

[that] did not make good professional sense, but ... suited his roving spirit", at the Tata Institute of Fundamental Research in Mumbai, India. In 1973 he led an expedition to Mauritania to repeat Arthur Eddington's 1919 measurement of the gravitational bending of starlight around the Sun's limb during a solar eclipse. Cécile and Bryce were also known for taking long walks in the stunning landscape of the American West and in the Alps, where Cécile set up the Les Houches scientific lecture series.

DeWitt's academic career was colourful and varied. After his postdoctoral fellowships, he worked in California from 1952 to 1955 at the Lawrence Livermore Laboratory with Edward Teller on modelling nuclear artillery shells. He briefly led the Institute of Field Physics at Chapel Hill, North Carolina, a centre funded by the industrialist Agnew Bahnson, who hoped to unlock technology from basic research in gravity. In 1973 DeWitt ended up, along with Cécile, at the Center for Relativity at the University of Texas at Austin, which was at the heart of the revival of research interest in general relativity in the 1960s.

Sadly lacking from the book is a personal description of the DeWitts' epic love story. Bryce and Cécile were together for more than 50 years and had four children. According to the publication list, the couple wrote their first paper together in 1952 and their last in 2004. Yet we learn little about their joint lives. There are scraps of information: Bryce mentions that he "cast glances" at Cécile in 1949, when he met her at the Institute for Advanced Studies in Princeton. A picture of Bryce and Cécile is captioned with a quote from one of DeWitt's obituaries: "They became lifelong sparring partners." I would have liked to have known more.

Nevertheless, the book is enthralling. It made me want to take up the challenge of quantum gravity, to follow the extraordinary trail set down by Bryce and Cécile to that untamed frontier of physics. ■

Pedro Ferreira is a professor of astrophysics at the University of Oxford, Keble Road, Oxford OX1 3RH, UK, and author of *The State of the Universe*. e-mail: p.ferreira1@physics.ox.ac.uk

GEOGRAPHY

Islamic views of Earth

A magisterial series revolutionizes our understanding of Arabic geography, finds **Celâl Şengör**.

Scientific geography was invented by the Greeks in the sixth century BC and reached its apogee in the mid-nineteenth century in Europe. In this five-volume work, *Geschichte des Arabischen Schrifttums (History of Arabic Literature)* — the last two of which were published in 2010 — science historian Fuat Sezgin shows that Muslim scholars played an integral part in developing Greek ideas about the planet, and explains how influential their work was in the West.

By reviewing and analysing a vast corpus of Arabic geographical writings from the eighth to the seventeenth centuries, Sezgin revolutionizes our view of the history of geography. The first three volumes, plus an atlas, cover the development of mathematical geography and cartography. The latter two volumes span a range of topics, from the history of general and regional geography, through topography and cosmology to the history of Arabic-Islamic travel reports. He brackets these as 'anthropogeography' to underline their relevance to human existence.

In the first three books, Sezgin establishes that Muslim scholars — starting with geographers during the reign of al-Ma'mun (786–833 AD), a caliph of Abbasid — inherited and developed the geographical and cartographical tradition of the Persian Sassanids and Greeks, from Eratosthenes to Ptolemy. The Muslims improved on Ptolemy's database of longitudes and latitudes of features such as cities, mountain ranges, rivers and continental coastlines.

They initiated geodetic work in the ninth century AD by re-measuring the length of a degree of meridian in the plains of Mosul and Damascus and at Mount Casius, or Jebel Aqra, near Hatay (ancient Antioch) in present-day Turkey, and by fixing the positions of geographical features on the basis of astronomical observations. In the eleventh century, this culminated in Turkish scholar Abu Rayhan al-Biruni's (973–1048) great

Geschichte des Arabischen Schrifttums, Band XIV. Anthropogeographie Teil I: Gesamt- und Ländergeographie; Stadt- und Regionalgeographie

FUAT SEZGIN

J. W. Goethe Univ.: 2010. 553 pp. €124. (In German.)

Geschichte des Arabischen Schrifttums, Band XV. Anthropogeographie Teil II: Topographie, Geographische Lexika, Kosmographie, Kosmologie, Reiseberichte

FUAT SEZGIN

J. W. Goethe Univ.: 2010. 470 pp. €117. (In German.)

work *Measurement of Distances Between Known Places on Earth*.

The many maps produced as a result of these activities by Muslim scholars eventually reached Europe. Beginning with portolan maps in the fourteenth century — predecessors of accurate navigational charts showing coastlines and harbours — they influenced the European cartography of Asia, Africa and the Indian Ocean until well into the nineteenth century.

Sezgin's two most recent volumes go beyond cartography. Arabic geographical activity started before the seventh century AD, he explains. Much geographical information was included in poetry — the names of places, oases and other watering sites. So the first geographical publications in Islamic culture were

penned by philologists in the second century of Islam, following the expansion of the Arabic empire under the Umayyads and then the Abbasids. The first map by a Muslim author — a remarkable map of the world in the form of a bird — was made in the seventh century by a young friend of the prophet Muhammad, 'Abdallah b. Amr b. al-Āṣ.

The demand for broader Muslim geographies grew as European interests expanded beyond its borders from the fourteenth to the sixteenth centuries. Travellers hunted for works on



A world map by ninth-century Muslim geographers.

F. SEZGIN

NATURE.COM

For more on Islamic history of science: go.nature.com/gbipbz

geography as well as those on the economics, vegetation, fauna and statistics of regions, countries and cities. Interest in archaeology and the study of ancient inscriptions also increased in Europe because those subjects were widely covered by Muslim authors.

