

Alphonse Louis Pierre Pyramus de Candolle.

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It has happened not uncommonly in the science of Botany that more than one generation of a family has followed the same pursuit. The subject of this notice was the second notable botanist of his name, and he leaves a son who also pursues the same science.

Augustin Pyrame de Candolle, the father of Alphonse, sprang from a Provençal family, which had fled from France in 1558 to escape religious persecution, and had settled in Geneva. He appears to have spent his earlier years in Paris, where he was intimate with the leading men of science; subsequently he held the chair of botany at Montpellier; but in 1814 he finally took up his residence at Geneva, having been appointed to the chair of botany in his native city. Himself a man of surprising powers of application, he set on foot that great work of descriptive botany, the *Prodromus Systematis Naturalis*, in which it was intended that all known plants should be arranged according to a natural system, and described at length. It was into this great enterprise that Alphonse de Candolle entered in early manhood, and at a time when his father was still actively at its head. It was to this that he devoted a great part of his long and strenuous life; at his death the great work remains still incomplete, though a wonderful monument of the capacity and endurance of two generations.

Born at Paris in 1806, Alphonse was still a small child when his father settled at Geneva. It might have seemed natural that, after the ordinary period of general education, he should, as the only son, take up the subject pursued by his father; but the latter, wishing him to enter a profession of more certain profit, directed him to the study of law, in which he graduated in 1829. But he had already in 1824 begun the long series of his botanical publications, which was continued till 1893; his inclinations seem plainly to have been towards the study of the laws of nature rather than of man, and,

after the publication of some botanical notes of minor importance, we find him in 1830 as the author of his first work on systematic botany, a monograph of the Campanulaceæ. This included, in addition to the more purely systematic treatment of the family, a very complete statement of the facts relating to its geographical distribution, and thus it foreshadowed the work which the author was in later years to accomplish in the two spheres of purely systematic botany, and of botanical geography.

Alphonse de Candolle was for a considerable time officially connected with the University of Geneva. In 1831 he was appointed honorary professor, with the duty of assisting his father in the management of the Botanic Garden, as well as in academic affairs. In 1835 he was appointed ordinary professor in his father's place, a post which he held till 1850, when he retired from the exacting duties of teaching to labours in the more direct advancement of his science.

The *Prodromus*, already planned by Aug.-Pyr. de Candolle, had reached its seventh volume when Alphonse de Candolle began to participate in its production. From that point onwards he contributed largely from his own pen to the monographs, while after his father's death in 1841 the editorship of the great work was entirely in his hands. The whole series of 17 volumes (1824–1873) consists of 13,194 printed pages; of these Alphonse de Candolle contributed 1387 pages, dealing with 45 families, 438 genera, and 5511 species. Those who are acquainted with such work will from these figures form some estimate of the great area of observation and accurate description over which he must have spread his energies.

During the half century over which the publication of the *Prodromus* extended, botany had been steadily advancing, and the advance is reflected in the style of the writing put into it by de Candolle and his collaborators. The descriptions become less brief, and more attention is given to the geographical distribution of the species. It is true that comparative morphology, development, and anatomy do not figure largely, for such branches of the science were in their infancy at the time when the idea of *Prodromus* was conceived. It was inevitable that, in a work of which the publication of the first part was necessarily separated from the later by so

long a period as half a century, the earlier parts should become obsolete before the work was completed, and no doubt in the original scheme a much more rapid progress was expected than actually proved possible. Be this as it may, it was at last found by Alphonse de Candolle that it was undesirable to attempt to complete the *Prodromus*, and in 1873 the work was finally closed, the Monocotyledons not having been even touched.

This unsatisfactory position has, however, been met by initiating a separate publication, under the title of the *Monographiæ Phanerogamarum*, of which the eighth volume is now in the press, the editorship having been shared by Alphonse and his son, Casimir de Candolle. The object of this work has been partly to revise the orders treated in the earlier volumes of the *Prodromus*, and secondly to take up the Monocotyledons, which were omitted from the *Prodromus*. A circular letter was issued in 1875 announcing the scheme and method of the new enterprise. Though well responded to, only seven volumes of the new work have yet appeared, including 17 families, eight of which are from the Monocotyledons. The treatment of the Smilacæ in the first volume, by Alphonse de Candolle himself, showed the wideness of the new scheme; for he took into account the anatomy, the affinities, the geographical distribution, and the fossil representatives of the family.

Here it may not be amiss to mention the extensive collection brought together originally by the father, and continually growing under the management of the son. It is probably the largest private collection in existence, its rival having been the Hookerian Herbarium, now incorporated with the great collection at Kew. This, together with the drawings and library, all managed with the greatest perfection, was willingly placed at the disposal of visitors, and especially of those who were engaged as collaborators in the systematic undertakings of the de Candolles.

