

# Abū Rayḥān Bīrūnī in the 15th/21th century

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# Abū Rayḥān Bīrūnī

Born: Kāth, Khwārizm, 362 H./973 CE Forced to move to  
Afghanistan: 407 H./1017 CE Died: ca. 442 H./1051 CE.



Quote on Bīrūnī by George Sarton, *Introduction to the History of Science*, vol. 1, p. 707.

“One of the very greatest scientists of Islām, and, all considered, one of the greatest of all times. His critical spirit, toleration, love of truth, and intellectual courage were almost without parallel in medieval times.”



# What makes Biruni so interesting?

Very good astronomers/scientist, good observer.

Interested in people, large network, knew literature, history, many languages: Khwarizmian (native), Persian, Arabic (his favourite scientific language); Sanskrit, some Hebrew and Greek

writes about all these things in his astronomical works, which are never dull

I try to use Biruni's didactical principles in this lecture.



# Why is Biruni inspiring in the 21th century?

Abū Rayḥān writes extensively on other cultures in his works on chronology, India, etc.

His approach is objective; he had good relations (even friendships) with people in other cultures and other religions, even if he disagrees with their opinions.

21st century is also a century of meetings between science, different cultures and different religions.



# Why this lecture about Biruni?

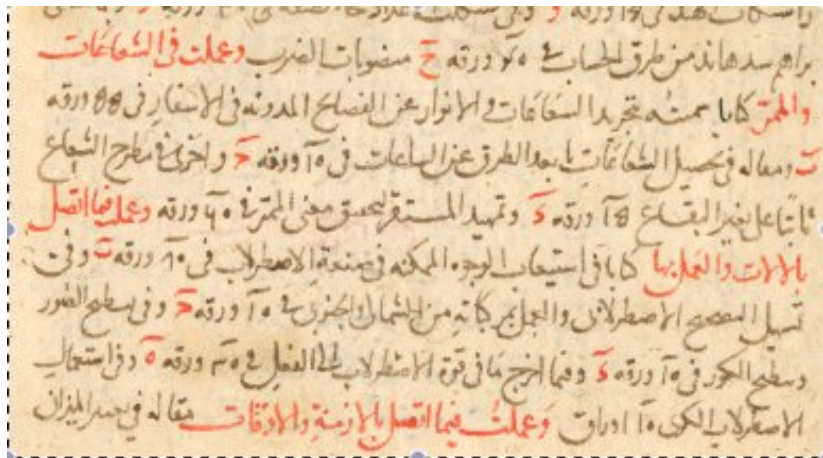
Many researchers in different countries have worked on him since 1875. My questions were:

1. Have all works by him been studied? What has to be done?
2. Can we start to analyze the connections between his works to get a better view of his scientific development and contributions?
3. Can we use 21th-century technology?



## In Holland, we have a unique manuscript about Biruni

A copy of the list of Biruni's own works, which he wrote when he was 61 solar years (63 lunar years) old. This is the only manuscript copy in the world.



## Website [www.albiruni.nl](http://www.albiruni.nl)

Purpose: to show what has been done and to make this work available as much as is possible.

For each work: Arabic edition, translations (in which language), Arabic manuscripts. Here are the (preliminary) results, for all details see the website [www.albiruni.nl](http://www.albiruni.nl). Red means: something which has not been studied.

Thanks to the work of many modern researchers!! Your help is also needed.

Sorry, I have used albiruni.nl because he wrote almost all works in Arabic and preferred Arabic as a scientific language (but I will say Biruni!)





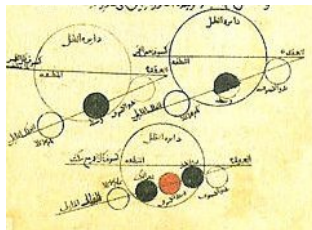
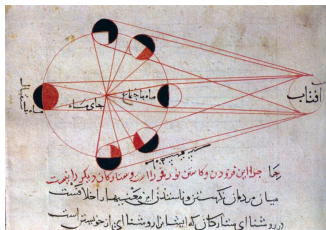
## Biruni's works existing in more than 10 manuscripts

Short title	Iran	Turk	Ind	WEur	Arab	Oth	Tot	Publ
1. Introduction to Astrology (Tafhim)								
Arabic	8	3	2	7	4	2	26	ArEnRuTa
Persian	10	1	6	3	-	3	23	Pe
(300 pp)								
2. Qanun Mas'udi	7	6	3	5	2	-	23	ArRuUz
(1000 pp)								
3. Chronology	8	4	1	4	-	-	17	ArPeEn RuUzTa
(300 pp)								
4. Astrolabe/Isti'ab	7	3	-	5	3	-	18	Ar(Ge)
(100 pp)								
5. <b>Astrolabe/ Potentialities</b>	4	1	2	1	2	-	10	<b>None</b>
(60 pp)								



# Introduction to Astrology

Written for a teenage daughter of a dignitary, in the form of ca. 500 questions and answers.



