D. Sultan Abul'Abbas Mamun Khwarizmshah was killed and Alberuni along with other noble courtiers was detained as a captive. Alberuni was once again uprooted from his homeland and this time it was for the rest of his life. One might think of the brighter side of this event, for it did bring Alberuni nearer to India — a country which he was destined to study profitably.

After Mahmud Ghaznavi had conquered Khiva, Alberuni was brought by him to Ghazna. For some time he was kept as a prisoner

52 Burni, al-Mamun al-Mas'udi, p. vi.
54 loc.cit.
in the fort of Nandna, in India, and it is in this context that he complaints of the severe curtailment of his freedom.

There are conflicting opinions about the way Alberuni was brought to the court of Mahmud of Ghaznai. Nizami 'Urusi Samarkandi advocates the theory that when Mahmud Ghaznavi asked Nizamun to send to his court some of the eminent scholars whom he had gathered around him, some of the scholars such as Sheikh Abu 'Ali Sina and Abu Sahl Yahya refused to go but some such as Abu Nasr, Abu'il Khair and Abu Raihan were willing. This may not be true and at least Yaqut, who in Mu'sjamul Adab discusses every single incident of importance in Alberuni's life, makes no reference to this. Also, it is a moot point that if Alberuni was invited by the king Mahmud himself, it is unlikely that he should want to kill him. Within a year, after the capture of Khiva by king Mahmud, while writing the fourth chapter of his Tahdid, Alberuni writes, 'On the day of writing this chapter, Tuesday, the first of Jamada II, the year four hundred nine of the Hijra... I was in strain and agony. I think that even Noah and Lot — peace be granted to them! — did not suffer such agony, and I do hope, with God's munificence, to be third in receiving His mercy for my salvation'. These could not be the words of a person who was enjoying the benevolence of a king and was being

55 Burni, al-Qanun al-Mas'udi, p.vi.
58 Nadi, Al-Biruni Corporation Volume, p.261.
60 Alberuni, Tahdid, p. 86.
treated as a state guest. It unmistakably shows that Alberuni had been taken captive by the king and was passing through the rigours of imprisonment when he wrote the above.

How much did king Mahmud disfavour Alberuni is not certain and the latter himself is silent on this point. Nowhere does he mention the grudge the king bore him and, on the contrary, praises him:

Mahmud did not withhold any blessing from me;
He made me rich, gave me in abundance and connived at my costly demands;
He forgave me my ignorance and honoured me;
Because of his glory I became happy and prosperous. 61

This, however, must have been a later development in his relations with the king. The antipathy that Alberuni developed against the king remained with him for long. He ridicules the king for torturing the Hindus and for demolishing their religious and cultural centres. 62 In his book, Kitab al-Hind, which was written just after the death of king Mahmud, he refrains from referring to him in terms which could be called glorifying and barely use any such words 'as a man would use when speaking of a deceased person who had been his benefactor'. 63 He does not dedicate Kitab al-Hind to the king in whose reign the preparatory part of the work was done. Such omissions and commissions do throw light on Alberuni's attitude towards king Mahmud.

61 Burnii, Al-Biruni, p. 77.
63 Sachau, Preface, Kitab al-Hind, p.x.
There is no evidence to show that Alberuni was ever in the official service of the court in Ghasnah. He probably was a state munajjam (astrologer-astronomer) and it was in this capacity that he had access to the court.64 Yaqut in Mu'ajjamul Adab narrates that when Mahmud wanted to kill Alberuni, he was deterred by his councillors from doing so because he was told that Alberuni was the greatest astrologer-astronomer of the age.65 But somewhere in the course of time, during the thirteen years (1017-1030) which Alberuni spent with Mahmud and probably in-between the invasions of India, that Alberuni had had the occasions to converse with the king and gradually impressed him with his erudition and knowledge. To Mahmud Ghasnavi the Hindus were infidels and deserved to be killed and dispatched to hell but to Alberuni they had amongst them great philosophers, mathematicians and astronomers. It seems that at some later stage Mahmud was able to appreciate Alberuni's approach. 'Some time after annexing the Panjab to his empire', writes Chatterjee, 'the great enemy of the Hindus and of their religion and culture, this lustshikan, issued a special type of coin for his Indian province; and on these coins in the matter of the legend something was done which was never done before and after in the annals of Islamic numismatics'.66 This promulgation of coins, with inscriptions in Sanskrit and with the translation of Kalima, la ilah a illa'l-Allahu Muhammad Rasul Allah, rendered into Sanskrit as avyaktam alah, Muhammad evatara, definitely shows a more accommodative

