

EYE ON SCIENCE



Bibliotheca Alexandrina
Planetarium Science Center
WINTER 2016 | Year 9, Issue 1

THE PEOPLE OF SCIENCE:
THE SCIENCE OF THE
ARABS





A Beautiful Mind Before Newton, there was

By: Lamia Ghoneim

Alhazen

Alhazen was the Arab scientist who birthed the scientific method, and the Father of Modern Optics. He was also the daring scientist who feigned madness to escape the madness of the Fatimid Caliphate, after failing to accomplish his impossible task. He was a genuine polymath, a controversial figure, and a brilliant mind.

The year 2015 marks the 1000th anniversary since the appearance of his remarkable seven-volume treatise on optics *Kitab al-Manazir*. We celebrate this event by narrating his life story, as accurately and as precisely as possible, for those who seek the truth.

Once Upon a Time

A little over 1000 years ago, in what is now known as Iraq, Al-Hassan Ibn Al-Haytham, or Alhazen as the Latins later dubbed him, was born in the city of Basra, during the reign of the Abbasid Caliphate. Little is known about his life as a youth in Iraq, even though an autobiography written by him in the year 1027 still exists. Being a true scientist, however, his writings say very little about his personal life; instead, it focuses on his intellectual genius.

What is known about his early years is that he was raised to be a civil servant and educated in Islamic studies in Basra and

Baghdad, excelling to be appointed as Minister of Basra and the nearby region. Surrounded by the culture of learning in Iraq and the golden age of scientific advancements in the Islamic Civilization, he began to focus his interest on science and other empirical subjects.

In studying science, he found his true passion and self worth, until he finally quit his job and left for Egypt—then ruled by the enemies of the Iraqi Caliphate, the Fatimid Dynasty—to further pursue his scientific studies.

In the Land of the Nile

In Egypt, Alhazen flourished and his reputation grew as a scientist, until he gained sufficient fame for his knowledge in physics to be recognized by the then reigning Fatimid Caliphate, Al-Hakim.

Al-Hakim himself was interested in science, particularly astronomy; while known as a patron of science and supporter of scientists, he was also known to be ruthless and quite eccentric though.

Ibn Al-Haytham was studying how to regulate the flow of the water of the Nile in order to minimize flooding; Al-Hakim heard about his endeavors, and ordered him to undertake the task straight away. While seemingly feasible on paper, Alhazen realized after travelling with a team up and down the Nile that his idea would require the implementation of a huge dam, requiring large construction equipment that was not available at that day and age.

Upon realizing he had to report his failure to an unpredictable Caliphate and was very likely to lose his precious head, Alhazen then feigned madness, in an effort to escape the fury of Al-Hakim.

In a way, he succeeded in his performance, for he was granted leave of his actions and simply confined to his home. The seclusion was just what he needed to become one of the greatest scientists of all time.

Prisoner of His Own Home

Over the next decade, being under house arrest for the rest of Al-Hakim's life, Alhazen managed to explain the nature of light and demonstrate the correct model of vision that was previously misunderstood by revered thinkers as Euclid and Ptolemy.

The prevailing wisdom before him was that we saw what our eyes, themselves, illuminated; their theory was that sight worked because our eyes emitted rays of light, like flashlights. This did not make sense to Ibn Al-Haytham; if light comes from our eyes, why, he wondered, is it painful to look at the Sun? This simple realization catapulted him into researching the behavior and properties of light: optics.

In order to solve his dilemma, Ibn Al-Haytham concocted a methodology of investigation characterized by a strong emphasis on carefully designed experiments, to test theories and hypotheses and verify them; by that, he gave birth to the scientific method that is used today by scientists in their investigative research.

He managed to demonstrate, by both reason and experiment, that light was a crucial, and independent, part of the visual process. He, thus, concluded that vision would only take place when a light ray came from a luminous source or was reflected from such a source before it entered the eye.

