demonstrates that those puzzles aren't necessarily insoluble. For instance, intelligent design adherents often describe the mammalian eye and the bacterial flagellum as so "irreducibly complex" that they couldn't have resulted from evolution, but Collins offers clear and accessible explanations of how step-by-step evolution could indeed produce such structures.

To Collins, evolution and faith are altogether compatible—indeed, each lends depth to the other. Why, he asks, would studying the laws of nature and the intricate mechanisms of the universe do anything but increase one's wonder at creation? "Many believers in God have been drawn to young earth creationism because they see scientific advances as threatening to God. But does He really need defending here? Is not God the author of the laws of the universe? Is He not the greatest scientist? . . . Most important, is He honored or dishonored by those who would demand that His people ignore rigorous scientific conclusions about His creation?"

This approach, known as "theistic evolution," probably predominates among scientists of faith. Collins suggests, with sweet ingenuousness, that it might attract broader support if it had a catch-

ier name. He proposes "BioLogos," from the Greek *bios* (life) and *logos* (the word of God). Alas, this sounds less like a theology than a macrobiotic cereal. But never mind. The book itself has a credible shot at spreading the word about the little-appreciated middle ground—at least, that is, for those who have ears to hear.

—*Amy E. Schwartz*

SCIENCE & TECHNOLOGY

Spectral Mathematics

MOST OF US CAN HANDLE A little arithmetic. We can tot up grocery receipts, buy enough cookies for a children's birthday party, or estimate how much gas we'll need to reach our destination. Numbers that represent familiar things—dollars, cookies, gallons of fuel—generally don't induce mental panic. But once we begin to think of those numbers as entities in their own right, obeying an abstract system of rules, we leave mere arithmetic behind and enter the realm of

UNKNOWN QUANTITY:
A Real and Imaginary History of Algebra.

By John Derbyshire. Joseph Henry Press. 374 pp. $27.95

mathematics. And that, for many people, is where puzzlement, if not outright phobia, sets in.

John Derbyshire, author of the elegant *Prime Obsession: Bernhard Riemann and the Greatest Unsolved Problem in Mathematics* (2003), attempts here to render non-threatening the large branch of mathematics known as algebra. Algebra began with number problems our ancestors must have dealt with. How do you allot grain fairly among families of different sizes? If one sheep's worth of wool makes a rug of a certain size, how many sheep do you need for a rug twice as long and wide? Early on, there must have been people of a mathematical bent for whom working out number puzzles was an attraction in itself. A cuneiform tablet from the Babylonians records the solution, awkwardly expressed in words, of what we would now call a quadratic equation. But lack of a handy notation hampered progress for millennia. Not until the 17th century did the familiar x's and y's become commonplace, and that's when algebra took off.

At first, letters stood plainly for numbers, so an algebraist could solve a problem in a general way, then answer a specific question by plugging in actual values. But true mathematicians deemed the last step uninteresting. It was the manipulation of symbols according to logical rules that caught their fancy, not the real-world applications. Soon, they realized that they could denote a certain operation—a swapping of coefficients in a cubic equation, say—by a symbol, then explore the algebraic properties and rules governing that symbol. Repeat, ad infinitum. Algebra, in this generalized sense, concerns logical relationships among abstract entities whose definitions in terms of simple numbers have been left far behind. We are in the world of fields and groups, rings and manifolds, homology and homotopy—and a strange, self-referential, infinitely fertile world it is.

Derbyshire has a witty, almost brusque way with words. He offers pithy anecdotes, sardonic asides, and sharp-eyed vignettes of his protagonists. Admirably, he doesn't talk down to readers but leads them on with breezy confidence. One

imagines a hearty, no-nonsense schoolmaster marching his pupils across the moors in a howling rainstorm, turning back occasionally to say, Come along now, it's just a bit of water, it won't hurt you!

There's no escaping the reality, however, that this is a book about algebra. Readers will be able to judge the depth of their fascination by marking the page number at which they begin to fall behind. I made it about two-thirds of the way through, but then I was trained merely as a theoretical physicist. As the concepts become more abstruse, the operations more convoluted, an urgent question presses: What's it all for?

Perhaps Derbyshire would regard the question as crass. To the mathematician, juggling esoteric concepts and searching out their abstract relationships needs no justification beyond the pure intellectual pleasure it affords. But for the rest of us, the journey becomes a bit of a slog. Derbyshire has written a charming, demanding book, but even he can't bridge the unbridgeable. Mathematics—like golf or opera—offers endless delight to some, but brings others, sooner or later, to a state of baffled exasperation.

—*David Lindley*

Better Living Through Neurochemistry?

IN THE RELATIVELY NEAR future, brain science may produce all sorts of technological breakthroughs: brain scans that determine whether someone is telling the truth; tests that uncover secret urges or latent tendencies, such as a penchant for violence; pills

HARD SCIENCE, HARD CHOICES: Facts, Ethics, and Policies Guiding Brain Science Today.

By Sandra J. Ackerman. Dana Press. 152 pp. $12.95

and other treatments to erase traumatic memories or reduce the misery they cause, as well as treatments to strengthen one's memory skills; and procedures to treat and even cure blindness, quadriplegia, epilepsy, and Parkinson's disease.

Some of the near-miraculous possibilities raise daunting questions. Should a "truth-detec-