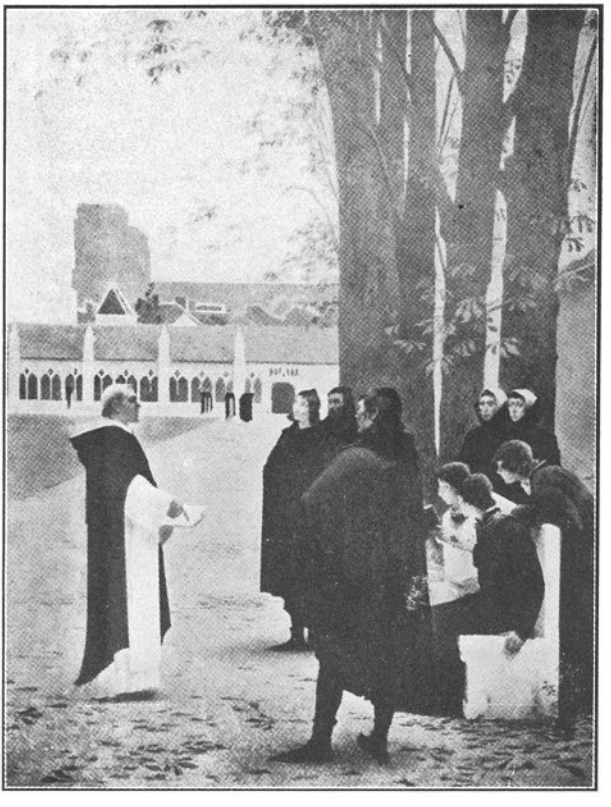

ST. ALBERT THE GREAT

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ALBERT, SAINT AND SCIENTIST

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AT ONE time when he was preaching at the University church in Dublin, Cardinal Newman said, "There are those, and of the highest order of sanctity too, as far as our eyes can see, in whom the supernatural combines with nature, instead of superseding it, invigorating it, elevating it, ennobling it; and who are not less men because they are saints. They do not put away their natural endowments, but use them to the glory of the Giver; they do not act beside them, but through them; they do not eclipse them by the brightness of divine grace, but only transfigure them. They are versed in human knowledge; they are busy in human society; they understand the human heart; they can throw themselves into the minds of other men; and all this in consequence of natural gifts and secular education." To no one can these words be better applied than to Saint Albert the Great, scientist, philosopher, theologian—the Universal Doctor of the Church.

In a golden age of scholars and saints Albert's name was great. He was great in holiness and great in knowledge, and his knowledge was as remarkable for its breadth as for its depth. He was not only a profound theologian and philosopher, but he was also a great student of nature, a tireless observer and a careful experimenter. In this respect Saint Albert stands out preeminent and almost unique among the learned men of his time, and no small part of his fame rests on the splendid work which he did in the broad fields of experimental science. One of his contemporaries (and the men of the thirteenth century were not overmuch given to flattery) spoke of him as "a man so distinguished in science that he could justly be called the

marvel of our times." For centuries Albert was known in popular legend as the wizard of science and now, since we know more of the history of experimental science and of the contributions of individuals, it can be said with certainty that Saint Albert holds an assured and honorable place among the students of nature. Critical modern authors as well as the medieval writers are unanimous in praising his work.

Thus Meyer, the historian of Botany, in summing up Albert's contribution to this science says of him, "No botanist who ever lived before Albert could be compared with him, unless it be Theophrastus, with whom he was not acquainted." We more easily grasp the importance of this statement when we take into consideration the fact that sixteen centuries separated Saint Albert and Theophrastus in point of time. Again, the late Professor John M. Stillman of Stanford University in his textbook, *The Story of Early Chemistry,* says, "Of the great value of the work of Albertus Magnus in helping to spread the knowledge of the chemistry of his time there can be no doubt. He presents this knowledge with a clearness and distinctness that characterizes him as one of the ablest thinkers of his century; this very clarity of expression, free from intentional secrecy or mystification, must have given his works an important value in helping to lay the foundations for sane and sensible points of view, in a time when, according to the writers of the times, fraud, charlatanry and imposture in alchemy were very prevalent." These testimonies of modern scientists show that Albert the Great holds an honorable place in the history of science.

