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## SAPORTA AND WILLIAMSON AND THEIR WORK IN PALEOBOTANY.

THE science of fossil plants has lost within a period of less than six months two of its oldest and most eminent cultivators, the Marquis Gaston de Saporta and Professor William C. Williamson, the former of whom died on the 26th of January, at the age of

seventy-two years, and the latter on the 23d of June, at the age of seventy-eight years. The immense loss which science has sustained in the death of these two men is only partially lessened by the fact that they were not cut off, as are so many men of promise, in the prime of life, but were spared to continue to a ripe age their valuable labors. The monument that each has erected for himself is greater and more enduring than any that others can ever erect for them.

Having been in direct communication with both of them for a full decade and having been also, to a limited extent, personally acquainted with them, I have felt it a duty to science, and especially to that branch of science which I have cultivated most, to speak a word from this side of the Atlantic in recognition of their services.

## THE MARQUIS SAPORTA.

IN a paper in which I contributed in 1885 to the Fifth Annual Report of the U. S. Geological Survey (p. 383), and in which I gave brief sketches of the principal workers in paleobotany, I attempted to review Saporta's work, as then known to me, from an acquaintance with his scientific contributions. This sketch was exceedingly defective and did poor justice to his merits, but was the best I was able to make at that date. Aside from the grave omissions there made, it must be said that his labors were

far from being completed, and in the last ten years of his life he produced many of his most important works. It is not always safe to judge an author by the number of titles that his bibliography contains, but for an author all of whose contributions are certain to be of value to science this criterion has considerable weight. I have been able to collect together about 150 titles of Saporta's works, several of which are volumes elaborately illustrated, and two of which consist of long series of exhaustive and painstaking papers.

I shall attempt here to mention only a few of the leading subjects to which the Marquis Saporta devoted his energies. He was born at St. Zacharie, Department of Var, in the South of France, on the 28th of July, 1823, and christened Louis Charles Joseph Gaston. As his name indicates, he was of Spanish descent and belonged to one of the oldest families of the nobility of that country that are so frequently met with in this part of France. We are informed by his illustrious co-worker, M. R. Zeiller,\* that he was in more or less direct communication during his boyhood with the eminent entomologist, Boyer de Fonscolombe, his maternal grandfather, and that his own father also cultivated entomology to some extent. This may have tended to inspire in him a taste at least for scientific study. But this atavistic taste did not develop in early life, and prior to the age of 30 he devoted himself chiefly to literature and history. At about that time he was accidentally brought into relations with the founder of paleobotany, M. Adolphe Brongniart, who had been interested in certain fossil plants from Tertiary beds near Saporta's home at Aix and from Manosque. This appears to have given the special bent to his mind which determined the labor of the rest of his life, and

thenceforward to the time of his death he devoted himself unceasingly to the study of fossil plants, and largely to those rich fossil floras which he has made known in Provence. A letter which he wrote to M. Charles Th. Gaudin, and which the latter published in the 6th volume of the '*Bulletin de la société Vaudoise des sciences naturelles*' for April 18, 1860, shows clearly that he had already at that date been a long time engaged in the collection and study of the fossil plants of Provence, but this seems to have been his earliest contribution on the subject of fossil plants. These already rather full notes were greatly expanded and published the following year in Gaudin's translation of Heer's *Researches on the 'Climate and Vegetation of the Tertiary,'* which forms a part of the 3d volume of Heer's '*Tertiary Flora of Switzerland,*' the French translation being published separately.\*

These papers were merely preliminary to the extensive series which began to appear the next year, viz., his '*Études sur la végétation du sud-est de la France à l'époque tertiaire.*' This series was published in the '*Annales des sciences naturelles, botanique,*' beginning with the 16th volume of the 4th series, 1862, and concluding with the 9th volume of the 5th series, 1868, and embracing 13 distinct papers, all profusely illustrated by beautifully prepared lithographic plates. Four years later he made a complete revision of this work in three similar papers which appeared in the 15th, 17th and 18th volumes of the same serial, 1872-1873. In 1888 he returned to this subject and published his '*Dernières adjonctions*' in two papers in the 7th and 10th volumes of the 7th series of the same work. In this exhaustive treatise the Tertiary flora of the

\* *Revue générale des sciences*, 15 avril, Paris, 1895, p. 359.

\* *Recherches sur le climat et la végétation du pays tertiaire*, par Oswald Heer, traduction de Charles Th. Gaudin, Winterthur, 1861. B. *Examen des flores tertiaires de Provence* par M. Gaston de Saporta, pp. 133-171.

South of France has been made as well known to science as is its living flora.

