eigenfunctions (of fictitious Hamiltonians) and which as they stand give no information about the electron density distribution—are subjected to equivalent orbital transformations to give orbitals that so far as possible satisfy the strong orthogonality condition, one finds that the various descriptions are in essential agreement about the answer to this question: Are there or are there not in XeF_2 and XeF_4 five and six electron pairs, respectively, in the valence shell of xenon?

Arguments about whether xenon utilizes *d*-character in its bonding orbitals are probably specious. The suggestion made in one study that changes in nuclear repulsion may be balanced by changes in electron repulsion reenforces my prejudice that the results of molecular orbital studies are to be viewed as, at best approximate, *descriptions* of electronic structure, not as *explanations*.

In summary, the noble-gas episode has been chiefly a domestic affair—one for chemists by chemists. Simultaneously, however, it has been an impressive illustration of the congency of an observation about science made 38 years ago by Gilbert N. Lewis. Scientific theories, Lewis wrote, "are not those beautiful structures so delicately designed that a single flaw may cause the collapse of the whole. The scientist builds slowly and with a gross but solid kind of masonry. If dissatisfied with any of his work, even if it be near the very foundations, he can replace that part without damage to the remainder. On the whole he is satisfied with his work, for while science may never be wholly right, it certainly is never wholly wrong; and it seems to be improving from decade to decade."

Human Engineering

Anthropometric Survey of Turkey, Greece, and Italy. H. T. E. Hertzberg, Edmund Churchill, C. Wesley Dupertuis, Robert M. White, and Albert Damon. Published for NATO by Pergamon, London; Macmillan, New York, 1963. Illus. $15.

No previous study of as many as 3356 men has been as thorough as this description of the pilots and enlisted men of three Mediterranean countries; the study was prepared for NATO. Data include social background, body-build photographs, skinfold and body composition measurements, and 150 measurements of the diameters and circumferences of body, limbs, and head. The primary purpose was to ensure functional fit of the men's equipment, clothing, and workspace, but the somatotype and body composition records are intended for much wider use in comparing populations, in aging studies, and in study of constitution.

A complete visual index for all measurements is given in chapter 7B, and chapter 8 devotes one page to each measurement, including an exact diagram, a photograph, and a description of technique, the usual statistical parameters (M, σ, V, N) for all subgroups (country total, pilots, cadets, ground forces, Army, Navy enlisted man), and percentiles for Turkey, Greece, Italy, and the U.S. Air Force. Together with these, the succinct descriptions of instruments and methods (Hertzberg, chapter 2), of somatotyping (Dupertuis, chapter 4), of measuring skinfold or subcutaneous fat (White, chapter 5), and of statistical methods and sampling (Churchill, chapters 3 and 7A) make up the ultimate encyclopedia for objectively describing body shape. This elaborate set of standards will be invaluable to everyone working in descriptive human engineering. But it will also be most useful to physicians and public health officers who, in making surveys, intend to use a few critical measures for nutritional status or growth. The many uses of such data are made apparent in chapter 6 where Damon gives a critical worldwide outline of such surveys, from 1869 to the present, and considers the evolution of the use of body-build methods and studies in such fields as nutrition, physiology, disease susceptibility, and race and population differences. This discussion saves the book from being a purely technical manual.

The style is laconic and clear throughout. There are very few obvious errors—on pages 136 and 137 the diagrams for patella height (bottom) and for calf height are interchanged. Some purists will object to use of "nasal root depression" rather than "nasion" (naso-frontal suture) for face, nose, and forehead heights. But an interesting discussion of anatomic variability in vertebral spine protrusion (for the landmark cervicale) applies by inference to nasion and other bony landmarks.

The population conclusions (p. 275) are limited to the major trend—body size increases from Turks to Greeks to Italians (to Americans). But the data indicate much more. Weight-stature ratios show that Turks are relatively lightest, Italians stoutest, with Greeks and U.S. Air Force personnel intermediate. Greeks and Italians tend to be stocky in build and Turks thin and muscular in comparison with more elongated Americans. All four populations are more alike in bony dimensions of the trunk than in limb lengths and proportions, in fat, or in head and face proportions. One of the most creative possibilities mentioned in Appendix III, "Future plans," is the proposed sale, three or more years hence, of the coded data cards to qualified scholars in NATO countries. This will stimulate comparison with local civilian samples, analyses of growth and health trends, and genetic studies.

The most surprising thing about this book is that the entire collecting, processing, and publishing of these data took only 3 years. This speed and competence is a tribute to the ability of the American team and to the enthusiastic cooperation they inspired and received in more than a dozen different Mediterranean Air Force centers. The human contribution made by this work to knowledge and to friendship contrasts with current political tensions.

Competent fieldwork in physical anthropology is not easy with respect to techniques or human relations. This effort, under the leadership of Hertzberg, clarifies both.

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German-English Dictionary

Dictionary of Pure and Applied Physics. vol. 1, *German-English*. Compiled by Louis de Vries and W. E. Clason. Elsevier, New York, 1963. viii + 367 pp. $9.95.

It might be assumed that the cooperation of two distinguished lexicographers would result in a nearly impeccable product; regrettably, this dictionary falls short of the high standards set by De Vries and Clason in their other volumes.