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64 Ibid., p. ix.
65 Yaqut, op.cit., pp. 911-12.
66 Chatterjee, op.cit., p. 98.
attitude towards the Hindus. For an orthodox Muslim like Mahmud, so call the prophet an avatāra (incarnation) was a great allowance. In this we may sense the influence cast by Alberuni, for there was no other person in the entire entourage of king Mahmud who could persuade him to mint his coins in Sanskrit and certainly ‘Alberuni deserves the credit for this friendly and cosmopolitan spirit towards the Hindus.’

After the death of king Mahmud, his unnominated son, Mas'ud, came to power (421-432 A.H./1030-1041 A.D.). The son, quite unlike his father, was unorthodox, liberal and cosmopolitan. The accession of kind Mas'ud to the throne of Ghaznīah brought great opportunities to Alberuni for a keener pursuit of learning and also working for his personal well-being. The young king was a great admirer of men of vision and learning and much interested in astronomy and other branches of knowledge. He spared neither money nor encouragement in the promotion of learning and the learned. Alberuni seems to have been one of the many scholars who were much benefitted by the king’s benevolence. As a result, his attitude towards the Ghaznīah court and the king radically changed and to a great extent he even forgot India, a country which he always kept very close to his heart. In al-Qanun al-Mas'udi he rarely makes references to India, and even if he does here and there, it does not show any progress of knowledge beyond what he had already exhibited in Kitab al-Hind. The words of benediction which he used for the new king were ornamental,

67 Ibid., p. 97.
68 Sachau, Preface, Kitab al-Hind, p. xvi.
warm and chosen rather than those plain, stiff and commonplace words which he used for his father. This change in the attitude of Alberuni was not merely the result of the rewards and pensions which he received from king Mas'ud, for these were granted to him even by Mahmud, who not only opened the doors of treasury upon him — made him rich and gave him in abundance but also connived at his costly demands. The warmth in his attitude was actually generated by the humanitarian, personal and friendly stance of the king towards him.

Alberuni wrote numerous books on astronomy and allied subjects under the patronage of king Mas'ud. Most of these books are lost, yet the most scholarly of his achievements, al-Qanun al-Mas'udi, is extant. Alberuni dedicated this work to the memory of the young king in 1030 A.D. The Sultan was so pleased that he offered him an elephant-load of silver coins which the Master humbly refused. The Sultan was, however, so moved by this gesture that he granted him all amenities of life and facilities for research and investigation till the end of his days. In the preface of al-Qanun al-Mas'udi, he himself admits, 'Is it not the [the king Mas'ud] who has enabled me for the rest of my life (Alberuni attained an age of sixty-one years) to devote myself entirely to the service of science, as he let me dwell under the shadow of his power and let the cloud of his favour rain on me... And with regard to this the favour conferred, he has deigned to send his orders to the treasury and the

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69 Burni, Al-Dirazi, p. 78.
71 Shahrnuri, op.cit., p. 93.
He goes on to express his sense of gratitude towards the king in declaring that it is the utmost that kings can do for their subjects.

Alberuni wrote two more books for the king, one dealt with the variations in the lengths of days and nights and the other was *Kitab Lawasimul Harakatain*, which was based upon the quotations from the *Koran*.

