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Über die Uhren im Bereich der islamischen Kultur

Von

Dr. phil. **Eilhard Wiedemann**

unter Mitwirkung von

Dr. phil. und Dr. techn. **Fritz Hauser.**

HALLE.
1915.
Druck von Ehrhardt Karras G. m. b. H. in Halle (Saale).

Eilhard Wiedemann

Über die Uhren im Bereich der islamischen Kultur

ISBN/EAN: 9783957705051

Auflage: 1

Erscheinungsjahr: 2017

Erscheinungsort: Dresden, Deutschland

Mathematicians, astronomers, and other scholars of Islamic civilization, and their works (7th-19th c.), İstanbul 2003; George Alfred Leon Sarton, *Introduction to the history of science*, Malabar, Fla. 1975.

/ صدیقه قیومی /

ساعت (۱)، این مقاله شامل بخشهای زیر است:

۱) مفهوم

۲) ساعت آفتابی

۳) ساعتهای آبی، شنی، شمعی و مکانیکی

۱) **مفهوم**، بازهٔ زمانی قراردادی برابر با یک‌بیست‌وچهارم شبانه‌روز. واژهٔ ساعت در عربی از مادهٔ «س و ع» (جمع آن ساعات و ساع) و دارای معانی متعددی است (← ابن‌منظور، ذیل «سوع») این واژه در قرآن به معنای قیامت* است. پیش از اسلام و در دورهٔ اسلامی، هریک از اجزای بیست‌وچهارگانهٔ شبانه‌روز را با نامی خاص می‌شناختند (قَلقَشَندی، ج ۲، ص ۳۵۸ـ۳۵۹؛ برای کاربرد این لغات در منابع نجوم دورهٔ اسلامی ← ابن‌قُتَیبه، ص ۱۳۱؛ ابوریحان بیرونی، ۱۳۷۳ـ۱۳۷۵، ج ۳، ص ۱۲۵). در زبانهای فارسی میانه نیز واژگان چندی در معنای ساعت (واحد زمانی) به‌کار می‌رفته‌اند، که ازجمله در زبان سغدی از مادهٔ زمن (žamn؛ قریب، ص ۴۶۱، ش ۱۱۳۲۳) و پارسا (pərsā/parsā؛ همان، ص ۲۸۹، ش ۷۲۰۴) گرفته شده‌اند (برای دیگر واژگان هم‌معنای ساعت در این زبان ← همان، ص ۱۸۳، ش ۴۵۸۴، ۴۵۸۶). در پهلوی، متداول‌ترین واژه در معنای ساعت (واحد زمانی) واژهٔ هاسر (hāsar؛ مکنزی[1]، ذیل "Hāsar")، برگرفته از ریشهٔ اوستایی hāθra بوده و معانی متعددی در زبانهای اوستایی و پهلوی داشته‌است (برای معانی مختلف ریشهٔ اوستایی ← بارتولومه[2]، ستون ۱۷۶۲ـ۱۷۶۳؛ برای معانی مختلف واژه در پهلوی ← مکنزی، همانجا). موضوع تقسیم شبانه‌روز به ۲۴ بخش (هرکدام یک ساعت) و نیز تقسیم هریک از این اجزا به بخشهای کوچک‌تر شصت‌گانه (شامل دقیقه و ثانیه) تحت تأثیر نجوم بین‌النهرینی، ازجمله نجوم بابلی ـ آشوری، به دانش نجوم یونانی و از آن طریق به سرزمینهای اسلامی راه یافته‌است. سندی از قدمت تأثیر نجوم بین‌النهرینی در یونانی در این زمینه از هرودوت[3] (متوفی ۴۲۵ ق م) در دست است که این تقسیم‌بندی را برگرفته از بابلیها می‌داند (← کتاب ۲، بند ۱۰۹). همچنین قراینی وجود دارد که نشان می‌دهد در دورهٔ بابلی ـ آشوری، تغییر طول ساعات شب یا روز در یک سال مورد توجه و بررسی قرار گرفته‌است. گزارش واردن[4] (ج ۲، ص ۸۴ـ۸۹) در این زمینه شامل فهرستی از مدت شبانه‌روز در طول یک سال بر اساس آرای اخترشناسان بابلی است که البته آن را بر اساس مفهوم ساعتهای برابر می‌سنجیدند. تغییر مدت طول شبانه‌روز یا شب، که براثر انحراف صفحهٔ استوای زمین نسبت به صفحهٔ مدار آن و نیز تفاوت سرعت گردش‌مداری زمین به دور خورشید به‌وجود می‌آید، توجه به طول مدت روز یا شبها را در یک سال درپی داشته‌است (← ابوریحان بیرونی، ۱۳۷۳ـ۱۳۷۵، ج ۱، ص ۶۳ـ۶۶، که گزارشی دربارهٔ علت تغییر طول روز و شب بنا به سنّت نجومی دورهٔ اسلامی داده‌است؛ نیز ← روز*). برخلاف منجمان آشوری، که از بازه‌های زمانی یکسانی برای تعیین طول روز و درنتیجه، محاسبهٔ اختلاف طول روز در یک سال سود جسته‌اند، منجمان یونانی از دو نوع مختلف ساعت برای تعیین طول ساعات روز استفاده می‌کرده‌اند؛ یکی، ساعتی که همواره طول آن یکسان فرض می‌شده و دیگری، ساعتی که بسته به طول روز تغییر می‌کرده‌است. این دو نوع مفهوم از ساعت به نجوم دورهٔ اسلامی نیز راه یافته‌است (← ادامهٔ مقاله). نوشتهٔ بطلمیوس[5] در این زمینه معطوف به گزارشی از چند ماه گرفتگی در قرن ششم پیش از میلاد است که استفاده از این ساعتها را نشان می‌دهد (← ۱۹۹۸، ص ۲۵۳). بطلمیوس (۱۹۹۸، ص ۱۲۳ـ۱۲۹) اقلیمهای هفتگانه را نیز بر اساس تعداد ساعتهای روز دسته‌بندی کرده‌است. در ترجمه‌های مختلف از این نوشتهٔ بطلمیوس در دورهٔ اسلامی، گوناگونی در نام این ساعتها دیده می‌شود که نشان‌دهندهٔ تحول اصطلاحات دربارهٔ انواع این ساعتها در قرون مختلف در نجوم دورهٔ اسلامی است؛ ازجمله در ترجمهٔ کهنی از *مجسطی* از حجّاج‌بن یوسف‌بن مَطَر* در ۲۱۲، این دو مفهوم به‌ترتیب ساعت معتدله (یا معتدلهٔ مطلَقة) و ساعت زمانی نامیده شده‌اند (همو، *المجسطی*، ترجمهٔ حجّاج‌بن یوسف، گ ۸۰ر) و در تحریر آن توسط خواجه‌نصیرالدین طوسی در ۶۴۴، به‌ترتیب اصطلاحات مستوی و زمانی و نیز محققه و مطلقه به‌کار رفته‌اند (همو، ۱۳۸۹ ش، ص ۴۸۰).

در ایران پیش از اسلام نیز (احتمالاً تحت تأثیر نجوم یونانی) واژهٔ هاسر معانی مختلفی داشته‌است؛ ازجمله ساعتی که طول آن در سال تغییری نمی‌کرده و نیز ساعتی که طول آن در سال و بسته به طول روز تغییر می‌کرده‌است. به نوشتهٔ هنینگ[6] (ص ۲۳۷ـ۲۳۸)، طول هاسر بلند در سال تغییر می‌کرده و به هشتاد دقیقه می‌رسیده‌است. تفاوت طول روز بین بلندترین و کوتاه‌ترین زمان آن در سال بر اساس این هاسرها در بُندَهِش ذکر

1. MacKenzie 2. Bartholomae 3. Herodotus 4. Waerden 5. Ptolemy 6. Henning

1. Devlet ikbal sa'adet iclal ile bin yüz yetmiş bir senesi Safer-ül-hayrın on altıncı
2. güni taht-ı[r] 'âlibaht-ı 'Osmanî üzere cülus-ı hümayun-ı meymenet makrunım vaki'
3. olub 'umumen tecdid-i berevat olınmak ferman-ı 'âlişanım olmagın medine-i Kandiye'de
4. vaki' 'utaka-ül-'arab-üs-sevda ta'ifesinin ekseri hammar ve hammal olub beynlerinde
5. re'is olmádıgından medine-i merkumede Sultan İbrahim Han – tabe serahu – cami'-i
6. şerifi mütevellisi olanlara vakfiçün yevmî bir akçe vermek şartıyla hüdavendigâr-ı
7. asbek merhum ü magfur leh Sultan Mahmud Han – tabe serahu – zamanında berat-ı şerifiyle
8. re'isleri olan cümlenin ma'kadı işbu rafi'-i tevki'-i refi'-üş-şan-ı hakanî ve şayeste-i
9. mekremet-'unvan-ı tacdârî kıdvet-ül-emasil ve'l-akran Kara 'Ali – zide kadruhu – her vechle
10. layık ve mahall-ı müstehak olmağın yedinde olan 'atik beratı ile der-i sa'adetime gelüb
11. tecdidin rica etmeğin mucibince mezbura sadaka edüb işbu berat-ı hümayunı
12. verdim ve buyurdımki ba'd-el-yevm mezbur Kara 'Ali – zide kadruhu – zikr
13. olınan ta'ifenin kema fi'l-evvel re'isleri olub hidmet-i lazımesin bi-kusur
14. mer'i ve mü'eddi kılındıkdan sonra şürutıyla mutasarrıf olub benim devam-ı 'ömür-i devletimiçün
15. du'aya müdavemet göstere şöyle bilüb 'alamet-i şerife i'timad kılalar. Tahriren
16. fi eva'il-i Rebi'-ül-âhir sene-i ihda ve seb'in ve mi'e ve elf.
17. be-makam-ı Kostantiniye.

IRCICA kit.

Avner Wishnitzer

"OUR TIME:" ON THE DURABILITY OF THE *ALATURKA* HOUR SYSTEM IN THE LATE OTTOMAN EMPIRE

Introduction

Over the last two hundred years, the use of mean time has become so widespread that it is largely taken for granted, as if part of the natural order of things. This was hardly the way the Ottoman elites of the early twentieth century saw it. In fact, the adoption of mean time and its implications became the object of a debate that was to continue into the Republican era. This debate is at the center of the current study.

Mean time entered the Ottoman Empire around the middle of the nineteenth century and was increasingly used in various governmental agencies alongside the indigenous hour system, commonly known as *gurubi* or *alaturka saat*. The use of mean time widened considerably following the 1908 Young Turk Revolution, but it did not fully supersede the Ottoman system down to the fall of the Empire. It was only in the beginning of 1926 that the old hour system was finally abolished and universally replaced by mean time in the newly established Republic of Turkey.[1]

So far, the few discussions devoted to the matter have focused on bureaucratic aspects of the process and sought to explain, in a somewhat teleological manner, the eventual triumph of mean time.[2] While certainly relying on these earlier studies, I

Author's Note: This article is largely based on my PhD dissertation. I wish to thank my supervisor, Professor Ehud R. Toledano, for his continuous guidance and the Colton Foundation for its support. The article itself was written during a post-doctoral year at the University of Washington. I would like to thank my host, Professor Reşat Kasaba, for his constant assistance, Professors Walter Andrews and Selim Kuru for their thoughts and insights, and the Fulbright Program for its support. Last but not least, I thank Dr. Eyal Ginio for his comments on an earlier version of this article.

[1] "Günün Yirmi Dört Saatine Taksimine Dair (1925)," *Düstür*, 3rd ed., vol. 7, 317-318.