Still the best introduction into (medieval Islamic) mathematics, astronomy, astrology. I always use it in my Islamic Science courses.

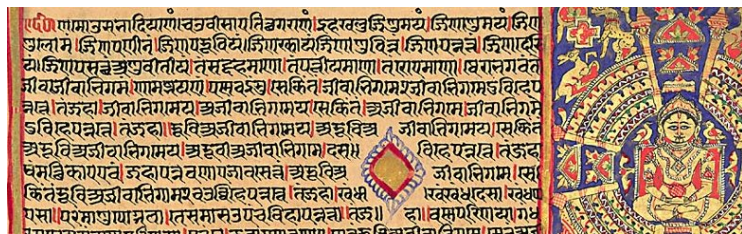


## Biruni's works existing in more than one but less than 10 manuscripts

Short title	Iran	Turk	Ind	WEur	Arab	Oth	Tot	Publ
6. Mineralogy.	1	2		2	1		6	ArEnRu
7. "Mixed astrolabes" (30 pp)	1	-	-	3	-	-	4	ArEn
8. Chords in a circle (50 pp)	-	1	1	1	1	-	4	ArPeGeRu
9. India (300 pp)	-	1	-	2	-	-	3	ArEnRuUz



Al-Biruni learned Sanskrit and Indian astronomy from Indian teachers. His book on India is mainly about Indian astronomy.



He translated works from Sanskrit to Arabic, and also from Arabic to Sanskrit  
 (*Elements of Euclid*, *Almagest* of Ptolemy, a work on astrolabes)



## Biruni's works existing in only 2 manuscripts

Short title	Iran	Turk	Ind	WEur	Arab	Oth	Tot	Publ
10. Map projections 2? (20 pp)	-	-	-	1	-	-	3?	ArEnGeRu
11. Rule of three in India (15 pp) ( $a : b = c : x$ )	-	1	-	1	-	-	2	ArRu(Pe)(En)
12. Specific Gravities (20 pp)	-	1	-	-	1	-	2	Ru



## Biruni's substantial works existing in only one manuscript

**Iran:** 13. Keys (Maqalid 'Ilm al-Hay'a), ArFr(Pe).

**Turkey:** 14. Coordinates (tahdid nihayat al-amakin). ArPeEnRu;  
15. Biruni's Arabic translation of Yoga sutra's from Sanskrit.  
ArEn; 16. Pharmacology. ArPeRu; (also six (?) ms. of a Persian translation).

17. Length of life according to Indian astrology. Ar.

**India:** 18. Shadows: ArRuEn, 19. Transits ArEn; 20. On the solar equations (incomplete) ArRu(En); 21. On asymptotes (of a hyperbola; incomplete) ArRu(En); 22. Arabic translation by Biruni of a Zij from Sanskrit, ArEn.

**Lebanon:** 23. Fakhri Sextant (very short text) Ar(Ge)

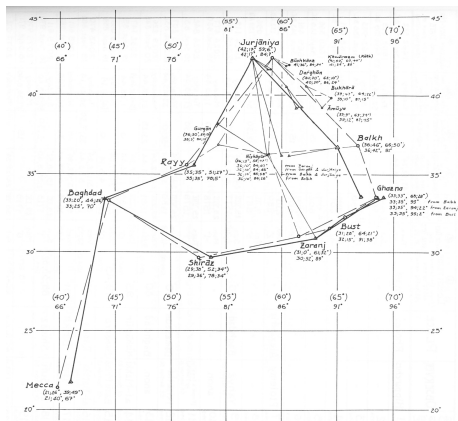
**England:** 24. Astrological lots. ArEn.

**Holland:** 25. List of work of Razi and of Biruni's own works.  
ArPeGeRu(En) 26. Explanation of the projection methods of  
Saghani.

**France:** 27. On facilitating the use of the different types of  
astrolabes.



# 14. Biruni's coordinates (Taḥdīd nihāyāt al-amākin fī taṣḥīḥ masāfāt al-masākin) exists in only one manuscript!



Comparison by E.S. Kennedy of Bīrūnī coordinates with modern values. We would know nothing about these coordinates if the unique manuscript had not been preserved.