King Mas'ud died in 1041 A.D. and after him his son king Maudud ascended the throne (432-441 A.H./1041-1049 A.D.). Nothing in particular is known about his relations with the new king but Alberuni's dedication of the book on mineralogy, *Kitab al-Jamahir fi Ma'arifat al-Jawahir*, to the new king suggests that his relations were smooth. Another book which he wrote for the king was *Kitab al-Dastur*. At the age of eighty years (according to lunar months) he wrote the last of his works, a kind of medical, *Kitab al-Saydina* (or al-Saydala).

Alberuni thus served three generations of the court of Ghaznah, from Mahmud to Maudud. He died, most probably in Ghaznah, though no traces of his grave exist, and probably the year of his death coincided with that of king Maudud.

The wars which took place during the lifetime of Alberuni in and around Central Asia, deeply affected the tenor of his life.

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73 loc.cit.
74 Shahverdi, op.cit., p.98.
75 Beilin, D.J., *Encyclopedia of Islam*, (New Edn.)
but they also offered him a chance to visit various geographical regions and to mix with peoples of different cultures. The wars and crusades of the Middle Ages, notwithstanding the destruction and misery which they wrought, had a silver-lining, for they facilitated a free exchange and inter-mingling of ideas, culture and philosophies and thus accelerated the rapid transmission of knowledge from one place to the other. In the train of foreign invasions, came scientists, philosophers, poets and artisans and when they returned to their homeland they were often accompanied by knowledgeable persons from the conquered land. A free exchange of nationalities and a free exchange of knowledge was the characteristic of that age. The increase in men and knowledge necessitated and accelerated the establishment of numerous embassies and centres of learning throughout the Islamic world at places such as Ghasnah, Khorasan, Bokhara, Baghdad, Damascus, Alexandria and Andulus, to name a few.

In addition, another factor, equally important, which was operative was the missionary zeal of the men who taken upon themselves the task of propogating their faith and who undertook long voyages, trekked large areas and often negotiated difficult routes. They met people, stayed with them, conferred with them and exchanged ideas. Sometimes these visits were brief but could be long at times. The establishment of permanent embassies proved to be greatly instrumental in propogating and circulating the religious literature, faith and values. They used to receive from their mother countries moral reinforcement and financial help. It was in this way that Greek, Roman, Syriac, Christian, Iranian
and Chinese thoughts came to India and, in turn, Bodhic and Hindu philosophies filtered out of India and reached distant lands in both the west and the east.

Whatever be the factors responsible for the spread of ancient knowledge, Alberuni had access to a rich legacy, specially of Hindu and Greek sciences. Ever since the fifth century B.C., Indian scholars and religious men had been visiting the west, at least as far as Greece. Alexander took Calanoos with him as far as Babylon. Later on, in the third century B.C., Shamanian monks, imbibed with a great Wander-lust and under instructions from Asoka, visited Asia Minor, Syria, Egypt and Greece. During the same period, Hindu scholars made visits to the Near East and it was through them that the Greek and Syrian world came to know about India. It is not known whether any Indian work was ever translated into Old Persian, Syriac or Greek.

During the Sassanid dynasty (261-641 A.D.) in Persia — the last of the native dynasties — a great stride was made to expand the horizon of knowledge, and many Sanskrit works were translated into Pahlavi and thence into Syriac, Arabic and Greek. In the sixth century A.D., the Sassanians established deeper cultural contacts with the contemporary Indian empires of the Guptas in the North and Chalukyas in the Deccan. This marks the beginning of an era of systematic translation of Sanskrit works into Iranian.

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76 Chatterjee, Al-Biruni Commemoration Volume, p.97.
77 loc.cit.
78 loc.cit.
the world knowledge by Indian, Greek and Syriac sciences through translations is remarkable indeed.