[2] Ekmeleddin İhsanoğlu and Feza Günergun, "Osmanlı Türkiyesi'nde Alaturka Saat'ten Alafranga Saat'e Geçiş," in *X. Ulusal Astronomi Kongresi (2-6 Eylül 1996)*, (İstanbul: İstanbul Üniversitesi Fen Fakültesi, Astronomi ve Uzay Bilimler Bölümü, 1996), 434-441; Doğan Gündüz, "Alaturka Saatten Alafranga Saate Geçiş: Osmanlı'nın Mekanik Saatle Buluşması," *İstanbul* 51 (2004): 120-126. Both Uğur Tanyeli and Palmira Brummett have discussed some cultural and political aspects of the Ottoman hour system but neither of them has focused on the transition process *per se*. See Uğur Tanyeli, "The Emergence of Modern Time Consciousness in the Islamic World and the Problematics of Spatial Perception," in *Anytime*, ed. Cynthia C. Davidson (Cambridge, Mass: MIT Press, 1999), 159-167; Palmira

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[Aspects artistiques et techniques de la montre en Iran]

L'article de J. Ṣadâqat-kiš (voir *Abst. Ir.*, VII, 576), sur les horloges et l'introduction de la montre en Iran, a suscité divers commentaires parus dans la même Revue. On doit

Abst. Ir. 8

09 NİSAN 1992

signaler au moins ce nouvel article, bien documenté, de S. Sepantâ, de caractère technique précis, qui décrit les types d'horloges et de montres introduites en Iran aux époques safavide et qâjâr, et les problèmes techniques posés par les réparations à faire sur place. L'auteur se sert en particulier des relations de voyage et histoires de Thévenot, Tavernier, Curzon, Krasinski. Il rassemble aussi les renseignements que l'on possède sur une horloge à eau qui existait à Yazd au XIV[e] siècle. Il relate la tragique histoire de l'horloger suisse Rodolfe (Stidler). C. F.

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David A. King

Islamic Astronomical Instruments

VARIORUM REPRINTS
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XI

New Light on the *Zīj al-Ṣafā'iḥ* of Abū Ja^{c}far al-Khāzin

Considerable obscurity has hitherto surrounded the work entitled *Zīj al-Ṣafā'iḥ* attributed to the mid-tenth-century Khurasan astronomer Abū Ja^{c}far al-Khāzin.[1] The title means "*zīj* of plates", where a *zīj* is an astronomical handbook consisting of text and tables[2] and the term used for plates is that used, for example, for the plates of an astrolabe. This title is cited by various later Muslim authors of consequence, including Abū Naṣr (*fl.* Khwarazm, *ca.* 1000 AD) and his student al-Bīrūnī (*fl.* Ghazna, *ca.* 1025), and both of these scholars discuss problems occurring in the *Zīj al-Ṣafā'iḥ*. All of the known references to the *Zīj al-Ṣafā'iḥ* have been gathered by J. Samsó Moya in his article on al-Khāzin in the *Encyclopaedia of Islam* and by F. Sezgin in his *Geschichte des arabischen Schrifttums*,[3] but in none of these references is there any indication of the reason behind the curious name "*Zīj* of plates".

In 1976 M. Alain Brieux of Paris sent me some photographs of an unusual Islamic astronomical instrument from the archives of Prof. Derek J. de Solla Price of Yale University.[4] The photographs were given to Prof. Price in 1946 by the Adler Planetarium in Chicago. The instrument appears to have belonged to Paul Klostermann of Munich in the 1920's, but it has since disappeared. The photographs were on display at the Exhibition "Science and Technology in Islam", held at the Science Museum in London on the occasion of the so-called Festival of the World of Islam, and the instrument was properly identified and briefly described in the unpublished catalogue of the Exhibition prepared by F. Maddison and A. Turner.[5] These photographs are here published with kind permission of M. Brieux and Prof. Price: as M.

SCIENCE AND CIVILISATION IN CHINA

BY

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VOLUME 4

PHYSICS AND PHYSICAL TECHNOLOGY

PART II: MECHANICAL ENGINEERING

The right of the University of Cambridge to print and sell all manner of books was granted by Henry VIII in 1534. The University has printed and published continuously since 1584.

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of it comes in the middle of the text and not at either end, while (*b*) it is mentioned by cross-reference at two other places in the text.

For the origins of his idea the Anonymus was no doubt as much indebted to the vertical Vitruvian water-mill as Belisarius later on. But as to its effects, Thompson and all other students of the matter are agreed that there is no contemporary mention of the idea, no evidence that it was anything more than a paper scheme.[a] The memorandum, as he says, was probably intercepted by some civil servant and pigeon-holed without ever reaching the emperor to whom it was addressed, and appears to have stayed in the files for half a millennium after it was written. In these peculiar circumstances it seems extremely unlikely that any word of the invention could have reached Tsu Chhung-Chih or Wang Chen-O a bare century later at the other end of the Old World. Li Kao's paddle-boats, in the latter half of the +8th century, were being built only fifty years or so after the reappearance of the Anonymus' suggestions, so that here again the possibilities of transmission seem small. One cannot help feeling that this constitutes the clearest instance so far unravelled of a strong probability that essentially the same ancient invention was made twice over in different places.[b] Provisionally we can only say that the first specification was Byzantine and the first execution Chinese.

(*j*) CLOCKWORK; SIX HIDDEN CENTURIES

The clock is the earliest and most important of complex scientific machines. Its influence upon the world-outlook of developing modern science was incalculable.[c] No one can doubt that the invention of the mechanical clock was one of the greatest achievements in the history of all science and technology. 'The fundamental solution', wrote von Bertele (1), 'of the problem of securing steady motion by intersecting the progress (of a weight-driven or any powered train) into intervals of equal duration, must be considered as the work of a brain of genius.' The essential engineering task was to devise means of slowing down the rotation of a wheel so that it would keep a constant speed continuously[d] in time with the apparent diurnal revolution of the heavens. The essential invention was the escapement. In what follows we shall show that the first of all escapements arose in China in the middle of a very long line of development of mechanisms for the slow rotation of astronomical models (demonstrational armillary spheres or celestial globes), the primary aim of which was computational rather than time-keeping as such. We shall also show that its first application

[a] It must be admitted also that from the technical point of view a set of ox-driven whims was singularly unsuitable as a nautical power-source. Possibly the plan was tried in one of the European Renaissance experiments. A 'horse-packet' was working successfully at Yarmouth, however, in 1818 (cf. Atkinson (1), pp. 40, 42, 54).

[b] This view is shared by Thompson. Suitable spheres of use might have been an important factor; probably China had more really good navigable rivers, lakes and canals at the times in question than were available to the East Romans.

[c] Cf., for example, Butterfield (1), pp. 8, 44, 59, 111, 120, etc.; Lynn White (7), pp. 124ff.

[d] In the sense that its motion should continue for extended periods without prolonged interruption. In fact, it proved easier to accomplish this by dissecting the motion into very short periods of discontinuity, rather than by any truly continuous braking device.

BİLDİRİLER

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THE MEYER FAMILY; THE WATCHMAKERS AND THEIR WATCH SHOWING THE *PRAYER* (*EZÂNÎ*) TIME

Atilla BİR
Istanbul Technical University

Şinasi AÇAR
Eskişehir Anadolu University

Mustafa KAÇAR
Istanbul University

The Meyer family; the watchmakers

As owners of a long living Watch Repair and Trade Establishment (1843-1981), the watchmaker family Meyer's, as experts, improvers and inventors on mechanical clocks and watches played an important role on the city.

Johann Meyer (1843-1920), who served as chief clockmaker at the court of Sultan Abdülhamit II (1876-1909), was send by Emperor Wilhelm II of Germany at the request of the sultan (*Figure 1*). He is the inventor of the automatic watch showing the prayer (*ezânî*) time. For this invention received a certificate on 14.12.1887 with a medal and also a certificate with a Mecidî Medal from the Sultan Abdülhamit II on 21.5.1896.

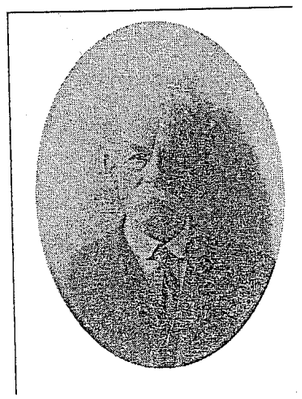


Figure 1- Johann Meyer (1843 – 1920).

Figure 2- Emile Meyer (3.9.1988 – 7.3.1954)

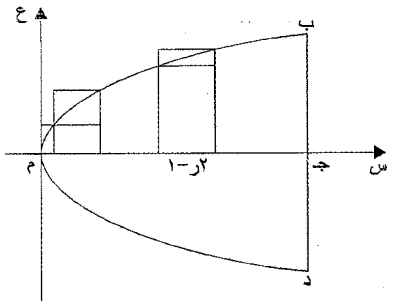
Figure 3- Wolfgang Meyer (23.5.1909 – 16.9.1981).

من مبدأ الاستنفاذ، أما طريقة ابن قُرَّة فيغلب عليها الطابع الحسابي أكثر من الهندسي، فالسهم قُسِمَ إذاً إلى أجزاء عددها:

١ + ٣ + ٥ + ... + (٢ر-١) + ... + (٢ن-١) = ن٢

وأصبح طول الجزء = طول السهم

ثم أنشأ على هذه الأجزاء مستطيلات، وحسب مساحة المستطيل العام المنشأ على الجزء (٢ر - ١)، ثم حسب مجموع هذه المستطيلات وأنهى (ن) إلى اللانهاية وهكذا وجد ابن قُرَّة مساحة القطعة من القطع المكافئ؛ فسبق ابن قُرَّة كوشي Cauchy في تعريف التكامل قبل عشرة قرون، ولعلّ كوشي استوحى من ابن قرة تعريفه للتكامل، فعرّف التكامل المحدود بطريقة كأنها تعميم لما اتّبعه ابن قرة.



الشكل (٣)

وائل أتاسي

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■ علم الساعات في الحضارة العربية الإسلامية

لعلّ أقدم وسيلة لقياس الزمن هي الساعة الشمسية أو المزولة sundial أو gnomon. ومنها تلك التي عثر عليها في مصر ثم نُقلت إلى متحف «آلان» ببرلين، وتتكون من لوح خشبي مدون عليه خطوط وأسماء الساعات، مثبتة على طرفه كتلة خشبية؛ سماها المصريون ساعة الظل لأنها تعتمد على طول الظل واتجاهه، كانت وسيلتهم لحساب مدة تعاقب الثيران المكلفة بتدوير آلات الري، ولتحديد مدة فتح السدود في الحقول. كذلك استخدم البابليون المزولة وعرفها الصينيون باسم «قويبياو» وكان لها عندهم تصميم مختلف؛ إذ تكونت من قضيب رأسي يلقي ظلاً، ومن شريط أفقي مدرّج يأخذ اتجاهاً من الجنوب إلى الشمال، يقاس عليه الظل حسب تقسيمات معينة موزعة بعناية فائقة.

ومن أجهزة قياس الزمن كذلك الساعة الرملية sandglass وهي مكونة من وعاء زجاجي على شكل قمعين متعاكسين - أو أكثر - ومتصلين من الجهتين الأضيق عبر فتحة تسهل مرور الرمل من القمع العلوي إلى السفلي، ثم تُقلَب الوضعية من جديد وهكذا. وقد صممت أحجام مختلفة لكل منها قياس محدد من الزمن حسب كمية الرمل. أما حبيبات الرمل المستعملة فهي متساوية ومفككة وجافّة لاتتكتّل عند عنق الساعة.

وقد طور المصريون النوعين كليهما، وإن لم يفيا بالغرض، لأن الساعة الشمسية لاتفيد في الليل ولا في النهار الغائم، والساعة الرملية لم تكن دقيقة بما يكفي بسبب الرطوبة التي تؤثر في انسياب حبيبات الرمل.

