practice of medicine.

Rushton concludes by connecting the trends he lays out for past generations to today's genetic theories of disease and attempts to predict what the future may bring. Like most scientists and clinicians, he sees genetics as having a growing influence on clinical medicine. But our knowledge of genetics does not automatically, let alone easily, give rise to clinically relevant insights. Rushton correctly identifies the tension between clinicians and scientists as one that will be as important in the future as it has been in the past. His book will help to focus the attention of historians, scientists and clinicians on the important area where theory and practice meet. □

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Spheres of influence

Daniel Kleppner

Rydberg Atoms. By Thomas F. Gallagher. Cambridge University Press: 1994. Pp. 495. £65, £100.

AN atom in which one electron is in a high-lying state, having almost but not quite enough energy to escape, is known as a Rydberg atom. These atoms possess bizarre and intriguing properties. Their diameter can be thousands of times larger than that of normal atoms, their radiation rate thousands of times smaller and their capacity for polarization millions of times greater; they are so fragile that radiation at room temperature can ionize them.

Rydberg atoms have been known since Joseph Balmer guessed the formula for the spectrum of hydrogen in 1883, but they were of only minor interest until the mid-1960s when radio astronomers discovered microwave emission — radio recombination lines — from Rydberg states of hydrogen. What precipitated today's interest, however, was the invention in the next decade of the tunable dye laser and the subsequent introduction of techniques for creating and studying Rydberg atoms in the laboratory. Rydberg atoms rapidly evolved from a novelty into the centrepiece of a large and varied field of atomic research. Although this field is now highly developed, it lacks a definitive overview. Thomas F. Gallagher, a pioneer and key participant in research on Rydberg atoms, has done much to remedy this problem.

He has produced a handbook on the theory and practice of Rydberg atoms,

describing their important physical properties, the relevant experimental and theoretical techniques and many of the mainstreams of research. The basic properties of atoms in Rydberg states and the techniques for producing and detecting them are lucidly presented. Particular attention is paid to their behaviour in electric fields and the process of field ionization. This process is interesting not only because of the physics involved but also because most experiments on Rydberg atoms use field ionization to detect the atoms. Selective field ionization, the detection technique of preference, is described in the general context of the structure of Rydberg atoms in strong electric fields, and adiabatic and non-adiabatic transitions in time-varying fields.

Other important categories include radiative interactions, microwave ionization, structure in magnetic fields, microwave and optical spectroscopy, quantum defect theory, autoionization, double Rydberg states, and collisions. About a third of the book is devoted to collisions, an area in which the author has made seminal contributions. There are chapters on collisions with neutral atoms and molecules, collisions with charged particles, spectral line shifts and broadening, resonant collisions and radiative collisions. The technical presentation is embedded in a lucid and fascinating commentary on the underlying physics.

Altogether, the book provides a reasonably comprehensive overview of the field. However, the important topic of interactions of atoms with the vacuum — cavity quantum electrodynamics and the Casimir force — is not discussed, although black-body radiation effects are covered. Also omitted is the study of semiclassical behaviour in regular and irregular systems — quantum chaos — for which Rydberg atoms have provided model test systems.

Rydberg Atoms is handsomely produced with many illustrations. The index is adequate though not exhaustive. The references to the literature are numerous, including many review articles on particular aspects of research. The book will undoubtedly be the standard reference work in the field for many years to come. As such, it should be invaluable both to experienced researchers and to graduate students. Furthermore, it constitutes a valuable resource for teachers of quantum mechanics and atomic physics, as Rydberg atoms are ideally suited to illustrating the role of scaling laws and a wide variety of basic phenomena such as adiabatic and non-adiabatic behaviour, tunnelling and radiative interactions. □

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New textbooks

Physical Chemistry by P. W. Atkins (3rd edn). Oxford University Press, £50 (hbk), £24 (pbk).

Inorganic Chemistry by D. F. Shriver, P. W. Atkins and C. H. Langford. Oxford University Press, £48 (hbk), £19.50 (pbk).

Bioinorganic Chemistry: Inorganic Elements in the Chemistry of Life — An Introduction and Guide by W. Kaim and B. Schwederski. Wiley, £19.95 (pbk).

Models in Biology: Mathematics, Statistics and Computing by D. Brown and P. Rothery. Wiley, \$39.95 (pbk).

Air Pollution and Climate Change: The Biological Impact by A. R. Wellburn (2nd edn). Longman, £17.99 (pbk).

The Key to Earth History: An Introduction to Stratigraphy by Peter Doyle, Matthew R. Bennett and Alistair N. Baxter. Wiley, £12.95 (pbk).

Principles of Conservation Biology by Gary K. Meffe and C. Ronald Carroll. Sinauer/W. H. Freeman, £29.95 (hbk).

An Introduction to Global Environmental Issues by Kevin T. Pickering and Lewis A. Owen. Routledge, £50 (hbk), £15.99 (pbk).

Environmental Science for Environmental Management edited by Timothy O'Riordan. Longman, £17.99 (pbk).

Vertebrate Zoology: An Experimental Field Approach by Nelson G. Hairston Jr. Cambridge University Press, £17.95, \$34.95 (hbk).

Analysis of Vertebrate Structure by Milton Hildebrand (4th edn). Wiley, \$46 (hbk).

Bacterial Systematics by Niall A. Logan. Blackwell Scientific, £18.95 (pbk).

Prokaryotic Genetics: Genome Organization, Transfer and Plasticity by Francoise Joset and Janine Guespin-Michel. Blackwell Scientific, £24.95 (pbk).

Genetics of Bacterial Virulence by Charles J. Dorman. Blackwell Scientific, £29.95 (pbk).

Principles of Gene Manipulation: An Introduction to Genetic Engineering by R. W. Old and S. B. Primrose (5th edn). Blackwell Scientific, £19.50 (pbk).

Introduction to Modern Virology by N. J. Dimmock and S. B. Primrose (4th edn). Blackwell Science, £19.50 (pbk).

Medical Virology by David O. White and Frank J. Fenner (5th edn). Academic, \$95 (hbk).

Developmental Biology by Scott F. Gilbert (4th edn). Sinauer/W. H. Freeman, £29.95 (hbk).