The advent of Islam and its spread as a political force brought a kind of unification of regional cultures. The conquest of Persia and Syria by Arab Muslims, who brought with them 'from the desert a keen sense of intellectual curiosity, a voracious appetite for learning, and many latent faculties', found themselves inheritors of older and superior cultures. It is interesting to note that within a century of the establishment of Baghdad, the Arab Muslims were in possession of 'the chief philosophical works of Aristotle, the leading Neo-Platonic commentaries, and most of the medical writings of Galen, as well as Persian and Indian scientific works'. The same period witnessed a deeper contact between the Arabs and the Indians and reached its high water-mark during the establishment of Abbasid dynasty in the middle of the eighth century. Relations established there became so rooted that they lasted for several centuries. Emphasising the deep and intimate nature of Indo-Arab relationship in this period, Ahmad remarks that 'during no period of their ancient and medieval history perhaps did the Indians have such close relations with the Arabs as they did during this period'. This augmented the process of exchange of knowledge in almost every possible field, on a reciprocal basis.

80 loc.cit.
Thus, Alberuni had had the good-fortune of going through the translated works of such writers as Ptolemy, Aristotle, Marinus, Plato, Eratosthenes, Varahamihira and Brahmagupta. This vast and varied literature engendered in Alberuni a universal and scientific outlook.

Alongside his personal wisdom, there appear to be two outside factors which played a great part in sharpening Alberuni's intellect and his deep and critical interest in Indian sciences and philosophies. One factor was the cultural level already reached by Baghdad in the ninth and tenth centuries and the other was the proximity of Ghazniah to India.  

Works and Writings

Alberuni was a prolific writer. Writing was the sole mission of his life and according to a classical estimate his writings weighed to more than a camel's load. This he could do through continuous and incessant labour. Yaqut notes that he himself had seen a closely written list of his works which ran into some sixty leaves. Alberuni is supposed to have written about 163 books including *Rasails*. A very rough estimate goes to suggest that if all of his works are taken together, they would run into something above eighteen thousand pages. Out of 163 works, only 70 books and *Rasails* cover about 6,987 folios and thus on an average each single work would be of about 100 folios. These 70 works, however, vary in volume: the smallest *Rasala* — *masala*

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82 Chatterjee, *Al-Biruni Commemoration Volume*, p. 68.
83 Shahrsari, op.cit., p. 93.
84 Yaqut, op.cit., p. 311.
"fi tabyih ra'v Batlamyus fi al-Salkhudah" (Elucidation of the Opinion of Ptolemy on Salkhudah) consists of only 7 folios, while the most voluminous is al-Masa'il al-Mufida wa'al Jawabat al-Sadida (Useful Questions and Right Answers), spread over 1,250 folios. It should, however, be borne in mind that the 70 works mentioned above do not include several voluminous and important works such as Al-Ganun al-Mas'iudi, Ather al-Raqiya, Kitab al-Jamahir and the last and incomplete work, Kitab al-Saydina.

Alberuni himself presented a list of his works in a book entitled Risala fi fihris Kutub Muhammad b. Zekariya al-Razi, wherein he mentions only 114 of his works in 13 sections. After the compilation of this list in 427 A.H./1036 A.D., Alberuni survived for twelve more years, which were still more productive. Besides these 114 works of which he claims authorship, 25 other works are included in his fihrist. Of these 12 were written by Abu Sahl 'Isa b. Yahya al-Masih, 12 by Abu Nasr Mansur b. 'Ali b. 'Iraq and one by Abu 'Ali al-Hasan b. 'Ali al-Jilli. The point to be noted is that Alberuni had critically gone through all these 25 books which were dedicated to him as a token of regard and love by their respective authors.

