pairs has been encountered, and none, so far, with 20 pairs. Among approximately 275 plants examined, 12 were apparently natural hybrids. During meiosis these plants exhibited chromosome behavior typical of hybrids.

Of forms usually referred to *Sphaeralcea* but not belonging to the subgenus *Eusphaeralcea,* the writer finds that *S. rivularis* (Doug.) Torrey has 33 pairs of chromosomes and that *S. umbellata* (Cav.) Don and *S. abutiloides* (L.) Don, have 17 pairs. Six species and 2 subspecies of the related genus *Malvastrum* (subgenus *Malacothamnus*) were found to have 17 pairs of chromosomes.

The subgenus *Eusphaeralcea* is unique in that it presents the lowest basal chromosome number and the first highly polyploid group detected in the Malvaceae. In view of the occurrence of several 5-paired species, Davie's suggestion[2] that 7 is the ancestral basic number for this family can hardly be accepted.

The chromosome number of the California species of *Malvastrum* (the genus *Malacothamnus* of Greene) clearly separates this group from *Sphaeralcea.* The chromosome numbers, considered in relation to the morphological evidence,[3] indicate that Greene's genus *Iliamna,* represented by *S. rivularis,* Zuccarini's genus *Meliphlea,* represented by *S. umbellata,* and Desvaux's genus *Phymosia,* represented by *S. abutiloides,* may be well founded.

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SCIENTIFIC MEN AND THE NEWSPAPERS

I LEARN from a letter which my friend Howard W. Blakeslee, of the Associated Press, publishes in SCIENCE for June 14, 1935 (p. 591) that scientists should "speak the language of the newspapers" and that they should be more emotional. This implies that newspapers are thoroughly satisfactory in their methods of appeal.

A community gets exactly the kind of a newspaper that it can digest—no better, no worse. Editors are aware of this and present the news accordingly. If their readers all wore Phi Beta Kappa keys they would remold their policies.

I see no particular reason why the scientist should become emotional and talk in the vulgate because the newspapers will then give his utterances more space.

It is the business of the journalist and not of the scientist to present the discoveries of the laboratory so that the many will understand. But heaven forbid that the popularizer should rely too much on emotion. We have passed the stage when gasping wonder can pass for popularization. We need more journalists trained in science and not more scientists with a flair for popular writing.

Since newspapers are published to meet the needs of the people by men who know their business it follows that it is the school and the college that are at fault. If we had a public adequately educated in science it would not be necessary to explain the meaning of elementary technical terms and principles or to resort to the literary devices of the primary school reader to drive home the facts about a new discovery. The question that Mr. Blakeslee raises is one that must be solved not by laboratory workers or newspaper editors but by the faculties of our colleges and universities. To think that at this late day it is possible to print in only one American newspaper the simple equation that expresses the mass-energy relation of Einstein in a popular article on atomic physics with the realization that it will be understood by enough readers! If an educated Greek in the time of Pericles could discuss geometry at the dinner table it must have been because science was taught as a cultural subject. Give us high-school and college graduates with a broad knowledge of science and the newspapers will respond to their demands rapidly enough.

WALDEMAR KAEMPFFERT,
Science Editor, The New York Times

SCIENTIFIC BOOKS

QUANTUM MECHANICS

Principles of Quantum Mechanics. By P. A. M. DIRAC. Second Edition. Oxford, Clarendon Press. 1935. xi + 300 pp. $6.00.

THE first edition of this book (1930) contained an absolutely reliable and authentic account of the foundations of quantum dynamics, its main methods and results. Naturally, it soon became an indispensable aid both to independent workers in this field and to advanced students preparing for independent work. The systematic use of the symbolic transformation theory, largely developed by Dirac himself, made the presentation in the larger part of the book concise, elegant and simple. It had, however, one serious drawback: the highly abstract character of the introductory chapters. In the first place, the notion of observables (see below) was introduced in a manner so detached from experiment that the reader may have remained unconvinced that their measurement is in all cases possible. In the second place, a rather

[2] J. H. Davie, *Jour. Genetics,* 28: 33–67, 1933.
[3] T. H. Kearney, *Univ. Calif. Publ. Bot.,* 19: No. 1, in press.

unusual meaning was assigned to the term "state." Having in mind the indeterminacies of atomic systems, the author aimed by this word at a characteristic which is at once but little affected by the uncertainties and is permanent in time (something like a generalization of the "stationary states"). It must be admitted that such a concept is fundamental, and attractive as a basis of quantum mechanics. But to use for it the word "state" is conducive to constant misunderstandings. It was mainly due to these two features that the first part of the old edition made difficult reading, overtaxing the powers of abstraction of the less experienced student and making the book unsuitable as a classroom text.