He proved that light only travels in straight lines, and he set out the initial arguments that confirmed the existence of an optical nerve, which interpreted how objects sending many rays to the eye could be seen even if only the perpendicular ray mattered. He explained how mirrors work, and argued that light rays can bend when moving through different mediums, as water.

Alhazen used a dark chamber he called *Albeit Almuzlim*, which translates to *camera obscura* in Latin, to help explain the nature of light and vision; his device is credited as the basis of photography.

A Beautiful Mind
Before Newton, there was

Alhazen



However, Ibn al-Haytham was not satisfied with elucidating these theories only to himself; he wanted others to see what he had reached. The years of solitary work culminated in his *Book of Optics*; the seven-volume treatise, which expounded just as much upon his methods as it did his actual ideas.

Through his *Book of Optics*, his ideas influenced European scholars, including those of the European Renaissance, who consider him the "Father of Modern Optics". During his solitary years, he wrote extensively on many topics, in total 96 books and manuscripts, 55 of which have survived.

His legacy in astronomy is also evident; there is the Alhazen Crater on the Moon, as well as the Alhazen Asteroid. In addition to optics and astronomy, he studied and wrote about mathematics, particularly calculus. He had a great influence on Isaac Newton, who was aware of Ibn Al-Haytham's numerous studies of calculus, which led to the engineering formulae and methods used ever since.

In fact, Newton's Third Law of Motion—for every action, there is an equal and opposite reaction—was based on Ibn Al-Haytham's postulate on the movement of bodies and the attraction between two bodies: gravity.

It may thus be safe to conclude that it was not the legendary apple that fell from the tree that enlightened Newton about gravity, but rather the books of Ibn Al-Haytham.

References

<http://gulfnnews.com>
<http://muslimheritage.com>
www.britannica.com
www-history.mcs.st-and.ac.uk

VISITORS INFO

Planetarium

Available Shows

Stars Show

45 min. Live Show by the PSC
Resident Astronomer

Oasis in Space

25 min. Full-dome Show

Stars of the Pharaohs

35 min. Full-dome Show

Seven Wonders

30 min. Full-dome Show

The Life of Trees

33 min. Full-dome Show

Kaluoka'hina

35 min. Full-dome Show

Mystery of the Nile

45 min. IMAX Show

Cosmic Voyage

35 min. IMAX Show

Alexandria, The Cradle of Astronomy

22 min. Full-dome Show

Visitors INFO

- For the Planetarium daily schedule and fees, please consult the Center's official website: www.bibalex.org/psc
- Kindly note that, for technical reasons, the Planetarium maintains the right to cancel or change shows at any time without prior notification.

History of Science Museum

Visitors INFO

Opening Hours

Sunday–Thursday: 9:30-16:00
Saturday: 12:00-16:00

Guided Tours Schedule

Sunday–Thursday:
10:30, 11:30, 12:30, 13:30, 14:30, 15:30

- Museum entry fees are included in all Planetarium shows tickets.
- For non-audience of the Planetarium, Museum entry fees are EGP 2.-
- Museum Tours are free for ticket holders.



ALEXploratorium

Visitors INFO

Discovery Zone

Opening Hours

Sunday–Thursday: 9:00-16:00
Tuesday: 9:00- 12:30
Saturday: 12:00-16:00

Guided Tours Schedule

Sunday, Monday, Wednesday, Thursday:
9:00, 10:30, 12:00, 13:30, 15:00
Saturday: 12:00, 14:00
Tuesday: 9:00, 10:30

Entry Fees

Students: EGP 5.-
Non-students: EGP 10.-

Listen and Discover

- For the list of shows available at the "Listen and Discover" and the schedule, please consult the Center's official website: www.bibalex.org/psc.
- For reservation, please contact the PSC Administrator, at least one week before the desired date.

Show fees

DVD shows:

Students: EGP 2.-
Non-students: EGP 4.-

3D shows:

Students: EGP 5.-
Non-students: EGP 10.-

4D shows:

Students: EGP 10.-
Non-students: EGP 15.-