

condition of the subject. One could wish, however, for a fuller analysis of the more important current theories. According to the author, secondary sexual characters afford no evidence fitted to solve the problems of sex. The evidence of Mendelian inheritance of sex is strongest in sex-limited inheritance; but even here a non-Mendelian hypothesis is held to be better. Sex-determination is a phenomenon of cell physiology and cell regulation. "To say more would certainly be premature."

Several minor criticisms might be made. Typographical errors are infrequent. "Biotype" is made synonymous with "pure line" on page 122. One feels that the inheritance of acquired characters could be discussed more judiciously after Mendelism, instead of before it. On the whole, however, the book is very well written and well made, and will be a valuable aid to both teachers and students.

The Heredity of Richard Roe. By DAVID STARR JORDAN. Boston, American Unitarian Association. 1911. Pp. 165. Price, \$1.20.

Heredity in the Light of Recent Research. By L. DONCASTER. Cambridge, The University Press. 1911. Pp. 143. Price, 40 cents.

These two books are intended for the laity, and are excellently designed for their purpose. Richard Roe is a typical man, whose history is described from germ cell to manhood. The author's treatment of his hero is conditioned by his public, and is popular to a degree not usually combined with accuracy. Because the book will be read by the uninitiated, one feels that the case against prenatal influences, for example, could have been made stronger without compromising the author's scientific standing. There is considerable matter in the latter part of the volume that seems at first sight irrelevant to the heredity of Richard Roe. But the whole book is written in such delightful style, a style which those acquainted with the author will at once recognize, that differences of opinion regard-

ing emphasis or relevance are quickly forgotten.

If Jordan's book furnishes inspiration, Doncaster's supplies information. The latter volume gives, in small compass, the main facts of heredity in a form readily grasped by any intelligent reader, yet with all the accuracy which the author's scientific reputation leads one to expect. Heredity is approached by the usual road, with a discussion of variation, its causes, and its study by statistical methods. The reader is given an elementary understanding of Mendelism, and is led within sight of some of the disputed questions regarding purity of gametes, inheritance of acquired characters, etc. Heredity in man, with its sociological bearing, closes the main part of the volume. Two appendices treat of the history of theories of heredity and the material basis of heredity. There is a short glossary, and a bibliography in which those books suitable for general readers are specially designated.

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A CLASSIFICATION OF THE DEPARTMENTS OF BOTANY AND AN ARRANGEMENT OF MATERIAL BASED THEREON

No one has made a serious attempt at the classification of the departments of botany. Various short classifications have been given in text-books with a view to arranging the facts presented to botanic students, but I am not aware that these have been made with a thought at presenting in logical sequence the divisions into which botany naturally may be divided. Such an arrangement is an important matter when the botanist wishes to arrange his books, photographs, microscopic and lantern slides, as well as museum material of plants. Recognizing the lack of such information, the attempt is made here to give a logical classification of the departments of botany, and it is hoped that the readers of SCIENCE will make additions and corrections, or suggest a rearrangement of this preliminary

and tentative scheme, which is presented in outline without definitions, which may be found in any large dictionary of the English language.

DEPARTMENTS OF BOTANY

I. *Systematic Botany.*

Terminology.
Nomenclature.
Classification.
Taxonomy.
Phylogeny.

II. *Morphologic Botany.*

Organography, including Morphogenesis.
Biometry.
Experimental Morphology.
Teratology.
Histology.
Cytology.
Embryology.

III. *Physiologic Botany.*

Special Physiology.
Phenology.
Zymology.
Genetics { Inheritance.
Hybridization.
Plant Breeding.

IV. *Ecologic Botany.*

Ecology Proper.
Anthobiology.
Myrmecophily.
Cecidology.

V. *Geographic Botany.*

Distribution.
Distributional Philosophy.
Distributional Statistics.
Floristics.
Synecology.

VI. *Pathologic Botany.*

Pathography.
Etiology { Physiologic Pathology.
Toxicologic Pathology.
Bacteriologic Pathology.
Fungologic Pathology.
Entomologic Pathology.
Chemic Pathology.
Therapy.
Prophylaxis.

