

Jaghmīnī's *al-Mulakhkhaṣ* :

Its Importance for the
History of Science
&
Islamic Civilization

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(fl. first half of 13th century)

الملخص في الهيئة البسيطة

al-Mulakhkhaṣ fī al-hay'a al-basīṭa

(Epitome of Simplified Theoretical Astronomy)

الملخص في الهيئة البسيطة *al-Mulakhkhaṣ fī al-hay'a al-basīṭa*

What was this work ?

- ▶ a popular elementary astronomical text
- ▶ composed ca. 618-19/1221-22
 - Oldest manuscript: Istanbul, Lâleli 2141, dated 644/1246-47
- ▶ subject of numerous commentaries and super-commentaries (in Arabic and Persian)
- ▶ basis for more advanced work
- ▶ part of the *hay'a* tradition (علم الهيئة)

What
was this *hay'a*
tradition ?

What was this *hay'a* tradition ?

The Classification of Astronomy

- ▶ Up to the 4th/10th century the science of the stars was *`ilm al-nujūm*
 - This included BOTH Mathematical Astronomy & Astrology
 - This term used by Fārābī, Abū `Abd Allāh Muḥammad al-Khwārazmī, and the Ikhwān al-Ṣafā'
 - Both Khwārazmī and the Ikhwān al-Ṣafā' use *`ilm al-hay'a* for a special branch of astronomy identified with knowledge (*ma`rifa*) of the arrangement (*tarkīb*) of the orbs, their configuration (*hay'a*), and the configuration of the Earth
- ▶ Ibn Sīnā (d. 428/1037)
 - in his *Aqsām al-`ulūm al-`aqliyya (Classification of the rational sciences)*
 - ▶ SEPARATES Mathematical Astronomy from Astrology
 - ▶ *`ilm al-hay'a* replaces *`ilm al-nujūm* for Astronomy

What was included under the general category of *'ilm al-hay'a* (علم الهيئة) ?

- ▶ After Ibn Sīnā: Astrology excluded from *hay'a*
- ▶ Based on Ptolemaic principles with a few techniques from India
- ▶ Did include topics in Practical Astronomy
 - Astronomical handbooks (*zīj*es)
 - Books on the making and use of instruments
 - Treatises on observational astronomy
 - Tables of prayer times, qibla directions, and other religious rituals
 - Topics in geography related to astronomy
- ▶ Did include Theoretical Astronomy
 - Works that presented a coherent physical cosmography based upon mathematical models
 - Did not usually deal with underlying philosophical basis

الملخص في الهيئة البسيطة

How does Jaghmīnī's *al-Mulakhkhaṣ fī `ilm al-hay'a al-basīṭa* fit into this scheme?

- ▶ A Theoretical work of *hay'a*
- ▶ Summary of Ptolemaic Astronomy for non-specialists; thus simplified (*basīṭa*) version of *hay'a*
- ▶ Lacked mathematical proofs, which could be found in Ptolemy's *Almagest*

What was the structure of a typical *`Ilm al-hay'a al-basīṭa* work?

- ▶ An **Introduction** defining the mathematical and physical principles
- ▶ A Section (divided into chapters) dealing with *hay'at al-samā'* (the configuration of the celestial region)
- ▶ A Section (divided into chapters) dealing with *hay'at al-ard* (the configuration of the earth)
- ▶ A Section dealing with **Sizes and Distances:**
 - Size of the Earth and the celestial bodies
 - Distances of those bodies from Earth

Some examples of other *hay'a basīṭa* works besides Jaghmīnī's *al-Mulakhkhaṣ*

- ▶ Shams al-Dīn al-Khiraqī (d. 533/1138-9)
 - *Al-Tabṣira fī `ilm al-hay'a*
- ▶ Mu'ayyad al-Dīn al-`Urḍī (d. ca. 665/1266)
 - *Kitāb al-Hay'a*
- ▶ Naṣīr al-Dīn al-Ṭūsī (d. 672/1274)
 - *Zubdat al-idrāk*
 - *Al-Tadhkira fī `ilm al-hay'a*

المُلخَص في الهيئة البسيطة

Significance for understanding scientific education within Islam

- ▶ It exists in thousands of extant copies: original, commentaries, supercommentaries & glosses containing the text
- ▶ Manuscripts of the text and commentaries shed light on transmission & transformation of knowledge
- ▶ An active tradition in Islam well into the 12th/18th century

Commentaries on Jaghmīnī's *al-Mulakhkhaṣ* (early 7th/13th c.)