Saint Albert's work in experimental science is of permanent value and interest, not only because of the strictly scientific method with which he pursued his studies, but also because of the wide scope of his interests and because of the remarkable results which crowned his labors.

The true greatness of a scientist, and especially of a pioneer scientist, is revealed more by his method of procedure than by the results which he attains. Judging from this point of view Albert was unsurpassed as a scientist in the thirteenth century. The method which Albert taught and practised was the method approved and so successfully applied by modern scientists, that of accurate observation and experiment. In an age when most scholars were content to study Aristotle, or the writings of some other recognized authority, and thus draw their knowledge of nature from the ancient authors, Saint Albert turned to the study of nature itself. He knew well that the ancient writers had made many errors, and that they not only could

not, but should not, be relied upon in the questions of experimental science. He knew also that outside the province of philosophy there lies a world of truth to be discovered, and that the key which unlocks the secrets of this world is experience—observation and experiment. Albert the Great and Roger Bacon may justly be called the rediscoverers of experimental science. In the records which Albert has left us, one easily sees what a patient and untiring research worker he was, and how heroically he labored against difficulties which are today either mere trivialities or altogether unknown, difficulties arising from the suspicion with which many people of his time looked upon this type of work, from the lack of laboratory equipment and also from the almost complete absence of reliable information on any scientific subject.

His greatness as a scientist is revealed, too, by the breadth of his interests. Despite the many handicaps with which he had to contend, Albert collected a body of scientific data which was unequalled in his day for either quantity or accuracy. He labored not merely in one or two, but in all branches of natural science: Physics, Mineralogy, Meteorology, Cosmography, Biology, Astronomy, and Mathematics—and thoroughly mastered all that was known at the time; thus he merited for himself the title of Universal Doctor. This achievement alone is sufficient to establish Albert's reputation as a scientist, but his fame is greatly enhanced by the new and fruitful discoveries which rewarded his own research. It will be sufficient to mention only a few examples of Albert's experimental work.

In Chemistry, Albert made a special study of sulphides, and synthesized very many of them. For the preparation of cinnabar (mercury sulphide) he directed that two parts by weight of mercury and one third part of pure sulphur be heated together in a closed vessel for some hours. Now, this is exactly what a modern scientist would do were he asked to prepare this compound. The remarkable thing in this simple experiment, however, is the proportion of materials used, because with all the facilities for experimental work which we have today, it has been proved that the preparation of this compound can be brought about by combining thirty two one-hundredths of a part of sulphur with two of mercury; Albert suggested the use of thirty three one-hundredths of a part. The correctness of this is nothing short of amazing when one considers that the use of a slight excess is always desirable, and is considered good experimental technique when working with volatile substances, such as sulphur, and also when one further considers that Albert lived seven centuries ago. He anticipated the enunciation of the chemical "Law of Definite Pro-

portions" by some five centuries, for this law was not definitely established until the researches of J. B. Richter late in the seventeenth century.

The full story of experimental work done by St. Albert in connection with the substance known as "white lead" (basic lead carbonate), which is used in making pigments, need not be gone into when one notes this striking fact. The procedure given in modern textbooks for the preparation of this compound (and this procedure is used commercially today), so closely resembles Albert's method, that one would be inclined to think modern authors had a copy of his work before them when they were writing their own texts.

The discovery of the element, arsenic, is now generally accredited to Albert the Great who obtained it by heating orpiment (arsenic trisulphide) with soap. Due to its extremely poisonous character, however, its properties were not clearly established until 1725, by J. F. Henckel. It is of importance today in the manufacture of pigments, and is also used, by means of one of its organic derivatives, in the field of medicine.

That he had an extensive knowledge of Meteorology, Albert proves in his *Libri Meteorum,* in which he goes into great detail concerning such phenomena as winds, rain, hail, thunderstorms and rainbows.

His opinions, expressed in his *Liber Cosmographicus de Natura Locorum,* had, according to Père Mandonnet, O.P., much to do with the desire of Columbus to undertake the perilous trip which resulted in the discovery of this continent. He most readily displays his keenness in this subject when, after considerable discussion concerning the polar and subpolar regions, he makes the terse statement, that at the poles there are six months of day and six months of night.

