

Milestones in Botany

Botany Begins with Aristotle

By Ruth A. Sparrow

Again this year Hobbies will give its readers glimpses of the rare first and early editions in the Milestones of Science Collection. Ruth A. Sparrow, Librarian, writes Milestones in Botany as the sixth in her series.—Editor's Note.

● ● ● Living plants are found in all parts of the world in more or less profusion. The mountain top and the desert each has its particular growth. The science of this vegetation is botany. Plants from the smallest microscopic plant to the largest tree have been of interest to man, for they provided him with food, shelter, medicine, clothing, transportation, and other necessities and comforts. All these were material interests, and for centuries no systematic study of plants was undertaken.

Aristotle (c. 350 B. C.) is credited as the first patron of botany and the first so-called director of a botanic garden. This garden was in the charge of his pupil Theophrastus of Ereus (372-287 B. C.) who is generally regarded as the first real botanist. He is the author of the earliest scientific work on plants, *Historia Plantarum* (Venice, 1497). The first part deals with the general anatomy and histology of plants, enumerating the external organs of a tree, as well as the sap, fibres, pith, etc. Several parts concern trees and shrubs, thorny plants, and those used for garlands; another deals with kitchen garden vegetables, cereals, gums and exudations and means of collecting them. In the second book *Ejusdem de Causis Plantarum*, Theophrastus studies the seed, grafting, budding, effects of weather and soil, cultivation, diseases, and perfumes of plants. He describes about five hundred species used mainly for the treatment of diseases.

Pliny in his famous *Historia Naturalis* (Venice, 1476) devotes sixteen of his thirty-seven books to botany. He describes about one thousand

plants, many of them noted for their medicinal value.

Dioscorides (c. 50 A. D.), a contemporary of Pliny, was a Greek botanist and physician in the Roman army. He traveled extensively in this latter capacity and became intensely interested in botany. As a result of this combination of profession and hobby he became the greatest of medical botanists. He knew over six hundred plants which he has described in *Materia Medica* (Venice, 1499). This work holds an important place both in the history of medicine and botany. As late as the seventeenth century no drug was considered genuine that did not agree with Dioscorides's description.

With the exception of Albertus Magnus (c. 1193) there was no botanist of any note from these early days until the Renaissance. Botany suffered during the Dark Ages with the other sciences. Ernest Meyer writes of Albertus: "No botanist who lived before Albert can be compared with him, unless it be Theophrastus, with whose work he was unacquainted, and after him none has painted nature in such glowing colours or studied it so profoundly until the time of Conrad Gesner and Caesalpino." Albertus Magnus was a Dominican monk who, although he attained a high position in the Church, still found time to pursue his study of nature. While he wrote in many other fields of science his outstanding work was in botany. His *De Vegetabilibus* (in *Parva Naturalia*, Venice, 1517) is the first general work on botany of real scientific importance. It is based on the work of Nicholas of Damascus. It shows the first indica-

tion of real scientific grouping of plants which he divides into leafless and leaf-bearing. He recognizes that species are mutable, and he has a most interesting chapter on the morphology of plants, and the very beginnings of plant geography are to be found here.

The sixteenth century saw a revival of interest in botany mainly through the efforts of a group of men known as herbalists. Otto Brunfels has been credited with restoring the science of botany in Europe. He was followed by others, among them Leonhard Fuchs (1501-1566), a German physician and botanist. Fuchs's *De Historia Stirpium Commentarii Insignes* (Basel, 1542) is one of the most beautiful and rarest herbals. It has woodcuts of extraordinary beauty, the work of three outstanding artists of the time. Plants are arranged alphabetically by their Greek names. This herbal also contains the first European figures of certain American plants, including Indian corn and the great pumpkin.

One of the earliest attempts at a methodical arrangement of plants was made by Andreas Caesalpinus (1519-1603), a professor of medicine in Pisa and Rome and later physician to Pope Clement VIII. He described and distributed some of the fifteen hundred plants known at that time into fifteen classes. Linnaeus called him the first true systematist. *De Plantis* (Florence, 1583) is the first edition of his important work in the history of botany.