Both flaws are completely eliminated from the second edition. The author does not forget for a moment to stress the experimental point of view and lives up in his exposition to the principle stated by him on page 5: "Only questions about the results of experiments have real significance and it is only such questions that theoretical physicists consider." The text is rewritten with a view of attributing to the word *"state"* its more common sense as the quantum analogue to the numerical values, at a given moment, of the coordinates and momenta of a classical dynamical system. (While an *"observable"* is the analogue to the instantaneous numerical value of a classical variable or of a function of the coordinates and momenta). This meaning of the word "state" may be less fundamental for the quantum theory than that used in the first edition, but its didactic superiority is unquestionable. It manifests itself in the fact that its use quite naturally divides the treatment into two parts—"part (I), dealing with relations and laws of nature governing the state of affairs in an atomic system at one instant of time, and part (II), dealing with the connexion between the state of affairs at one instant of time and at a slightly later instant." The content of the first part (Chapters II to V) is, from the mathematical point of view, the symbolic algebra of transformations and, from the physical, the statement of the limitations of our power of observation of small systems. The second part (Chapters VI to XIII) is, in both respects, the analogue of the equations of motion of classical mechanics and contains all the special applications.

This change in the direction of making the exposition less abstract does not sacrifice, but rather enhances, its logical rigor and mathematical elegance. It makes the book clear and simple in all its parts, and there is no longer any reason why it should not prove of excellent service as a text in advanced courses. In fact, the author's ability "to keep the physics to the forefront" is an important pedagogical advantage. Paradoxically, it takes a great master of mathematics to give a truly physical presentation, and the formalism developed by Dirac is particularly adapted to keep the mathematical apparatus ancillary to the physical content.

The subject-matter is not materially changed in the new edition. One of the most important events, since the appearance of the old one, was the discovery of the positron. It was a triumph of Dirac's theory of the electron because it supplied a physical interpretation of the negative energy states. Questions relating to the formation of electron-positron pairs are in the foreground of current theoretical investigations. The author must have felt, however, that these theories have not yet crystallized into a consistent system and are not secure enough to be included in a treatise of the character of a text- and hand-book: only one brief section is devoted to the positron. On the other hand, there is attached to it a new chapter on the electromagnetic field theory which has attained in the last years a formally satisfactory character as a complete analogue to classical electrodynamics (although some deeper problems connected with the structure of the electron remain unresolved). A valuable new feature is an "Index of Definitions," which was lacking in the first edition.

PAUL S. EPSTEIN

GARDEN PLANTS

The Genetics of Garden Plants. By M. CRANE and W. J. C. LAWRENCE. Foreword by Sir Daniel Hall. Pp. xxi, 236. 53 figures, 42 tables. Macmillan and Company, London, 1934. 10s. 6d.

THE authors state in their preface that the object of this book is twofold: first, to give an introduction to the essential principles of genetics and cytology; and secondly, to give an account of recent results in relation to horticulture.

The first three chapters are devoted to a brief treatment of the genetics and cytology of diploid and polyploid plants. The next chapter deals with flowering and ornamental plants. Limitations of space preclude a discussion of all the work which has been done, so the authors confine their attention chiefly to those plants which have been most intensively investigated. The sweet pea, garden stock, Chinese primrose, dahlia and snapdragon are considered and the chapter closes with brief comment on a number of interspecific hybrids. The present reviewer would have welcomed a more detailed account of the work which Baur and his associates have carried on with *Antirrhinum,* but obviously in a general text covering such a wide field it is impossible to discuss any particular plant at great length.

The tomato, garden pea, radish, lettuce, onion, beet, cucumber and potato are among the vegetable and salad plants discussed. A long list of fruits is dealt