by the weather, we are shaping the weather through our greenhouse-gas emissions.

This brings us to Tim Flannery's *The Weather Makers*. Flannery is an acclaimed scientist, writer and explorer, and his book carries a ringing endorsement from Bill Bryson, so it should be a good bet for the *Silent Spring* of climate change. Flannery is a consummate science writer and weaves together fascinating descriptions of his own exploration and experiences with interviews from other researchers. On the impacts of climate on biodiversity, I've not read anything better. From the last sighting of the golden toad in 1987 — a solitary male waiting in forlorn hope for a mate that never came — to the grotesque 'hairy

seadevil', dragged up into our world from the ocean depths and slowly dying from the heat, the writing is wonderfully evocative.

Unfortunately, there are also some nagging errors. Most of these are relatively minor, such as citing incorrect figures for Kyoto Protocol targets. But there are some clangers that Flannery or his editor should really have picked up. At one point he talks of "sea water turning acidic, its pH increasing by half to one unit". This kind of error is rather, well, basic.

Such distractions aside, this is a very good book. It covers the science and the politics of climate change in an engaging and thoughtful manner. Drawing on James Lovelock's Gaia hypothesis at regular intervals, Flannery leaves

the reader in no doubt about the magnitude of the problem we are facing and the urgency with which we need to act. The Kyoto Protocol and related political machinations are largely covered well, as are the options for mitigation through renewable energy, nuclear power and increased energy efficiency.

Is this a *Silent Spring* for climate change? It's not far off. If you want the real story on climate change — its history, science and politics — you should put down the *Daily Mail* and pick up one of these two excellent books.

Dave Reay is at the School of Geosciences, University of Edinburgh, Edinburgh EH9 3JN, UK. He is the author of *Climate Change Begins at Home* published by Macmillan.

FILM

Big trip to the red planet

Roving Mars

An IMAX movie produced and directed by George Butler
Walt Disney Pictures: 2006
<http://disney.go.com/disneypictures/rovingmars>

Jay Pasachoff

Robotic space exploration is humanized and dramatized when it is turned into an exciting story and presented on a screen so large, and showing such detail, as to be overwhelming. The IMAX film *Roving Mars* brings the movie skills of the Walt Disney Company to NASA's Mars exploration missions. We hear and see the stories of the Spirit and Opportunity rovers as they were built, launched and operated on the martian surface.

My bedroom television, although not small, subtends an angle of about 10°, the width of my fist held at arm's length (astronomers go around measuring angular distances with their fists and fingers all the time). An IMAX movie, seen from a typical seat in the middle of the theatre, subtends an angle of about 70°. What's more, it is 50° high, enveloping you in the picture. But IMAX is more than simply a big screen — the film in the water-cooled IMAX projectors (and in the IMAX cameras) is much larger than ordinary film, having about ten times the area, so it captures much more detail. And the detail shows: the images are crystal clear. High-quality sound, with pumping subwoofers, also helps the ambience, and *Roving Mars* has an appropriately ethereal score by Philip Glass.

The film begins by crediting NASA's Jet Propulsion Laboratory (JPL) with the unique capability of building the rovers, and explains that Steve Squyres of Cornell University was chosen to head the mission. A substantial part of the film deals with building and testing the rovers, which we see in exquisite, close-up detail. We learn how flexible each rover is, with

its six wheels each individually mounted and with a robotic arm that has the equivalent of shoulder, elbow and wrist motions. We see the individual devices on the arm, and how one of them, the rock abrasion tool, can cut through rock surfaces to allow unweathered surfaces to be analysed.

The movie takes us to Cape Canaveral for the launch. Dramatic high-resolution images are followed by an animation of the mission. The main problem I had with the film was distinguishing photographs from the animations, which are of exceptionally high quality; I wish the latter always had "animation" printed in a corner, or some other demarcation. And I wish the movie-makers hadn't added whooshes of sound as the later-stage rocket engines ignited, as sound doesn't travel in space.

We are shown an animation of the landing

on Mars, as no cameras hovered overhead to film the event. We see the delicate rovers cradled in spherical airbags that are cut free from parachutes and left to bounce several times, with the images animated using actual data transmitted to Earth. Real cutaways to the scientists, engineers and administrators in the JPL control room provide the spirit of space exploration. We clearly see the emotional effects of the time delay caused by the finite speed of light. And we share the elation in the control room when, after a frightening further delay, the first signals come through.

