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The Istanbul Museumfor the History of Science and Technology in Islam (An Overview).

(By Prof Fuat Sezgin – Published in 2011)

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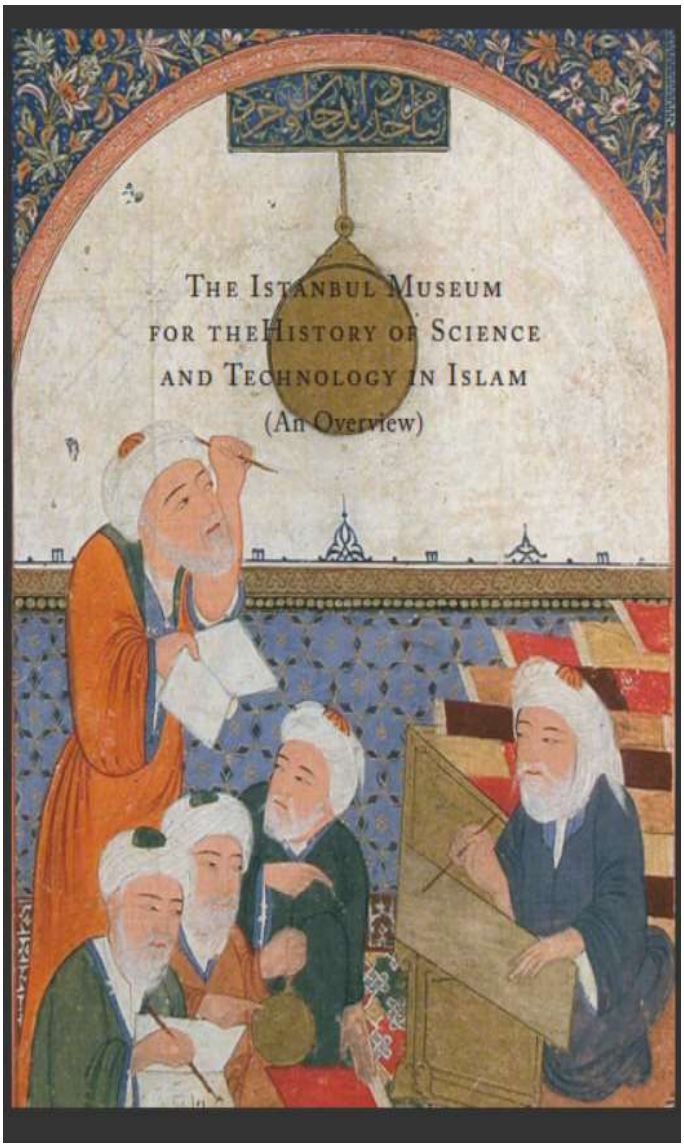
The book of the History of science and technology in Islam by Fuat Sizgin is divided into 5 volumes and 13 chapters, whereby the author guides the readers in a journey through time and space, showcasing the scientific development during the golden age of the Islamic civilization.



Science grew to become an integral part of the Islamic nation's identity, with various contributions from a diverse pool of individuals of different cultures, ethnicities and even religions. The early days of scientific Islamic discoveries faced many challenges due to a lack of the sources in Arabic and funding; nonetheless, it encouraged many scientists to seek and spread the knowledge, fueling some of the greatest unearthing and preservation efforts that paved the way for the golden age, the renaissance and even the industrial revolution in centuries to come. These scientific interactions led to more understanding of both cultures.

As early as the third decade following the rise of Islam, the newly established state expanded its territories through conquests and diplomatic convoys. To the north, it reached Asia Minor and western Persia, and to the south-west, it extended to Egypt. The Muslims captured Damascus in 636 AD, Emessa (modern-day Homs) and Aleppo in 637 AD, Antioch (now Antakya) in 638 AD, and Alexandria in 642 AD. These conquests brought them into lasting contact with the populations of these cities, who had been ruled for centuries by the Roman and later Byzantine empires. The conquerors were known to have treated these natives well and effectively utilized their knowledge and technical skills. The state encouraged its new citizensintegration, embraced their

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multiculturalism/multilingualism and their unique skills, resulting in the Translation movement of Antiquitybooksrelating to astronomy, geography, navigation, math, geometry and optics. All of which, allowed to spread of knowledge and drove the development in these areas and even the establishment of new branches of science.

The Medicine chapteris divided into 5 parts. These include medical instruments, a series of anatomical illustrations, the anatomy of the organ of vision, portraits of famous physicians and instruments and models.

TheArabic scientific literature was established in geography, botany, zoology, chemistry, astronomy, physics, as well as in medicine. In the 3rd- 9th century, the Islamic scholars built on their Greek predecessor's achievements and illustrated the human body parts.

In the 30th treatise of his extensive surgical book, The Andalusian physician 'Abbas Al-Zahrāwī details and illustrates over 200 instruments. In his book, he expressedregret regarding the neglect of surgery over the period leading to his era, mentioning that only a few illustrations from earlier works were known, however, this should be understood as referring to a specific, limited geographical area.

The 30th treatise of al -Zahrāwī's book played a crucial role in the evolution of European surgery starting in the 13th century, particularly due to its detailed descriptions and illustrations of medical instruments and treatment procedures. It is striking to observe the widespread presence of al -Zahrāwī's surgical manuscripts in European libraries were translated to Latin, Hebrew, and Provençal.

Drawings of human anatomy, pathology and physiology along with descriptive text were customary in all medical books. The Muslims were infamous for illustrations of the human body explaining the anatomy behind it.This part of the chapter demonstrates how the Islamic – Arabic culture excelled in the field compared to its western's counterpart, the advancements accomplished and traces the origin of knowledge back to the Greeks.