Robert Hooke (1635-1703), an English mathematician and natural philosopher, was the first to apply the term "cell" to the units of plant structure. He was deeply interested in microscopy and made his own microscope. He cut thin slices from all kinds of bodies, both animal and plant, and with the aid of his microscope discovered that all were porous and perforated much like a honey comb. These he called cells. His observations were published in *Micrographia* (London, 1665). This publication contains

the earliest known picture of cells.

Nehemiah Grew (1641-1712), an English plant anatomist and plant physiologist, and Malpighi both made extensive studies on plant structure, and the publication of their results was almost simultaneous. Grew applied microscopy to the study of the structure of plants and laid the foundations of vegetable histology. *The Anatomy of Vegetables Begun* (London, 1672) and *The Anatomy of Plants* (London, 1682) were his contributions to the subject.

Stephen Hales (1677-1761) was one of the earliest workers at plant physiology. His *Vegetable Staticks* (London, 1727) mainly concerns the investigation of the movement of sap in plants. Hales invented a special apparatus for his experiments on the gaseous constituents of the air. This work is one of the most important and original contributions to the subject.

Linnaeus (1707-1778), a Swedish botanist, is known as the father of modern systematic botany. System with him was almost a mania. His *Systema Naturae* (Lugduni Batavorum, 1735; facs. 1907) is merely an outline of his scheme for the classification of plants and animals. This was accepted as the standard by botanists until the ultimate establishment of the natural system by Jussieu in 1787. In *Species Plantarum* (Holmiae, 1753) Linnaeus employed the binomial system of nomenclature, now almost universally used.

The earliest work on pollination was Christian Konrad Sprengel's *Das Entdeckte Geheimnis der Natur in Bau* (Berlin, 1793). At the time of publication it received scant attention, and Sprengel was so discouraged that he gave up botany. It is however a most important and outstanding book and of great beauty.

Robert Brown (1773-1858), a Scotch botanist, made a great contribution to botany in a paper published

in the *Philosophical Magazine* in 1828. He had been investigating the passage of the contents of a pollen tube into the ovule. He saw that the granules in the tube were in constant motion. He did not offer any explanation for this, but in recent years it has been recognized and known since then as "Brownian movement."

Hooke's cell theory was elaborated by M. J. Schleiden (1804-1881), a German botanist, in his *Beiträge zur Phytogenesis* (Berlin, 1838). The announcement of the cell theory was an outstanding landmark in the development of botanical science. There were errors and omissions, but it was revolutionary and paved the way for Schwann who later established the theory.

One of the greatest discoveries in botany was in a new branch—heredity. Gregor Mendel (1822-1884), an Austrian monk, achieved the first revolutionary results in the experimental investigations of heredity. For some years Mendel worked in the garden of the monastery experimenting on the inheritance of individual characters of a number of varieties of garden peas. After eight years he read a paper before the Natural History Society of Brünn at which time he announced his results: that height, color, and other characteristics depend on the presence of determining factors behaving as units; in any given germ cell each of these is either present or absent.

Mendel's papers were published in 1866 and 1869 but were entirely overlooked for some years. It was W

Olbers Focke's book *Die Pflanzen-Mischlinge* (Berlin, 1881) which brought the papers to light. In his book Focke gave a remarkable history of plant-bastardism and described Mendel's experiments. It was not until almost twenty years later that the full recognition was given Mendel. In 1900 De Vries and other botanists in searching the literature rediscovered the papers and made them generally known to the scientific world.

Hugo de Vries (1848-1935), a Dutch botanist, announced his mutation theory in *Die Mutationstheorie* (Leipzig, 1901-1903). He describes it as a sudden variation as distinguished from a gradual variation in which new characters become fully developed only in the course of many generations. It is a most important contribution to the study of the origin of species.

Since the days of Theophrastus when only some five hundred species of plants were known and then only studied for their medicinal virtues, the science of botany has progressed until today about two hundred and fifty thousand are known and described. We know that plants have a similar existence to animals; that they are composed of cells; that each part of the plant has its function; and that heredity, variation, and environment play a great part in plant evolution. Botany today is more than flower-picking and herb-stewing. It is one of the two great branches of science dealing with living things and is closely related to zoology with which it has many problems in common.