Working upon this extensive herbarium, among divers families, gave de Candolle an opportunity of extending the science beyond the mere recognition and description of new forms, an opportunity which he grasped from the first. It has already been remarked that in his earliest monograph of the Campanulacæ he paid particular attention to the geographical distribution of the species.

Himself never an extensive traveller, he yet, by careful and systematic collection of facts, prepared himself to be the author in 1855 of the *Géographie botanique raisonnée*, which is considered to be his most important work. It was not his object to compile from books of travel a description of the vegetation of the earth, nor did he attempt to explain all the known phenomena of distribution of plants. In his own words his object was "to seek out the laws of the distribution of plants upon the earth, by means of a limited number of facts, which should serve as a basis, and proofs"; "*rerum cognoscere causas* should be the goal in all true science." And again, the principal object should be to show in the distribution of plants as they are, what may be explained by the actual conditions of climate, and what depends upon anterior conditions. The work was divided into three parts: the first dealt with the mode of action of temperature, light, and moisture upon plants; the second with plants from the point of view of their distribution on the globe, the causes of their origin, their frequency or rarity; in the third the different countries were studied from the point of view of their vegetation.

His introduction of a modified method of the sum of temperatures was perhaps the most important point. Boussingault had already introduced the method, calculating the sum of temperatures upon the rough thermometric mean. De Candolle showed that the true method of sums of temperatures consists in calculating them above a certain minimum, from which point the vital phenomena of the plant in question begin to be active. Each species extends further northwards as far as it finds a certain fixed sum of heat, thus calculated, between the day when a certain mean temperature commences, and that when it ends; but these rough results are modified by other conditions; still, though not mathematically exact, the method laid down by him gives useful results in connection with the study of the geographical limits of species.

These and kindred subjects occupied the attention of de Candolle repeatedly in later years; the most important of his later geographical writings being that in which he distinguished among plants six "physiological groups." In these were associated together plants which behave alike with regard to heat and moisture, and which accordingly may have together passed through

different geological phases, and are always found in those regions of the globe where similar conditions occur.

Having thus interested himself in questions of geographical distribution at large, it seems a natural step in specialisation of such study that de Candolle should have taken up the question of the "origin of cultivated plants." The difficulties of this subject are not merely botanical, but ethnological, historical, palæontological, and even linguistic; he arrived at his conclusions by a combination of all these lines of research. The result of this wide research, involving such varied and numerous facts, was a book published in 1882, which takes its place as the first authority on the subject.

The attitude of de Candolle towards evolution was favourable from the first. Considering that he was already over fifty years of age when the *Origin of Species* appeared, it would have been conceivable that his opinions should have been too long held for change. But, on the other hand, his writings previous to it show that he was well prepared for some such view. He had already speculated upon the origin of those "physiological groups" mentioned above, and had included in his reasoning observations and ideas relating to earlier geological periods. He had even recognised the possibility of new hereditary forms, which should have been derived from actual specific forms; but he felt the difficulty of such modifications being brought about without the hand of man, there being little probability that these modifications would be transmitted in the ordinary course of things; still he admitted the possibility of species, under the influence of diverse circumstances, being modified, and developing accidentally under a new form. To one who was already in this position, "the origin of species, by means of natural selection," would be accepted as a welcome solution of the difficulty. He wrote in 1862, "Darwin has placed his finger upon the essential point of the question, by seeking a cause by which the variations from one generation to another would be necessarily fixed instead of disappearing"; while in 1873 he wrote, "One had believed in this evolution without understanding how it could operate; selection has come as an explanation how the changes, once produced, are fixed."

But it would be impossible here to review all the literary achievements of this most fertile writer; for almost seventy years he

was at work, and the mere list of his publications, in which his contributions to the *Prodromus* and to the *Monographiæ* appear only as single numbers, amounts to 235. His botanical subjects ranged from strict taxonomy, through writings on geographical distribution, effect of external conditions on plants, and economics, to the theory and practice of botanical description and nomenclature. But, like many men of outstanding ability, his energies were at times diverted into other lines than those of his favourite study; bred a lawyer, he doubtless found that early training of value in his capacity as a member of the Representative Council, which he entered in 1834. Judging from his mixed writings, his interests appear to have been wide, with a special bias towards anthropology, and the amelioration of the conditions of the race; these tastes found their expression in his legislative successes.

It was natural that a man with such a scientific record as his should have received very wide recognition, not only in his own country, but throughout the scientific world. The Royal Societies of London, Edinburgh, and Dublin, the Institute of France, the Academies of all the chief capitals of Europe, claimed him as a foreign member or associate. Our own Society will feel that in offering him in 1877 a place among the foreign fellows it had honoured itself. He has gone to the grave full of years and of honours, leaving as his mark upon the progress of botany such a record of solid and long-continued work as has seldom been attained by scientific writers.