

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.

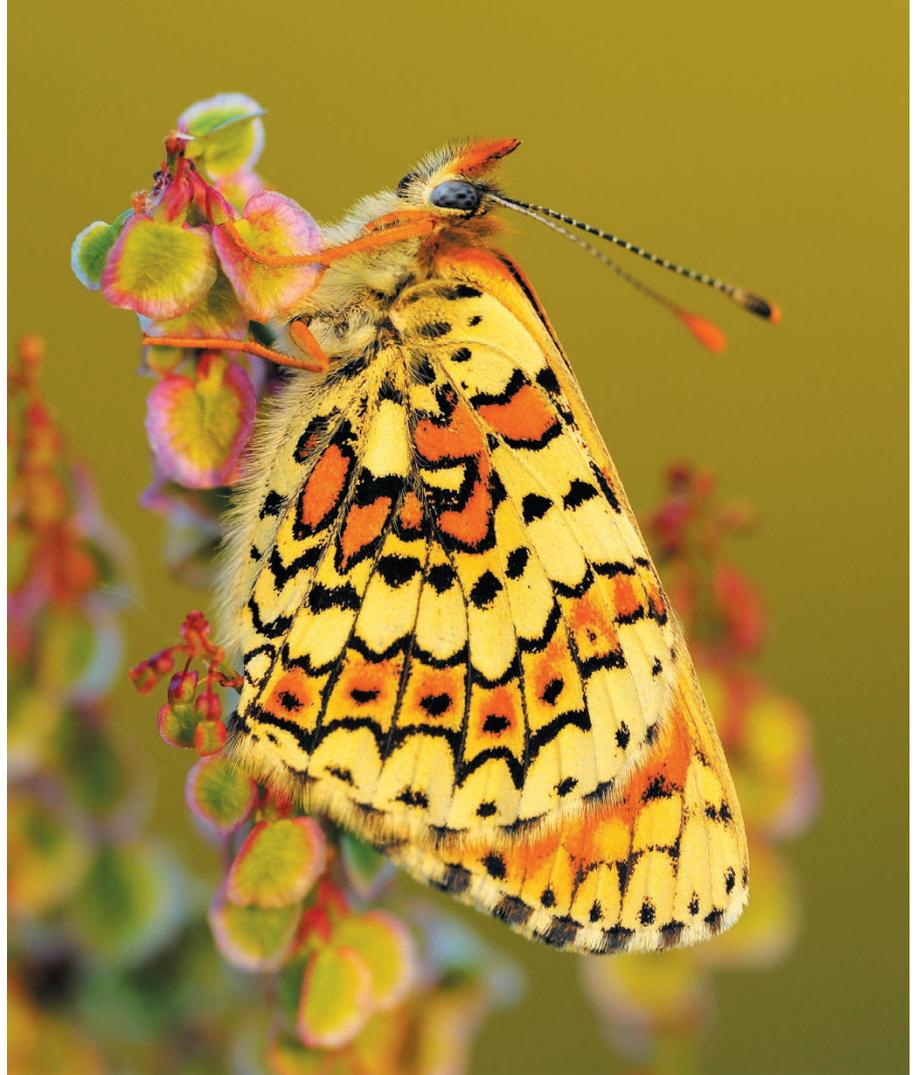
*Onni giorno* is a dispatch from a strong woman fighting in a hostile environment. She sees an anti-intellectual tendency in her parliament, an anti-scientific attitude in the Italian judiciary and a reluctance of most scientists in the country to speak up in scientific controversies — “leaving the floor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

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

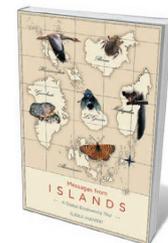
#### ECOLOGY

# 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 ▶

▶ number of the small woodland meadows that constitute a habitat archipelago within the geographical archipelago. The meadows are so tiny that they support only a small butterfly population; each has a high risk of extinction every year.

Hanski, his colleagues and an ever-changing army of students surveyed all 4,000 or so meadows, which support 400–800 populations each year. Through this and many experiments, such as quantifying rates of dispersal between patches, they constructed a model of the butterfly's metapopulation — the most detailed and satisfying description of such a population structure currently available, by some distance.

Åland, of course, is the basis of a chapter. We learn how Hanski drew on the deep knowledge of Finnish butterflies and moths that he gained as a keen teenage naturalist in his search for a suitable model system. As elsewhere in the book, he explores much broader questions in population biology — for example, how agriculture, deforestation and other types of habitat change have shattered what would once have been contiguous habitats. Many more species live in metapopulations today than in the past, so understanding them can help in the design of protected areas, increasing the chance that a threatened species will persist.

Hanski's passionate concern for biodiversity is evident throughout the book. The chapter on Madagascar discusses the island's community of nearly 300 species of dung beetle (the subject of Hanski's doctorate and an abiding passion throughout his life). Madagascar has experienced extensive deforestation in the past century, making it likely that some of the dung-beetle species known from nineteenth-century collections are now extinct. More positively, Hanski and his students have documented how some species have



Biologist Ilkka Hanski, who died this year.



A few of the 300 dung-beetle species endemic to Madagascar.

evolved to utilize the dung of introduced livestock such as cattle.

This leads to a more general discussion of how biodiversity is generated, for example drawing lessons from Darwin's finches and pollinating bees about when natural selection favours specialization or being a jack-of-all-trades. That, in turn, leads back to the Glanville fritillary, in which Hanski has demonstrated genetic differences in the colonization ability of butterflies from the core and periphery of the metapopulation.

Haminanluoto is the smallest island discussed in the book. This 2-hectare islet is on the south coast of Finland near the village of Hanski, named after a seventeenth-century ancestor of the ecologist. At the age of 14, Hanski counted 15 species of bird on the island. Repeat counts in 2003 and 2013 found about the same number of species, although some of the original species had gone and new ones had colonized the island. Hanski muses on how human activities have affected the natural dynamics of species turnover. This leads to thinking about

the future potential impacts of climate change.

Here again, Hanski's own experiences are illuminating.

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As a doctoral student he took part in an expedition to the virgin forests of Gunung Mulu in Sarawak, on the north coast of Borneo. He studied the dung-beetle communities living at different altitudes and found that species composition changed as you moved up the mountain. Thirty-five years later, he returned and repeated the exercise. He found the same sequence of species along the transect, but the whole distribution had shifted upwards, probably owing to global warming. Hanski laments another difference: Gunung Mulu is itself now an island in a sea of oil palm, no longer part of a much more extensive forest.

Hanski wrote *Messages from Islands* after being diagnosed with cancer. His book does not shy away from the challenges that face humanity or the threats to biodiversity. Yet it is an uplifting read, revealing the author's humanity and deep love of the natural world. I cannot think of a better book to give to a general reader who wants an insight into modern ecology and how ecologists go about their trade. ■

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