

doesn't realize that the biggest charge in the brain is a mere tenth of a volt — not the stuff that sparks are made of. ■

William H. Calvin is a neurobiologist at the University of Washington, Seattle, Washington 98195-1800, USA. He is the author of *A Brain For All Seasons*.

A complete history of astronomy

Storia dell'astronomia: dalle origini al duemila e oltre

by Giacomo Leopardi & Margherita Hack
Edizioni dell'Altana: 2002. 646 pp. 37 euros. In Italian

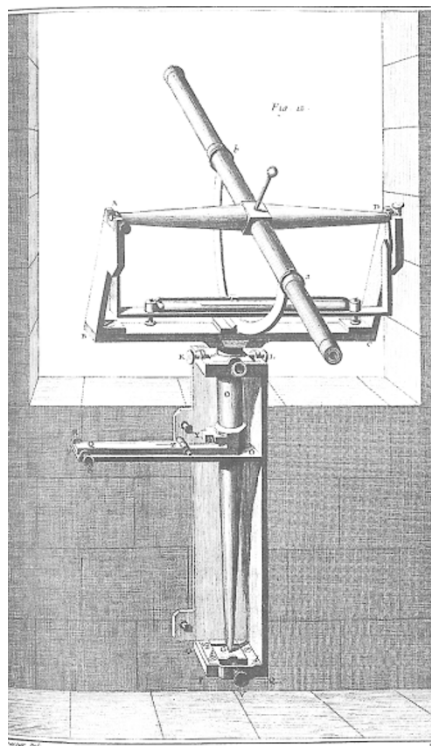
Giovanni F. Bignami

In the introduction to his *Why Read the Classics*, Italo Calvino mentions only one Italian author, Giacomo Leopardi (1798–1837). Calvino does not praise Leopardi as the author of the *Canti*, which is one of the greatest poetic works of the nineteenth century, but instead refers to the unique education that the young genius received in his father's castle. Count Monaldo had a well-organized, 16,000-volume library in Recanati, a small town in central Italy, where young Giacomo used to sit and study in its central room, writing at a small table with his back to the east.

In 1811, while aged just 14 to 15, Leopardi wrote a 300-page history of astronomy, the *Storia dell'astronomia*. It contains more than 1,700 footnotes and references, and an organized bibliography of 300 works spanning two millennia and in many languages, both modern and ancient. He presumably had access to these in the astronomy corner of Monaldo's library. He refers to almost 2,000 astronomers, philosophers, poets and other authors, frequently in the original language. The new edition of his book, updated to the present day by the Italian astronomer Margherita Hack, includes translations of the Greek passages; young Leopardi assumed that his readers would not need them.

However, even at such a tender age, Leopardi was not merely trying to show off his immense erudition. His deep poetic and philosophical mind surfaces frequently in a sea of arid facts, dates and quotations. Consider, for example, his comment on the Latin translation of the Greek poem *Phenomena* by the little-known astronomer Aratus (*circa* 272 BC). The translation, they say, is by Cicero (yes, the illustrious one), and Leopardi goes off on a tangent on the poetic qualities of the great Roman. Along the way he entirely forgets the original subject — perhaps it was too boring.

Or take the story of the 'mechanical astronomical clock', sent in around AD 800 by the Arabic scientist al-Mansur to Charlemagne,



Big future: improvements to telescopes since the eighteenth century led to astronomical advances.

and Gian Domenico Cassini's observations of Jupiter, showing the giant planet's fast rotation. Leopardi interprets these as implying that man learns to understand what is outside and far away better than what he is sitting on (namely, the copernican debate on the rotation of Earth) or what goes on inside his soul.

In the new, elegant edition of the book, Hack takes over where Leopardi ends. She had a daunting task because so much more has happened in astronomy in the past two centuries than in the previous two millennia. She does a splendid job of presenting an accurate and balanced account, even of today's accumulating, sometimes contradictory and always diverse discoveries. To keep the size of the book manageable, she had to keep within 200 pages, compared with the 300 of Leopardi. She spares us any debate on Cicero's poetics, but has an obvious soft spot for Sir Arthur Eddington, who added so much to our knowledge of the structure of stars, from whom we get ample quotes. However, in a philosophical vein akin to that of Leopardi, Hack ends her contribution with an enlightening reflection on the weak and strong anthropic principles. A difficult but important subject, this is where today's astronomy and philosophy converge to provide a coherent understanding of today's cosmology as it emerges from both ground- and space-based observations.

