

# Stars in Their Eyes

In 1676, Isaac Newton wrote: “If I have seen further it is by standing on the shoulders of giants.” He was explaining his inspiration for the law of universal gravitation by referring to Copernicus, Galileo and such classical Greek scientists as Pythagoras, Ptolemy and Euclid.

But in fact, Newton probably owed a greater debt to the slew of Arab astronomers and scientists of medieval Islam, who translated, developed and refined the theories of the ancient Greeks before relaying their breakthroughs to Renaissance Europe. The work of these early Arab scientists represents true milestones in the history of science, foreshadowing many of the European discoveries of subsequent centuries.

As a prime example, more than five hundred years before the publication of Newton’s *Principia Mathematica* – largely credited as being the launching pad for modern astrophysics and rocket science – Abd al-Rahman al-Khazini proposed that the gravity of a body depended on its distance from the centre of the Earth; and he was one of the first to differentiate between force, mass and weight, which was later formalized in Newton’s third law of motion.

Al-Khazini’s magnum opus, *The Book of the Balance of Wisdom*, also served as an inspiration for centuries of Muslim thinkers, including, among others, the celebrated 14th-century polymath, Ibn Khaldun, and the foremost Arab geographer, al-Idrisi. In addition to designing the first accurate navigational map, al-Idrisi hinted at the concept of gravity and presented the Earth as a sphere, with a circumference of 37,000 kilometres, which constitutes an error of less than 10 per cent.

These medieval scholars were driven both by intellectual curiosity and religious directive: for instance, al-Idrisi’s calculations on the size and shape of the Earth were instrumental in determining the qibla, or sacred directions to Mecca. And throughout the Muslim world during this golden age, Arab caliphs built observatories in order to tackle the job of setting Ramadan and Eids according to the lunar phases, and prayer and fasting according to solar cycles.

The scholars were so good at studying the heavens that they corrected and extended Greek astronomical charts, which led to the discovery and naming of a multitude of stars, such as Algol from al-ghoul, the “demon” star; Deneb, one of the brightest stars in the sky in Cygnus, from the Arabic for tail; and the red super giant, Betelgeuse, probably from bayt-al-jawza, “home of the central one”.

While the Phoenicians were the first to navigate by Polaris, the North Star, Arab navigators determined the latitudes and constantly improved the instruments that were used to calculate the angle of that star above the horizon. They invented the kamal, the precursor to the quadrant of the 15th century, and refined the elegant and complex astrolabe, which had been invented by the ancient Greeks.

Indeed this hints at the true achievement of Arab science of the golden age. Rather than taking the classical theories and practices on trust, these medieval scientists focused on empirical enquiry and scientific advance, thereby bringing them closer to the philosophically informed science of the ancient Greeks and Phoenicians they were revising. For instance, when Arab astronomers noted from observations that the stars did not always behave as Ptolemy’s model predicted, they began to offer amendments to his geocentric view of the universe.

In the 13th century, Nasir al-Din al-Tusi declared the Ptolemaic model of planetary motion flawed, and created a more accurate version. Three centuries later, the Polish astronomer Copernicus borrowed al-Tusi's model to make the shocking proposition that the Earth revolves around the sun.

The time has come to correct the perception of Arab scientists as mere messengers or conduits who preserved the classical knowledge of Pythagoras, Ptolemy and Euclid, among others. By any measure, these Arab giants contributed as much to modern science as their Greek predecessors.

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## **The Pan-Arab Space Agency**

The buy-in by Abu Dhabi's Aabar Investments of the commercial space travel start up, Virgin Galactic, has attracted worldwide interest for all the right reasons. For a start, the deal – valued at an estimated \$280 billion – constitutes a boost for a barely nascent private space programme, as envisioned by such maverick entrepreneurs as Virgin's Richard Branson, and comes at a time when many funding sources have dried up in the wake of the global recession. More importantly, though, it provides a rare opportunity for the Arab region to acquire space flight capability of its own and, consequently, regain its position among the world's space exploring nations.

Through a modern prism that has been skewed over the centuries by western narratives, it is all too easy to forget the instrumental role played by the early scientists of the region. Indeed, when in 1676, Isaac Newton wrote about his inspiration for the law of universal gravitation, he paid homage to such predecessors as Copernicus, Galileo and the classical Greek scientists Pythagoras, Ptolemy and Euclid.

