Feathers: The Evolution of a Natural Miracle
THOR HANSON
Basic Books: 2011. 352 pp. $25.99

US palaeontologist John Ostrom, who posited that birds, as vertebrates with feathers, were related to theropod dinosaurs. Ostrom's claim was based on fossil evidence and supplemented by others' work on metabolism and behaviour. But for decades, the controversial argument that birds and dinosaurs were related lacked a key element: an evolutionary history of feathers.

At the time, the dogma was that all birds — and only birds — have feathers. This changed in the 1990s, with the discovery of 'feathered dinosaurs' from the Yixian Formation in Liaoning Province in China. The rich fossil findings stimulated a re-evaluation of the evolutionary history of both feathers and the animals that bear them. Phylogenetic analysis confirmed that theropods and birds are sister groups, and the feather structures on the Yixian fossils provided direct evidence for the evolution of feathers. These findings complemented other data from ontogeny, molecular biology and morphology. Finally, a clear picture of the evolution of feathers has emerged.

Hanson's tale is comprehensive, accurate, timely and engaging. One thing missing is the story of the technical breakthroughs that led to the understanding of feather structure (keratin) and genomics. The fact that feathers are insoluble is partly because of their structure — they are made from highly organized filaments — and partly because of their amino-acid composition (they contain many stable intra- and intermolecular disulphide bonds).

In the late 1960s, a group in the protein-chemistry division of the Commonwealth Scientific and Industrial Research Organisation in Australia isolated and identified the soluble monomer of feather keratin, and revealed the characteristics of the gene family involved. Ornithologists quickly became interested. This accomplishment provided ways to test directly the 'feathers arose from scales' hypothesis and to map molecular evolution more widely onto lineages derived from other features. Comparative work on the proteins of the other epidermal structures, such as claws, scales and beaks, soon followed.

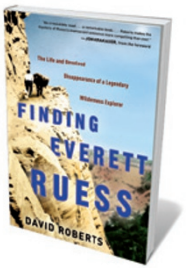
Feathers is a compelling introduction to one of nature's wonders. ■

Alan Brush *is professor emeritus in ornithology at the University of Connecticut, Storrs, USA.*
e-mail: brushes2@juno.com

Books in brief

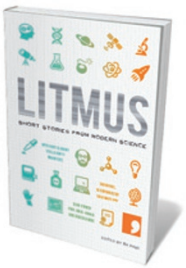
Sex on the Moon: The Amazing Story Behind the Most Audacious Heist in History
Ben Mezrich DOUBLEDAY *320 pp. $26.95 (2011)*
In 2002, NASA fellow Thad Roberts, aided by three interns, stole lunar and martian samples from a Johnson Space Center vault in Houston, Texas. As writer Ben Mezrich deftly recounts, Roberts's motivation was not geological obsession, but a desire to impress one of his accomplices, Tiffany Fowler. In a bizarre act that was both poetic and literal-minded, Roberts made love to her on a bed strewn with Moon rocks — hence the book's title. Rarely has career suicide been so entertaining.

A Martian Stranded on Earth: Alexander Bogdanov, Blood Transfusions, and Proletarian Science
Nikolai Krementsov UNIVERSITY OF CHICAGO PRESS *192 pp. $35 (2011)*
We sometimes forget that the Russian revolution convulsed science as well as society. Now philosopher of science Nikolai Krementsov gives a portrait of a Bolshevik scientist at the epicentre of that revolution. A political rival to Lenin, Alexander Bogdanov was a physician, philosopher and sci-fi writer. Krementsov sketches a rounded picture of a polymath who set up the world's first institute for blood-transfusion research and whose philosophical work laid the foundations of systems theory.



Finding Everett Ruess: The Life and Unsolved Disappearance of a Legendary Wilderness Explorer
David Roberts BROADWAY BOOKS *416 pp. $24.99 (2011)*
American wilderness artist and writer Everett Ruess, a contemporary of photographer Ansel Adams, was an archaeologist–naturalist manqué who ventured solo into remote areas of Arizona, Colorado, New Mexico and Utah, starting when he was just 15. Ruess was a prodigious journal-keeper, poet and printmaker, but disappeared in November 1934 near Escalante, Utah, aged just 20. His fate remains a mystery but his works continue to astound. Roberts shows that we can still 'find' Ruess in compilations of his art and writings.

Sustainability Management: Lessons from and for New York City, America, and the Planet
Steven Cohen COLUMBIA UNIVERSITY PRESS *256 pp. $35 (2011)*
Some 25 years after the concept of sustainability emerged, policy solutions to implementing it remain elusive. Cohen, executive director of Columbia University's Earth Institute in New York, argues that we now have enough successful examples to draw up blueprints for keeping the planet viable and economies afloat. Through case studies such as New York's community gardens, Cohen looks at sustainable practice in business, energy, water and food supply, and the technical, financial and political challenges of transmuting ideas into action.



Litmus: Short Stories from Modern Science
Edited by Ra Page COMMA PRESS *298 pp. £9.99 (2011)*
From Jeremiah Horrocks's observation of the transit of Venus in 1639 to Alan Turing's revelations about morphogenesis in 1952, 'eureka' moments shift our take on the cosmos. They can also make for supercharged narratives. In 17 short stories, novelists and poets including Sean O'Brien and Kate Clanchy retell lightbulb moments from centuries of science. Each has an afterword by an expert, from Jim Al-Khalili on Einstein's special theory of relativity to Denis Noble on heart modelling and Giacomo Rizzolatti on mirror neurons.