VII. *Paleontologic Botany (Paleobotany, Paleophytology).*

Paleography.
Paleostratigraphy.
Paleogenesis.
Paleotechnics (Paleomechanics).

VIII. *Historic Botany.*

Etymology.
Biography.
Synonymy.
Bibliography.
History of Botanic Work, Exploration and Discovery.

IX. *Philosophic Botany.*

X. *Ethnobotany.*

XI. *Applied Botany.*

Cultural.
Agricultural.

Horticultural { Floriculture.
Fruticulture.
Olericulture.
Viticulture.

Forestal.
Landscape Gardening.
Esthetic (use of plants in decoration).
Economic.

Medical { Pharmacognosy { Pharmacoërgasy (culture, collection and harvesting of drugs).
Pharmacoemporium (commercial handling of drugs).
Pharmacodiakosmy (packing, etc.).
Pharmacology.
Pharmacodynamics.
Phytotoxicology.
Materia Medica.

Educational.

The application of this scheme of classification is illustrated in the arrangement of a collection of lantern slides, according to the following:

CLASSIFICATION OF LANTERN SLIDES

SYSTEMATIC.—Arrangement according to Natural Families (see Engler's "Syllabus der Pflanzenfamilien," 1-314).

MORPHOLOGY (Spermatophytes).—The general and detailed structure of Angiospermæ and Gymnospermæ.

315. Seedlings.
316. Roots.
317. Stems and Buds.
318. Leaves.
319. Flowers.
320. Stamens and Pollen.
321. Pistil, including Ovary, Style and Stigma.

322. Fruits and Seeds.
 323. Distribution of Fruits and Seeds.
- HISTOLOGY** (Pteridophyta).—Minute microscopic anatomy. See systematic slides for other details and embryology for details of development, etc.
324. Anatomy of Root.
 325. Anatomy of Stem.
 326. Anatomy of Leaves.
 327. Anatomy of Other Parts.
 (Gymnospermæ). Microscopic Anatomy. See embryology for details of fertilization and embryonic development.
 328. Anatomy of Root.
 329. Anatomy of Stem.
 330. Anatomy of Leaves.
 331. Anatomy of Other Parts.
 (Angiospermæ).
 332. Cells in General.
 333. Cytoplasm.
 334. Nucleus and Division. The slides are arranged alphabetically according to the author's name.
 335. Cell Contents. Plastids; Starch; Aleurone Grains; Inulin; Crystals and Cell Sap.
 336. Cuticle and Epidermis (Hairs, Glands and Pitched Leaf Surfaces).
 337. Tissue and Tissue Differentiation.
 338. Organs of Secretion and Milk Tubes.
 339. Anatomy of Roots.
 340. Anatomy of Stems.
 341. Anatomy of Leaves.
 342. Stomata.
- EMBRYOLOGY.** Fertilization, development of embryo. Fertilization in lower plants (algæ, fungi, mosses) given with systematic slides.
 343. Pteridophyta.
 344. Gymnospermæ.
 345. Angiospermæ.
- PHYSIOLOGY.**
 346. Apparatus and Materials.
 347. The Structure and Properties of Protoplasm (see histology under the head of Cytoplasm).
 348. Nutrition of Plants.
 (a) Absorption of Water and Dissolved Minerals.
 (b) Transfer of Water and Minerals.
 (c) Transfer of Elaborated Substances.
 (d) Absorption of Gases.
 349. Transpiration and Apparatus.
 350. Metabolism. Photosynthesis; Respiration; Fermentation; Nitrogen Assimilation; Use of Minerals; Formation of Special Substances; Storage; Secretion; Excretion (see slides under histology).
 351. Growth; Increase in Size; Measurements; Effect of External Conditions; Movements.
 352. Reproduction (see slides classified systematically under algæ, fungi, mosses and embryologic slides under embryology).
 353. Genetics. Hybrids and New Races produced by Plant Breeding.
 354. Irritability. Geotropism; Heliotropism; Hydrotropism; Thigmotropism; other tropisms and manifestations of irritability.
 355. Locomotion.
- ECOLOGY.** For some slides illustrating relationship of flowers, insects, etc., see morphology. For slides illustrating some xerophytes, hydrophytes, mesophytes, see systematic slides and histology for microscopic structure. For distribution of seeds and fruits, see morphology.
 356. Parasitism (see morphology).
 357. Mycorrhiza, Mycodomatia and Leguminous Tubercles. See Physiology under Nitrogen Assimilation.
 358. Commensalism.
 359. Cecidology (Galls).
 360. Honey Dew and Plant Lice.
 361. Fungi and Ants. (Extra-floral Nectaries.)
 362. Pollination of Flowers.
- GEOGRAPHY.**
 363. Maps illustrating Distribution of Species.
 364. Statistic Charts of Distribution.
 365. Photographs of Plant Formations; Associations and Societies. General Views of Plants under various Environmental Surroundings.
- PATHOLOGY.**
 366. Diseases of Plants due to Insects. (For galls see Cecidology under Ecology.)
 367. Diseases due to Fungi. Diseases of field and greenhouse plants; destruction of wood and timber; methods of study; inoculation; culture of diseased, as contrasted with healthy plants; laboratory methods; instruments; culture growths.
 368. Diseases due to Climate.
 369. Diseases due to Chemicals (Gases, etc.).
 370. Diseases that are purely Physiologic.
- PALEOBOTANY.** For plants see under head of systematic slides.
 371. Slides illustrating various fossil plants.