Recent researches of eminent orientalists such as Sachau, Suter, Weidemann and Boilot greatly improved the list of the works of Alberuni and made it more exhaustive by including all those

85 These seventy works have been taken from the first hundred books which have been mentioned in the fihrist of Alberuni and whose folios are known. See Ahmad Saeed Khan's *A Bibliography of the Works of Al-Biruni*, presented to Al-Biruni and Indian Sciences, N.S.A., New Delhi, November, 1971.
names which are found in *Kashf as-Zunun* of Haji Khalifa, *Mu'ajjamul Adha* of Yaqut and in random references given in Alberuni's own works. An exhaustive list now includes 183 works.

Out of these 183 works, the MSS of 41, i.e., less than one-fourth of the total number, are known to exist in the various libraries of the world. 23 of these have been edited entirely and five only in parts. The number of works which have been translated in various languages of Europe is 12 and the works which have been translated in part is seven. These translations are from Arabic into German, English, Russian and Urdu, and two fragments are translated in French and Turkish.

A study of the *fihrist* as given by the author himself (translated into French, *Epitre sur le Repertoire des livres de Muhammad b. Zakariya al-Razi*, by Krause from Paris in 1936) shows that the 138 works mentioned therein, fall into 16 sections. The largest number of works, amounting to 18, is in the First Section which deals with astronomy. The second largest is the Second Section which has 15 books, primarily dealing with geography (Longitudes, Latitudes and Azimuths etc.). This is followed by the Tenth Section which has 13 works devoted to anecdotes which are translations of stories from Persian and Sanskrit. Next follow the Eighth Section which has 12 books on miscellaneous subjects such as astronomy, geometry, geography and physics. The Thirteenth Section ranks fifth in order of magnitude and has 10 works, mostly miscellaneous writings of Alberuni after he had attained the age of sixty years. Next in size are the Third and the Ninth Sections.
which are devoted to arithmetic and astronomy, and include eight and seven works respectively. Then follow the Fifth, the Sixth, the Seventh and the Twelfth Sections each of which has five works that respectively cover subjects such as the construction of astrolabe, the measurement of time, comets and miscellaneous topics. All the MSS in the Twelfth Section were reported as lost by the author. The smallest is the Fourth Section on Rays and Passing (Astrological Notions) and includes four works.

Besides the above, there is another small Section — the Sixteenth — including only one work, which we have kept out of consideration here because the work was not authored by Alberuni. Similarly, the Fourteenth and the Fifteenth Sections have also been left out as they include works composed by his friends.

Alberuni wrote about 29 books on geography and related subjects. Out of these 10 are on mathematical geography, four on cartography, four on geodesy and four on climatology. The remaining seven works deal with comets, meteors and surveying. It is interesting to note that out of these seven works, six are exclusively devoted to the structure, appearance and types of comets, the phenomenon of falling stars and also a demolition of the impression that the appearance of these stars is a bad omen. One work, as its title Taghkira fi'l-misahat li'l-musafir al-muqawwi (Memoir on the Distance Covered by a Healthy Man) suggests, deals with the measurement of land.

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86 These do not take into account those books in which geographical matter appears by way of subsidiary information or reference.
Methodology of Work

Alberuni’s methodology is direct and scientific. His fascination for the 'unknown' outweighs that of the 'known'. He builds up the 'known' by accumulating the facts and examining the assembled facts critically through the eyes of a scientist -- unbiased, detached and rational. Thus he probes the 'unknown'.

Alberuni’s is a comparative method. He believes neither in philosophical deduction which may degenerate into unwarranted speculation nor in induction from the evidence of our senses which may be misleading in the understanding of the problem. In order to arrive at a satisfactory result, he employs a systematic methodology in which he tries to reach first hand original sources even if they are difficult to access. He goes even to the extent of learning the languages of his sources: Greek, Syriac, Sanskrit and so on. The last mentioned he learnt in order to acquaint himself with the original writings of Pulisa, Varahamihira, Brahmagupta, Balbhadr, Lata and a host of others and also with the Puranas. Alberuni believed that it is through the original writings that one can form a basis of understanding of the scientific traditions of a nation and the translations of the original works may be full of gross errors due to unfaithfulness, lack of sincerity, bias, prejudice and temperament of the translators as also due to the careless or the unscrupulous attitude of the copyist who seldom bother to look after the minor details and which at places may lead to a gross alteration of meaning of the original texts. He laments that 'such is the custom of the
copyists and scribes in every nation', and even goes so far as to declare that the students of Puranas are not free from it', for they are not men of exact learning', 87