While in the midst of the studies of the Tertiary flora of southern France he undertook another even more ambitious work, being nothing less than a complete monograph of the Jurassic Flora of France to be published in the great paleontological serial, the 'Paléontologie Française.' This monumental work was issued in fascicles to the number of forty-seven, beginning in January, 1872, and ending in July, 1891. It was finally published in four large volumes, with an aggregate of over 2000 pages and 300 plates, royal octavo. It is a complete systematic treatise on the entire Jurassic Flora of France, from the Infralias or Rhetic to the Purbeck, and like all Saporta's works, which differ in this respect from those of most paleobotanical authors, it is founded upon a most careful study of the living vegetation of the globe.

It seems almost incredible that in the midst of these great labors Saporta should have found time for anything else beyond a few minor contributions; but not only was the number of these latter large and their magnitude often considerable, but several of them rise to the dignity of important works. Among such are to be mentioned his classical memoir on the Fossil Flora of Sézanne,\* at the extreme base of the Tertiary; the still more extended monograph of the 'Pliocene Flora of Meximieux, Department of Ain,' in which, however, Professor A. F. Marion, of the University of Montpellier, was associated with him; † a fine es-

say on the 'Flora of Gelinden'\* in Belgium, a formation in the extreme Upper Cretaceous, which appeared in 1873, with a revision of the same † in 1878, in both of which, as in the one last mentioned, Professor Marion assisted him; the handsome volume which he published in 1879, entitled 'Le monde des plantes avant l'apparition de l'homme,' which is a popular account of the whole subject of fossil plants written in a lucid and fascinating style, and which is to-day the best popular work on the subject and was translated into German by Carl Vogt in 1881; a still larger work somewhat in the same line but much less popular, and in the preparation of which Professor Marion was again associated with him, viz., 'L'Évolution du règne végétal,' published in three volumes as one of the International Scientific Series, no English translation of which has appeared. The first volume of this work, published in 1881, relates to the Cryptogams, and the second and third, which appeared in 1883 and 1885, respectively, to the Phanerogams. This is the most successful attempt thus far made to trace the development of plants from its earliest beginnings to its latest forms by the aid of paleontology, and if it be true, as is generally admitted, that complete success in this attempt was not attained, it will nevertheless form the basis for all future researches in this line.

Another and very different task was undertaken when in 1882 he essayed to reply to the strictures of Dr. A. G. Nathorst on the nature of the supposed fossil algæ of the earliest rocks. To this controversy he has contributed two elaborate treatises, the

\* *Prodrome d'une flore fossile des Travertins anciens de Sézanne.* Mém. Soc. Géol. de France, 2e Sér., Vol. VIII., Paris, 1868, pp. 287-438, pl. xxii.-xxxvi.

† *Recherches sur les végétaux fossiles de Meximieux*, par le Comte G. de Saporta et M. le Dr. A. F. Marion; précédées d'une introduction stratigraphique par M. Albert Falsan. Archives du Muséum d'Histoire naturelle de Lyon, Vol. I., Lyon, 1876, pp. 131-335, pl. xxi.-xxxviii.

\* *Essai sur l'état de la végétation à l'époque des marnes heersiennes de Gelinden*, par le Comte G. de Saporta et le docteur A. F. Marion. Mém. Cour. Acad. roy. Belgique, Vol. XXXVII., No. 6, Bruxelles, 1873.

† *Révision de la flore heersienne de Gelinden*, par le Comte G. de Saporta et le Dr. A. F. Marion. Op. cit., Vol. XLI., No. 3, Bruxelles, 1878.

first entitled: 'A propos des algues fossiles,' which appeared in 1882 in the form of an illustrated folio volume of 82 pages and 9 plates; and the second entitled: 'Les organismes problématiques des anciennes mers,' which is a slightly larger companion volume of 102 pages and 12 plates. This is not the place to discuss the question involved in these works, but no one denies that the Marquis Saporta has here brought forward the strongest evidence that the case will permit for the existence of vegetable remains at these remote periods.

A second popular and very useful work was his 'Origine paléontologique des arbres cultivés ou utilisés par l'homme,' a small octavo volume of 360 pages and numerous woodcuts, which appeared in 1888. This work evinces a wide acquaintance with the dendrology, not only of Europe but of the world, and is based mainly upon the author's profound knowledge of the Later Pliocene and Quaternary floras of France.

