the lasing modes is increased by photons; the loading of the modes results from a stimulated emission process that does not depend directly on collisions. The situation in an atomic laser is entirely different. Collisions are necessary to load atoms into the atomic collective wave mode of a Bose–Einstein condensate, and as the occupation number n_{at} of the atomic mode is increased, the reverse process starts, in which collisions restrict n_{at}.

The circle of potential readers of the book is very wide—from graduate students to professors (and possibly to atomic engineers in the future). I recall the talk I had with Peter Kapitza some 30 years ago, when he recalled the advice that his teacher, Ernest Rutherford, would offer speakers about to address Royal Society meetings. The first part of the talk should be comprehensible to the wives of the RS members, he would say, the second to the RS members themselves, and the third might not be even very comprehensible to the speaker. I note with pleasure that Meystre's book seems to follow this recipe. And I therefore recommend it to all strata of the physics community.

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Extreme Stars: At the Edge of Creation

James B. Kaler
Cambridge U. Press, New York, 2001. $34.95 (236 pp.).
ISBN 0-521-40262-X

When I was a plasma physicist and knew no astronomy, I somehow presumed to know enough about the Sun and stars. I recall advising John Bahcall, a recognized expert on the Sun: "Don't use the expression 'standard solar model.' The outer part of the Sun is turbulent; magnetohydrodynamic turbulence is not understood quantitatively; thus we don't really know what's inside the Sun." It is clear to me now how ridiculous my comment was. Helioseismology, solar structure theory, and solar neutrino physics all seem to indicate that certain solar quantities are indeed known to an accuracy of about 0.1%, even in the convection zone and in the core. The accuracy of the standard solar model is actually better than the accuracy of some parameters of the standard model of elementary particles.

By ingeniously combining various astronomical observations with the stellar structure theory, astronomers have been able to learn a lot, not only about the Sun but also about distant stars. The entire Hertzsprung–Russell diagram, which maps the stars into the temperature–luminosity plane, appears to be well understood. Some stars out there are very different from the Sun. Some of those stars are 40 times hotter, 1000 times larger, 10 000 times more luminous, 100 000 times smaller. Others are much younger than the Sun. And there are stars older than the Sun by a factor of about 2.

All these and other inordinate stars are described in *Extreme Stars* by James Kaler, a popular book that began as a series of articles published in *Astronomy* magazine. The pieces, expanded and completely rewritten, are linked to "show the flow of stellar evolution from a unique perspective, as viewed from edges of the Hertzsprung–Russell diagram." The reader should not worry about the author's expertise—Kaler is well known to professional astronomers for his many works on planetary nebulae.

Compare Kaler's book to the stellar chapters of the standard candle of introductory astronomy texts, *The Physical Universe* by Frank H. Shu (University Science Books, 1982). With a text of similar length, Shu explains more physics, while Kaler gives more actual astronomical data. I should think that an educated astronomer would already know nearly everything in Shu's book, while some facts in Kaler's might be new. There are many beautiful and helpful illustrations in Kaler's book.

To give a sense of the book's style and level, I offer a random mix of topics and quotations from the book, which might help the reader decide if this book is right for him or her.

▶ The limb (outer edge) of the Sun appears darker than the center. This is because the Sun is spherical and "we do not see as deeply when we look away from the center as we do at the center itself, as our line of sight enters at an angle," and the higher-level gases are cooler.

▶ Gravity is the weakest of the four forces. The next one in strength is the weak force. Third is the electromagnetic force. The greatest of all forces is the strong force.

▶ "We are tiny compared with the Galaxy, but have the power to comprehend its greatness. It is easy—but misleading—to confuse size with significance."

▶ "The dimensions of supergiants are truly astounding. In spite of their great distances, several are large enough to have had their angular diameters measured by various kinds of interferometry . . . ."

▶ The existence of neutron stars (10 km spherical bodies made of nuclear matter) is firmly established, but do you know what exactly has been observed to establish it?

Kaler's book may be useful to the reader who wants to learn more about the phenomenology of stars.

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Fundamentals of Quantum Chemistry: Molecular Spectroscopy and Modern Electronic Structure Computations

Michael R. Mueller
Kluwer Academic/Plenum, New York, 2001. $69.50 (265 pp.).
ISBN 0-306-46596-5

Michael R. Mueller's *Fundamentals of Quantum Chemistry* is designed as a practical introductory textbook for undergraduate and graduate students. Physical chemists and chemical physicists have a need for quantum mechanics texts that cover normal modes of vibration, molecular orbitals, and chemical reaction dynamics. Physics-oriented texts often omit these topics.

Quantum mechanics texts more specifically designed for chemists have been available for more than 50 years, with three current high-quality examples being *Molecular Quantum Mechanics* by P. W. Atkins and R. S. Friedman (Oxford U. Press, 1996), *Quantum Chemistry*, 4th ed., by Ira N. Levine (Prentice Hall, 1991), and *Quantum Mechanics in Chemistry* by George C. Schatz and Mark A. Ratner (Prentice Hall, 1953; Dover, 2002). Mueller's book is not designed to compete with these excellent texts, but rather to present the basics of the subject to even second-year undergraduates. The author, however, recognizes that for some students this is a terminal course in quantum chemistry.

The book includes applications of quantum mechanics to the vibration, rotation, and electronic structure of molecules. Solid-state chemistry and polymers are excluded, as are most aspects of dynamics, although there are 16 pages on one-dimensional scattering.