He marshals different shades of opinion on a single problem, compares and scrutinizes them, brings out points of similarities and contrasts, evaluates the values of each, accepts one and disregards the others and this he does in order to weed out the possible encroachment of vulgar notions of the illiterate into the field of positive science.

Another aspect of his methodology is that he interrogates people to know their views and judgements, which may give him a perspective and understanding of a problem. Sometimes his method is not to speak himself but to let his informant speak, giving extensive quotations from their classical authors.

ALBERUNI'S WORKS ON GEOGRAPHY AND ALLIED TOPICS

(A) Mathematical Geography and Cartography:

1. Kitab Tahdhib al-Aqwal fi tashih al-'Urud wa'l-atwal
   (Improvement of Statements on Correction of the Latitudes and Longitudes).

2. Kitab tashih al-manqul min al-'ard wa'l-tul
   (Correction of the Translational Errors Relating to the Latitude and the Longitude).

3. Maqala fi tashih al-tul wa'l-'ard li-masakin al-ma'mur

min al-ard
(Correction of the Longitudes and the Latitudes of Cities of the Inhabited Part of the World).

4. Maqala fi ta'yin al-balad min al-'ard wa'il-tul
(Fixation of the Longitude and the Latitude of a City).

5. fi ikhtialaf dhawil-fadh fi istikhraj al-'urud wa'il mil
(Differences of Opinion Among the Learned on Obtaining the Latitude and the (Angles) of Declination).

6. Kitab al-ajwiba wa'il as'ila li-tashih simt al-Qibla
(Questions and Answers Relating to the Correction of the Direction of the Qibla).

7. 'Idah al-adilla 'ala kayfiyat simt al-qibla
(Exposition of the Proofs on the Nature of the Direction of the Qibla).

8. Tahdhih shurut al-'amal li-tashih sumut al-qibla
(Rectification of Conditions Operative in the Work of Correcting the Direction of Qibla).

9. Fi taqwim al-qibla bi-Bust bi-tashih tuliha wa'ardiha
(Determination of the Qibla at Bust by Correcting its Latitude and Longitude).

10. Fi'il-imbi'ath li-tashih al-qibla
(The Process for the Correction of the Qibla).

11. Talafi 'awarid al-Zaila fi kitab dala'il al-qibla
(Correction of the Mistakes in the Book "Dala'il al-Qibla").

12. Tahdid al-ma'mura wa tashihuhu fi'l-sura
(Delimitation of the Inhabited World and its Correction on the Map).

14. Kitab tahdid nihayat al-amakin li tashih masafat al-amakin
(The Determination of the Coordinates of Positions for
the Correction of Distances Between Cities).

(B) Geodesy

1. Maqala fi istikhraj qadr al-ard bi-rasad inhitat al-ufaq
'an qulal al-jibal
(Discourse on Obtaining the Value of the Earth by Measuring
the (Angle) of Declination of the Horizon from the Summits
of Mountains).

2. Fi ghurub al-shams 'ind manarat Iskandriya
(On Setting of the Sun at the Light-House of Alexandria).

3. Tasawwur amr al-fajr wa'l-shafaq fi jihatay al-sharq
wa'l-gharbmin al-ufaq
(Representation of the Phenomena of Dawn and Evening
Twilight in the two directions of East and West on the
Horizon).