Without stopping to mention other works which have almost as much claim as the ones already treated, I will indulge in a final word relative to the work upon which our author was engaged at the time of his death. I allude to his studies in the Lower Cretaceous flora of Portugal. After the death of Oswald Heer, to whom the collections made by the Geological Survey of Portugal from the plant bearing Mesozoic beds of that country had been sent, and who had published one important contribution to the subject, these collections were sent to Saporta, and he had been engaged upon them, as time would permit, since 1886. In 1888 he published, in the 'Comptes Rendus,' a preliminary account of their nature, in which it appeared that there were now being found in the Portuguese beds below the Cenomanian certain dicotyledonous forms which greatly interested the Marquis, since this was by far the earliest appearance in Europe of that type of plant life;

although, as was well known to him, we have, in our Potomac flora of Virginia, deposits of still greater age containing such plants. The appearance of this and a still later similar paper on the same subject but without illustrations, taken in connection with the fact that I was at the time actively engaged in the study of the equivalent beds of this country, led to an interesting correspondence, which was kept up until the summer of 1894, when it was my good fortune to pay a visit to the veteran paleontologist at Aix for the purpose of examining the material in his hands with a view to a comparison of the Portuguese forms with those of the United States. My brief sojourn at Aix and at Fonscolombe, as the guest of the Marquis, afforded me the valued opportunity to add to my knowledge of him as a scientific man and a genial correspondent, a glimpse of his personal character, and to learn that along with those sterling attributes which are required to make a man of science there went the generous hospitality, the unaffected simplicity and the cordial affability that characterize the true nobleman. My reception on that occasion at the Château of Fonscolombe, his country residence, where I made the acquaintance of his interesting family, was of the warmest character; and my brief stay there was in the highest degree enjoyable.

I found that the first instalment of his work on the Portuguese Flora was almost ready to appear, but the material that had reached him since this volume went to press was considerable, and this I was also permitted to see. I need not here repeat the account which I have already given in these columns\* of the scientific value of this visit and the general nature of the work under consideration. He promised to send me the new volume, together with a number of other works of his which I informed him I had

\*SCIENCE, New Ser., Vol. 1, March 29, 1895, pp. 337-346.

not yet received, but they never came, as the hand that was to direct them was soon stricken and compelled to lay down the pen that had written so many volumes and the pencil that had done more than any other to embellish the science of fossil plants.

His last undertaking seems to have been a work on the fossil *Nympheaceæ* and two preliminary papers had already appeared in the '*Comptes Rendus*.' He showed me a wonderful series of specimens and the inimitable drawings of them that he was making.

The question naturally arises: Upon whom is the mantle of this eminent investigator destined to fall? In addition to a large amount of posthumous work that is known to exist, much of which is probably nearly ready for publication, there are the large collections which have been sent to him from many sources and which are greatly in need of elaboration.

He left a large family, children and grandchildren, and at least two of his sons have grown to manhood, the eldest, Count Saporta, whose acquaintance I made, as well as that of the Countess, was the private secretary to the Comte de Paris, and even while I was there he had received a dispatch announcing that the Comte was dying at his place of exile in England, whither he had to repair immediately, and we traveled together to Marseilles. Another married son, the Viscount Antoine de Saporta, has made at least one important contribution to fossil plants, viz., a review of Nathorst's '*Fossil Flora of Japan*,'\* based on the original Swedish text before the appearance of the authorized French translation, which was regarded of sufficient moment to call forth a reply from the author†. He may have written still other papers which have not come to my notice. Whether this young

man is to follow in the footsteps of his father remains to be seen.

There are two features of Saporta's work which have not been mentioned, viz., attention to bibliographical matters and a tendency to philosophize. For the past ten years Saporta had been contributing most valuable summaries in the entire domain of vegetable paleontology, which were published in the '*Revue générale de botanique*,' under the direction of M. Bonnier. Many of these amount to original contributions and include the description and illustration of new forms.

With regard to his philosophical tendencies it should be said that he allowed the logic of facts to influence his thoughts, and was, from the outset, a consistent exponent of the general doctrine of evolution and the special doctrine of plant development. In addition to the works above referred to, which directly bear upon this subject, and to the general treatment of it in his popular works, he has contributed quite a number of articles to the popular magazines, especially to the '*Revue des Deux Mondes*,' which have afforded him an opportunity to strike out the broad outlines of a general philosophy. One of the most original of his rational conclusions, and one that is fully sustained by the facts, but almost completely ignored by all other writers, is that the most important subdivisions of the geological scale must be drawn at different points for plant development from those at which they are commonly drawn for animal development. For example, the Mesophytic age properly ends with the Jurassic instead of with the Cretaceous, while the Tertiary for fossil plants closes with the Miocene instead of with the Pliocene.

PROF. W. C. WILLIAMSON.

IN my series of sketches of the leading paleobotanists,\* referred to above, still

\* Fifth Annual Rept. U. S. Geol. Surv., 1885, p. 376.

