in 1918 allowed Harlow Shapley, who would become Pickering's successor, to extend the boundaries of the Milky Way. Leavitt's work also laid the foundation for Edwin Hubble's finding, in 1925, that our Galaxy was not a lone 'island Universe' but one of billions. In 1929, Hubble used Leavitt's work and spectral shifts to show that this populous Universe is also expanding.

Annie Jump Cannon arrived in 1896, following studies in mathematics, physics and astronomy at another women's college, Wellesley, in the Massachusetts town of the same name. She refined and simplified the Pickering–Fleming system of stellar classification by proving that most stars were of a similar type. The International Astronomical Union adopted her system in 1922, three years after Pickering's death.

Cecilia Payne, educated at the University of Cambridge, UK, came to the observatory on a fellowship in 1923, under Shapley. As part of her PhD, she determined correctly that stars were predominantly composed of hydrogen and helium. In 1956, she became Harvard's first female professor of astronomy.

Payne provides some of the book's most touching passages. Sobel describes, for instance, Payne's distress at the untimely death of her friend and fellow computer Adelaide Ames in 1932, and her whirlwind romance with the astronomer and Russian émigré Sergei Gaposchkin, whom she married in 1934. Later that year, Payne won the inaugural Annie Jump Cannon Prize for contributions to astronomy, receiving $50 and a gold pin, designed by Cannon, in the form of a spiral nebula.

These personal touches flesh out the women's lives. We are shown Payne, for instance, pawning her violin and jewellery to fund her research, and combining motherhood with astronomy. The low wages were a sticking point with many of them — Fleming often mentions it in her diaries. Yet, as Sobel shows, they clearly liked and admired Pickering and Shapley, who encouraged their work and facilitated their professional progress.

One of the last computers in the twentieth century, Radcliffe alumna Ellen Dorrit Hoffleit, gets a brief mention towards the end. She joined the observatory in 1928. In 2004, I met her at Yale University in New Haven, Connecticut, when I was making a radio documentary for the BBC on the Harvard computers. An energetic 96, Hoffleit was working on a paper about meteors. Like all of this band of remarkable women, she was unforgettable, as is this book. ■

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POLITICS

Life at the divide

Alison Abbott hails a memoir from Italian senator and biologist Elena Cattaneo, scourge of pseudoscience.

One hot day in August 2013, the phone rang in the laboratory of neuroscientist Elena Cattaneo at the University of Milan. The then-president of Italy, Giorgio Napolitano, wished to speak to her in Rome as soon as possible.

Cattaneo was already a minor national figure, known for her opposition to all forms of pseudoscience, however powerful the perpetrators. In one of her first public fights, in 2009, she criticized the Vatican for condemning the use of human embryonic stem cells in research. At the time of the call, she was in the middle of a battle to stop the government supporting a clinical trial of an unproven stem-cell 'therapy' run by the maverick Stamina Foundation in Brescia. The call made her wonder whether she had overstepped some mark.

Napolitano had something quite different to discuss at his residence in Rome, the baroque Quirinal Palace. He told Cattaneo, then aged just 51, that he wanted her to become a senator for life: what did she think?

"It was as if my every atom had been paralysed by the question," she recalls in her book *Ogni giorno: Tra scienza e politica* (*Every Day: Between Science and Politics*). "Seconds passed without me being able to line up a meaningful sentence. The President realised, and touching my arm as if to shake me, he jokingly said: 'Professor, can I get you a cordial?'"

Cattaneo works on Huntington's disease, an incurable genetic disorder in which brain cells progressively die. Stem-cell research has provided new insights into the disease, which is why she had fought so hard for the right to do it responsibly. Those battles stole precious time and energy. Would being a senator for life — with the inevitable widening of her repertoire of fights — drain too much from her scientific life?

Elena Cattaneo.

ANTONIO SCATTOLON/CONTRASTO/EYEVINE

***Ogni giorno: Tra scienza e politica* (Every Day: Between Science and Politics)**
ELENA CATTANEO
Mondadori: 2016.

Ogni giorno is a fascinating account of how a scientist entered the messy business of politics (arguably more so in Italy than in other rich countries) and learnt to survive. Cattaneo accepted the position. As one of only a few appointed by the president, the role signifies a person's importance to national culture. But she set boundaries. She would not give up her lab, and in the Senate she would engage mainly with themes relating to science. She would apply the same rigour to evidence supporting a political hypothesis as she would to that supporting a scientific one. She would not vote if such evidence were missing, and she would vote only according to her conscience, never along any party lines.