372. Instruments used in preparation of fossils for microscopic study.

373. Slides illustrating ancient vegetation in landscape reproductions.

HISTORIC BOTANY.

374. Photographs of Noted Botanists.
375. Reproductions of Ancient Botanic Books.
376. Maps illustrating Routes of Botanic Travel.

ETHNOBOTANY.

377. Cultural and Medicinal Plants of Indians.
378. Views illustrating Aboriginal Uses.

APPLIED BOTANY.

- (*Cultural.*)
379. Variations.
380. Mutation (Sports).
381. Selection.
382. Propagation. Methods of Crossing illustrated; hybrids and hybridization; cuttings; grafting; methods of seed planting and care of seedlings.
383. Implements used in Agriculture and Horticulture.

AGRICULTURE.

384. Preparation of Soils.
385. Application of Fertilizers (Visible Results of Application).
386. Cultivation of Crops.
387. Harvesting of Crops.
388. Preparation of Crops for Use.

HORTICULTURE.

389. Greenhouse and Greenhouse Construction.
390. Culture of Greenhouse Plants.
391. Floriculture.
392. Fruticulture.
393. Olericulture.
394. Viticulture.

FORESTAL.

395. Preparation of Seed Bed.
396. Care of Young Trees.
397. Methods of Thinning.
398. Character of Forest (Pure, Mixed).
399. Relation of Trees to Soil, Light, etc.
400. Methods of Cutting.
401. Methods of Lumbering.
402. Sawing and Dressing.
403. Tools used in Forestal Operations.
404. Gathering of Secondary Products. Fagots, Turpentine, Sugar, Fruits and Seeds.
405. Trees in General.
406. Botanic Landscapes.

LANDSCAPE GARDENING.

407. Japanese Gardens.
408. Italian and French Gardens.

409. Formal Gardens.
410. Natural Gardens.
411. Garden Plans, etc.

ESTHETIC BOTANY.

412. Plants and Flowers in Decoration.
413. Conventionalized Plant Parts for Wallpapers and Tapestries.
414. Artificial Flowers, etc.

ECONOMIC BOTANY. For figures of economic plants and their parts, see under systematic classification.

415. Food Plants in General.
416. Root Foods.
417. Stem Foods.
418. Leaf Foods.
419. Fruit Foods.
420. Farinaceous Products (see under histology, No. 335).
421. Spices.
422. Plants used in Textile Industries.
423. Tanning Plants.
424. Dye Plants.
425. Rubber Plants.
426. Gum-yielding Plants.
427. Oil-yielding Plants.
428. Building and Furniture.
429. Methods of Gathering.
430. Methods of Shipment.
431. Methods of Preparation.
432. Methods of Manufacture.
433. Machinery.
434. Packing for Sale.
435. Methods used in Sale and Distribution.