The first Muslim book of general geography to be published in Arabic in Europe (in Rome in 1585) was *Garden of Strange Things of the Earth and Lands* by a previously unknown Ottoman author called Sālāmī b. Gündoğdı aş-Şālihī. Its influence on European knowledge cannot have been great, because it was never translated. The second such book, by contrast, had an immense influence. Translated into Latin in abridged form in 1619 under the misleading title of *Geographia Nubiensis*, the book was al-Idrisī's famous *Journey of Those who are Amazed*, written for the Norman king Roger II in Sicily in the twelfth century. It accompanied

al-Idrisī's world map, the Tabula Rogeriana, showing a dagger-shaped Africa and the confluence of the Indian and the Atlantic Oceans.

Sezgin ends his review in the seventeenth century, when European geographical activities began to overtake the Muslim effort. He singles out for praise the huge efforts of the European orientalists. From the late eighteenth century onwards, they unearthed huge amounts of material from the libraries and book shops of Islamic countries, transporting it to European libraries for study. This was despite the devastation of the Crusades that began in the eleventh century, the Mongol invasions of the thirteenth century and subsequent years of neglect. Sezgin's eulogy stands in contrast to the attack on the orientalists by Palestinian-American cultural critic Edward Said, who called them sinister servants of imperial powers.

The importance of Sezgin's series cannot

be overestimated. It opens up a little-known world, much of which was forgotten even in Muslim countries. And it contains some unexpected gems, including the best assessment of German geographer Carl Ritter's 20-volume work on comparative geography (1822–59), often misrepresented as a book of history with a teleological bent. Sezgin's books also confirm the intellectual place of seventeenth-century Turkish travel writer Evliya Çelebi as an original thinker and observer in the Ottoman world, a fact that is under-appreciated.

The first two volumes of Sezgin's series are translated into English; I hope that the rest will soon follow. Sezgin's immense scholarship deserves a wide readership. ■

A. M. Celâl Şengör is professor of geology at the Istanbul Technical University, Ayazaga 34469 Istanbul, Turkey.
e-mail: sengor@itu.edu.tr

FICTION

Attack of the killer fungi

Philip Ball applauds physicist Paul McEuen's debut thriller about a madness-inducing mould.

One of my more humdrum obligations as a science commentator was to read Michael Crichton's *Prey*, his 2002 thriller based on the premise of nanotechnological robot swarms run amok. As a novice in this genre, I found myself comparing his characters' psychological implausibility to the illogical quirks of figures from myth and legend. But with guns.

Crichton made millions with his formula; *Spiral* deserves to do the same for Paul McEuen, a physicist at Cornell University in New York. His debut novel is more enjoyable and more palatable than Crichton's and boasts impeccable science.

Even so, nothing in *Spiral* bucks the thriller formula. Every scene is tailored for the screen, and the film rights have already been sold. The dialogue reflects how people speak in blockbusters, not in real life, and the story has the familiar cast: the vulnerable but plucky mother, the ruthless assassin, the sadistic billionaire, the child in peril, and so on. There's the race against time, the apocalyptic threat. And, just as films like this offer a great ride when done well, so too does *Spiral*.

The fictional tale begins at the end of the Second World War, when young Irish microbiologist Liam Connor is brought on board a US warship to witness the effects of a devastating biological weapon developed by the Japanese: a fungal infection called the

Uzumaki that induces hallucinations and madness, and is ultimately fatal. Connor ends up hiding away a tiny vial of the stuff, wrestled from the Japanese engineer Hitoshi Kitano who was responsible for developing it.

Sixty years later, Connor is an octogenarian with a Nobel prize, and still in active research at Cornell. Unknown to the authorities, he has for decades been secretly searching for the cure that he is sure will one day be needed for the Uzumaki. Aware that a cure would turn the deadly fungus into a potential weapon by conferring protection only on some, he is determined to keep his work from the US military. Then he is found dead at the bottom of a gorge, apparently having thrown himself off a bridge to escape from a mysterious woman caught on security cameras. His coded last message to his colleague Jake Sterling, his granddaughter Maggie and her son Dylan makes them the only people who can prevent a global outbreak of the killer fungus. But who is behind the fiendish scheme to release it?

You can see a lot of the plot coming — the denouement even involves the old chestnut of who gets to the gun first. But that doesn't detract from the page-turning quality. It is a delight to see how McEuen — an expert in carbon-nanotube physics and nano-electronics — has marshalled his knowledge to kit out the technical plot devices. Nanotech-



Spiral: A Novel
PAUL MCEUEN
Dial Press/Headline:
2011. 320 pp.
\$25/£19.99

nology, microbiology, information technology and synthetic biology are all brought into play in a convincing, unforced manner. Devotees of scientific trends will recognize many elements, from genetically engineered oscillating fluorescence to microfluidic labs-on-chips.

McEuen shows that the imagination of an inventive scientist is far more interesting than that of a writer who has merely done his homework. In his use of science he trumps Crichton and many other novelists who like to spice their narratives with cutting-edge science. I confess that my interest finds less purchase with square-jawed, stolid heroes like Jake, whose physical prowess and ex-army credentials are carefully established in preparation for gutsy displays. But that is the genre, and Jake is less tiresomely bland than the wooden leads in the books of Dan Brown and Crichton.

A more appealing hero is Cornell University itself, which enjoys a touching love letter here from the author. But, as ever, the stars of the show are the villains: the microcrawlers that scabble ominously across the book's cover — microelectromechanical devices with a seriously bad attitude.

Next time, McEuen should allow himself to push harder at the genre's boundaries. And I do hope there will be a next time, if he can escape the lab bench and the jaws of Hollywood. ■

Philip Ball is a writer based in London. His latest book is *Unnatural*.