Hack was one of only a few women astronomers when she began her career, and she has campaigned hard for the place of women in science. The revered elder of

Italian astronomy, she is now an important public and political figure, and celebrates her 80th birthday this week. Happy birthday, Margherita. ■

Giovanni F. Bignami is at the Agenzia Spaziale Italiana, 23 Via di Villa Grazioli, 00198 Roma, and the University of Pavia, Italy.

Portraits of our family tree

The Human Fossil Record. Volume 1: Terminology and Craniodental Morphology of Genus *Homo* (Europe)

by Jeffrey Schwartz & Ian Tattersall
Wiley: 2002. 400 pp. \$125, £92.95, 147.10 euros

Jacopo Moggi-Cecchi

Interpretations of the human evolutionary process often differ among specialists. The contrasting opinions are in some cases based on a discordant reading of the fossil evidence — the morphological features of the bones and the teeth of our ancestors. Anatomical details described as 'thick', 'broad' or 'deep' by one scholar are not necessarily perceived as such by a second or third scholar and defined using a corresponding term. And this, in turn, may affect the final interpretation.

This book, the first volume in a series of four, was conceived with this issue in mind and is based on an apparently simple idea: to provide a detailed description of the most relevant fossil specimens attributed to the genus *Homo* from all over the world, following a consistent protocol and accompanied by basic photographic documentation. Giving shape to this idea made the project a "Herculean task" (in the authors' own words). The scale of the task and the significance of the book lie in the method used: nearly all of the fossil specimens have been described by the authors, using the same procedure throughout. As a result, readers can be assured that the adjectives used to describe morphological features are applied consistently for each description presented. This, in turn, allows easier, direct comparisons between specimens for each anatomical detail. The descriptive protocol applied and the terminology used are accurately explained, region by region, in the first part of the volume, together with drawings showing the anatomical features mentioned in the text.

The descriptions, arranged by site, range from an isolated tooth to the most representative specimens of large collections, and include recent discoveries up to the two skulls from Georgia. Photos of the specimens (not all of them in sharp focus) have been taken mostly by one author. You won't

find a single measurement in the book: the effort has gone into capturing the shape of a bone or a tooth through its verbal dissection. In an era in which every morphological detail of a fossil can be captured using the most sophisticated technologies, and the information stored in digital archives, a book of anatomical descriptions may seem outdated. This is not so. Detailed morphological accounts are powerful analytical tools and rich sources of information, and this book represents an invaluable archive.

We are at a stage in human evolutionary studies when we are just starting to grasp the developmental mechanisms underlying specific morphologies. When new discoveries of the developmental biology of bone and teeth are made, we will be able to use this archive to document the evolution of a specific shape in our fossil relatives. This is a true thesaurus, in its literal meaning: a textbook to go back to several times, for different scopes. ■

Jacopo Moggi-Cecchi is at the *Laboratori di Antropologia, Dipartimento di Biologia Animale e Genetica, Università di Firenze, 12 via del Proconsolo, 50122 Firenze, Italy.*

.....

Winning the numbers game

The Honors Class: Hilbert's Problems and Their Solvers

by Benjamin H. Yandell

A. K. Peters: 2002. 496 pp. £28, \$39, 46 euros

W. Timothy Gowers

One of the best ways for a twentieth-century mathematician to achieve immortality was to solve a problem from the famous list of 23 compiled by David Hilbert and delivered to the International Congress of Mathematicians in 1900. The 'honours class' of Benjamin Yandell's title refers to those who managed this feat; his thoroughly researched and highly entertaining book tells us about their lives and about the problems themselves.

