Aristotle (384–322 BC) was inspired by observation of the natural world on the Greek island of Lesbos.

HISTORY OF SCIENCE

The first scientist

Roberto Lo Presti applauds a brilliant reappraisal of Aristotle as the father of observational biology.

Aristotle is considered by many to be the first scientist, although the term postdates him by more than two millennia. In Greece in the fourth century BC, he pioneered the techniques of logic, observation, inquiry and demonstration. These would shape Western philosophical and scientific culture through the Middle Ages and the early modern era, and would influence some aspects of the natural sciences even up to the eighteenth century.

Armand Marie Leroi's reappraisal of this colossus, *The Lagoon*, is one of the

most inspired and inspiring I have read. It combines a serious, accessible overview of Aristotle's methods, ideas, mistakes and influence with a contextualizing travelogue that also found expression in Leroi's 2010 BBC television documentary *Aristotle's Lagoon*. Leroi's ambitious aim is to return Aristotle to the pantheon of biology's greats, alongside Charles Darwin and Carl Linnaeus. He has achieved it.

Leroi, an evolutionary developmental biologist, visits the Greek island of Lesbos — where Aristotle made observations

of natural phenomena and anatomical structures — and puts his own observations in dialogue with those of the philosopher. It was in the island's lagoon of Kolpos Kalloni that Aristotle was struck by the anatomy of fish and molluscs, and started trying to account for the function of their parts. Leroi's vivid descriptions of the elements that inspired Aristotle's biological doctrines — places, colours, smells, marine landscapes and animals, and local lore — enjoin the reader to grasp them viscerally as well as intellectually.

Aristotle's time on Lesbos was only a chapter in a life of discoveries, and Leroi covers those signal achievements with breadth and depth. He details the theoretical and methodological principles governing the functional anatomy of species from pigeons to tortoises, discussed by Aristotle in *On the Parts of Animals*, as well as the descriptive zoology expounded in his *History of Animals*. For instance, Leroi explores Aristotle's theory of causation, based on the distinction between material, efficient, formal and final causes. He looks at the philosopher's views on the directedness of natural phenomena and the role played by necessity and hazard. He sketches out the theory of four elements (fire, air, water and earth) as the prime constituents of natural bodies. And he looks at the theory of soul and its relationship to the body — through which Aristotle accounted for aspects of physiology and psychology, from nutrition to rational thinking.

Fascinating chapters are devoted to Aristotle's gradualist conception of the natural world and living things — perhaps best expressed in the saying *natura non facit saltum*, or 'nature does not make jumps'. Also covered is his theory of sexual generation and transmission of hereditary traits, which he expounded in the masterful *On the Generation of Animals*. Despite a number of mistaken assumptions (such as the lack of a female 'seed'), this theory encompasses a huge number of valuable observations and insights that laid the foundations of modern embryology.

The Lagoon traces other ways in which Aristotelian thought has permeated West-

ern science. Leroi charts its influence on Renaissance anatomists and physiologists. The English physician William Harvey's discovery of blood circulation, for instance, was largely inspired by Aristotle's biological ideas, especially the concept of the heart as the most important organ in the body, as well as by

The Lagoon: How Aristotle Invented Science

ARMAND MARIE LEROI
Bloomsbury/Viking:
2014.

DEAGOSTINI/GETTY

The cuttlefish was among many creatures that Aristotle observed.

BLOOMSBURY

Aristotle's empirical emphasis on investigation and demonstration. Leroi shows how masters of comparative anatomy including Georges Cuvier (1769–1832) took inspiration from Aristotle in describing and comparing the parts of animals in light of their function as well as of their shape. He compares Aristotle's theories with the thinking of taxonomists such as Linnaeus, of Darwin on evolution, and of the twentieth-century fathers of systems theory and cybernetics such as Walter Cannon and Norbert Wiener.