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By any measure, these Arab giants contributed as much to modern science as their Greek predecessors. The deal between Aabar Investments and Virgin Galactic is therefore particularly refreshing. Aside from the concomitant plan to establish a pan-Arab space agency that would encompass spaceport facilities for launching satellites and space tourists, the resulting space race will require a good deal of pioneering research and development, which in turn will boost Arab science and technology. And the onus will be on this new generation of rocket scientists to correct the perception of Arab scientists as mere messengers or conduits who preserved the classical knowledge of Pythagoras, Ptolemy and Euclid, among others.

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## **The Noughties**

There are decades when conflicts shuffle the terrain and earthquakes are little more than bothersome tremors – and then there are decades when the world splits asunder to the molten core and tries to reinvent itself. The ten-year period beginning in 2000 belongs to the latter variety.

Marked by a string of cataclysmic events of almost biblical proportions, this decade has been anything but dull. In a sense, it began with the televised tragedy of 9/11, replayed over and over again to a public whose appetite for destruction has only become more insatiable since; and it ended with the Nobel Peace Prize being awarded to the first Black American in the White House.

Hemmed in by those events were a tragic tsunami that killed almost 300,000 people, a hurricane that nearly wiped off the map an entire city, and sordid details of abuse and torture carried out by Islamic extremists and American soldiers alike. It was the decade in which neocons and witless figures in the US administration touted an unrealistic estimate of America's position in the world: not only had the US lost the skills needed to maintain its imperial role, but increasingly it was a role the US could not afford. These facts were brutally confirmed in the invasions of Afghanistan and Iraq and – transposing to America's closest regional ally – of Lebanon, during Israel's botched attempt to wipe out Hezbollah.

Toxic debt entered our lexicons: through overexposure to the sub-prime mortgage and above-average levels of greed, a global financial collapse was averted by a last-minute save by state bailouts. The International Monetary Fund estimates that by the end of the decade, the world's banks will have lost \$2.8 trillion.

In terms of high-profile summits, the decade began in New York, with the ambitious Millennium Development Goals aimed at promoting the quality of life for the world's poorest billions – whose midway target deadlines have slipped by unnoticed. And it ended in Copenhagen, with noble if ultimately equally vacuous statements of intent regarding insufficient targets on climate change.

To look back on the ideas that shaped the past decade is to survey a scene of wreckage after a bomb has exploded, like, say, that which killed Lebanon's former Prime Minister, Rafik Hariri.

Just about the only thing this decade has not had is a name. Belatedly, there has been a growing movement to refer to this decade as the noughties. This is perhaps fitting given the ubiquitous nihilist streak and the grandiose delusions that have been the defining features of the past ten years.

Compare that with the “aughts” that was immediately coined for the decade 1900-1909. Where the aughts corresponded to an exciting dawn of discovery and hope – this was the age of the first radio receiver and the mass production of cars – the noughties have come to symbolize a climate of fear in which people have embraced scaremongering.

Even the raft of new gadgets rolled out over the past decade – iPods, BlackBerrys, Xboxes, PlayStations and iPhones to name a few – has done little more than divert momentarily public angst. It is hardly a coincidence, for example, that two of the most memorable movies of the decade, *The Day After Tomorrow* and *2012*, were runaway successes that could cater to the public's deep-rooted craving for obliteration.

To be sure, a decade is just an empty unit of time, arbitrarily fencing off events that occur within a set period from others. It is mostly useful as a means to an end: when we get to close one decade, we can act as Janus – the twin-faced Roman god who gave his name to January – and look forwards while simultaneously glancing backwards.

So, as we bid adieu to the noughties, it might be time to ponder how to address the decade to come. Will it be the Calamitous 2010s on account of the disastrous defeat that will follow America's decision to reinforce inevitable failure in Afghanistan and in the wake of spiralling oil prices after Israel pre-emptively bombs Iran's nuclear facilities? Or, in an even more cash-strapped age, will we plump for the minimalist Xs, marking the time when the inbuilt instability of capitalism finally snaps and when the dollar collapses as the world finally loses patience with American egotism.

Unfortunately, the omens are not encouraging. For anyone with a sense of history, it is hard to be cheery when the biggest challenges for the future are being evaded. We are destined to wander in the wilderness of the noughties for some time.

But by the next aughties, MMCs or however our descendants will call the first decade of the next century, the world will certainly have reinvented itself either as a promising land to embody the best human hopes, or as a moribund and withering outcrop of the Solar System.