"Acorns stored in a dead tree by acorn woodpeckers in California." [From *Food Hoarding in Animals*; photograph courtesy Walter Koenig]

press; and McNamara *et al.*, *Behavioral Ecology* **1**, 12–23 [1990]), and these should, at the very least, help organize future work on the function of food hoarding and the ecological pressures that have affected its evolution.

Vander Wall casts a wide net. Mass provisioning by insects (filling a burrow with prey on which eggs are laid) is regarded as an example of food hoarding, though my own feeling is that this creates too heterogeneous a category to hope for common causal or functional explanations of food hoarding. For anyone who disagrees, *Food Hoarding in Animals* contains a wealth of material on mass provisioning, ably presented. A further critical comment is that the discussion itself is sometimes uncritical, giving as thorough and balanced a coverage to ideas that are best discarded (for example, that food hoarding evolved from "food envy" in animals) as to ideas that make interesting testable predictions (for example, that hoarding occurs in animals that cannot economically defend a rich food source).

Behavioral ecologists concerned with food storing, foraging, and the coevolution of animals and plants will find *Food Hoarding in Animals* a valuable reference work. Anyone simply curious about the behavior of animals will find much in the book to enjoy.

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Atoms and Laser Light

The Theory of Coherent Atomic Excitation. BRUCE W. SHORE. In two volumes. Vol. 1, Simple Atoms and Fields. Vol. 2, Multilevel Atoms and Incoherence. Wiley-Interscience, New York, 1990. xxiv, 1735 pp., illus. $123.

The Theory of Coherent Atomic Excitation is a two-volume monograph that examines the resonant and near-resonant interaction of light with atoms. Studies of such interactions are often concerned primarily with the properties of the light and use the ideas of quantum or nonlinear optics. This book differs sharply from such treatments in that the emphasis is on the behavior of the atom.

The most prominent feature of laser light—its coherence—makes it necessary to replace Einstein's rate equations with the time-dependent Schrödinger equation in the description of atomic excitation by laser light. In this regime of coherent excitation, atomic dipole moments are important as well as the atomic populations of ground and excited states. Standard perturbation theory, which is at the heart of conventional atomic spectroscopic theory, is insufficient because laser light fields can be very strong. On the other hand, if the light is nearly resonant the description of the atom itself may be simplified; instead of giving a full description of the atom in configuration space, we may restrict our attention to the subset of relevant states involved in the interaction. The simplest model atom that serves this purpose is the celebrated two-level atom. The time-dependent equations solved in Shore's monograph are therefore written in the energy representation, where truncation of the atomic structure is most natural. The strong light fields may, for most applications, be described as classical external waves (although their description in terms of quantized photon states is also explained).

The two-level atom in a monochromatic field in the so-called rotating wave approximation lends itself to analytic solutions, and these are carefully explained by Shore. The equations for more complicated atoms must be solved numerically, however, and various numerical techniques and results are also described in detail. In addition, the interaction of atoms with partially coherent fields is treated, and various classical stochastic models of the noisy laser light are presented.

The book is very detailed and stresses completeness rather than overview and synthesis. Derivations are fully reported, making the arguments easy to follow. It will be very useful to those who work or are just beginning to work on resonant optical problems. The book contains a nearly complete set of references and will also serve as a compendium and guide to the growing literature on this subject.

Most textbooks on quantum mechanics pay so much attention to the study of stationary states that students could get the impression that classical mechanics is about time-dependent processes and quantum mechanics about eigenstates of the Hamiltonian. (Even scattering theory is usually treated in a stationary picture.) The subject of coherent atom excitation offers a wealth of quantum-mechanical, time-dependent phenomena and brings to life this often forgotten side of quantum mechanics. This book would be useful as a source of such examples or for reference in a graduate-level course.

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Applications Development Using Case Tools. Kenmore S. Brathwaite. Academic Press, San Diego, CA, 1990. xxiv, 263 pp., illus. $49.95.

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