

1. Qshyar ibn Labbn.

Objekttyp: **Chapter**

Zeitschrift: **L'Enseignement Mathématique**

Band (Jahr): **8 (1962)**

Heft 1-2: **L'ENSEIGNEMENT MATHÉMATIQUE**

PDF erstellt am: **27.04.2024**

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MODERN FUNDAMENTAL OPERATIONS
IN AN EARLY ARABIC FORM:
'ANABĪ'S HEBREW COMMENTARY ON
IBN LABBĀN'S KITĀB FĪ UṢŪL ḤISĀB AL-HIND

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(Reçu le 6 avril 1961)

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1. QŪSHYAR IBN LABBĀN.

The apogee of Arabic science in the Orient came in the course of the tenth and eleventh centuries. This was especially true in mathematics. For example, special mention may be made of Abū al-Wafā' (940-ca. 997) who was one of the last great translators from the Greek and also was a commentator on Euclid, Diophantos, and Ptolemy [2]. There was also abū Kāmil Ṣuġā', the Egyptian calculator, who flourished ca. 900 and elaborated upon the algebra of al-Khwārizmī. It was abū Kāmil who influenced later European mathematics through Leonardo Fibonacci. Then there were Thābit b. Qurra (908-946), al-Isfahānī (end of tenth century), abū Ja'far al-Khāzin (d. between 961 and 971), and others. It was a period when not only were the older works translated and improved upon from the Greek and Arabic but there were also many original works.

Abū al-Hasan Qūshyār ibn Labbān b. Bāshahrī al-Jilī (971-1029) was one of this group [3]. He was a Persian and also wrote on astrology and astronomy. Qūshyār was variously cited as Qusyan, Qushiyad, Goshar, Lakusiar, and Gossar [4]. Other

variants used for his name were Djabah [5], Halebi [6], or al-Kiya [7]. He evidently came from a place called Jili (Djilan), a village on the south of the Caspian Sea.

It has been stated that ibn Labbān was a Jew but there is no evidence for this [8]. He was the teacher of al-Nasawī (ca. 1030) who also wrote on mathematics [9]. Unfortunately, almost nothing has come down to us of ibn Labbān's biography. However, some of his mathematical works are extant as well as others in astrology and astronomy.

2. EXTANT WORKS OF IBN LABBĀN.

The following works of ibn Labbān are known [10]:

1. al-ziğ al-jamī'.
2. kitāb al-mudkhal fī šinā 'at aḥkām al-nujūm;
3. kitāb al-ašturlab wakaifiyat 'amalihi wa'tibārihi 'ala't-tamām wal-kamāl;
4. risālāt al-ab'ād wal-ajrām;
5. tağrīd uṣūl tarkīb al-juyūb;
6. kitāb fī uṣūl ḥisāb al-hind.

The last one is the subject of this work and will be described at length in the next section.

3. KITĀB FĪ UṢUL ḤISĀB AL-HIND AND ITS HEBREW TRANSLATION.

This treatise, "Book on the Foundations of Hindu Reckoning", is extant in Arabic in only one manuscript [11]. There is also a Hebrew commentary [12], *Iyyūn hā 'iqqārim*. The latter is treated in this study.

The Hebrew version gives not only much translation from the Arabic but also gives a very full explanation as well as a commentary upon the fundamental operations as given by ibn Labbān.

The Hebrew text is the work of Shālôm ben Joseph 'Anābī who lived in Constantinople. He completed this commentary sometime between 1450 and 1460. Other of his works extant