The greatest part of Albert's biological work is contained in two large treatises, *De Vegetabilibus et Plantis* and *De Animalibus.* An example from each of these works will suffice to establish him as a biologist. In his *De Vegetabilibus et Plantis,* Albert starts systematically by giving the divisions of botany, and next proceeds to show the effect of environment on plants. He then treats of plant anatomy and physiology, from which we may infer that he was skillful in the use of the scalpel, and knew that plants could not assimilate complicated foods. These foods, he says, must be broken down into simpler substances, which are then absorbed at the roots, and thus transmitted to all parts of the plant. He also adds that the roots have an excretory function, i. e., the waste products of the plant are disposed of in part through the roots. Modern plant physiologists have shown

that the roots of plants do excrete oxygen and small traces of mineral acids.

Turning now to Albert's study of animal life, we find that *De Animalibus* begins with a general survey of human anatomy, and here again this scientist par excellence shows many modern tendencies. For example, in osteology, he uses the vertebral column as the point from which to study structure; while his contemporaries and the majority of those who follow him use the skull as the central point, because of the important organs contained therein. However, for the comparison of structure, the vertebral column has been shown to be more important, and modern anatomists have reverted to St. Albert's method.

But such details are of interest only to the specialist or historian of experimental science. For Catholic students and for the learned world in general, St. Albert's work in science has a much wider significance, which, far from being overlooked, is emphasized anew by his canonization a few years ago under the title of Universal Doctor.

This significance is twofold. In the first place, St. Albert's scientific work is an answer to the age-old charge that the Church is or has been opposed to the study of nature. This accusation has been made and refuted a thousand times, yet it still lives on, and is believed by multitudes today. The canonization of Albert the Great should silence this charge forever; for Albert himself was a great churchman, a bishop and a saint, and he lived at a time when the Church was supreme in Europe. If the Church was opposed to the study of the experimental sciences in the thirteenth century, either St. Albert would never have carried out his studies of nature, or the Church would have intervened and condemned his works and his writings. The fact of the matter is that, although individual churchmen have objected to the study of natural science, the Church officially has never done so. On the contrary, She approved and encouraged these studies, holding that all truth, whether natural or supernatural, is precious, since it comes from God, Who is Truth itself, and helps to reveal Him to our feeble minds.

In the second place, it presents St. Albert as an ideal and an inspiration to scholars, Catholic and non-Catholic alike. In any branch of science the quest for truth (which is many-sided though changeless) is an absorbing and difficult task. To the student himself there is always the danger of over-specialization, and the student of nature in particular is exposed to the special danger of being absorbed in the study of merely material things to the exclusion of the spiritual. It is in the scientific work of the Universal Doctor that we find the

golden mean. Great as he was in the study of nature, he was greater in philosophy, and greatest in theology. He was the complete scientific man whom modern scientists would do well to imitate. For the experimental scientist he is a guiding star, his pure light directing their thought ever upward from material things to spiritual, from nature to that knowledge of God, the Author of nature, which is attainable only in philosophy and theology. On the other hand, for the philosopher floating high above the earth, the example of St. Albert is as a beacon that marks a safe landing field. Too often in the past philosophers have neglected this light on the earth. Some of them, losing sight of it entirely, have destroyed themselves and their followers in the trackless void. Great mistakes have been made, but they need not be repeated, nor will they be, if scientists and philosophers look to St. Albert for light, guidance and inspiration.

"He was a burning and shining light: and you were willing for a time to rejoice in his light."[1] Had Albert been only a burning light his name and work would now be buried under the dust of centuries. But he was a shining light too, beckoning and pleading through all the long years—beckoning still, as if to say, "This is the way; your way leads to chaos in everything." What is this way? "O God, who did make Blessed Albert Thy Pontiff and Doctor great in subjecting human wisdom to divine faith: grant us we beseech Thee, so to follow in the footsteps of his teaching, that we may enjoy perfect light in heaven."[2] A burning and shining light he was; a shining light he remains for all time.

[1] John, v: 35.
[2] Prayer: Feast of St. Albert.