Leroi is careful not to represent Aristotle as a precursor in crude terms, or to read him through inappropriate contemporary lenses. Instead, he highlights aspects of Aristotle's doctrines that still 'speak' to contemporary scientists, and that have been illuminated by modern scientific understanding — for example, Aristotle's emphasis on direct observation and dissection. The philosopher argued, Leroi explains, "that 'knowing' in the sense of 'perceiving' is the foundation of 'knowing' in the sense of 'understanding'".

As Leroi acknowledges, decades of scholarly effort by philosophers and historians such as Allan Gotthelf and James Lennox have gone into the reassessment of Aristotelian biology and its effect on the history of Western science. In this respect, the book broaches no new questions, and brings no new perspective to the heated debates among Aristotelian scholars.

But that is to miss its point. *The Lagoon* is a wonderful introduction to Aristotle's biology, which specialists will also enjoy. Every page is a reminder of the great beauty that we can experience by seeing the world through Aristotelian eyes. ■

Roberto Lo Presti lectures on classics and ancient philosophy and coordinates the doctoral programme on the history of ancient science at the Berlin Graduate School of Ancient Studies, part of the Humboldt University of Berlin.
e-mail: roberto.lo.presti@hu-berlin.de

Books in brief

Sustainability: A History

Jeremy L. Caradonna OXFORD UNIVERSITY PRESS (2014)

As a concept, sustainability is now near-ubiquitous. But is it a "buzzless buzzword", as environmentalist Bill McKibben has opined? Historian Jeremy Caradonna writes that, on the contrary, this dynamic ethos has plenty of buzz. Predicated on joined-up thinking (such as the idea that society, economy and environment are linked), it emerged with seventeenth-century concerns over European deforestation and is now, Caradonna posits, the keystone of solutions to looming global crises. An exemplary study of an idea's long march through domains from urbanism to social justice.

The Marketplace of Attention: How Audiences Take Shape in a Digital Age

James G. Webster MIT PRESS (2014)

The legions of social networks, news outlets and other digital media all jostle for a limited resource — human attention. As James G. Webster notes in this uneven but fascinating study, "It's a zero sum game that dooms most offerings to obscurity". His investigation of what pulls audiences in trounces prevailing thinking, such as the theory that audiences are zombies herded into "filter bubbles" by data-driven choices. Instead, he reveals a "massively overlapping culture" in which commonality remains surprisingly high.

Doctored: The Disillusionment of an American Physician

Sandeep Jauhar FARRAR, STRAUS AND GIROUX (2014)

In this absorbing memoir-cum-analysis, Sandeep Jauhar traces his years as a fledgling cardiologist against the backdrop of a health-care system in peril. US medicine emerges as an arena in which the physicians suffer as much as the patients: out of 12,000 doctors surveyed in 2008, Jauhar notes, just 6% reported positive morale in their colleagues. Factors such as vast medical-school debts, grinding overwork and the rise of autonomy-eroding health-maintenance organizations are leaving many medics reeling and many potential wannabes seeking other fields. An impassioned call to action.

Hyper: A Personal History of ADHD

Timothy Denevi SIMON AND SCHUSTER (2014)

It began with screaming in a world reduced to a colourless blur. Writer Timothy Denevi was diagnosed with attention deficit hyperactivity disorder (ADHD) at the age of six, and in this haunting narrative he explores the world's most scrutinized childhood condition from the inside out — a litany of school conflicts and rounds of evolving treatments. Through it, Denevi interweaves ADHD's historical trajectory and recent findings, from difficulties with diagnosis (the symptoms are easily conflated with 'normal' childhood behaviour) to the brain regions implicated. Denevi has survived, but at a cost.

Veiled Warriors: Allied Nurses of the First World War

Christine E. Hallett OXFORD UNIVERSITY PRESS (2014)

Professional nursing during the Great War is often seen through the gauze of romantic myth-making, notes historian Christine E. Hallett in this stinging chronicle. In fact, the trained nurses of the Allied forces were less noble young helpmeets than a heterogeneous group of tough-minded women. Eager for formal social and political recognition, they were also faced with grisly new medical challenges such as gas gangrene. As Hallett writes, they fought "a multi-layered battle: for lives, for recognition, and for equality". **Barbara Kiser**