# Biruni's astrolabe works: research projects? 1

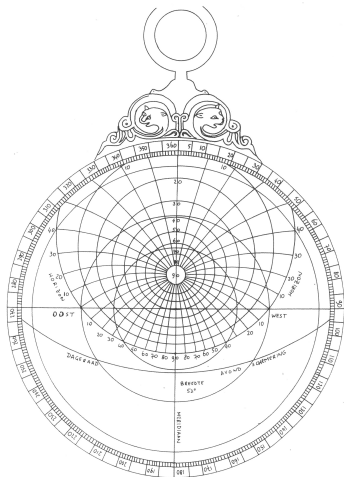
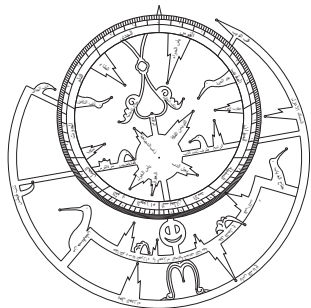
Common astrolabe, made by Ḥāmid Khojandī in 374 H (when Biruni was a young boy).





## Biruni's astrolabe works: research projects? 2

Common astrolabe consists of three parts: spider (stars), plate (horizon), and "horse" (axis) and is based on stereographic projection (pole = north pole)



# Biruni's astrolabe works: research projects? 3

Mixed astrolabe: parts with northern projection, other parts with southern projection

Fig. 4.

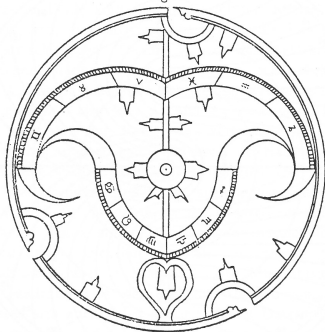
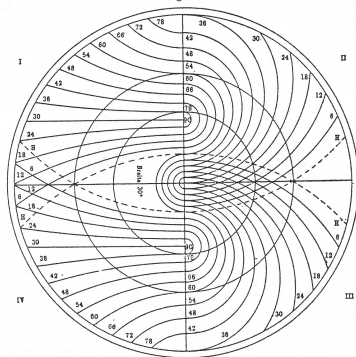
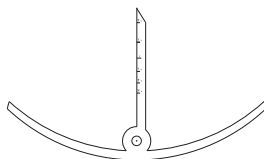
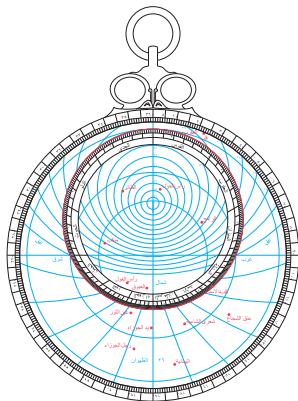


Fig. 5.



## Biruni's astrolabe works: research projects? 4

Zawraqi (boat) astrolabe: now stars are fixed, horizon is moving



## Biruni's astrolabe works:

4. Exhaustive discussion of all possibilities in the (practical) construction of the astrolabes, in 78 chapters [ed. Seyyed Mohammad Akbar Jawadi al-Hosseini, Meshed 1380 A.H. Shamsi]: common, mixed, zawraqi, others
5. **Operations with the common astrolabe, in 68 chapters** [10 manuscripts]
10. Theory of the common astrolabe; finding the ascendant with the other types of astrolabes (published by Dallal)
28. **Applications of the different types of astrolabe, including the zawraqi (and criticism of the long astrolabe book of Abdur-raḥmān Ṣūfī), in 20 chapters and introduction.** [1 manuscript]



# Back to Biruni: some fragments 1

35. **Finding the qibla:** all manuscripts are in Iran. Tehran, Daneshkade-ye Ilahiyat 341/2, Isfahan, Daneshkade-ye Adabiyat 34/3, Nashriya vol. 5 p. 303; Isfahan, Daneshgah-e Esfahan, ms. 286/3 Isfahan, Ketakhkhana-ye marhum Muhammad Baqir Ulfat Isfahani, see Name-ye Baharestan, first year no. 2, summer 1379, p. 136;
37. **On the day, daylight, night, al-yawm wa-l-nahAr wa-al-layl:** unique ms. in Tehran, Malik 6075/13
38. **(Astrological) choices of days,** unique ms. in ikhtiArAt al-ayyAm: Meshed, Shaykh Ali, Haydaresh 32/14.