In August that year, she was sworn in along with conductor Claudio Abbado (who died five months later), architect Renzo Piano and Nobel-prizewinning physicist Carlo Rubbia. She threw herself into action, appointing a small team to help with research and administration, and organized a series of workshops with invited scientists from around the world. The aim was to educate parliamentarians in themes such as science, health and innovation, neuroscience and cell therapy.

She quickly learnt about Senate investigations and organized one into the Stamina debacle, a process that took more than a year. Published in February 2015, the report assigns responsibility for every step in the affair that allowed public hospitals to host the treatment, the government to support it and numerous courts to rule that patients had the right to it — even though it had been condemned as dangerous by the Italian health authorities.

Her repertoire of battles, as anticipated, did expand and she found herself on steep learning curves. One of these was genetically modified (GM) crops. In 2015, Italy's parliament debated the sensitive issue of whether each European Union member state should have the right to ban cultivation in their territories

of GM crops that had been approved by EU authorities. Giving evidence at a Senate hearing, veterinary scientist Federico Infascelli described experiments in which he had apparently showed harmful effects in animals that were fed GM crops.

Cattaneo spent the weekend poring over his papers. She could not understand the data, and discussions with Infascelli did not help. So she prompted investigations into his work, which eventually saw some of the papers retracted. Her team went on to produce a 1,556-page document for the Senate compiling nearly all available scientific evidence about GM crop safety. For her pains, Cattaneo was demonized by some in the Senate as a lobbyist for the agricultural biotechnology firm Monsanto.

She has confronted many other issues in the Senate — for example, the continuing need for animals in research, the non-transparency of some government decisions relating to science, the murky proposal for a major research centre to be built on the site of the 2015 Expo in Milan, and issues such as research financing.

"The book is a dispatch from a strong woman fighting in a hostile environment."

Ogni giorno is a dispatch from a strong woman fighting in a hostile environment. She sees an anti-intellectual tendency in her parliament, an anti-scientific attitude in the Italian judiciary and a reluctance of most scientists in the country to speak up in scientific controversies — "leaving the floor open to pseudoscientists and charlatans".

Inevitably, she has made enemies. But she has made friends, too. In June, a total stranger, an accountant from the small provincial town of Molinella near Bologna, left his entire fortune of more than €1.5 million (US$1.6 million) to her to distribute to research in ways she sees fit.

Having reported these various stories for years, I was fascinated to learn from the book how many more weapons one has when fighting battles for science from within a political system — but just how taxing those battles can be.

Cattaneo might turn out to be the last senator for life to be appointed. There will be a referendum on the Italian constitution on 4 December. A 'yes' vote will lead to a smaller, less powerful Senate in which the president will have the right to directly appoint a handful of senators for only a seven-year period. ■

Alison Abbott *is* Nature's *Senior European Correspondent.*

CISCA CASTELLINS/NATURE IN STOCK/FLPA

A Glanville fritillary butterfly (*Melitaea cinxia*), subject of a unique long-term data-collection effort

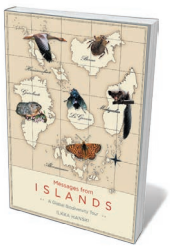
ECOLOGY

Winged insights

H. Charles J. Godfray is inspired by the scientific memoir of late island ecologist Ilkka Hanski.

Combining a personal memoir with serious discussion of a scientific subject is a difficult literary trick. The Finnish biologist Ilkka Hanski succeeded with aplomb in his last book, *Messages from Islands*, in which each chapter begins with insights from an island that moulded his thinking about ecology, evolution and conservation. Hanski, one of the foremost ecologists of his generation, died in May (A.-L. Laine *Nature* **534,** 180; 2016).

Finland is a land of lakes and islands, so perhaps it is not surprising that Finnish ecologists are drawn to investigating how populations and communities persist in fragmented habitats. Hanski is most celebrated for developing the ecological concept of a metapopulation — a population of populations connected by dispersal — and its applications to conservation.



Messages from Islands: A Global Biodiversity Tour
ILKKA HANSKI
University of Chicago Press: 2016.

There are several types, but a classical metapopulation is sometimes likened to a collection of "blinking lights", with individual short-lived populations winking in and out of existence while the whole ensemble persists.

Hanski explored the concept through his 25-year, and ongoing, study of the Glanville fritillary (*Melitaea cinxia*) in the Åland Archipelago between Finland and Sweden. This checkerspot butterfly has exacting habitat requirements: it occupies a fluctuating ▶