حين أدرك المصريون أن تدفق الماء من ثقب في وعاء يحدث بمعدل ثابت مادام ارتفاع الماء في الوعاء ثابتاً، اخترعوا الساعة المائية، وكان لها أشكال هندسية مختلفة. وأقدم نوع منها الساعة ذات التدفق البسيط «clepsydra». وهي وعاء من الفخار ذو ثقب في جداره قرب القاعدة. ومنها كذلك الوعاء القابل للغطس المعروف عند العرب باسم «الطرجهار» tarjahar وهي كلمة فارسية، وفيه ثقب قرب القاعدة يوضع الوعاء على سطح الماء فيغطس فيه في وقت معين ومحسوب. وقد طور اليونان القدماء هذه الساعات ونوعوا فيها، ومنها ذات التدفق الخارجي ومنها ذات التدفق الداخلي. وأجروا عليها بعض التعديل بغرض ضبط سرعة التفريغ والتمكن من متابعة انقضاء الوقت. وأشهر من قام بهذا التعديل عالم إسكندري يدعى كتيسبيوس Ctesibius (٢٧٠-٢٤٦ق.م). وأخذ عنه أرخميدس Archimedes (ت٢١٢ق.م) وزاد عليه، وألف مقالة في عمل البنكام «الساعة المائية» وكتاباً في عمل ساعات الماء التي ترمي البندق. وجاء من بعده فيلون البيزنطي Philon في النصف الثاني من القرن الثاني قبل الميلاد فألف كتاباً في عمل ساعات الماء التي ترمي البندق، ومن بعده فيتروفيوس Vetruvius في النصف الثاني من القرن الأول الميلادي الذي ألف كتاباً قسمه إلى عشرة كتب منها كتاب عن الساعات.

كذلك أبدع الصينيون في القرون الوسطى في تصميم الساعات المائية

CONSTRUCTION OF CLOCKS AND ISLAMIC CIVILIZATION.

I

It is well known that ancient Muslims—Arabs as well as non-Arabs,—like many other peoples knew the sun-dial and such other instruments of a very primitive type as must have enabled them to know the different periods of day and night; but few of us to day have any idea of how ingeniously and with what admirable skill the Arabs used to construct clocks, deriving their inspiration from the Byzantinians. Faithful disciples of the Greeks, as they were in almost all the sciences and arts of that age, they based also their art of horology on the experiences of Greek scientists. The study of Greek sciences though begun as early as in the Umayyad period, was taken up in right earnest during the reign of Ma'mūn (198-218 A.H., *i.e.*, 813-833 A .D.), the time when flourished the first Arabic writer on Mathematics, Abú Abdulláh Muhammad al-Khwârazmi (about the year 205 A.H.=820 A.D.) whose works have come down to us. Similarly the oldest writer on Astrology, Abū Yúsuf Ya'qúb ibn 'Ali al-Qarashî al-Qarsarāní, wrote[1] during the reign of the same Caliph.

Ma'mún's father, the great Hárúnu'r-Rashíd is said to have sent to Charles the Great a clock which, according to Einhard's report, was received by Charles in 807 A.D[2]. About the same time, or perhaps even a little earlier, the Arabs must have begun to construct astrolabs and other instruments, mention of which has incidentally been made by Jáhiz[3], in his well known book, the *Kitabu'l-*

(1) About 200 A.H.—815-16, A.D.

(2) *Einhardi Annales*, edidit G. H. Pertz, p. 53-54. Hannover 1845 *Eihnards Jahrbuecher* (German translation by O. Abel), p. 108-09. Berlin 1850. *Vide* Eilhart Wiedemann and Fritz Hauser, *Die Uhr im Bereich der islam-ischen Kultur*, p. 36, to which work I am greatly indebted.

(3) Jàhiz died in 255 A.H.=869 A.D.

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the built environment. Wendy Ashmore has recently identified what she deems the five principle components of the Maya pattern pertaining to Tikal and related sites. These are (1) north–south axial arrangements, (2) complementary and paired functions of buildings centered along the main axes that serve to demarcate supernatural and celestial from underworld or terrestrial dimensions, (3) subsidiary eastern and western monumental arrangements within precincts providing for a triangulation with monuments located on the northern perimeter of individual precincts — and identified with the celestial vault and the cosmic tree of the north, (4) ball courts as transitional zones between north and south; and (5) the construction of causeways and paved roads linking precincts into a symbolically coherent cosmogram. To this listing I would add specific buildings that embody solar cosmograms and cosmic templates, as well as sculptural programs and iconographic vocabularies deployed across whole sites to imbue them with a sacred geography and cosmological ecology. We can no longer assume that the Maya built in a random and largely organic fashion — by accretion and accomodation as opposed to design and structure. Primitivist and eurocentric portrayals of the ancient Maya have eroded in recent years under the onslaught of a new world order reinterpreted on the basis of surviving hieroglyphic stairways, monumental texts, commemorative stelae, funerary shrines, frescoed murals, painted ceramics replete with textual information, and pre-Columbian and contact period codical documents and screenfold books. These sources are now providing a revolutionary perspective on the Maya.

RUBEN G. MENDOZA

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See also: Geomancy in China

CLOCKS AND WATCHES There was a long tradition in the Hellenistic world for the construction of large waterclocks. Vitruvius, writing in the first century BC, mentions the waterclocks constructed by an Alexandrian engineer called Ctesibius (ca. 300 BC) which incorporated gearing, automata and audible time signals. The well-known Alexandrian writer Hero, who flourished around AD 60, is known to have written a book on waterclocks. The Byzantine historian Procopius described a monumental waterclock constructed at Gaza in the sixth century AD. It is almost certain that the inspiration for the construction of waterclocks in the Islamic world came from this Hellenistic tradition.

Islam

Monumental waterclocks are described in detail in two Arabic treatises. Al-Jazarī in his machine book *Kitāb fī maʿrifat al-ḥiyal al-handasiyya* (The Book of Knowledge of Ingenious Mechanical Devices), completed in Diyar Bakr in 1206 describes two such machines. Riḍwān ibn al-Saʿātī, in his treatise *Kitāb ʿamal al-sāʿāt wa'l-ʿamal biha* (Book on the Construction of Clocks and on Their Use) dated 1203, describes the waterclock built by his father Muhammad at the

saat - غرائب الساعات

لم يتفنّن البشر في آلة من الآلات كما تفننوا في الساعات فانهم صغّروا جرمها حتى صيروها كفص الخاتم وكبّروهُ حتى صارت كالقصور الباذخة وصنعوها على اشكال لا تُحصى كما يظهر من الرسوم التي ادرجناها في الجزء الاخير من السنة الثامنة من المقتطف

ومن اشهر الساعات الكبيرة المعروفة الآن ساعة ستراسبرج . تغلّب عليها مهرة الصنّاع زماناً طويلاً فانجزوها سنة ١٥٧٤ ولم تزل حتى الآن على وضعها الذي وضعت عليهِ حينئذٍ . طولها ثلاثون قدماً وعرضها خمس عشرة قدماً ولها في وجهِ قاعدتها كرة كبيرة تدلُّ على مبادرة الاعتدالين وموقع الشمس والقمر . وبجانب الكرة آلات تدلُّ على مواقع السيارات وايام الاعياد والاصوام . وفوقها فسحة في عرضها يمرُّ فيها تمثال كلّ يوم من ايام الاسبوع ففي يوم الاثنين يمر تمثال الالهة ديانا وفي يوم الثلاثا يمرّ تمثال الاله ابلون وهلمّ جرًّا . وبينا الساعة فوق هذه الفسحة وتُعلَم منها الساعات والدقائق . وعلى جانبيها تمثالان لاله الحب احدهما يقرع جرساً بحسب الساعات وارباع الساعات والآخر يقلب ساعة رملية في آخر كل ساعة . وفوق هذه المبنا مبنا أُخرى اوسع منها عليها علامات البروج وفوقها كرة يظهر منها عمر القمر وفوق الكرة تماثيل كثيرة تظهر عند الظهيرة

قال بعضهم وقد راقب هذه الساعة انهُ بعد الساعة الحادية عشرة بربع ساعة قرع الهُ الحب الجرس قرعةً وللحال ظهر فتًى في اعلى الساعة بيدهِ قضيب فضرب بهِ جرساً ضربةً واختفى عن الابصار وهذا الفتى رمز الى الفتوّة . وبعد ربع ساعة ظهر شاب مكان الفتى بيدهِ محجن فيهِ ازهار نضرة فقرع بهِ الجرس قرعتين . وبعد ربع ساعة آخر ظهر مكان الشاب كهل مدرّع بالحديد وقرع الجرس ثلاث قرعات . ولما دنا العقرب من الساعة الثانية عشرة ظهر شيخ هرمٌ محدوب الظهر فضرب الجرس بعكّازهِ . ثم ظهر تمثال الموت في هيئة هيكل من العظام وبيدهِ عظم كبير فضرب الجرس بهِ اثنتي عشرة ضربة وللحال ظهر في رواقٍ فوقهُ تماثيل الرسل الحواريين الاثني عشر وتمثال السيد المسيح فساروا امامهُ وسجدوا لهُ واحدًا بعد آخر وهو يباركهم . وحينئذٍ انتصب ديك على رأس قبة بجانب الساعة وصاح ثلاثًا وهو يرفرفُ ويصفق بجناحيهِ وقلب احد الهي الحب ساعتهُ وضرب الآخر الجرس بطرفتهِ . انتهى

ويقال ان هذه الساعة غاية في الضبط ولاسيّما في دلالتها الفلكيّة . بل زعم بعضهم انهُ لما

el Muktabas, 11/8 (1887) s. 461-464, Beyrut

المقتطف

الجزء الثاني عشر من السنة الثامنة . ايلول ١٨٨٤

الساعات

بلغنا ان جماعة من اصدقائنا المشهورين بعمل الساعات عاتبون على المقتطف لسببين اولهما انهُ لم يفرد للساعات مقالةً مطوّلةً كما افرد لغيرها من المصنوعات وانما قصر الكلام فيها على نبذ قصيرة والثاني انهُ اشار في الخطبة التي عنوانها "حاجتنا الكبرى" الى الساعات للتمثيل على قصورنا في الصناعة حالَ كونهِ لم يوفها حقّها عليهِ فافردنا هذه المقالة اجابةً للطلب ودفعًا للعتب مقتصرين على ما تروق مطالعتهُ القرّاء غير متعرّضين لتفصيل دقائق صناعة الساعات ولا مدّعين افادة اربابها فوائد خفيت عنهم او قصر باعهم عن الوصول اليها فنقول

تدلُّ صناعة الساعات على تقدُّم التمدُّن في البلاد التي تروج فيها لان الغاية منها معرفة الوقت وان كان كثيرون يتخذونها للزينة . ومعرفة الوقت تهمُّ ذوي الاشغال اكثر ممَّا تهمُّ المتفرّغين واشغال المرتقين في التمدن اكثر من اشغال من دونهم . ولذلك اصبحت معرفة الوقت بين المتمدنين حاجةً ضرورية لا يستغنون عنها في اعمالهم فلو اخلّت شركات السكك الحديدية او شركات التلغراف او ما شاكلها من الشركات بضع دقائق في تعيين اوقاتها لافضى اخلالها الى خسائر عظيمة ومخاطر كثيرة على المال والنفوس سواء كان في تشويش نظام الاشغال او في اصطدام القُطر بعضها ببعض واهلاك مَنْ عليها من الركّاب