## Back to Biruni: some fragments? 2

40. **Burhan Arshimidis**: one manuscript in Tehran, Daneshgah 1751, 65a

41. **On the knowledge of the sun by means of the celestial Globe, risAla dar ma'rifat-i aftAb az kura (Persian)**, one manuscript in Meshed 5542?

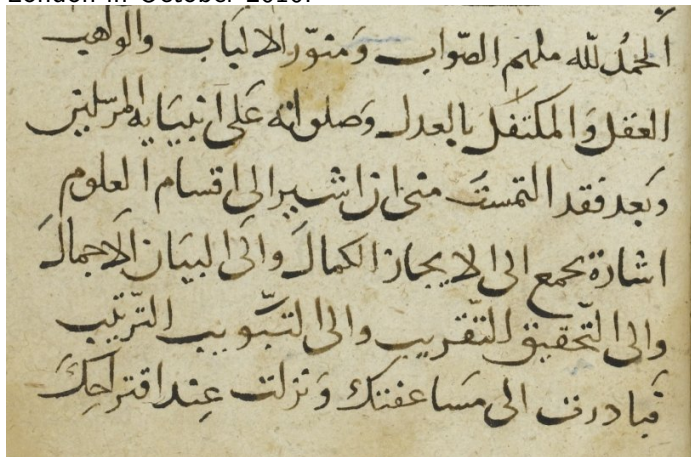
43. **Treatise on Geometry, risAla fl'l-handasa**, Tehran, Da'irat al-Ma'arif ms. 1927/1. Is this a real ms. or a photo of some other ms.?

These manuscripts have to be inspected to see whether they contain genuine Biruni material.



## Hikmat Abi Rayhan?

33. Hikmat Abi Rayhan? a manuscript sold by Sotheby's in London in October 2010.



# Some Biruni manuscripts are available online! (Edinburgh, Athar-e Baqiya, only the pictures without the other pages)

Not always easy to find; see website [albiruni.nl](http://albiruni.nl) but I would like to find more!

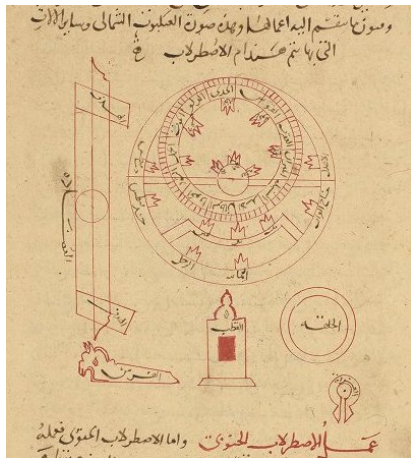


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# Biruni's main astrolabe work is completely online (Schoenberg Collection, Penn State)



# Conclusion 1

Still some work on Biruni to do for historians of Islamic science!

Modern internet technology can be used to put works at the disposal of researchers (outside copyright limits). See [www.albiruni.nl](http://www.albiruni.nl)

But there is more!



## Note

Many existing editions are not based on all extant manuscripts and/or they are insufficient because difficult passages of Biruni have not been understood (Example from the Qanun Mas'ūdī, Hyderabad edition).

وله بقي مربع : ه ط و بصل واحد من ساء ...  
طول : ه ط ه ب ج ، كو ، كد ، والتعديل الاعظم : ا ، يز ، ند ، ا ،  
و نسبة : ه ط ، الى : ط ز ، كنسبة جيب زاوية : ز ، القائمة الى جيب زاوية  
زه ط ، فزاوية : ز ه ط ، د ، مو ، نط ، كا ، ويخرج : ط ه ، على استقامته  
الى : م ، وهو موضع الاوج ، وقد صارت قوس : م د ، فهذه الزاوية  
معلومة وقوس : د ب ، ه ، ي ، يز ، لو ، فجميع قوس : م ب ، معلومة  
وسيخصها من التعديل . ، قريب من : . ، ط ، نه ، فيصير موضع الاوج  
في الجوزاء : كه ، يح ، ه ، كد ، وفان عسى انهم احد اخذ العملين كان عمل  
طله ساء . ، ا ، بذلك من جهات

نوز  
weg  
جيب  
ب

## Conclusion 2: an open question.

Abu Rayhan Biruni, probably the most outstanding medieval Islamic scientist, deserves a scholarly edition of all of his works, based on all extant manuscripts.

(just like Archimedes, Euclid, Huygens, Newton, etc.)

This project would require 20 years and an international cooperation of experts, including Arabists, historians of astronomy and mathematics, and scholars of Sanskrit.

But who will take the initiative and support such a project?

