BOOKS & ARTS

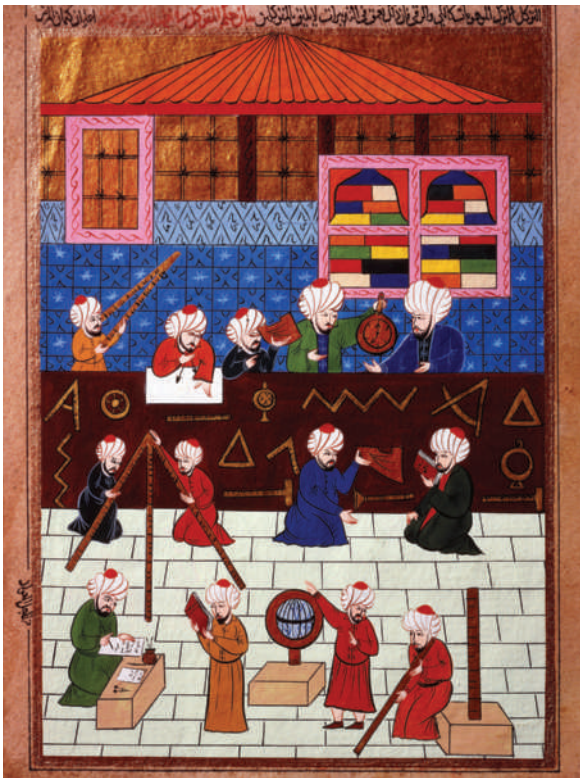
Shining light upon light

Two science histories dissect the transfer of knowledge between the Greco–Islamic and European civilizations, and put right the impression that the flow was one way, explains **Yasmin Khan**.

It has been widely accepted that the Islamic civilization had merely a bridging role in preserving the wealth of inherited ancient Greek knowledge ready for future consumption by the West. This pervasive belief, now known to be a damaging distortion of history, is explored in two new books.

In *Aladdin's Lamp*, John Freely, a seasoned academic and historian, writes a captivating account of the transfer of scientific ideas between these civilizations. Interlacing historical events with finesse, his story has a nostalgic quality that makes for escapism but falls short of convincing. At first glance, we assume that Freely will offer us an exposé of the central part the Islamic world played in the pursuit of science, and the key contributions it made. Instead, it quickly transpires that Freely's handling of Islamic discoveries could be construed as damning with faint praise in comparison with his treatment of Greek knowledge.

Freely introduces his book by declaring that "Modern Science traces its origins back to ancient Greece", arousing suspicion that his motive is to venerate the ancient Greeks as the progenitors of scientific ideas, and to suggest that later civilizations should be viewed as being in their shadow. By the end of the book it becomes apparent that this suspicion is founded. Yet Freely's thesis raises the question of whether the emergence of modern science, as practised today, really was spearheaded by the ancient Greeks. Old-school historians were adamant that the scientific revolution emerged in the sixteenth and seventeenth centuries, when the original sources of classical Greek thinking were 'rediscovered' by Europe.



From the ninth century, Islamic astronomers used translated Greek texts to develop theories that enlightened scientists in Europe.

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Aladdin's Lamp: How Greek Science Came to Europe Through the Islamic World
by John Freely
Alfred Knopf: 2009. 320 pp. $27.95

Science and Islam: A History
by Ehsan Masood
Icon Books: 2009. 256 pp. £14.99

Others, such as Ehsan Masood, beg to differ. In *Science and Islam* — the accompanying book to a BBC television and radio series that focuses on science in the Muslim world — he shows that the information flowed in two directions. Through a translation movement that began in the early ninth century, the Islamic world built extensively on Greek ideas, as well as on knowledge from other civilizations, to develop new theories. A golden age for the Islamic civilization, this prolific period spanned more than 800 years. Scientific, technological and engineering endeavour was cultivated to such an extent that it attracted interest in Europe, which was supposedly languishing in the Dark Ages. We now know that the notion of a Dark Age was a myth, constructed to make the Renaissance seem all the more spectacular.