والساعات آلات لقياس الوقت وكان الناس يعتمدون في قياسهِ على الاجرام السماوية والاظلال قبل اختراعها . فيقيسون السنة بدوران الارض حول الشمس والشهر بدوران القمر حول الارض واليوم بدوران الارض على محورها . وكانوا يقيسون ساعات النهار بمراقبة ظلول الاشجار وساعات الليل بمراقبة مواقع الكواكب واظلال الاشباح ايضًا . ثم اضطرتهم الاحوال الى التدقيق في قياس

اندلس تاریخی

بسم الله الرحمن الرحیم

جواهر زواهر حمد وسپاس بی غایه اول مبدع حواد ثخانهٔ موجودات تعالی شانه حضرتلرینك بارگاه الوهیتنه عرض وتقدیمه شایان واحقدر که اثردن مؤثره استدلال ایچون جملهٔ مکوناتی یوقدن وار وبوجلهدن نوع انسانی شرف عقل ونطق ایله ممتاز الاطوار ایلدی وروایح فوایح صلوات بی نهایه اول منبع ینابیع تحقیق وعرفان ومشعل مناهج فضل وایقانك مضجع مقدسلرینه رفع واتحاف سزاوار والیقدر که ظلمتکاه جهانده ایقاد ایلدیکی مشکاة شرع مطهر کذکشتکان راه معرفت ایچون سراج انور وتأسیس ایلدیکی بنیان مرصون الارکان دین مبین تابروز محشر دائم ومستقردر وطرف تحف تسلیمات زکیه اول خواجهٔ مدرسهٔ توحید وعرفانك ارواح آل واصحابنه ارسال واهدایه اولی واوفقدر که هربری طریق سعادت رفیق شریعتده نجم تابان هدایت وبدرقهٔ امتدر * اما بعد معلوم ارباب رشد ونهی اولدیغی اوزره وقتاکه اشعهٔ عالمتاب آفتاب اسلام مشرق بطحادن پرتو افکن بروز اولدی نجید اعصارده نیرو غنودهٔ پستر سکون وآرام

تونس شهرینی غارت ایتدکلرنده ینه اسکی خصومت وتعصبك اثری اوله رق خط عربی ایله نقدر کتاب بولنمش ایسه بلا ترحم آتشه القا اولنمش واسپانیاقرالی اوچنجی فلیپ زمانده افریقیه امرائنك ملازیدا نك درونی کتاب ایله مملو پرسفینه سی طوتیلوب بوکتابلر اسپانیا قرالرینه مخصوص اولان اسکوریال کتبخانه سنه وضع ایله کویابوتصادف ضایعات سابقه یه فی الجمله صورت تلافیده واقع اولدی ایسه ده بیك سکسان بش سنه سی حزیرانك یدنجی کونی مذکور کتبخانه محترق اولغله جمله سی عربی اوله رق سکزبیك قدر کتب نادره محو ونابود اولمشدر

مخترعات

ملت حنیفهٔ عربیه کرك مرکوز فطرتلری اولان جوهر استعداد وقابلیت وکرك هیئت مدنیه لرینك اقتضای ترتیب نظامی اوزره مألوف اولدقلری تربیه وعادت کتبیدهٔ محفظهٔ طبیعت اولان بونجه علوم ومعارفك کسوه پذیر وجود اولسنه باعث وعلت اولوب انکله برابر برنیچه صنایع بدیعه وعملیات نافعه اختراع وایجادینه دخی الت ظهور اولدیلر

چالارساعت

اوروپا تاریخلرینك جمله سی متفقدر که مقانیق یعنی دور وحرکته دائر چرخ والات اعمالی صنعتنده ملت اسلامیه استعداد زمانیلرندن زیاده ایلرو لمشلر ایدی ازجمله چالارساعت وسائر تعیین اوقاته متعلق الات وادوات حکومت اسلامیه نك ظهوریله برابر میدانه چیقمش وابتدا اوروپاده بویوله ساعت خلفای عباسیه دن هارون الرشید ك قرال شارلمانیه کوندردیکی هدایانك اره سنده کورلمشدر هدایای مذکوره برچالار ساعت وغایت مصنع برشطرنج طاقمی ایله برچوق میوه وسبزه رسملرندن مرتب اوله رق اولوقته قدر اوروپا اولر بومقوله ساعت ومیوه وسبزه رسملری بیلدکلرندن جمله یه باعث استغراب اولدی مؤرخین افرنجیه دن بری دیرکه فرض ایده لمکه ذکر اولنان ساعت وزن وتحریك میاهه خاص اولان یالکز برالت ایله حرکت ایتسون ویاخود مجرد صوساعتی اولسون مادامکه پرنجدن معمول اون ایکی عدد یوارلغی ینه اول معدندن مصنوع پرطاسك اوزرینه حساب معین ایله پرده پرده شوروب بووجهله اون ایکی ساعتی تعیین ایدر ایدی بوندن اکلا شیلور که عربلر

■ الساعات

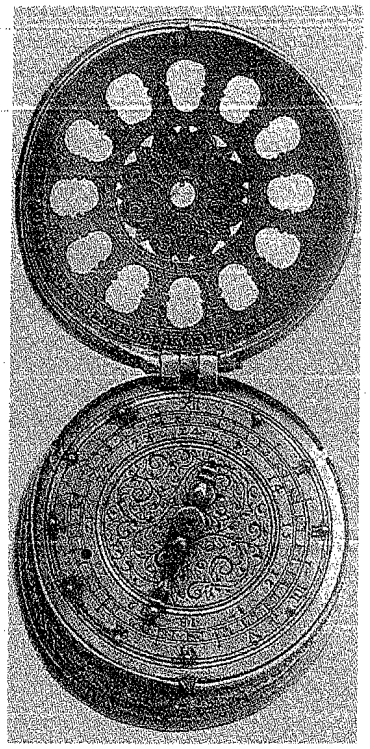
الساعة أداة لضبط الوقت، وهي إما أن تكون ساعة جدارية clock أو ساعة جيب pocket أو ساعة يد watch. ويتطلب كل منها مصدراً للطاقة power، ووسيلة لحملها والتحكم بها، وإلى مؤشرات أو عقارب للدلالة على الزمن.

لمحة تاريخية

استخدمت في العصور القديمة الساعات الرملية sandglass المبينة في الشكل ١ لقياس الزمن بالساعات والدقائق، إذ يتطلب تسرب الرمل من ثقب صغير بين سلسلة من الحواجل زمناً ثابتاً تقريباً. ولقد أطلق على هذه الوسيلة لقياس الزمن اسم الساعة الرملية لأنها كانت تستخدم أساساً لتقدير عدد الساعات، إلا أنه يمكن ضبط كمية الرمل فيها أو قطر الثقب الواصل بين سلسلة الحواجل الظاهرة في الشكل لتغدو ملائمة لقياس أي زمن.

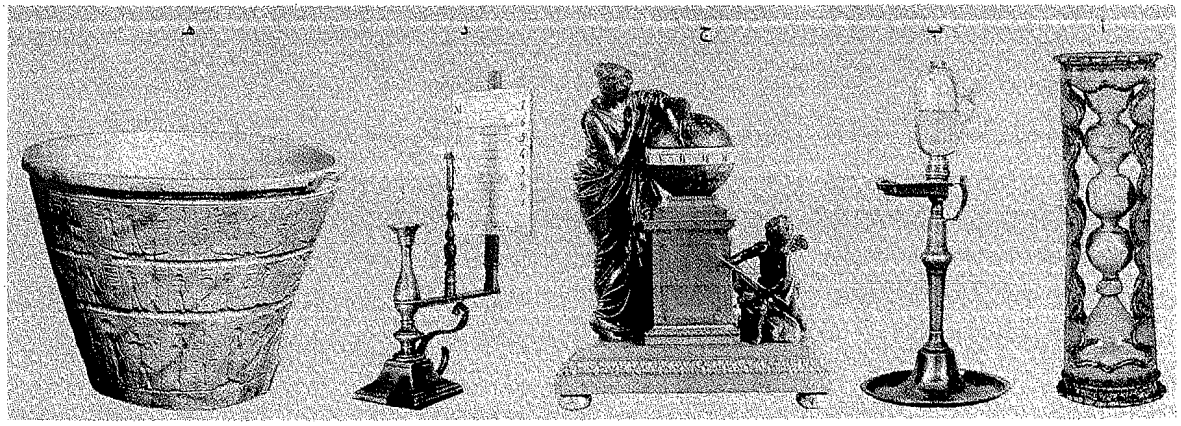
استخدم دوران الأرض حول الشمس وسيلة لقياس الزمن منذ أمد بعيد. ولعل أقدم وسيلة عرفها الإنسان حتى قبل الميلاد بنحو ٣٥٠٠ عام هي المِزْوَلة gnomon أو الساعة الشمسية، وهي عصاً شاقولية أو مسلّة obelisk تُلقي بظلها على الأرض. ومازالت المتاحف تحتفظ بساعة من هذا النوع استخدمت في مصر قبل الميلاد بثمانية قرون.

كما استخدمت عند غياب الشمس وسائل متنوعة يظهر بعضها في الشكل ١ كالشمعة ذات الأثلام notched candle، أو الحبال ذات العقد knotted rope إذ استخدم الزمن اللازم لانتقال الحريق من عقدة إلى عقدة مجاورة مقياساً للزمن، والساعة المائية water glass. ويُروى أن هارون الرشيد أهدى عام ٨٠٧ م الملك شارلمان ساعة نحاسية دقاقة أدهشته. وكانت الساعات القديمة مجهّزة بعقرب واحد يشير إلى الساعات ولم تكن تتصف بالدقة العالية. ومما حسّن من دقتها اكتشاف العالم الهولندي كريستيان هويغنز Christiaan Huygens عام ١٦٥٧ كيفية استخدام رقّاص الساعة أو النواس وسيلة لضبط دقات الساعة. وتلا ذلك قيام صانع الساعات البريطاني جورج غراهام George Graham بتحسين آلية الإفلات في الساعة، الأمر الذي زاد من دقتها وقيام جون هاريسون John Harrison بابتكار وسيلة لتعويض تغير طول النواس بسبب التمدد الحراري.



الشكل (٢) ساعة جيب «بيضة نورنبرغ»

وقد أمكن تطوير ساعات جيب كتلك المبينة في الشكل ٢ في القرن السادس عشر الميلادي نتيجة تطوير النابض الملفوف كمصدر للطاقة، وقد أخذت الساعة في حينه شكل البيضة بل لقد أطلق عليها اسم بيضة نورنبرغ



الشكل (١) وسائط ضبط للوقت قديمة

(أ) ساعة رملية إيطالية تعود إلى القرن الثامن عشر. (ب) ساعة زيت مدرجة هولندية من القرون الوسطى. (ج) ساعة ميكانيكية فرنسية تعود إلى القرن الثامن عشر. (د) شمعة ذات أثلام فرنسية تعود إلى القرن السابع عشر. (هـ) ساعة مصرية مائية قديمة.

الموسوعة العربية, المجلد العاشر, دمشق 2004. İSAM 138734

Wardī, *Taʾrīkh*, n.p. n.d. [Cairo], ii, 66; J.-C. Garcin, *Remarques sur le plan topographique de la grande mosquée de Qūṣ*, in *AI*, ix (1970), 97-108; idem, *Un centre musulman de la Haute Egypte médiévale, Qūṣ*, Cairo 1976, indispensable for the period of the military vizierate. (Th. Bianquis)

RZEWUSKI, (Count) Wenceslas Severin (1785-1831?), the son of a Hetman or supreme general of Poland.

Born at Lemberg (Lvov), he was eight years old at the time of the Second Partition of Poland in 1793. Deeply moved by the dismemberment of his native land, Wenceslas' father voluntarily exiled himself to Austria and chose Vienna for his home. He established friendly relations with the Viennese aristocracy and the French emigrés, and it was in this Franco-Germanic milieu that the young Rzewuski was brought up. Under the influence of his uncle, Jan Potocki, he early acquired a great love for the Orient and avidly studied oriental languages. Together with the famous orientalist Josef von Hammer, he began in 1809 the publication of a periodical, *Die Fundgruben des Orients* "Treasures of the East".

