SAINT ALBERT THE GREAT—SCIENTIST

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THE canonization of Albertus Magnus is creating a widespread appreciation of the first scientist to be declared a Doctor of the Church. Religion is not subversive of progressive work in science, and the truly scientific world is realizing this. The place of St. Albert in science has never been forgotten. Historians have been found to attest him in every century. It remains, however, for the scientists of this day to recognize as one of the fathers of science ". . . the dominant figure in Latin learning and natural science of the thirteenth century . . . the most prolific of its writers, the most influential of its teachers, the dean of its scholars, the one learned man of the twelfth and thirteenth centuries to be called 'the Great.' "[1]

Albert's attitude was that of a man of science. His intuitive genius, insatiable curiosity and steadfastness of purpose are characteristic of the scientific mind at its best. He ranged over the whole world of general science, undertaking the huge task of describing all nature. If much of his work is based primarily upon Aristotle, it is not exclusively or slavishly so. Albert won his own place in the sun because of the accuracy and clearness with which he distinguished the subject matter of science and its use. "The desire for concrete, specific, detailed, accurate knowledge concerning everything in nature is felt by Albert in other of his writings to be scarcely in the spirit of the Aristotelian natural philosophy which he follows and sets forth in his parallel treatises."[2]

Pouchet was not without justification when he conferred the title of "Father of the Experimental School" upon Albert. The scientific thought of the Greeks was characterized by observation. Experience as a criterion in natural science is characteristically Albertian. Thus we find Albert writing in a proem: "Our method of procedure in

[1] Lynn Thorndike, Ph.D., *A History of Magic and Experimental Science*, The Macmillan Company (1923), Vol. II, p. 521.
[2] *Ibid.* Vol. II, p. 535.

this work will be to follow Aristotle's order and his opinion, explaining and proving the latter wherever the need arises."[3] He observed animals and botanical specimens in the Danube region, and utilized his travels in Friesland, Holland, Italy and France to gather fresh material. This insistence upon observation moulded Albert as a true scientist. He attempted the solution of erosion, of the formation of mountains, of the movement of the sea, of volcanic eruptions. The botanical part of his work is particularly remarkable. It contains the rudiments of botanical geography, notes on the morphology of seeds, and on the relation between plants and insects. Sarton holds the concluding books of this work as original contributions. Such sentences as "I have experienced this," or "I have not experienced this," or "I have proved that this is not true," interspace Albert's tracts.[4]

Albert proved himself in the field of botany. He busied himself in discovering the hidden life of plants, their physiology and anatomy, generation and nature. Of the utmost importance is his discussion of seeds in *De Vegetalibus.* His work in plant embryology reared a firm genetical foundation for Mendel's towering structure of heredity. Albert was the first naturalist to distinguish between the buds of trees and flowers. He was the first to indicate the triple position of the plant seed in the pollen of flowers. He was the first to refer to the influence of light and heat on the growth, strength and breadth of trees and their bark. He was the first to discover that the sap of trees is odorless in the root and fragrant as it rises in the trunk and branches. He was the first to refer scientifically to the rarity of duplicate leaves. Centuries later, Mendel successfully carried out Albert's suggestions in the science of tree-grafting.

Albert was the first to construct a scientific botanical classification. He was centuries ahead of Carl von Linne *(Carolus Linnaeus)* in attempting order in the classification of animals. "The advantages of a comprehensive system of classification are obvious," writes Dr. Shull. "Any kind of arrangement is better than none. Such an arrangement applied to animals is not only a convenient aid to the other branches of zoology; it actually raises problems which would otherwise scarcely be discovered. The development of even a slight degree of order out of confusion always suggests the possibility of further generalization."[5]

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[3] *Opera Omnia,* VIII, i, 1.
[4] *Ibid.* XXIII, ii, 10 and 99; XXIII, i, 9 and 14 and 23, 57, 83 and 104.
[5] A. Franklin Shull, *Principles of Animal Biology,* McGraw-Hill (1929).

