

of a light ray into its vertical and horizontal components of velocities. He carried out all his work geometrically, and introduced many new ideas, such as the study of how the atmosphere refracts light from celestial bodies.

Later Islamic scholars, including the thirteenth-century Persians Qutb al-Din al-Shirazi and Kamal al-Din al-Farisi, extended the *Optics*. Al-Farisi, who wrote *The Revision of the Optics* (*Tanqih al-Manazir*), used geometry to arrive at the first correct mathematical explanation of the rainbow (at the same time as, but independently of, the German scholar Theodor of Freiberg).

The *Book of Optics* was first translated into Latin in the late twelfth or early thirteenth century, as *De Aspectibus*. The English philosopher and empiricist Roger Bacon then wrote a summary of it, as did his Polish contemporary Witelo. It was soon being cited across Europe. Among the many ideas taken up by Ibn al-Haytham's Latin-reading disciples was that pure light was not visible, and that its job was simply to allow us to see

“Many historians of science consider Ibn al-Haytham to be the first true proponent of the modern scientific method.”

colour. Even Kepler, who studied Ibn al-Haytham's work, thought this; it took Newton to describe light as itself being made up of different colours. (Other erroneous ideas in *Optics* include a repetition of

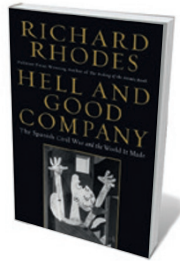
Ptolemy's mistaken law of refraction, and an incorrect understanding of reflection as a more intense form of refraction.)

Ibn al-Haytham's work decisively influenced the theory of perspective that flowered in Renaissance European science and art. *De Aspectibus* was translated into Italian in the fourteenth century, making it accessible to practitioners such as the Florentine art theorist and architect Leon Battista Alberti, author of the 1435 treatise *On Painting* (*Della pittura*), the sculptor Lorenzo Ghiberti and the geometer-artist Piero della Francesca. They harnessed Ibn al-Haytham's discussions on perspective to help to create the illusion of three-dimensional depth on canvas and in friezes. These revolutionary artists strove to understand both the objective world and the visual system that determined its appearance.

Today, as we use laser beams to manipulate atoms, stimulate neurons with light or convey information in entangled photons, it is worth recalling that the foundations of this field were laid down around 1,000 years ago by Ibn al-Haytham. ■

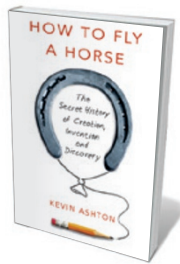
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Books in brief



Hell and Good Company: The Spanish Civil War and the World it Made
Richard Rhodes SIMON AND SCHUSTER (2015)

His 1986 *The Making of the Atomic Bomb* (Simon and Schuster) is a towering chronicle of modernity. Now historian Richard Rhodes examines the “little world war”, Spain's hellish 1936–39 civil conflagration (see *Nature* **494**, 34; 2013). As he shows, it was a testing ground for medical and technological advances — in blood transfusion on one hand, and on the other in airborne warfare, which led to the bombing of Guernica immortalized in Pablo Picasso's great painting. Luminaries drawn to the war, he shows, ranged from geneticist J. B. S. Haldane to writer George Orwell.



How to Fly a Horse: The Secret History of Creation, Invention, and Discovery

Kevin Ashton DOUBLEDAY (2015)

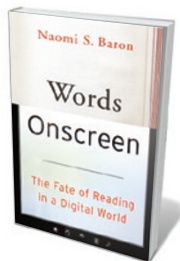
This study of creativity by Kevin Ashton — the technical pioneer behind the ‘Internet of Things’ — is a testament to Thomas Edison's definition of genius (1% inspiration, 99% perspiration). Science, Ashton argues, is less a thing of “eureka shrieks” than of hard work, small steps and understanding of adversity. His case studies compel, from Réunion slave Edmond Albius's 1841 breakthrough in vanilla pollination to surgeon Judah Folkman's “series of repetitive failures” that led to the discovery of angiogenesis, now key to cancer treatments.



Future Arctic: Field Notes from a World on the Edge

Edward Struzik ISLAND (2015)

In September 2014, dwindling sea ice forced some 35,000 walrus onto the Alaskan coast — just one ecological event in a multitude besetting the ‘climate-changed’ Arctic. Journalist and explorer Edward Struzik cogently analyses the environmental and policy challenges, drawing on research into past extinctions and present disruptions such as tar-sand exploitation, military territorialism and tundra fires. As he ticks off the costs to indigenous peoples, ocean biodiversity, caribou habitat and more, the case for an Arctic treaty and serious conservation efforts becomes ever clearer.



Words Onscreen: The Fate of Reading in a Digital World

Naomi S. Baron OXFORD UNIVERSITY PRESS (2015)

For every digital devotee clutching an e-reader, there is an old-school bibliophile brandishing a physical book. But which works best for reading comprehension? In this thoughtful study, linguist Naomi Baron investigates each platform in the light of recent research, and surveys US, Japanese and German reading habits. E-readers, she finds, democratize access and offer easy storage, but can also discourage tackling more involved texts or rereading, and encourage “power browsing” rather than perusal. She recommends allowing room for both options — letting “form follow function”.



What Nature Does for Britain

Tony Juniper PROFILE (2015)

Part research round-up, part manifesto, this treatise on Britain's ‘natural capital’ is a model of pragmatism. As environmentalist Tony Juniper shows, UK ecosystems were valued at £1.6 trillion (US\$2.4 trillion) in 2011 by the Office for National Statistics. Yet poor practices such as overfishing and soil degradation are breaking nature's bank. Juniper offers smart policy action points for switching to sustainability, and ingenious case studies — from ‘woodland system’ farming to reintroduced beavers that help with riverine flood control. [Barbara Kiser](#)