Actual film obtained on the martian surface is shown for only a few minutes at the end, but the treatment is nonetheless first-rate. The narrator discusses the evidence for past water on the martian surface, and we see types of rock that only form as sediments, such as jarosite. The movie shows, in tremendous close-up, the haematite masses known as 'blueberries' that have eroded out of the rocks — these are taken as evidence for past water on Mars. And we see some dramatic images of the planet's surface, including the crater that Spirit

The rovers' six wheels and battery of tools made them well equipped to explore the martian surface.

DISNEY ENTERPRISES

Hidden depths

The photographer Bill Curtsinger has completed 33 photographic essays for *National Geographic* magazine as part of his quest to reveal marine species in their natural settings. The photograph of the harbour porpoise above is from his book *Extreme Nature: Images From the World's Edge* (White Star, €29.20).

climbed out of, complete with tyre tracks.

Roving Mars is a model of how to draw the public into space exploration. The giant size and excellent sound make the movie especially commanding, but even the TV-resolution DVD that may soon be available would be suitable for showing in schools. A 20-page 'educator guide' can be downloaded from the official

website, which includes an excellent 90-second trailer that samples various parts of the movie.

The film can now be seen at IMAX cinemas across the United States and will be released in other countries later in 2006.

Jay M. Pasachoff is field memorial professor of astronomy at Williams College, Williamstown, Massachusetts 01267, USA.

in communication. The contemporary importance of access, a vital performance indicator for modern museums, is highlighted.

The Renaissance *Wunderkammer*, or chamber of wonders, tended to be the private preserve of a rich or royal coterie with the means to indulge their passion for bringing together natural and artistic objects, which were often presented together in ornate cabinets. Alessandro Tosi compares the relatively unscientific *Wunderkammer* of the German tradition with the great Italian Renaissance collections of Ulisse Aldrovandi, Francesco Calzolari and others, which were almost exclusively devoted to natural history and were an important component of an emerging scientific culture.

Anna Maerker discusses the anatomical collections of La Specola in Florence and the Josephinum in Vienna, and examines the transition of the former from a cabinet of curiosities to a public museum. She also explores how the rejection by both physicians and surgeons of collections of anatomical models, which they dismissed as merely a source of entertainment for the middle classes, led to a rapprochement of these hitherto rather antagonistic disciplines. Samuel Alberti's article focuses on the concept of ownership of collections, and cites John and William Hunter as private collectors whose anatomical collections became public when they were sold to the University of Glasgow in Scotland; medical students were afforded free access while the public had to pay. Collections made and owned by learned societies formed the basis of today's great regional museums, such as those in Manchester and Sheffield, and Alberti compares the ways in which such regional museums developed.

The paper by Jonathan Simon on eighteenth-

The chamber of wonders

From Private to Public: Natural Collections and Museums

edited by Marco Beretta

Science History Publications: 2005. 272 pp. \$39.95

Kathie Way

We have all visited museums of natural history and perhaps been excited, intrigued, inspired — or even thoroughly bored — by the objects on display. But I suspect that we seldom pause to wonder how the contents of these galleries arrived in their mahogany drawer or tabletop vitrine. These essays, edited by Marco Beretta, address and offer answers to this question.

In his excellent preface, Beretta discusses the idea that the emergence of natural history as an independent discipline "was closely connected to the possession and domination of nature, rather than its contemplation". Thus it was the passion for collecting natural-history artefacts from the Renaissance to the end of the eighteenth century that drove the establishment of the discipline. The growth of exploration, the trade routes forged by the East

India Company, and the burgeoning enthusiasm for 'cabinets of curiosity', beginning in the seventeenth century, support this chronology. The 12 expert contributors to this volume provide a wealth of historiographic data drawn from late Antiquity to the nineteenth century, and examine the role of the natural-history collection through time.

Giovanni di Pasquale looks at how the Greeks and Romans documented the past through the accumulation of relics, from the ancient library at Alexandria to the established Roman museums and their collections. The suggestion that collecting relics condemns a still evident culture to the distant past is an interesting one. Susana Gómez López deals with Spanish museum collections from the fifteenth century onwards and concentrates on the link between the scientific thinking of the time and the collections in Seville, a port of entry for commodities, including slaves, from the New World. She uses a number of sixteenth-century personalities, including Spain's King Philip II, to illustrate the collecting ethos of the time and the value of collections