Also, whilst applying himself to the study of Arabic, he set up his own stud farm, having conceived the extravagant idea of improving the European horse stocks by bringing in new blood from the Arabian desert. A journey to the East was now vital for him. In 1817, having made various preparations, he set out for Istanbul in order to realise his plan. His journey took two years and had no element of the merely pleasant jaunt. He explored Turkey and Syria; went into the mountains of Nadjd; ploughed through the desert with Bedouin tribes who proclaimed him *amīr*, joined up with, in their company, the escort providing the safety of the Pilgrimage Caravan and thus was able—although a non-Muslim—to get into Mecca, whose site and the rites there he describes briefly; had a long stay with Lady Hester Stanhope; took part, against his better judgement, in the rising at Aleppo of 1819; and returned to Europe with 140 horses chosen from amongst the best of the Nadjdī stock.

Once back home, he wrote in 1822 a work in two volumes, totalling some 800 pages, *Sur les chevaux orientaux et provenants* (sic) *de races orientales*. Vol. I is devoted to the Bedouins, their natural habitat, their customs and their tribes. It is thus a lively and vivid travel narrative, rich in anecdotes and descriptions of all kinds. Everything goes past in review: towns, notably Aleppo and Damascus, the countryside, the desert, famous historical sites (Palmyra, Baalbek), the Caravan to Mecca, eminent personalities (Lady Hester Stanhope and the explorer ʿAlī Bey, whose last moments he describes, dying, he affirms, in the Christian faith) and the main events, especially the great revolt at Aleppo, whose course is recorded day by day.

Bibliography: Rzewuski's book, unpublished, is in two volumes, richly illustrated with drawings in Indian ink, in the Warsaw Library, no. Tv. 6651; cf. L. Damoiseau, *Voyage en Syrie et dans le désert*, Paris 1833, 9, 67, 77, 114-15, 130, 140.

(J. Chelhod)

S

ṢĀʿ (a., masc. or fem.), a measure for grain "of the value of 4 *mudd* (*modius*) according to the custom of Medina" (*LʿA*; al-Khʷārazmī, *Mafātīḥ al-ʿulūm*, ed. Van Vloten, 14). If the cubic contents of the *ṣāʿ*, like that of the *mudd*, varied with town and district as far as commercial transactions were concerned, the value of the *ṣāʿ* was from the canonical point of view fixed in religious law by the Prophet in the year 2/623-4 when he laid down the ritual details of the orthodox feast of *ʿīd al-fiṭr*, which carried with it the compulsory giving of alms called *zakāt al-fiṭr*, the value of which in grain was one *ṣāʿ* for each member of a family. It was, of course, the *ṣāʿ* of Medina that was chosen as the standard measure and the *mudd* of Medina henceforth was called *mudd al-nabī*.

This primitive *mudd* of orthodox Islam was standardised by Zayd b. Thābit; and it is from this standard that the *mudd*s and *ṣāʿ*s made henceforth for religious use seem to have been copied more or less accurately. This is, at least, what has been proved for the Maghrib from various documents. According to these documents, the official capacity of the *mudd al-nabī* would be approximately 5 gills and that of the *ṣāʿ* 5 pints.

The Muslim jurists give the following estimates of this measure. For them the value of the *ṣāʿ* is 26 2/3 *riṭl*s or *raṭl*s, the *riṭl* being equivalent to 128 Meccan drams and the dram equivalent to 50 2/3 grains of barley. We see how lacking in precision this definition is. If there is no *mudd* or *ṣāʿ* available, the quantity of grain to be distributed for the *zakāt al-fiṭr* is measured with the hands held together, half open, with palms upwards.

Lastly, besides this use of the *ṣāʿ* and of the *mudd al-nabī*, these measures are further used in certain measurements required by religious law: (1) to calculate the *zakāt*, and (2) to measure the minimum quantity of water necessary for an ordinary ablution (*wuḍūʾ*, a *mudd*) and for general ablution (*ghusl*, a *ṣāʿ*).

Bibliography: The Arabic dictionaries, especially the *Muḥīṭ al-muḥīṭ*, Beirut 1870, ii, 1221, col. 1; the treatises on Islamic law and the collections of Ḥadīth; A. Bel, *Note sur trois anciens vases en cuivre gravé, trouvés à Fès et servant à mesurer l'aumône légale du Fiṭr*, in *Bull. Archéolog.* (Paris 1917), 359-87, illustrated, where further references are given. See also makāyīl and the Bibl. there. (A. Bel)

SĀʿA (a.) "hour", hence "clock".

1. In technology.

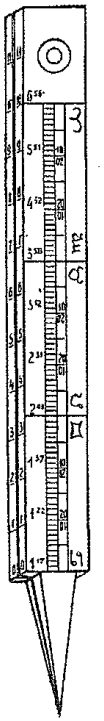
Monumental water-clocks are described in detail in two Arabic treatises. Al-Djazarī [*q.v.* in Suppl.] in his book on mechanical contrivances completed in Diyār Bakr in 602/1206 describes two such machines. Riḍwān b. al-Sāʿātī, in a treatise dated 600/1203, describes the water-clock built by his father Muḥammad at the Djayrūn gate in Damascus (see E. Wiedemann and F. Hauser, *Über die Uhren in Bereich der Islamischen Kultur*, in *Nova Acta der Kaiserl. Leop. Deutschen Akad. der Naturforscher*, ciii [1918], 167-272). It fell into disrepair after Muḥammad's death and was restored to working condition under his son's supervision. It was a large construction, having a timber working face about 4.73 m wide by 2.78 m high, built into the front of a masonry structure. The clock had several design defects which undoubtedly caused the

TAKIYÜDDIN
SAAT

Tekeli, Sevim:
16'ıncı [Onaltıncı] Asırda Osmanlılarda Saat ve Takiyüddin'in "Mekanik saat Konstrüksüyonuna Dair En Parlak Yıldızlar" Adlı Eseri. [engl. Titel:] The Clocks in Ottoman Empire in 16th Century and Taqi al Din's "The Brightest Stars For The Construction Of The Mechanical Clocks". Ankara, Ankara Üniversitesi Basımevi, 1966.
V,339 S., 120 Ill..
(Ankara Üniversitesi Dil ve Tarih-Cografya Fakültesi Yayınları ; 171, Felsefe Arastırmaları Enstitüsü Yayınları : 1)
Sign.:55343

DOĞU ve KUZEY AFRİKA SAATLERİ

Namaz Vakitlerini Belirlemek İçin Pergel



Büyük bir ihtimalle meşhur astronom Ebū' Abdallāh Muḥammed b. Mūsā el-Ḫārizmī[1] (3./9.yüzyılın 1. yarısı)'ye ait olan henüz yayınlanmamış bir yazmada namaz vakitlerini belirlemeye yarayan basit bir alet tarif edilmektedir (*berkār yu'refu bihī el-evḳāt li-eṣ-ṣalāt ve-yūḳasu bihī eẓ-ẓıll*). Bunun tarifi J. Frank ve E. Wiedemann[2] tarafından incelenmiştir. Özetleri şöyledir: "Alet bir tür pergeldir, kolları her iki dış yüzlerinde bir çizelge taşımaktadır.

1 Halife el-Me'mūn döneminde (198-218/813-833) faaliyette bulunmuştur, bkz. Sezgin, F.: a.e., Cilt 6, s. 140-143. Bize ulaşan yazma (Berlin 5790, fol. 77b-97b) *Zīc*'inin veya *Kitāb el-Aṣṭurlāb*'ının bir bölümü gibi görünüyor.

2 *Die Gebetszeiten im Islam*, in: Sitzungsberichte der Physikalisch-medizinischen Sozietät 58/1925/1-32 (Tekrarbasım: Islamic Mathematics and Astronomy serisi Cilt 92, Frankfurt 1998, s. 97-128).

قواعد النشر

يسر هيئة تحرير مجلة دراسات بيت المقدس أن توجه الدعوة إلى جميع المختصين لتقديم مشاركات أكاديمية أصيلة في أي مجال من مجالات بيت المقدس من بداية ظهور الإسلام إلى الوقت الحاضر. عند إرسال مخطوطاتكم نرجو مراعات الإجراءات التالية:

- ترسل البحوث باللغة العربية أو الإنجليزية على ثلاث نسخ مطبوعة على وجه واحد فقط من الصفحة وبمسافات مزدوجة وهامش 2,5 سم، على أن تكون مرفقة بقرص كمبيوتر إذا أمكن.
- يجب أن تكون المخطوطة مابين 5 آلاف و8 آلاف كلمة.
- يجب أن تتضمن صفحة العنوان: عنوان المقالة وإسم (أسماء) المؤلف (المؤلفين) والعنوان الحالي للمؤلف. أما المخطوطة فيجب أن تتضمن عنوان المقالة فقط وبدون إسم المؤلف لتسهيل مهمة التحكيم.
- تنشر المجلة البحوث الأكاديمية التي تتحقق فيها شروط الأصالة والإحاطة والاستقصاء والعمق والموضوعية والمنهجية والرجوع إلى المصادر الأصلية وأسلوب البحث العلمي بالطريقة المتعارف عليها.
- جميع المخطوطات يجب أن تستوفي مستوى متطلبات المجلة الدولية لدراسات الشرق الأوسط.
- توثيق المراجع والمصادر المشار إليها، وتكتب في آخر البحث.
- يشترط في البحث ألا يكون قد نشر في أي مكان آخر، أو غير مرسل للنشر إلى مطبوعة أخرى..
- تعرض البحوث المقدمة على محكمين من داخل هيئة التحرير أو من أعضاء الهيئة الإستشارية الدولية للمجلة، وتبقى أسماء الباحثين والمحكمين مكتومة، يطلب من الباحث إعادة النظر في بحثه في ضوء ملاحظات المحكمين.
- لرئيس التحرير الحق في إجراء التغييرات التي يراها ضرورية لأغراض الصياغة والتبويب.
- ما تنشره المجلة يعبر عن وجهة نظر صاحبه، ولا يعبر بالضرورة عن وجهة نظر المجلة.
- البحوث التي ترسل إلى المجلة لا تعاد ولا تسترد سواء نشرت أم لم تنشر، ولا تلتزم المجلة بإبداء أسباب عدم النشر.
- ترتب البحوث عند النشر وفق اعتبارات فنية لا علاقة لها بمكانة البحث أو الباحث.
- يعطى صاحب البحث المنشور 20 فصلة (مستخرج) من بحثه المنشور، ويكون للمجلة حق إعادة نشر البحث منفصلاً أو ضمن مجموعة من البحوث، بلغته الأصلية أو مترجماً إلى أي لغة أخرى، دون حاجة إلى استئذان صاحب البحث.

والمجلة تنشر مقالات ووثائق وتقارير ومراجعات لكتب ومقالات. ويرجى العلم بأن الكتب التي ترسل للمراجعة في المجلة سيتم مراجعتها أو ذكرها على الأقل. أما الكتب التي لن يتم مراجعتها فلن تعاد إلى أصحابها أو للناشرين. بالإضافة إلى ذلك فإن المجلة تقدم معلومات وإعلانات وتقارير عن مؤتمرات ومعارض ... وأحداث لها علاقة ببيت المقدس.