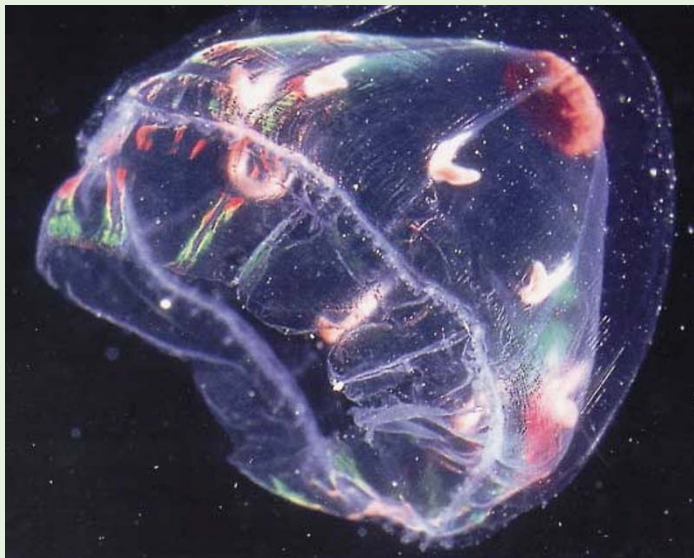
Yandell groups the problems according to their mathematical area, more or less as



Sum people? Several mathematicians rose to the challenges set by David Hilbert (top row, centre).

Marine masterpieces

It was the artist Marc Chagall who said: "Great art picks up where nature ends." Now Judith Connor and Nora Deans look at jellyfish and the art that they have inspired in *Jellies: Living Art* (Monterey Bay Aquarium, \$16.95). The fine specimen shown here is *Crossota alba*, which glows in the dark.



Hilbert did himself, although he reclassifies one or two problems because of the unexpected nature of their solutions. He then introduces each area, describes each problem within it, discusses the solution when there is one (by his reckoning only three remain unsolved), and intersperses the mathematics with plenty of biographical information about those who contributed to it. The result is a vivid history of much of twentieth-century mathematics from mathematical, personal and political perspectives — in Russia and Germany, at least, mathematics and politics were not entirely separate, with devastating results.

Occasionally one has too clear an idea of how the book was put together. Unlike many authors, Yandell does not try to hide behind his text. The book is full of such phrases as "Michael [Artin] remarked to me that..." or "[Paul] Cohen thought... and I agree". In addition, some of the anecdotes, although amusing, are not really relevant. In the middle of a long discussion of A. N. Kolmogorov, we are treated to two stories about Sofya Kovalevskaya because she "throws an interesting light on Kolmogorov's early milieu". The remarkable story of Srinivasa Ramanujan is told because he wrongly claimed to have proved a result closely related to the Riemann hypothesis. And the general introduction to the section on number theory begins with a very short paragraph about G. H. Hardy before suddenly being interrupted by three well-worn tales about Paul Erdős. These are included because Erdős has "a connection to the eighth Hilbert problem", but we are never told what the connection is. (The eighth problem is the Riemann hypothesis again; it is one of the three that have not been solved.)

This is the second recent book on Hilbert's problems — the other, Jeremy Gray's *The*

Hilbert Challenge (Oxford University Press, 2000), was reviewed last year in *Nature* (410, 632–633; 2001). However, despite a necessary overlap between these books, they are very different in character and to some extent they complement each other. Gray's book was centred much more on the problems themselves — why they were chosen, why they were so influential, how even very different-looking problems had similar underlying themes — whereas Yandell takes their importance largely for granted.

Gray included biographical details only when they help to explain the progress of the problems, whereas Yandell is far racier and revels in the human story. For example, you will not discover from Gray that Hilbert often became infatuated with pretty women, of whom Emmy Noether (possibly the greatest female mathematician ever) was not one, or that Pavel Aleksandrov liked to work outside under the burning sun wearing nothing but dark glasses and a Panama hat. Yandell's book is also significantly longer than Gray's, which allows him to discuss some of the mathematics in a more leisurely way. He does this well, although some of his discussions fall between two stools: unnecessary for the expert, but incomprehensible to the general reader.

Yandell turned his back on mathematics to become a writer after a distinguished undergraduate career at Stanford University. This makes him an ideal author for a book of this sort, to which he brings a rare combination of mathematical and literary sophistication. *The Honors Class* will be greatly enjoyed by anybody who wants to know more about mathematics and its practitioners. ■

W. Timothy Gowers is at the Centre for Mathematical Sciences, Wilberforce Road, Cambridge CB3 0WB, UK.