4. Risala fi'l-ghazaliyat al-shamsiya
(The rising of the Sun).

(C) Climatology

1. Fi'l-ikhtilaf al-waqi fi taqasim al-aqalim
(On the various opinions on the Division of the Climates).

2. Maqala fi sifat asbab al-sukhuna al-mawjudah fi'l-'alam
wa-ikhtilaf fusul al-sanah
(Description of the causes of heat found in the world and
the differences in the Seasons of the year).

3. Risala fi sabab bard ayyam al-'ajuz
(Cause of cold during the days of Old Woman).
(D) Miscellaneous

1. Kitab fi tahqiq mali'l-Hind min maqalatin maqbulatin fi'l-'aql au mardhula
   (Verification of what is said about India which is accepted or rejected by reason).

2. al-Qanun al-Mas'udi
   (Canon Masudicus).

3. al-Jamahir fi'l-Jawahir
   (The collection on gems and precious stones).

Alberuni's Works on India

   (Collection of the ideas of the Indians on astronomical calculations).

2. Tahdhib zij al-Arkand
   (Correction of the astronomical tables of al-Arkand).

3. Khayal al-Kusufayn 'ind al-Hind
   (The image of the two eclipses by the Indians).

4. Tadhkira fi'l hisab wa'l-add bi-arqam al-Sind wa'l-Hind
   (Calculations and enumeration according to the numerals of Sind and India).

5. Kayfiyat rusum al-Hindi fi ta'allum al-Hisab
   (Indian rules for learning arithmetic).

6. Fi anna ra'y al-'Arab fi maratib al-'adad aswab min ra'y al-Hind fiha
   (The superiority of the Arab opinion to that of the Indians relating to the rules of numbers).

7. Fi Nashikat al-Hind
   (On the Indian rules of the Three).
8. Tarjamat ma fi Brahmasiddhanta min turuq al-hisab
(Translation of the methods of calculations as found in Brahmasiddhanta).

9. Fi tashih al-'an min al-zaman 'ind al-Hind
(Assertment of the present moment of time according to the Indians).

10. al-jawabat 'an al-masal al-marada min munajjimi'l Hind
(Replies to questions raised by the Indian astronomers).

11. al-jawabat 'an al-masa'il al-'ashr al-Kasmiyiya
(Replies to the ten questions raised by the Kashmiris).

12. Maqala fi hikayat tariq al-Hind fi istikhraj al-yumr
(On the account of the Indian method of calculating the age).

13. Tarjamat kitab al-mawali al-ghifira li-Brahimihira
(Translation of the small work of Varahamihira on births).

14. Tarjamat hadith Nilufar fi qissat Dabisti wa Barbihakin
(The translation of the Anecdotes of Nilufar in the story of Dabisti and Barbihakin).

15. Tarjumat Kalba Yarah wa-huwa maqala li'l-Hind fi'l-arad
alla ti tajri majra al-'ufuna
(Translation of Kalb-Yara, which is an Indian treatise on diseases which spread putrefacation).

16. Kitab fi tahqiq mali'l-Hind min maqalatin maqbulatin fi'l-aql
an manhula
(Verification of what is said about India which is accepted or rejected by reason).

17. Maqala fi Basdiv al-Hind 'ind maji' ihi'l-adna
(Discourse on Basdiv of India and his arrival in the near future).

18. Tarjamat kitab Shamil (Shamkh) fi maududat al-mahsusa wa'l-
ma'qula
(Translation of the book of Shamkh on the sensible and reasonable beings).
19. Tarjamat kitab Batanjali fi'l-khalas min al-irtibak
   (Translation of the book of Patanjali on removing confusion).

20. Kitab fi'illah tansif al-tadil 'ind ashab al-Sindhind
   (Reasons for the division in two of the equation according
   to the authors of Sindhind "Sidhanta").

21. Tarjamat kitab fi usul al-handasa li Uqliidas ila lughat
    al-Hind
   (Translation in Sanskrit of the book of elements by Euclid).