مجلة دراسات بيت المقدس (شتاء 2009): 1-14

تاريخ الساعات في مدينة بيت المقدس خلال العهد العثماني

بشير عبد الغني بركات

مدير دار إسعاف النشاشيبي للثقافة والفنون والآداب – القدس

برع المسلمون في صناعة الساعات الرملية والزئبقية والمعدنية في عصورهم الذهبية، وأشهر مثال على ذلك تلك الساعة النحاسية التي أهداها هارون الرشيد لشارلمان ملك فرنسا فأحدثت مفاجأة علمية لدى الفرنجة آنذاك.[1] لكن تلك الصناعة انتقلت إلى الغرب وتطورت تدريجيا في عصرٍ تزامن مع تقهقر الشرق علميا وصناعيا حتى أصبح المسلمون يستوردون الساعات من الدول الأوروبية مع غيرها من المصنوعات المتطورة. وتزامن ذلك أيضا مع بلوغ الدولة العثمانية أوج عظمتها العسكرية، ومع ذلك فإنني لم أعثر على ذكرٍ لأي ساعة في القدس صُنعت في تلك الدولة العظمى خلال دراستي لعهدها الزاهر. وسأحاول في هذا البحث عن تاريخ دخول الساعات إلى مدينة بيت المقدس واستيرادها وأصنافها وصيانتها أن ألج باباً في تاريخ بيت المقدس لم يطرقه أحد من قبل. وهو يستند بمعظمه على حجج تركات الموتى في سجلات المحكمة الشرعية المقدسية.[2]

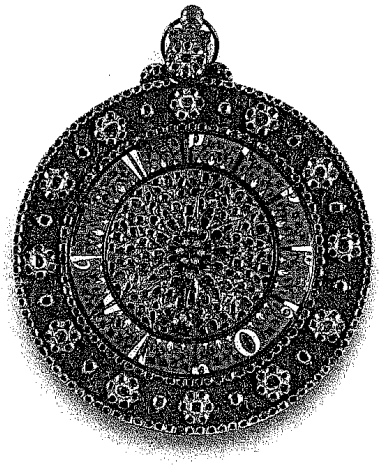
الأذان يقوم مقام الساعات

كانت عامة الشعب في العهد العثماني تتخذ من أذان الصلاة وإقامتها وسيلة لتحديد الأوقات حيث كانت الساعات بمختلف أنواعها غير متوفرة لدى الطبقتين الفقيرة والمتوسطة. وتدل على ذلك مئات الحجج الشرعية، ففي الثالث من ربيع الأول

Sergi Organizasyonu: Şennur Sertürk,
Ed. Selahattin Özpalabıyık, Çeviriler: Mary Isın.

Zamanın Görünen Yüzü
SAATLER

Visible Faces of the Time
TIMEPIECES



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Kültür Varlıkları ve Müzeler Genel Müdürlüğü

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FELSEFE ARAŞTIRMALARI ENSTİTÜSÜ YAYINLARI SAYI: 1

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The Clocks in Ottoman Empire in 16th Century And Taqi al Din's "The Brightest Stars For The Construction Of The Mechanical Clocks"

SEVİM TEKELİ

ANKARA ÜNİVERSİTESİ BASIMEVİ . 1966

KİTAP YAYINEVİ – 79
TARİH VE COĞRAFYA DİZİSİ – 32

SULTAN İÇİN BİR SAAT; YAKINDOĞU'DA AVRUPA SAAT VE SAATÇİLERİ/OTTO KURZ

ÖZGÜN ADI
EUROPEAN CLOCKS AND WATCHES IN THE NEAR EAST

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ALİ ÖZDAMAR

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YAYINA HAZIRLAYAN
DOĞAN GÜNDÜZ

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1. BASIM
ŞUBAT 2005, İSTANBUL

ISBN 975 8704-81-8

YAYIN YÖNETMENİ
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STUDIES OF THE
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VOL. 34

O. KURZ

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LEIDEN

Topkapı Sarayı Müzesindeki saatların kataloğu.

Catalogue of clocks and watches in the Topkapı Sarayı Museum.

Katalog der ausgestellten Uhren im Topkapı Sarayı Museum zu Istanbul.

Catalogue des pendules et montres exposées au musée de Topkapı Sarayı à Istanbul.

Wolfgang Meyer
İstanbul-Karaköy,
Billur Sok. No. 8

İSLAMDA VE OSMANLILARDA SAAT

Prof. Dr. Muammer Dizer

Prof. Dr. Muammer Dizer, Boğaziçi Üniversitesi Astronomi Bölümü Öğretim Üyesi ve Kandilli Rasathanesi Eski Müdürü. Astronomi tarihi konusunda çok sayıda makalesi ve eseri bulunan Dizer'in yayınlanmış eserleri şunlardır;

1- Türkiye'de Astronomi Çalışmaları (1935-1971)
Kandilli Rasathanesi 50. yıl Yay. No: 1 İstanbul, 118 sf., 1973
(Selâhattin Beyazıt, Atilla Özgüç ile)

2-Cumhuriyetin 50. yılında Türk Rasathaneleri
Kandilli Rasathanesi 50. yıl Yay. No: 3 İstanbul, 40 sf., 1973

3- Kandilli Rasathanesi
Kandilli Rasathanesi 50. yıl Yay. No:2 İstanbul, 55 sf., 1973

4- Kandilli Rasathanesi Kitaplığı, Yazma Eserler Kataloğu I
Kandilli Rasathanesi Bilim Tarihi Yay. No: 6, İstanbul, 46 sf., 1973

5- Kandilli Rasathanesi Kitaplığı Takvim Kataloğu
Kandilli Rasathanesi Bilim Tarihi Yay. No: 7, İstanbul, 46 sf., 1973
(Atilla Özgüç ile)

6- 1923-1966 Döneminde Astronomi Dalındaki Araştırmalara Türklerin Katkısını Gösteren Bir Bibliyografya ve Bazı Gözlemler
TÜBİTAK, IV. Bilim Kong. Bilim Adamı Yetiştirme Grubu, Tutanak 4 sf., Ankara, 1973
(E. İnönü ile)

7- İslâmda Rasathaneler (Uluslararası Sempozyum, 1977)
Editör: M.E. Basımevi, 300 sayfa, 1980

8- The Relation of Islam to Astronomy
Istanbul, Kandilli Rasathanesi Matbaası, 18 sayfa, 1980

9- Osmanlı Türklerinde Astronomi ve Rasathaneler : İstanbul Rasathanesinde Sarkaçlı Saat Kullanıldı mı?
TÜBİTAK, VII. Bilim Kong. BAYG Grubu, 1980

10- Rub'u Tahtası, Boğaziçi Üniversitesi Yay. 1986

11- Ali Kuşcu, Kültür Bakanlığı Yay. 1987

12-Takıyüddin, Kültür Bakanlığı Yay. 1988.

İnsanlar toplum hayatı yaşamaya başladıktan sonra güneşi günlük ve Ay'ı da uzun süreli yaşantılarını düzenlemekte kullanmışlardır. Güneşin gök yüzündeki durumunu tanımlamakta kullanılan aracın şekli ne olursa olsun, buna saat adı verilmektedir. Şu halde saatin yaşam hikâyesi insanlık tarihi kadar eski dersek bir gerçeği vurgulamış oluruz. Şüphesiz başlangıçta günlük işleri düzenlemekte güneşin doğuş ve batışı yeterli idi. Fakat toplum hayatı ve özellikle mabetlerin insanlar üzerindeki etkisi, zamanı tayinde bir alet kullanmayı zorunlu kıldı. Zaman tayininde kullanılan aletlerin en eskisi yere düşey çakılan bir çubuktur.

Güneşin gök yüzündeki konumuna göre düşey çubuğun gölgesinin doğrultusu veya uzunluğu zamanı verir. Güneş doğar ve batarken çubuğun gölgesi sonsuz, öğle vaktinde ise en kısa ve kuzey-güney doğrultusundadır. Tarihi kadimde bir çubuk gölgesinin uzunluğu ve yönü ile zamanın tayin edildiği bilinen bir gerçektir. Çok eskiden beri düşey bir obelisk veya gnomon denen düşey bir çubuğun öğle gölge uzunluğunun bütün bir yıl boyunca değiştiği bilinmektedir. Bir düşey çubuğun gölgesinin en kısa olduğu zaman yaz başlangıcını, en uzun olduğu zaman ise kış başlangıcını işaret eder. Diğer astronomi amaçları için de kullanılan obelisk gibi düşey sütunlar ilk astronomi gözlem aletini oluşturur.

Bir çubuğun gölgesi yardımı ile zaman tayininde kullanılan alete genel anlamda güneş saati adı verilir. Yunan matematikçileri fevkalade karışık güneş saatleri yaptılarsa da bunların gerçek kâşifi değillerdi. Nitekim Herodotus'dan öğrendiğimize göre Güneş saatleri Babil kökenlidir.

Memleketimiz müzelerinde çok eski zamanlardan kalma güneş saatleri bulunmaktadır. Bu saatler incelendiğinde bazılarının evleri ve hatta mezar taşlarını süslemekte kullanıldığını görüyoruz. İzmit(Nikomedia) bölgesinde bulunan taşdan yapılmış dikey çubuklu güneş saati olasılıkla bir evin güney cephesini süslemekte idi. Bu saatin kadranı oniki eşitparçaya bölünmüş olup, her biri birer Yunan harfi ile tanımlanmıştır. Çubuğun gölgesi saatin orta çizgisi üzerine geldiği zaman tam öğle vaktini işaret eder. Burada A harfi ile tanımlanan ilk çizgi, güneşin doğuşundan sonraki ilk saati gösterir. Bilindiği gibi M.Ö. 3000 yılından beri Sümerliler gece ve gündüzü oniki eşit parçaya bölmüşlerdir. Bunlara Arapçada saat-i zamaniye veya eşit olmayan saat taksimatı adı verilir. Benzer taksimat İslam ülkelerinde de uzun yıllar kullanılmıştır. M.Ö. 1 ve 2. yüzyıla ait olduğu sanılan, Yalvaç (Phisidia) da bulunan taş parçası üzerindeki iki güneş saati olasılıkla, bir binanın doğu ve güney cephelerinin birleştiği köşe üzerinde bulunuyordu.

İlginç diğer bir örnek de M.Ö. 2. yüzyıllarda, bir Roma mezarı taşı üzerine işlenmiş güneş saatidir.