Similarly, George Saliba's iconoclastic *Islamic Science and the Making of the European Renaissance* (MIT Press, 2007) argues that much Islamic scientific thought was highly original. He vehemently maintains that the astronomers who worked under Islam, such as Nasir al-Din al-Tusi and ibn al-Shatir, overhauled Ptolemy's Greek *Almagest* through commentary, correction, objection and ultimately reformulation. The planetary theories that were developed by Islamic astronomers, argues Saliba, would later have a major influence on Nicolaus Copernicus.

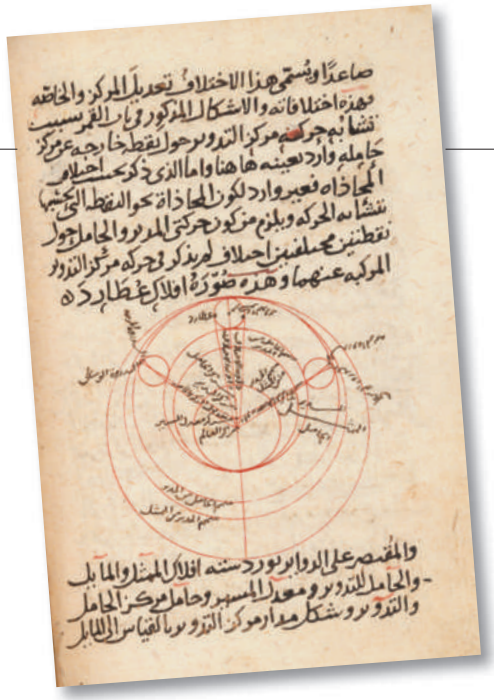
Remarkably, besides the Greeks, Freely overlooks cross-cultural influences that were infused into Islamic scholarship. For example, when the art of paper-making was learnt from the Chinese in the eighth century, its growth into an industry in Baghdad further facilitated the translation movement, transforming learning forever. Caliph Harun al-Rashid was among the Muslim rulers who promoted the mass translation of Greek texts into Arabic; al-Rashid's Baghdad is the setting for the fictional story of Aladdin from the *Thousand and One Nights*. Aladdin's ever-glowing magical lamp is portrayed by Freely as a symbolic baton of knowledge that passed from the Greeks to the Arabs and then onto the West. This metaphorical use of light as a beacon of knowledge is in line with the tainted accumulative view of history: when the lights flickered out in one dying empire, a new erudite civilization was ready to stoke the flames, thus shedding light upon light. By contrast, Masood observes that the exchanges of knowledge took place within an interdependent framework; a far-reaching and complex web that was more interconnected than Freely suggests.

Freely does acknowledge a masterpiece produced by Ibn al-Haytham (known in the West as Alhazen) — the *Book of Optics*, which is considered one of the most influential works produced in Islamic science, representing a definitive advance beyond the achievements of the ancient Greeks in their study of light. Masood elaborates further, asserting that al-Haytham pioneered a progenitor to the modern scientific method back in the eleventh century. Al-Haytham's investigations were based on experimental rather than abstract evidence, and his experiments were systematic and repeatable, enabling him to establish empirical proof of the intromission theory of light — that vision is the result of light from objects entering the eye. Two centuries later,

al-Haytham's work had a profound influence on Roger Bacon, the Arabic-speaking Oxford scholar who was a protégé of the pupils of the Spanish Moors; Bacon quotes al-Haytham throughout his *Opus Majus*. It was not until the seventeenth century that a different historical figure, Francis Bacon, would champion the modern scientific method as part of the scientific revolution.

Masood asserts that the eighth-century chemist Jabir ibn Hayyan produced texts rich with laboratory techniques and experimental methods that are familiar in modern-day chemistry. Jabir came up with a framework for classifying materials and devised an array of chemical processes including sublimation, liquefaction, crystallization and distillation, and discovered both alkalis and strong acids such as sulphuric and hydrochloric acid. Subsequently, al-Razi (also known as Rhazes) built on Jabir's work and surpassed him; his practical work reinforced the need for proof by experimentation, enabling him to contribute to the development of pharmacology.