Certain aspects of the dictionary suggest an undue delegation of authority or inadequate editorial responsibility. Although I acknowledge the merit of including ". . . also . . . the most useful and commonly used technical

words from other related fields," I fail to see why, for example, the following terms are listed, sometimes with incorrect equivalents: *Eisenbahngelände* (railway territory), *Fördereinrichtung* (ticket distribution system), *Grenzverkehr* (frontier traffic), *Pickel* (pick axe), *Unternehmer* (contractor), and the like. The inclusion of the names of elements, chemical compounds, minerals, and other classes of terms, which often have similar spellings in both languages, also seems superfluous in a physics glossary—for example *Neon, Cadmiumarsenid, Renardit, Ulrichit,* and *Chromosom.*

Listing terms under their adjectival modifiers is not the best lexicographic practice, especially if the modifier does not alter the meaning; *elektrisch* and *magnetisch* have more than 40 entries each, and *mechanisch* has 19.

Many terms are poorly translated: *Kaltemission* (the translation is autoelectric emission, but should be field emission); *Ultraschalldickenmesser* (supersonic thickness gauge should be ultrasonic). Other dubious translations are: *Netzebene* (atomic plane), *Nullindikator* (null detector), *elektrisches Feld* (field of force), *gedämpfte Wellen* (type B waves), and *Brennzeit* (conducting period).

That specific areas of physics to which the terms apply are seldom indicated may cause misunderstanding—for example, *Blitzlicht* (flashlight). No distinction is made between British and American usage—for example, valve versus electron tube. Even casual perusal turns up omissions: *Elektret, Kraftarm, Lichtfluss, Messkreis,* and *Sendevermögen.*

The components of multicompound words are often not listed separately; for example, *Brennstoffvorratsmesser, Sonderrechenstab,* and *Gitterwechselspannung* appear, but *Vorratsmesser, Rechenstab,* and *Wechselspannung* do not. Misspellings and typographical errors are too frequent: "chrystal," nuclear "magic" moment, cubing "formular," "Hammerarbeit." The latter term has the double distinction of being both misprinted and incorrect; it should be *Hämmerbarkeit* (malleability).

The format and paper are satisfactory; the type, while legible, should have been larger.

Despite these shortcomings, the compilation has merit for the physicist and student not conversant with German, since most terms are pertinent and are rendered in accurate and idiomatic English. For the translator who does not have special knowledge of physics, the dictionary would seem to be less than authoritative.

I hope that a new edition will be more rigorously edited so that it will be comparable to the authors' other fine lexicographic contributions.

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Introductory Textbook

Botany: A Functional Approach. Walter H. Muller. Macmillan, New York, 1963. xvi + 486 pp. Illus. $7.50.

This addition to the available textbooks for general botany courses should be well received. It is intended for a one-semester course and follows a conventional organization. In approximately the first quarter of the book, Muller treats introductory material and fundamentals of structure. In the second quarter functional processes, their correlations, and their importance to plant distribution are considered, with a meaningful chapter on soils. Next, a chapter on inheritance and variation is followed by a section (nearly 150 pages) concerned with a survey of the plant kingdom. Final chapters treat evolution, growth and flowering, populations and their problems, and the origin of life.

The use of a single-column format, with wide outer margins, gives a pleasant typographic effect. Key terms are set in bold face type. Margins are used extensively for illustrations, most of which are drawings. More illustrations, including greater use of photomicrographs, would probably be helpful to students. A few comments on specific drawings may be noted. The extent of apical meristems and the distribution of immature vascular tissues are not handled accurately in the drawings that depict structural development in stem and root. Bundle sheath is omitted as a label in the drawing of leaf structure. No mention of this structure and its function is made in the text, but it is included in the glossary. In the illustration of *Ulothrix,* flagellae may well have been added to the spores produced from the zygote. A probable omission of text material is obvious at the top of page 35.

The coverage of the text is extensive and up to date, but its treatment of many aspects is abbreviated in conformity with the limitations of a one-semester course. Knowledge and full appreciation of variability is thereby limited, and in some cases accuracy is sacrificed. An appealing feature is the emphasis given to the application of fundamental subject matter to problems of significance for mankind. The author believes, and rightly so, that "botany lends itself more readily to the teaching of biological concepts of general educational value than do other biology courses." This belief finds expression by taking the subject out of the classroom and giving it effective application to conservation, dust bowls, plant distributions, plant diseases, population growth, and food problems.

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Physical Meteorology

An Introduction to Atmospheric Physics. Robert G. Fleagle and Joost A. Businger. Academic Press, New York, 1963. xii + 346 pp. Illus. $12.

Current textbooks on physical meteorology tend to be limited to a few standard topics—meteorological optics, acoustics, solar and terrestrial radiation, and one or two others—that are immediately associated with obvious meteorological phenomena. The authors of this book have been more ambitious. In their discussion of atmospheric physics, they have included introductions to gravitation, atmospheric thermodynamics, and geomagnetics and, in two appendices, a review of mathematical functions and operations pertinent to meteorological physics as well as a few paragraphs on units, dimensions, and significant figures (the latter are misleadingly titled physical topics).

With this coverage, the authors have produced a text adapted to a two-semester course for either of two groups: (i) nonscience undergraduates who desire a single earth science course of balanced breadth and depth and (ii) first-year graduate students who are beginning their professional study without any undergraduate preparation in meteorology. Each subject is developed clearly, carefully, and in considerable detail, without immediate reference to other related phenomena. For this reason, the book is not particularly convenient for use as a refer-