M.Ö. 3. yüzyıldan itibaren düzlem güneş saatleri ile beraber küresel güneş saatleri de kullanılmaya başlandı. İlk defa M.Ö. 3. yüzyılda Kaldeli bir rahip ve astronom olan Berosus, yarıküre şeklinde güneş

علم الساعات والعمل بها

تأليف رضوان بن محمد الساعاتي المتوفى حوالي سنة ٦١٧ هـ

مع

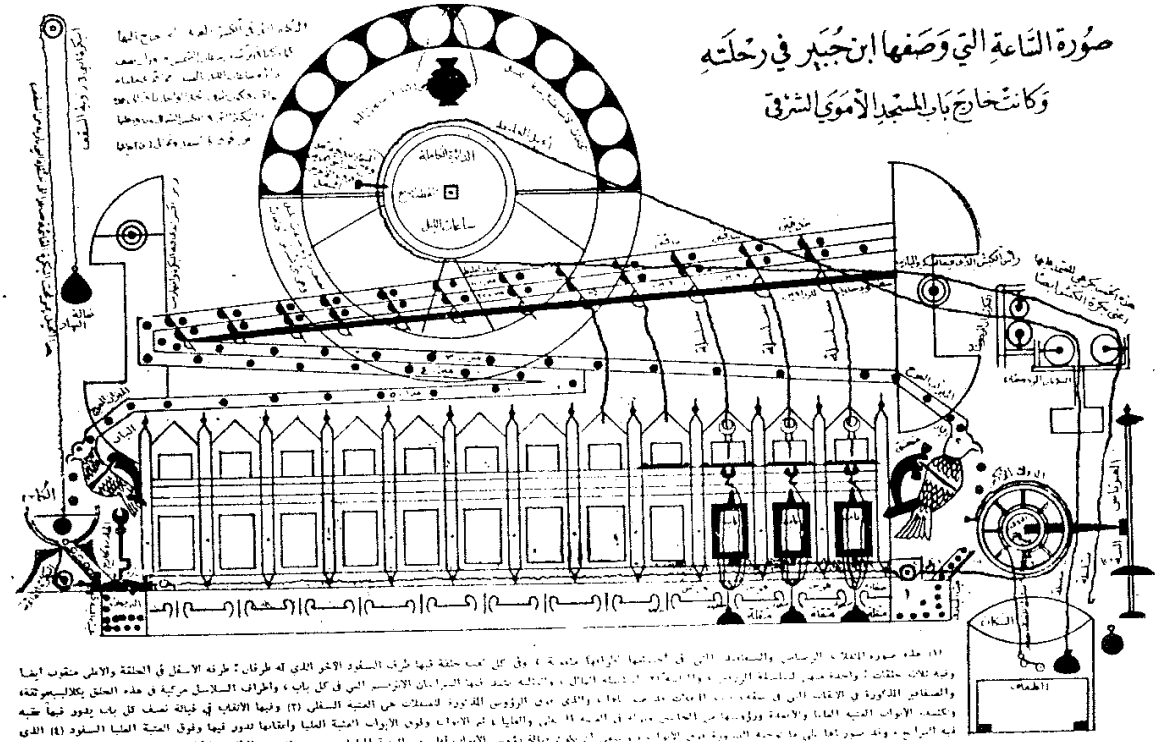
مجموع في الميكانيك الإسلامي

بعثه من مرقده وحققه وقدم له

محمد أحمد دهمان

بين صفحتي ٢٣٠ و ٢٣١

صورة الساعة التي وصفها ابن جبير في رحلته
وكانت خارج باب المسجد الأموي الشرقي



(١) بكرة العزبة الشرقية من الحائط .

مصطبة السهود تحت الساعات ، وليست من الأصل زدناها لكثرة ورودها في كتب التاريخ

A BRIEF HISTORY OF CLOCKS

Horology, or the science of calculating time, has preoccupied human beings for thousands of years. The first instruments for measuring time were made in Egypt and Mesopotamia and are thought to have been used in the 17th century BC,1 although the oldest surviving example dates from three centuries later. Early measurements of time were based on the principle of measuring the distance moved by the sun from sunrise to sunset over specific intervals. Having realised the causative link between sunshine and shadows, the change in direction and length of shadows through the day provided the principle on which the first clocks were made. As countries enjoying almost constant sunshine, Egypt and Mesopotamia provided perfect conditions for the development of the shadow clock and sundials. But these were of scant use in northern climes where cloud obscured the sun for a large part of the year. It was hardly worth taking pains to construct an instrument which would only work at 25 percent of its capacity, and furthermore, whatever the climate, shadow clocks were useless during the hours of darkness.

Egyptian civilisation was the source of two significant units of time which we still use today. One was the concept of a year divided into 365 days, and the other a day divided into 24 hours. The Egyptian calendar year was only a quarter of a day out from the solar year on which it was based.[2]

The Obelisk in Sultanahmet Square in Istanbul. The miniaturist Lokman who illustrated the circumcision celebrations of Şehzade Mehmed, the son of Sultan Murad III, noticed the slant of the apex of the Obelisk. Surname-i Hümayun. Topkapı Palace Museum Library H.1344

The Egyptians were aware that the relative lengths of night and day varied through the year, with the result that the equal hourly periods into which they divided darkness and daylight varied in length accordingly. An hour varied from 120 minutes in summer to 90 minutes in winter.[3]

The picture of an Egyptian shadow clock dating from the 13th century BC shows the hours of daylight divided into ten, but in later years the two hours of dusk and day-

Sayı

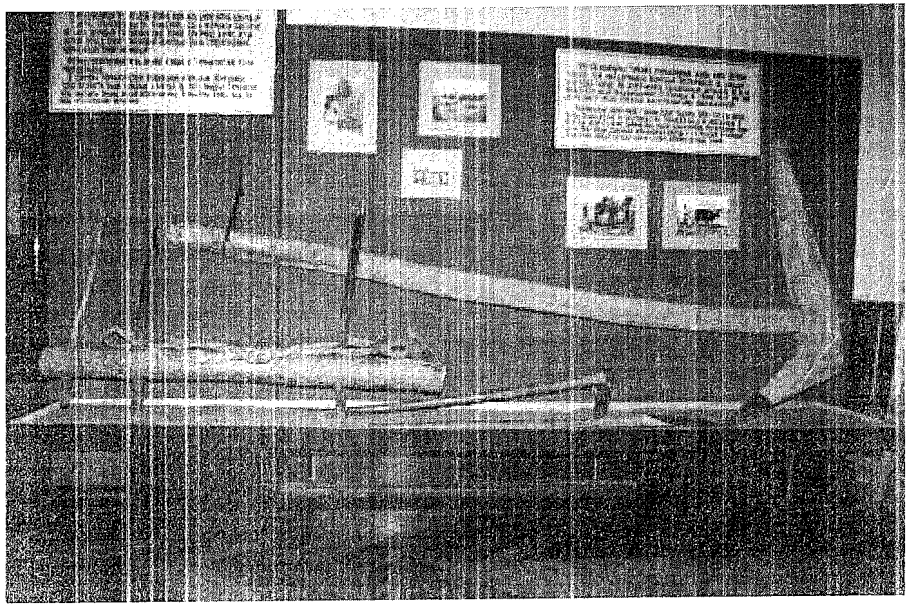
Über die Uhren im Bereich der islamischen Kultur.

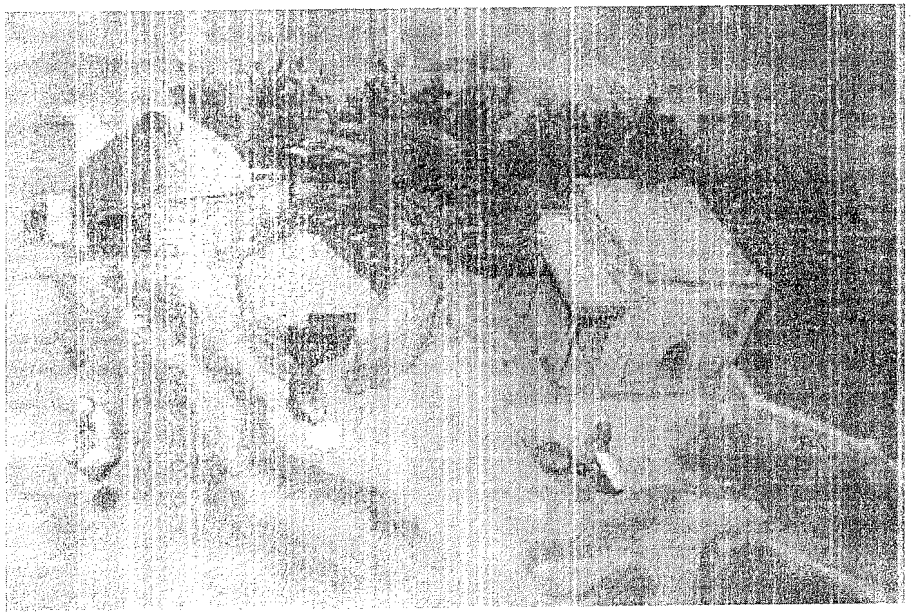
Von

Dr. phil. **Eilhard Wiedemann**

unter Mitwirkung von

Dr. phil. und Dr. techn. **Fritz Hauser.**





TÜRKÇE SĀʿATNĀMELER VE HİBETU'LLĀH İBNİ İBRĀHİM'İN SĀʿATNĀMESİ

Ahmet BURAN *

Giriş

Nesnenin harekete başladığı an ile durduğu an arasında geçen süre, bir bütün halinde, zaman kavramıyla ifade edilmektedir. Atom sürekli hareket halinde olduğuna göre, aslında genel anlamda hareketin bittiği an yoktur. Dolayısıyla zaman, sürekli var olan ve içinde geçmiş, yaşanan an ve gelecek gibi üç temel bölüm bulunan bir kavramdır.

Fizik bilginleri ve felsefeciler zamanı "birbirini izleyen anlardan oluşan çizgisel bir bütünlük; önce olandan sonra olana doğru giden sonsuz anlar bütünü" olarak tanımlamaktadırlar. Zaman, "hareketin ölçüsü", zaman duygusu ise, "insanın ayırt edici" bir özelliğidir. Zaman, "a priori" olarak vardır ve "görüngüler" ancak onun içinde gerçeklik kazanırlar. Dolayısıyla zaman, kimi düşünürlerce, "varlığın dördüncü boyutu" , hatta zamanın dışında herhangi bir varlıktan söz edilemeyeceği için "varlığın kendisi" olarak da tanımlanmaktadır.

Eşyayı, insanı, varlığı kuşatan bu kavramın kontrol edilmesi, durdurulması veya tersine çevrilmesi mümkün değildir. İnsan hayatının her anını ilgilendiren ve dünya üzerinde yaşadığımız süre ile de yakından ilgili olan bu kavramı insanoğlu tanımaya çalışmış ve bunu yaşadığı doğal ortamın şartlarına bağlı olarak bölümlere ayırmıştır. Böylece, dünya zamanına ait olmak üzere asır, yıl, mevsim, ay, hafta, gün, gece; saat, dakika, saniye... gibi zaman bölümleri ve birimleri ortaya çıkmıştır.

İnsanın hayatını belli bir düzen ve disiplin içinde sürdürebilmesi için zamanı iyi ve doğru kullanması gerekir. Onun için her din ve felsefe zamana değer verir. Kur'an-ı Kerim'in bir ayetinde[1] zamana yemin edilmesi ise, bu önemin belirtilmesi bakımından özel bir anlam taşımaktadır.

Çok eski çağlardan beri insanlar zaman ve zaman kavramının oluşumunda

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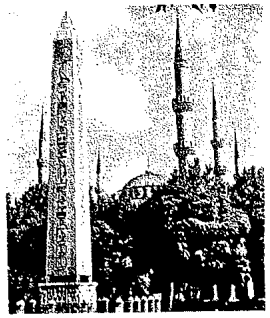
[1] Asr / 1.

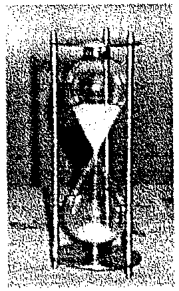
Türk-İslâm Bilim Tarihi
SAATLER

Dr. Müh. A. Necati AKGÜR

Eski Mısır'da uzun kış geceleri ile kısa yaz geceleri gibi gündüzler de 12 saate bölünürdü.Buna **mevsim saatleri (fr. Heure temporaire, ing. Temporary hours.** Eski deyişle: **Saat-i zamaniye** ya da **saat-i muavvece)** adı verilmektedir. Söz gelimi İstanbul enleminde, 22 Haziran yaz gündönümü sıraları en uzun gündüz süresi 15 saat 22 dakikadır (Takvimlere bakınız). Bu süre 12'ye bölünürse, bu günler için mevsim saati süresi (yaklaşık) 1 saat 17 dakika eder. 22 Aralık kış gündönümü sıralarıysa, en kısa gündüz süresi 9 saat 27 dakika, mevsim saati süresiyse yalnızca 47,25 dakikadır. 21 Mart ve 23 Eylül ilkbahar ve sonbahar ılınımı günleri sıraları, bilindiği gibi, gece-gündüz süreleri eşitlenmekte ve her biri 12 şer saat olmaktadır. Bu durumda mevsim saati süreleri de tam bir saat olacaktır. Mısır'da saat süreleri ise, gündüzleri gnomon (yere dikilmiş bir çubuğun gölgesi uzunluğunun ölçülmesi) ile, geceleriyse kimi bilinen yıldızların doğuşları ya da boylam çizgisi üzerine gelişleri (köşegensel yıldız saatleri yöntemi) ile ölçümlenirdi. İstanbul Sultanahmet meydanındaki, üzeri hiyeroglif yazısıyla süslü ünlü büyük dikilitaş da, 4'üncü yüzyılda Mısır'dan getirilmiş bir gnomondur (Şekil 1). Bunlara yardımcı olmak üzere de kum saati ya da su saati kullanılmaktaydı. Kum saati, söz gelişi bir saatte 8 kere alt-üst ediliyorsa, saati 8 eşit zaman parçasına bölüyor demektir. (Şekil 2).