Among other European scholars who Masood explains were profoundly influenced and inspired by Muslim polymaths were Leonardo da Vinci and Johannes Kepler. Masood highlights some of the discoveries, scientific instruments and inventions made by Muslim scholars in the realms of medicine, surgery, chemistry, physics and astronomy.



Nasir al-Din al-Tusi's early work on planetary orbits may have later inspired Nicolaus Copernicus.

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A science journalist and editor at *Nature*, Masood manages to address the subject in a refreshingly non-partisan fashion, presenting a spectrum of arguments from the most relevant academics and historians. He is bold enough to present counter-arguments from adversarial sources, to the extent that he seems polemical. The result is a successful compilation of a complex and contentious history that is conveyed with simplicity. Because *Science and Islam* is aimed at a popular audience, many intricate details are missing. Yet it is the first concise book on the topic suitable for the non-expert.

Both books are opportune and contribute to the long-overdue popularization of the multicultural history of science. No doubt a flurry of similar books will shortly appear, especially given the current political climate coupled with the underpinning role that science has in modern society and the possibilities for development it offers in reviving the Middle East. Yet what is still needed is an updated popular historiography that can span the full breadth of world history and position the outputs of Islamic science into a wider context. That is worth waiting for. ■

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Myth of the missing mothers

Motherhood, the Elephant in the Laboratory
Edited by Emily Monosson
Cornell Univ. Press: 2008.
232 pp. $25, £13.95

Confront a scientist with data and they will suggest a hypothesis to explain them. When confronted with the dearth of women in the scientific profession, scientists often try to connect gender — female — with a physiological reason for absence — motherhood. Family, they say, must be the reason that there are so few women in the sciences, as the years when women start families coincide with those when young scientists are building academic careers.

This hypothesis does contain a kernel of truth: the academic profession, which evolved from medieval monasteries, was not designed with a dual-career family in mind. The modern workplace is still evolving, far too slowly, towards a gender-equal world, where both parents have busy lives and both can pursue their scientific passions.

Motivated by her own struggles to balance motherhood and work, toxicologist Emily Monosson collects in *Motherhood, the Elephant in the Laboratory* the parenting experiences of nearly three dozen mothers and scientists, two of whom are her daughters. She groups these viewpoints by era, starting with women who came of age scientifically in the 1970s and going up to the present day. One sees the gradual changes that have resulted from, and helped to support, a steadily increasing presence of women in science.

But progress is not steady enough. Those of us who raised families in the 1990s pushed to replace 'disability leave' with proper 'maternity leave' and to create rooms where mothers could express breast milk. We tried to get on-site day care, although we were rarely successful. We thought these accommodations were a good start and a done deal. Yet, as the disturbing stories of women who got their PhDs in the past decade make clear, university women still confront ignorance and inflexibility. Many practices that should have vanished — lack of maternity leave or the inability of employers to cope with pregnant employees — are still with us.

> "It is harder to raise a family as a supermarket employee than as a professor of physics."

Evolutionary biologist Gina Wesley-Hunt (PhD 2003), tells us she "was fired for getting pregnant". Katherine Douglass, a physician and Monosson's daughter, describes the difficulty of finding a romantic partner who would view her as an equal. A young nursing mother, Deborah Duffy (PhD, Psychology, 2001), recalls an all-day interview for a faculty position without the requested breaks for pumping breast milk. "As I sat there doing my best impression of a dairy cow," she writes, "I recall thinking, 'What a bizarre experience.'" My fervent hope is that the experiences described in *Motherhood* become less bizarre — not because female science professors do not have children but because they do, thus helping their colleagues become familiar with the process.

Monosson's book sets out the variety of paths possible for scientist mothers, but it contains few stories about women who have successfully combined traditional careers as science professors with traditional families. I know many such women. I am one, as is Stefi Baum — astronomy professor, mother of four, an old friend and a contributor to the book. It is unfortunate if young women approach their futures convinced that they have to make radical compromises to combine family and