22. Tarjamat kitab Samkhya
   (Translation of the book on Samkhya).

23. Tarjamat kitab al-Majasti li-Batlamiyus ila lughat al-Hind
   (Translation in Sanskrit of Ptolemy's Almagest).

24. Tarjamat kitab fi'l-usturlab li-ABI Rayhan ila lughat al-Hind
   (Translation in Sanskrit of Abu Rayhan's book on Astrolabe).

25. Ghurrat al-Zijat an Ghurrat al-Aswaj, wa ma' nah Zij Bijaia
    Nand
   (The choicest of the tables, that is to say, the astronomical
    tables of Vijay Nanda).

26. Tarjamat ma fi Paulisa-Siddhanta
   (Translation of the Contents of Paulisa-Siddhanta).

Manuscripts Available in the Libraries of India

1. Ahmedabad (Gujarat), Dargah Library of Pir Muhammad Shah:
   Ghurrat al-Zijat (Arabic)

2. Aligarh (U.P.), Maulana Azad Library, Aligarh Muslim Univ.:
   i. Kitab al-Tashim li-Awa'il Sina'at al-Tanjam (Arabic)
   ii. al-Qanun al-Mas'udi (Arabic)
   iii. Kitab al-Saydla (Persian)

3. Bombay (Maharashtra), Mulla Fiores Library:
   al-Qanun al-Mas'udi (Arabic)
4. **Calcutta** (West Bengal)
   (a) Library of the Asiatic Society:
   al-Risala fi Sina'at al-Usturlab (Arabic)

   (b) National Library:
   al-Qanun al-Mas'udi (Arabic)

5. **Hyderabad** (Andhra Pradesh), State Central Library (Asifiya):
   i. al-Qanun al-Mas'udi (Arabic)
   ii. Riyadat al-Fikr wa'l-'Aql (Arabic)

6. **Rampur** (U.P.), Raza Library:
   i. Kitab fi Isti'ab al-Wujuh al-Mumkin fi Sana'at al-Astrulab (Arabic)
   ii. al-Qanun al-Mas'udi (Arabic)

7. **Patna** (Behar), Bankipur Library:
   i. Kitab fi Ifrad al-Maqal fi amr al-Asalal (Arabic)
   ii. Fi Rashikat al-Hind (Arabic)
   iii. Tahmid al-Mustaqarrli Tahqiq Ma'nal-Mamarr (Arabic)
   iv. Maqala fi Istikhraj al-Awter fi'l-Da'ir bi Khwaas al-Khatt al-Munhani Fiha (Arabic)
   v. al-Athar al-Baqiya 'an al-Qurun al-Khaliya (Arabic)
   vi. Risala fi Barahin A'mal Habash bi-Jadwal al-Taqwin (Arabic)
   vii. Risala fi Tashih ma waqa'a li Abu Ja'far al-Khasin min al-Sahw fi Zij al-Safa'i (Arabic)
   viii. Risala fi Majasat Dawa'r al-Sumut fi'l-Asturlab (Arabic)
   ix. Risala fi Jadwal al-Dawa'iq (Arabic)
   x. Risala fi Barahin 'Ala 'Amal Muhammad bin al-Sabbah fi Istiinan al-Shame (Arabic)
   xi. Risala fi Dawa'ir allati Tahuddu al-Se'at al-Zamaniya
   xii. Risala fi Burhan 'Ala 'Amal Habash fi Nata'li' al-Simt fi Zijih
   xiii. Risala fi Ma'rifat al-Qasim al-Falakiya bi-tariq ghyar tariq al-nisha al-Mu'allafa
   xiv. Risala fi hall Shubhat 'Araqat fi'l-Thalithata 'Ashreta min Kitab al-Useel
   xv. Risalat Abu Masr fi Jawab Masra'il al-Mandasa
   xvi. Pasl min Kitabin li Abu Masr fi Kurriyat al-Sama'