ered to be only indications of how one would start to construct a specific satellite. Until one comes to grips with the actual building of the hardware, the temperature control problem, the vibrations that the satellite will have to stand during the launching, the question of how to separate the satellite itself from the empty last stage, and such problems, treatment of the basic design of a particular experiment is, in a very real sense, incomplete. This is particularly true during this initial period in the development of research satellites, when small size and severely limited weight greatly enhance the various instrumentation and construction problems. Ziegler lists many components that are now available or will soon be available that should be useful in the design of satellite instrumentations. Of particular interest are solar power supplies and transistors. These should make it possible to boil down the required instrumentation weights by a considerable amount.

The typography of *Scientific Uses of Earth Satellites* is very good, and the illustrations are clear. The book should be taken as a compilation of thoughts, in various stages of advancement and completeness, on what research one might do with earth satellite vehicles and how one might go about doing it. Taken thus, it makes worth-while reading and should serve as a valuable source of ideas in the field for some time to come. It stands as a challenge to its various readers to devise other experiments or to improve on those that are described.

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Chromosomes, Sex-Cells and Evolution in a Mammal. Based mainly on studies of the reproductive glands of the gerbil and a new list of chromosome numbers of mammals. Phillip V. Tobias. Lund, Humphries, London, 1956. 420 pp. Illus. 60s.

The author of *Chromosomes, Sex-Cells and Evolution in a Mammal,* who is senior lecturer in anatomy at the University of Witwatersrand in Johannesburg, Union of South Africa, describes and interprets his investigations on the chromosomes in the germ cells of the seminiferous tubules of the gerbil, a desert rat—more specifically, of the subspecies *Tatera brantsii draco*—as a first step toward a comparison of the chromosomal complements of various species of *Tatera*. His presentation of the material is greatly influenced by his acute awareness of "the need to break down the artificial apartheid between chromosomes and their cellular and physiological milieu" (page xvii). Against this background of the new "unitarian biology," the author "treats a restricted set of cytogenetical facts from a morphological and cytochemical, a genetical and evolutionary viewpoint" (page 5). The facts themselves could be more accurately described as strictly cytological, since the gerbil is, genetically speaking, a complete unknown.

Phillip Tobias is fully aware of the limitations of his project. The researches were undertaken between 1946 and 1952, and the literature is covered, in the text of the book, through 1952; the more recent work on mammalian chromosomes, done with improved cytological techniques by Hsu, Makino, and others, could thus not be included. This lack is particularly noticeable in the chapter on the chromosomes of the rat, in which the author introduces the criteria used in characterizing the chromosomes of a mammal and discusses their validity. More recent papers, through 1955, are included in the appendix, which gives the most complete list of mammalian chromosome numbers available at present, covering 264 species and subspecies.

The main body of the book is divided into six parts entitled (i) "Introductory section," (ii) "The chromosomes," (iii) "Descriptive account of spermatogenesis," (iv) "Nuclear behavior during spermatogenesis," (v) "Cytoplasmic behavior during spermatogenesis," and (vi) "The spermatogenetic wave."

The chromosomes of the gerbil offer certain advantages for intensive study. The diploid number is 34 (relatively low for a eutherian mammal) and the average length of the chromosomes is somewhat greater than in the rat (6.0 to 7.9 microns for the largest chromosome as compared with 3.9 to 4.4 microns in the rat). Twenty-two chromosomes have subterminal, and 12 have submedian, constrictions, marking their point of attachment to the spindle fibers. The second part of the book also contains a chapter on chromosomal evolution in rodents and in mammals in general, a highly interesting but speculative subject. For the uninformed reader, the most obvious fact seems to be that morphological evolution of mammals has taken place, together with diversification of chromosome numbers in some groups, without such diversification in others ("multiformity" versus "uniformity"). In "multiform" groups, the mechanisms responsible for the changes in chromosome number are still a matter of debate; however, it seems quite clear that polyploidy has not played an important, if any, role.

In the fourth part, sections of particular interest include (i) a description of the last two premeiotic divisions of the spermatogonia, in which the chromosomes are excessively contracted because of a prolonged prophase, (ii) an account of the behavior of the plasmosomes (nucleoli), and (iii) a detailed description of the behavior of the sex chromosomes, which are the largest pair in the diploid complement, with the Y chromosome slightly shorter than the X; both X and Y possess a submedian centric constriction and two subterminal secondary constrictions that mark off two terminal pairing segments.

If a general criticism of the book can be made, it would be that the treatment of the older literature is too detailed and follows a historical approach more appropriate for a textbook. There are some minor errors and omissions. At the very beginning of the book, and in keeping with the tenets of "unitary biology," the reader would like to have a brief description of the gerbil, which is an unfamiliar animal to most of us, and an account of its natural history. To me it seems illogical to speak of "polysomic loss of chromosomes" and to define polysomy as "the duplication or loss of one or more chromosomes from the complement" (page 79). Any biologist who works with amphibians will object to having this class of vertebrates, following Matthey (1949), referred to as "ancient and almost extinct" (page 88). Under the heading "Experimental induction of polyploidy," a single reference to plants is given, while the work of Beatty and Fischberg on mice, which was first published in 1949, is not mentioned. Labeling of the structural details of the seminiferous tubules in plates ix–xii would be helpful, as would a statement of the magnification. This is omitted from all plates with the exception of one figure.

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Elements of Engineering Materials. Charles P. Bacha, Joseph L. Schwalje, and Anthony J. Del Mastro. Harper, New York, 1957. 494 pp. Illus. $6.50.

Elements of Engineering Materials is an introduction to the study of engineering materials and is on an elementary level. It is not directed specifically toward any one of the usual engineering curriculums but is intended as a general survey textbook for all engineering students.

The book consists of four sections. Part I, entitled, "Fundamentals of engineering materials," includes a chapter with qualitative descriptions of thermal, mechanical, and electric properties of interest to the engineer. This is followed by a chapter on the principles of strength of materials. There is also a chapter on the structure of metallic materials, with