MEDICAL BOTANY. For illustrations of medical plants see systematically arranged slides.

436. Culture of Drugs.
437. Collection and Harvesting.
438. Handling of Drugs.
439. Packing of Drugs.
440. Manufacture into Medicines.

EDUCATIONAL BOTANY.

441. Photographs of Home and Foreign Botanic Gardens.
442. Laboratory Buildings.
443. Laboratory Equipment.
444. School Gardens.
445. Students at Work.

The slides are all numbered according to the plan outlined above, and if more than one slide is to be classified with a given number, an additional number is added according to the decimal system of card indexing. Thus 442.1, 442.2, 442.3, etc., would indicate that

there are several lantern slides illustrating the laboratory buildings of the world. The system of classification is thus made elastic.

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THE NEW CATALOGUE OF CHIROPTERA
IN THE BRITISH MUSEUM

DURING the past twenty-five years the study of recent mammals has been pursued with an activity unprecedented in the history of other groups of vertebrates. Collections aggregating hundreds of thousands of specimens have been brought together, mostly by three or four museums, and the number of known forms whose existence was previously unsuspected has increased so rapidly that only a few specialists are fully aware of what has been taking place.¹ The trustees of the British Museum have recently issued the first volume of a second edition of the Catalogue of Chiroptera.² This is the first monographic treatment of a large group of mammals in which the systematic activities just alluded to are adequately summarized. Its interest is therefore twofold: to systematists an account of the technical matter which it contains, and to general zoologists as the first definite indication of the extent to which currently accepted ideas regarding the world's mammal fauna must be revised.

The volume now issued, containing more than 900 pages, is by Mr. Knud Andersen, who has spent nearly seven years in its preparation. It deals with the Megachiroptera, the old world fruit-bats, only. No group of mammals has ever been treated in such detail, and it is doubtful whether any work of similar size on any group of vertebrates contains so large and so well arranged a mass of original

¹ The field work which has led to this result was made possible by the invention of several types of small traps, not originally intended for scientific purposes.

² "Catalogue of the Chiroptera in the Collection of the British Museum," second edition, by Knud Andersen. Vol. I., Megachiroptera. London, printed by order of the trustees, etc., 1912. Actual date of publication, March 23, 1912.

observations. The number of forms recognized is 228, distributed among 38 genera and subgenera. These are represented in the British Museum by 1,470 specimens and all but 21 of the species and subspecies.³ In the first edition of the catalogue (Dobson, 1878) the Megachiroptera occupy 98 pages, with 78 forms and 13 genera and subgenera, represented by 425 specimens. This increase of nearly 300 per cent. is probably less than may be expected among the "insectivorous" bats (Microchiroptera). Mr. Andersen's studies of the Microchiropterine genus *Rhinolophus* resulted in an increase of from 21 to 105 or more, while his "Monograph of the Chiropteran Genera *Uroderma*, *Enchisthenes* and *Artibeus*," shows the old genus *Artibeus* with its six forms, as understood by Dobson, to consist of 32 forms representing three distinct genera. The number of bats known to Dobson was about 440; it is to be expected that the number recorded in the new edition of the catalogue will exceed 2,000. The significance of this increase will be understood when it is recalled that the entire number of living mammals is generally supposed to be about 5,000, a total in which the bats form about one tenth.

In general plan the present volume agrees with the original edition and with the well-known form of the British Museum "Catalogues." With the increase of fineness in discrimination, however, greater detail of treatment has become necessary. To take an example at random: in the original edition the account of *Pteropus "medius"* occupies two pages; in Mr. Andersen's volume it covers seven and a half without counting two devoted to a race not recognized by Dobson. This increase is due chiefly to the more elaborate description of characters, but it is partly the result of greater detail in the bibliographic citations; for the period covered by three lines under the name *medius* by Dobson 25 lines are here required. Perhaps the most striking

³ About 1,000 specimens in other museums were also examined. All of this outside material is carefully designated in the text or in footnotes.