The Islamic- Arabic culture presented works on the bone structure, the nervous system, muscles, veins and arteries, examples include pregnant woman`s circulatory system shown in (*Tasrih-I Mansuri)* book, by the Persian physician Mansur b. Muhammad b. Ahmad b. Yusuf in the late 8th/14thcentury, which had been published several times in India since 1848.

K. Sudhoff who studied the book compared the current anatomical drawings tothe Persian manuscripts texts and the early western books in his investigations into the anatomical illustrations. He concluded that the series of anatomical pictures along with the texts reached the west at two distinct periods. A13thcentury manuscript from Provence kept with the Basel family, was the only manuscript to contain illustrations of a skeleton along with its legend, and female genital organs (without a diagram of the embryo).

Sudhoff discovered that the manuscript preserved by the Basel family was different from the Latin manuscripts at cloister in Prufening and Scheyern from ca. 1154 / ca. 1250, respectively. He stated that the manuscripts from Provence have been combined from two distinct compilations of the 11th and 12th century which originated in Salerno, while the manuscripts from Prüfening, Scheyern and Oxford reached the occident via the Byzantium reign. On the hand, the Persian manuscripts originates in Greek, they were written in Alexandria and translated to Arabic during (4th/10th century) by Ali B. Al Abbas Al- Magusi and Avicenna (Ibn Sina).

This medicinal chapter describes the ophthalmology advancements, the medical progress made during the era and illustrates the differences in the western and Islamic approaches. The old scientific Arabic literature depended on textual descriptions and was not heavily illustrated, except for the fields of mathematics and astronomy. But even in these fields it is not infrequent that the spaces for figures are left empty by the copyists, probably in anticipation that a specialist would be entrusted to complete this work.

In 1908, JuliusHirschberg criticized the lack of figures in the Arabs optical books and how their textbooks of ophthalmology were shortanatomical illustrations of the eye. However, his statements were proved untrue, and was not aware the three anatomical illustrations of Hunainb.Ishaq discovered at later date.

Thus, Hirschberg`s looked for the oldest Arabic drawing of the eye known to him, he says: "Fortunately we have this illustration of the optic nerve crossing together with that of the eye and the brain in a later Arabic text on ophthalmology, that by Halifa from Syria, from about 1266 our era, but only in the Jeni [Cami] manuscript of this work, not in the manuscript from Paris". Which led Hirschberg to the conclusionthat Arabs had a crucial influence on ophthalmology since Hunain ibin Ishaq was an influential Nestorian Christian translator, scholar,

physician, and scientist from Iraq, he translated lots of Greek works and tried to exploit the anatomy, physiology, and the pathology of the brain in his illustrative drawings in the book.

However, Hirschberg acknowledged the Arabs advancements and efforts, so he didn't criticize the Arabs for dragging the optic nerve crossing unnaturally to the front, in an imaginary stylized representation of the brain for better clarity and Hirschberg stated that westerners did that in their diagrams as well.

Hirschberg concluded that the anatomy and the nomenclature of the eyes were originated by Arabs not the Greeks, citing that the current terminology used in the west is derived from the medieval Latin translations of the Arabicterms. He also highlightedthat theimportant concept handed down from *the Kitab Al- Mansuri* by Al-Razi is the understanding that the pupil contracts in response to light.

In 1941, S.L. Polyak wrote that structural and functional knowledge of the eyes was acquired by western Europe through the late Middle Ages, along with a creative pictorial representation that was demonstrated first by the Arabs with other intellectual and practical pursuits such as medicine, philosophy, alchemy, etc.

S.L. Polyak considered Ibn al- Haitham and his commentator Kamaladdin Al- Farisi (ca. 700/ 1300) as an important representation of the physiological optics field development,due to their connectionsto well-known works on optics written in Europe in the 13th century.In addition to the works of Ibn Sina and Ibn al-Haitham which had been available for more than a century in Latin translations.

Kamaladdin Al- Farisi's achievements were appreciated by Schramm in the following words: "Through his deliberations and experiments Kamaladdin Al- Farisi has been led to a result which was achieved afresh only in 1823 by Johannes Evangelista Purkynje. Kamaladdin Al-Farisi was the first to detect definite proof for the reflection on the upper surface of the lens and gave reasons for it in the context of his theory in an excellent manner."
The illustration by Hunain b. Ishaq (d.259/873) of the eye is the oldest known preserved pictorial anatomical diagram. As S.L. Polyak`s book (*The Ten Treatises on The Eye*) included a well described illustrations of the eye, optic nerve, and its connection with the brain, the physiology, pathology and the treatments of eye diseases as he used the information of *(Kitab Al – AshrMakalat Fi Al -Ain)* book by Hunain b. Ishaq.

Chemistry and Alchemyreached the Arab regions early in the middle of 2nd / 8th century compared to the West. One of the significant figures of Arab alchemy is Gabir b. Haiyan. As well as Prince Halid b. Yazid, who was among the first Arabs to engage himself in this field (after 102/720) and he is the first to suggest translating books on alchemy, medicine and astronomy along with citing every reference precisely, paving the way to the modern research method and it's recorded that Greek manuscripts were translated to Arabic followinghis orders.

Minerals and Fossilswere studied by Julius Ruska (J. Ruska).He studied the participating cultures that impacted the history of science distinguishing between four cultural areas such as: the Egyptian–Babylonian, the Greco–Roman, theIslamic, and the Christian–Occidental, which leads into the modern era. In this section, he clarified that Greeks had substantial knowledge regarding mineralogy but lackedexplanations and the origin of this information whether theyborrowed from other cultures or their own, whereno references of the information chains were cited. On the other hand, the Arabic – Islamic scholars havecited and credited every source with great precision, along with mentioning each adopted information of the mineral, the author's name, the title of the work and the chapter.