younger, more competitive sperm. Smith hypothesizes that the prostaglandins in the semen, known to produce contractions of uterine smooth muscle, may enable the sperm to be conveyed closer to the ovum. In a similar way female orgasm and accompanying uterine contractions may be a way for a woman to differentially aid the sperm of a man she likes, trusts, and feels attracted to. Among prostitutes, Smith finds it significant that call girls, whose customers are better-paying, more considerate, and higher in status, experience orgasm considerably more often than streetwalkers. The chemistry of female secretions may also act selectively on the ejaculates of preferred and less preferred males.

The last, unabashedly speculative, section in Smith's paper picks up the theme of the interplay of male and female strategies. Using fossil and archeological data to speculate about the food resource base of the hominoid lineage, he constructs a series of scenarios from *Australopithecus* to *Homo sapiens sapiens* that portray the changing importance of sperm competition, the changing strategies of males and females, the changes in the mating system that would result, and a timetable for the emergence of traits we see today.

As a whole the book is broad, ambitious, stimulating, and well referenced. I recommend it for young investigators in search of research ideas, as well as for old investigators looking for new directions and fresh perspectives.

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Gaseous Nebulae

Physics of Thermal Gaseous Nebulae. (Physical Processes in Gaseous Nebulae.) LAWRENCE H. ALLER. Reidel, Boston, 1984 (distributor, Kluwer, Hingham, Mass.). x, 350 pp., illus. $49.50. Astrophysics and Space Science Library, vol. 112.

Ionized gaseous nebulae comprise such objects as diffuse nebulae, planetary nebulae, and supernova remnants. They emit a spectrum composed of emission lines and continuum corresponding to an ionized low-density plasma with typical densities in the range of 1 to 10^5 particles per cubic centimeter, densities many orders of magnitude smaller than those attained in terrestrial laboratories.

The study of gaseous nebulae has been of paramount importance for our understanding of the universe. Diffuse nebulae, or HII regions, are conglomerates of gas and dust in which stars are being formed at present. Planetary nebulae are shells of gas ejected from, and expanding about, extremely hot low-mass stars. Supernova remnants are shells of gas violently ejected during supernova explosions by massive stars. In addition to their intrinsic importance, gaseous nebulae give us important clues for the study of the dynamics of the interstellar medium, stellar evolution, galactic chemical evolution, and pregalactic conditions.

The study of gaseous nebulae combines atomic physics with astrophysics through the computation and use of atomic parameters. These parameters permit one to derive such physical conditions in the nebulae as the radiation field, the source of energy input, and the temperature, density, and chemical composition of the ionized gas.

Lawrence H. Aller has been one of the leading astronomers in this field for almost five decades. The book under review is based on lectures he has given over the course of his career.

The first part of the book deals with the study of physical processes in gaseous nebulae. It discusses the early development of the physical concepts, key papers on the subject, and the latest results as of 1983. It presents many tables and the relevant references needed to interpret mainly the optical and ultraviolet spectra of gaseous nebulae. It also presents several exercises at the end of each chapter.

The second part deals with models of photoionized nebulae, like HII regions and planetary nebulae, and models of shock-excited nebulae, like supernova remnants. Special emphasis is given to the effects produced by interstellar dust on the observed spectra, mainly through extinction in the ultraviolet and optical regions and through radiation in the infrared regions, but almost nothing is mentioned of the physics of dust grains.

The third part deals with applications to specific objects like the Orion nebula, which is the most observed HII region due to its apparent size, low reddening, and high surface brightness; the Gum nebula, which is the galactic HII region with the largest apparent size; and 30 Doradus, which is the most important HII region in the Large Magellanic Cloud. The section also includes an account of recent developments concerning the chemical composition of gaseous nebulae and the relationship of gaseous nebulae and stellar evolution, enrichment of the interstellar medium with elements heavier than hydrogen, and chemical evolution of galaxies. The book ends with an appendix by C. Mendoza, which is an excellent compilation, complete up to August 1982, of transition probabilities, electron excitation rate coefficients, and photoionization cross sections.

The book is directed to astronomy graduate students, physicists interested in astrophysics, and astrophysicists interested in the interpretation of the spectra of gaseous nebulae. It could be used in a graduate course on physical processes in gaseous nebulae.

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Cosmology

The Big Bang and Georges Lemaître. A. BERGER, Ed. Reidel, Boston, 1984 (distributor, Kluwer, Hingham, Mass.). xxii, 420 pp., illus. $59. From a symposium, Louvain-la-Neuve, Belgium, Oct. 1983.

This volume is the proceedings of a symposium held in honor of the Belgian-born scientist and priest Georges Lemaître 50 years after his initiation of big-bang cosmology in 1933, the year of his famous paper on the "primeval atom." It is fitting that Lemaître should be considered the father of the big bang. He was not alone in the formulation of a theory of an expanding universe, but he was the first to take the bold leap of considering a universe that began a finite time in the past. The subject is alive and vigorous to this day, as is here attested. The book is divided according to Lemaître's principal scientific interests into sections entitled Cosmology, Celestial Mechanics, and Structure of the Universe and Cosmic Rays. Lemaître was interested in cosmic rays because he thought they were remnants of the primeval atom; today we recognize this to be impossible although we still do not understand the details of the origin of cosmic rays. The true remnant of the primeval atom is the microwave background radiation, an isotrophic blackbody remnant of the hot big bang, which was discovered in 1965, a year before Lemaître's death. A final section, entitled Georges Lemaître: The Man and His Work, contains delightful papers by Deprit and Godart.

Reviews of fundamental cosmology emphasizing Lemaître's contributions are presented in papers by McCrea and Peebles. Lemaître favored a class of