A continuous chain of astronomical learning

- ▶ Mīrak al-Bukhārī (d. 740/1339)
- ▶ Faḍl Allāh al-`Ubaydī (d. 751/1350)
- ▶ **Kamāl al-Dīn al-Turkmānī** (fl. 755/1354)
 - Kūhistānī (d. 936/1530)
- ▶ Humām al-Tabīb (d. 813/1410)
- ▶ **al-Sayyid al-Sharīf al-Jurjānī** (d. 816/1413)
- ▶ **Qāḍīzāde al-Rūmī** (d. 835/1432)
 - Kubnawī (9th/15th c.)
 - Sinān Pāshā (d. 891/1486)
 - Faṭḥallāh al-Shirwānī (d. 891/1486)
 - Muḥammad al-Nīksārī (d.900/1495)
 - `Abd al-`Alī al-Bīrjandī (d. 932/1525-6)
 - Kūhistānī (d. 936/1530)
 - Bahā' al-Dīn al-`Āmilī (d. 1031/1622)
 - Molla Çelebi (d. 1066/1656)
- ▶ `Abd al-Wāḥid b. Muḥammad (d. 838/1434)
- ▶ Ḥusayn b. al-Ḥusaynī al-Khwārizmī (d. 839/1435) [in Persian]
- ▶ Fasīh al-Nīsābūrī (d. 850/1446)
- ▶ Muḥammad al-Kāfiyājī (d. 878/1474)
- ▶ Niẓāmī al-Kūhistānī (d. 936/1530)

Qāḍīzāde al-Rūmī (d. 835/1432)

Sharḥ al-Mulakhkhaṣ

- ▶ Written in 1412
- ▶ Dedicated to Ulugh Beg (d. 853/ 1449) whose *madrasa* in Samarqand was a place where mathematics and astronomy were taught
- ▶ Became the subject for numerous super-commentaries
 - Kubnawī [Diyarbakir court (late 9th/15th c.)]
 - Sinān Pāshā (d. 890/1486) [written by order of Sultan Muḥammad Khān]
 - Faṭḥallāh al-Shirwānī (d. 891/1486) [Qāḍīzāde's student]
 - Muḥammad al-Nīksārī (d.900/1495)
 - `Abd al-`Alī al-Bīrjandī (d. 932/1525) [Isfahan at court of Safawid Shāh Ismā`īl I]
 - Kūhistānī (d. 936/1530)
 - Bahā' al-Dīn al-`Āmilī (d. 1031/1622) [Isfahan at court of Safawid `Abbās I]
 - Molla Çelebi (d. 1066/1656)

al-Mulakhkhaṣ

Evidence that it was used in Madrasas

- ▶ Large number of manuscripts (over 300 of Qāḍīzāde's Commentary alone)
- ▶ We know that Qāḍīzāde's and other commentaries taught at madrasas
- ▶ Indications in historical sources and manuscripts that these works were taught in schools
- ▶ Was treated like a teaching textbook; data was updated in order to make it more up-to-date [example: revision of maximum daylight information incorporated into the *Mulakhkhaṣ* from Ṭūṣī's *Tadhkira* (in this case Ṭūṣī's data was considered more correct)]

Chart: Maximum Daylight and Latitudes of Climes

CLIME	Max. Daylight (Hours)	Ptolemy	Bīrūnī	Ṭūsī	Jaghmīnī: Laleli 2141.3	Jaghmīnī (Rudloff/ Hochheim)	Qāḍīzāde's <i>Sharḥ</i>
I	12¾	12;30°	12;39,5°	12;40°	12;30°	12;40°	12;40°
	13	16;27°	16;38,34°	16;37,30°	16;27°	15;37°	16;37°
II	13¼	20;14°	20;27,29°	20;27°	20;14°	20;27°	20;27°
	13½	23;51°	24;4,30°	24;5°/24;40°	23;51°	24;40°	24;40°
III	13¾	27;12°	27;27,40°	27;30°	27;12°	27;30°	27;30°
	14	30;22°	30;39,27°	30;40°	30;22°	30;40°	30;40°
IV	14¼	33;18°	33;36,56°	33;37,30°	33;18°	33;37°	33;37°
	14½	36;00°	36;21,29°	36;22°	36;00°	35;22°	36;22°
V	14¾	38;35°	38;53,36°	38;54°	38;35°	38;54°	38;54°
	15	40;56°	41;13,52°	41;15°	40;56°	41;15°	41;15°
VI	15¼	43;1°/ 43;15°	43;23,5°	43;22,30°	43;11°/ 43;15°	43;22°	43;22°
	15½	45;1°	45;22,8°	45;21°	45;1°	45;21°	45;21°
VII	15¾	46;51°	47;11,26°	47;12°	46;51°	47;12°	47;12°
	16	48;32°	48;52,21°	48;52,30°	48;32°	48;52°	48;52°
	16¼	50;4°	50;24,34°	50;20°	50;25°	50;20°	50;20°

Interpretation of Chart

- ▶ Jaghmīnī's original text [as in **Laleli 2141.3**], which contained **Ptolemy's** values was modified
- ▶ This was done in order to take into account **Ṭūsī's values**, which themselves were rounded from those one finds in Bīrūnī
- ▶ This indicates that copyists, teachers, and commentators felt free to rearrange and modify original [as with Euclid's *Elements*]

CONCLUSIONS

- ▶ Jaghmīnī's *al-Mulakhkhaṣ fī `ilm al-hay'a al-basīṭa* gives strong evidence for a continuous tradition of scientific learning in the madrasas, one lasting at least 600 years
- ▶ Shows that Islamic Civilization was able to accommodate science within religious institutions