Şekil 1



Şekil 2

Mezopotamya'da ise günler, eşit olarak 12 saate ayrılırdı. Tarihçilerin pîri-atası sayılan Herodotos (M.Ö. 490-425), ünlü **Tarih**'inde, Yunanlılar'ın gnomonu, Güneş saatini, günün 12'ye bölünmesini Babil'den öğrendiklerini söyler. Yunanlılar, ancak Helenistik dönemde (M.Ö. 330-30), bir günü 24 saate bölmüşlerdir (21 Mart-23 Eylül mevsim saatleri gibi). Bu türlü saatlere de **Eşit saatler (Heure équinoxiale, saat-i müsteviye** veya **saat-i mu'tedile)** denilmektedir. Biz bugün saat deyince, bu sonuncu saatleri anlıyoruz (Sayılı, s. 88-100 ve 333-334; Ali Kuşçu, II konu-kesim 9; Gazi Ahmet Muhtar Paşa, s. 3; Herodotos, II, 109; Meyer, s. 15; Dizer, I yazı)

797 yılında, Şarlman, Halife Harun Reşit'e bir elçilik heyeti göndererek ondan Filistin'de Franklar'ın da yerleşebilmeleri ricasında bulunmuş, böylece Kudüs'te bir manastır ile bir hastane kurdurulmasını sağlamıştı. Buna karşılık olarak Harun Reşit de, dört yıl sonra, Şarlman'a bir heyet ve hediyeler yollamıştı. Şarlman, heyeti İvre kentinde kabul etmişti. Hediyeler arasında bir de fil bulunmaktaydı ki bu filin, 810 yılında, Ekslâşapel kentinde ölmüş olduğu bilinmektedir. Daha sonra 807'de, Halife, Şarlman'a ikinci bir heyet ve hediyeler yollamıştı. Bu hediyeler arasında ise bir çalar su saati de bulunmaktaydı (Salih Zeki. c. 2, s. 62).

Ünlü gezgin Marko Polo (1254-1324), Kubilay Han'ın başkenti olan Hanbalık (bugünkü Pekin)'tan sözederken: *"... Bu binada büyük bir gong bulunuyor. Bu gongun yanında da bir saat var. Gece başlayınca, nöbetçi büyük gonga bir defa vurur. Böylece gongun sesini duyan, saatin bir olduğunu anlar. Bir saat sonra iki defa, daha sonra üç defa vurur. Sabah Güneş doğunca da aynı işi yaparlar"* diyor (Marko Polo. c. 2, s. 86). Sözkonusu saatin bir gnomon olduğu anlaşılmaktadır.

Biz bu araştırmamızda, saatleri, yalnızca, bizde eskiden kullanılan (alaturka) ve şimdi kullanmakta olduğumuz şekilleriyle ele alarak inceleyeceğiz.

Saatleri buna göre önce ikiye ayıracağız:

1. Akşam başlangıçlı saatler
2. Öğle bağlantılı saatler

1. AKŞAM BAŞLANGIÇLI (gurûbî, alaturka, ezanî) SAATLER

Ay (Hicrî) takviminde Ay aylarının, bir akşam vakti, Güneşin ufuk çizgisi üzerinde battığı yerde, yeni Ay'ın sola bakan pek ince bir ayçe biçiminde görünmesiyle başladığını biliriz. Böylece başlayan bu yeni ayla birlikte yeni bir gün de başlamış olmaktadır. Dolayısıyla Hicrî tavkvimde günler, akşamları, Güneşin batışı anında (şerîat'a yani İslâm dini hükümlerine göre: Güneş dairesinin, bütünüyle batarak üst yanından ufuk çizgisine teğet olduğu anda) başlamaktadır. İşte saatimizi, yeni bir günün başladığı, bu Güneşin batışı anında 12.00 a (yani 0.00 a) getirirsek, **akşam başlangıçlı (gurûbî** veya **alaturka)** saatimiz çalışmaya başlamış olacaktır.

Demek oluyor ki akşam başlangıçlı saatlerin **temel ilkesi**, akşamları,

OTTOMAN CLOCK TOWERS

The history of mechanical clocks in the Ottoman Empire goes back to the early 16th century. While clocks and watches became commonplace articles in the palace, spreading from there to the upper echelons of society, they remained a luxury for the majority of people.

In the early years of the 19th century as modernization and reform gained momentum among the Ottomans, the construction of clock towers began in Anatolian cities. In the Balkan territories of the empire, however, the construction of clock towers began as early as the mid -17th century. In his Seyahatname Evliya Çelebi reports the existence of Ottoman clock towers in some of the cities in the Balkan peninsula.

Not till one and a half centuries later did the construction of clocktowers begin in Istanbul and the rest of Anatolia. In Europe the construction of clock towers began in the early 14th century, the first being built in Italy. [1]. Why was it that the Turks took so long to build their own clock towers despite their readiness to adopt other innovations? One of those who asked this question was Baron von Busbecq who travelled to Istanbul and Amasya as envoy of the Austrian emperor during the reign of Sultan Süleyman the Magnificent. He attributed it to a fear of undermining religious tradition [2].The true reason was the strong association of the concept of time among the Ottomans with prayer times. This time system based on unequal hours could not readily be adapted to the western system of hours of fixed length nor to the working of mechanical clocks. Clock towers began to be constructed in Anatolia a hundred years before clocks and watches became widespread in Ottoman society and before the adoption of the European time system. Sometimes in later years two of the four dials showed Turkish time while the other two showed European time, a practice which continued through to the end of the 19th century.

The widespread construction of Ottoman clock towers coincides with a growing desire for modernization and reform throughout the empire. At the instigation of the state the concept of time based on the hours of prayer gradually changed in favour of a more detailed division of time as in the West, motivated by the desire to introduce a system based on a more time-conscious attitude. All technical innovations among the Ottomans had begun at the imperial palace. It was therefore natural that changes of the concept of time should again be pioneered by the Ottoman ruling classes.

An Ottoman clock tower in the Balkans.

MW, 3. (1913) pp. 262

makale KUR'AN (VI)

THE CLOCK, THE CALENDAR AND THE KORAN

—:o:—

THE religion which Mohammed founded bears everywhere the imprint of his life and character. He was not only the prophet but the prophecy of Islam. This is true not only as regards matters of faith and ritual, but also of many things which at first sight would seem to have no connexion with either.

The connexion of the three words in the title may seem merely fortuitous or alliterative to the reader: to the Moslem their connexion is perfectly evident, because the clock and the calendar are set back and regulated by the book of the prophet. The Moslem calendar with its twelve lunar months and its two great feast days, is fixed according to the laws of the Koran and orthodox tradition, based upon the practice of Mohammed himself. The fast month of Ramadhan, for example, is so-called from the Arabic root which means *to burn*, and before the days of Islam this month, in accordance with its name, always fell in the heat of summer. Because of the change in the calendar, and because Mohammed abolished the intercalary months, the fast occurs eleven days earlier each year and travels all round the seasons. Although the ancient Arabian year was composed of twelve lunar months, the Arabs about the year 412 introduced a system of intercalation whereby one month additional was inserted every three years. Mohammed abolished this scientific practice and we read in the Koran (Surah ix. 36, 37): "Verily, the number of months with God is twelve months in God's Book, on the day when He created the heavens and the earth; of these are four that are sacred; that is the subsisting religion."

By this one verse of the Koran, which is unchanged and irrevocable, the whole Moslem world is practically

bound fast to the lunar calendar. Beidhawi and other Moslem commentators try to explain these verses in such a way as to hide the fact that the Arabs in the "Time of Ignorance" were far more scientific in their calendar than were Mohammed himself or the Arabs who followed his leading. In the Commentary of Mohammed Hussein Nisabori, printed in the margin of the thirty volume Commentary by Et Tabari, we find, however, the true explanation. After giving the usual explanations, which do not explain, he says: "There is, however, another explanation of this verse. The meaning of *nasi* is the adding of a month to certain years so that the lunar year will be equivalent to the solar; for the lunar year of twelve months consists of 354 days and a fifth or sixth of a day, as we know from the science of astronomy and the observations of astronomers. But the solar year, which is equivalent to the return of the sun from any fixed point in the firmament to the same position, consists of 365 days and nearly a fourth day. Therefore the lunar year is less than the solar year by ten days, twenty-one and one-fifth hours, nearly, and by reason of this difference the lunar months change from season to season; so that, for example, the month of pilgrimage will sometimes occur in winter, sometimes in summer, or in the spring or autumn. In the "Time of Ignorance" they were not pleased when the pilgrimage occurred in an unsuitable time for their merchandise. Therefore they arranged for a leap year with an additional month, so that the *hajj* should always occur in the autumn; so they increased the nineteen lunar years by seven lunar months, so that it became nineteen solar years, and in the following year they added a month. Then, again, in the fifth year; then in the seventh, the tenth, the thirteenth, the sixteenth, the eighteenth year, etc. They learned this method from the Jews and the Christians who also follow it on account of their feasts. And the extra month was called *Nasi*." Nisabori goes on to give a tradition according to which Mohammed himself abrogated this practice when he made his last pilgrimage to Mecca and established the ritual of the *hajj*.

The origin of the lunar calendar is, therefore, based

Saat 7

CLOCKS The earliest chronometrical instruments used by the Arabs were sundials, until in the VIIth century by their contacts with the Persians and Byzantines they became acquainted with sand-glasses and water clocks. The latter were soon equipped with various kinds of mechanical devices, so that, according to a German chronicler of the beginning of the IXth century, Caliph Hārūn al-Rashīd* could send an artistic clock made by Arab craftsmen as gift of honour to Charlemagne which aroused great admiration within the circle of the emperor's court.

In the XIIth century clocks with movable figures such as drummers, scribes or different animals pointing out the time were much in favour and their production reached a high grade of perfection. A skilful clockmaker of the XIIth century, Muhammad al-Kharāsānī, constructed a waterclock for the Umayyad* mosque in Damascus, which was praised by contemporary authors as a masterpiece of its time. Also at the various courts in Spain, Arab craftsmanship in this field enjoyed for many years a high reputation. The first clocks with wheel-works date from the XVIth century.

-TAKIYYÜDDIN?
-SAAT

Tekeli, Sevim:
16'ïncï [Onaltïncï] Asïrda Osmanlïlarda Saat ve Takiyüddin'in "Mekanik saat Konstrüksüyonuna Dair En Parlak Yïldïzlar" Adlï Eseri. [engl. Titel:] The Clocks in Ottoman Empire in 16th Century and Taqi al Din's "The Brightest Stars For The Construction Of The Mechanical Clocks". Ankara, Ankara Üniversitesi Basïmevi, 1966. V,339 S., 120 Ill..
(Ankara Üniversitesi Dil ve Tarih-Cografya Fakültesi Yayïnlarï ; 171, Felsefe Arastïrmalarï Enstitüsü Yayïnlarï : 1)