Albert's experimental work is perhaps most pronounced in *De Animalibus*. He proved by experiment that a cicada, after decapitation, continues to sing in its breast for a long time. He proved that fish have palates for different kinds of water; that frogs and turtles will not drink sea water.[6] For the first time in the presentation of zoology, Albert inserted logical order and method into the treatment of this science. His method of procedure is presented in the proem to *De Animalibus*.[7]

Realizing the basic importance of embryological aspects in differentiation, Albert commenced his study by attempting to solve the genetical problem of generation. In this sequence he often erred because he was pioneering and had to resort to the work of the Greek school for stimulation. However, much of this embryological venture planted the seeds for the work of other scientists in other centuries. The germs of embryological truth were planted by Albert. "New discoveries do not contradict earlier truth, but include it as a special case, or as an imperfect statement of some larger truth. The fact that changes are necessary means that knowledge has been increased. The fact that scientific theories have often been altered justifies no reproach to science, for . . . they are simply the most coherent organization of its data that are possible at a given time."[8]

In zoology, Albert considered the nature of animal bodies, their structure and faculties. He devoted six books to the description and classification of different species of animals, discussing many of them for the first time. He studied the habits, and experimented with various reactions upon birds and bats, fishes, snakes, lizards, worms, toads and frogs.

Albert developed formulae which are today taken for granted. He was a chemist of amazing proportions. He experimented with metals, but not according to the recipes of the alchemists, as is sometimes charged against him. Natural science, according to Albert, is not the reception of what one is told, but the investigation of causes in natural phenomena. He visited mines, and did not hesitate to seek out the workshops of the alchemists in order, as he tells us, to investigate the validity or falseness of the transmutation of metals. *"Fui et vidi experiri."*[9] He brought his chemical knowledge to bear

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[6] *De Animalibus,* XXII, ii, 28; XXII, iii, 29; XXIV, i, 123.

[7] XXVI, i, 1.

[8] Forest Ray Moulton, *The Nature of the World and of Man,* University of Chicago Press, (1926) p. 4.

[9] *Mineralium,* II, ii, 1; III, i, 1; IV, 1, 6.

upon the study of minerals, and scientifically described ninety-five kinds of precious stones. Worthy of special note is his discussion of the action of acids, gases and vapors on stones and metals. He was the first to explain the presence of the fossil remains of shells in rocks, which he attributed to a recession of the sea.

Albert wrote learnedly about climatology and geography, anticipating the moderns in the matter of terminology. He described tides, wind, rain and snow; argued for and explained the rotundity of the earth and the inhabitability of the antipodes.[10] A copy of his works, owned and annotated by Columbus, is still preserved in Seville. There seems to be no doubt that Albert's works, well known to the Spanish Dominicans, prepared Diego Deza for a friendly reception of Columbus and his dreams.

What is most noteworthy and commendable in all his scientific procedure is that those opinions which he could not prove or test to his own satisfaction, he stated hypothetically, and encouraged his pupils to investigate and enlarge upon his own observations and experimentations. Albert looked to nature as the best authority and maintained that any scientific investigation in which the experimental method is applicable may be regarded as mature and entitled to recognition. By the adoption of this principle, Albert influenced every branch of science. He drew a sharp distinction between authors who state what they themselves have seen and tested and those who appear to repeat rumor or folk-lore. He frequently rejected and refuted statements of Pliny, and heavily scored Solinus and Jorach for unscientific and unreliable statements. If he appears, at times, unduly credulous, it is because no means were at hand to disprove the force of existing authority.

The development of a new subsidiary system of knowledge was the task that St. Albert set for himself. He was a pioneer, breaking the trail for the scientists that were to follow. His extensive knowledge merited for him the title of *Doctor Universalis*. He was also called *Doctor Expertus* because of his success in experimentation. A shining example of the ideal scientist, combining great holiness and deep learning, and amazing industry!

[10] *Ibid.* III, iv, 8-26.