\* Ann. de Sci. Nat., Bot., 6th Ser., Vol. XV., 1883, pp. 149-167.

† Loc. cit., pp. 337-341.

greater injustice was done to Prof. Williamson than to Saporta. I was acquainted with his work at that time only from the great series of memoirs which he was publishing in the Philosophical Transactions, and which I was only able to consult in the ponderous volumes of that serial. I therefore limited myself almost exclusively to a mention of that work, 12 numbers of which had then appeared. The earliest paper relating to fossil plants with which I was then acquainted was dated 1842, and I therefore provisionally gave this date as the beginning of his work on fossil plants. I soon after collected titles, some of which go back to 1836,\* but in a letter from him dated June 16th, 1886, thanking me for this poor mention of his name, he said: "Your only mistake is in starting me on my paleobotanical career in 1842, since I am the same W. C. Williamson, Jun., whose name you will find so frequently in the Fossil Flora of Lindley and Hutton. You will see that my labors began in 1833, so that I have now been in the field 56 years—a regular old stager." I was indeed aware that a 'Mr. William Williamson, Jun.,' had contributed to Lindley and Hutton's Fossil Flora a large number of notes and sketches, all of which had been used by those authors and gratefully acknowledged, and I suspected that this might have been the same Professor Williamson, but as these notes all referred to impressions of plants from the Oölite of Yorkshire, while his chief labors had been on the internal structure of Carboniferous plants, it was natural that I should doubt their identity. I am now happy to be able to correct his correction and show that his absolutely first contribution to that work was made in 1832 instead of 1833.†

\*See the Proc. Geol. Soc., London, for Nov. 16, 1836, Vol. II., p. 429.

†The Fossil Flora of Great Britain by John Lindley and William Hutton, Vol. I., London, 1831-1833 (the first fascicle, pp. 1-48, pl. i.-xiv., was issued in

The same year in which I received the above mentioned letter there occurred a transaction, which, though trifling in itself, serves in an admirable way to illustrate Professor Williamson's personal character. Being very desirous to obtain the reprints of his memoirs 'On the Organization of the Fossil Plants of the Coal Measure,' from the Philosophical Transactions, as well as many other works relating to fossil plants, I had prepared an extensive list of such works, including this one, from a catalogue of Dulau & Co., Soho Square, London, and requested the Geological Survey to purchase the books. The invoice arrived substantially complete with the exception of Professor Williamson's work. Much time elapsed and the work did not come, further correspondence showing that it had not been possible to obtain it. I therefore wrote direct to Professor Williamson, begging him if possible to spare a set to Messrs. Dulau & Co., for our use in America. The very next steamer brought the full set direct to me without cost and another characteristic letter, from which I make the following extract:

"Your letter of October 28th has thrown light upon what appeared to me a queer affair. I received an application from Messrs. Dulau for a set of my memoirs; I replied that I had only three spare copies left, that I never had sold a copy and that I much preferred not doing so, since I had rather reserve them and give them to some 1841 and the second, pp. 49-166, pl. xv.-lix., in 1832. His first sketch, which was that of *Cyclopteris Beanii*, constitutes pl. xlv., and is described on pp. 127-129. It was found by his father, but a note signed by 'W. Williamson, Jun.,' on p. 127, shows that he had much to do with it, and although it is not stated that the sketch was made by him, there is every probability that it was. An examination of the entire work shows that he contributed no less than 30 of the species described in it, constituting nearly all from the Oölite of Yorkshire, and that in every case he not only furnished the specimen but an accurate drawing which the authors always used).

paleontologists that I knew would make good use of them. \* \* \*

"I am so glad that you have written direct to me about the affair, because yours is precisely the sort of case that I contemplated in my letter to Dulau & Co. I will send the set of 12 memoirs to you and beg that you will accept them from me."

William Crawford Williamson was born November 24th, 1816, at Scarborough, in Yorkshire. We are fortunate in having a most admirable sketch of his life by Mr. Charles Bailey, F. L. S., published in the Manchester Scientific Student's Annual Report for 1886, which sets forth the principal facts in connection with his early life and also contains, as a frontispiece, an excellent portrait of him at that date. In this paper Mr. Bailey says:

"Circumstances had made Professor Williamson's father a gardener by profession, but nature had made him a geologist, and placed him in one of her most valuable domains, viz., on the Oölitic and Cretaceous rocks of Yorkshire. The late Professor Phillips tells us in the preface to the third edition of his classical work, *Illustrations of the Geology of Yorkshire*, how he had, in company with his uncle, William Smith, 'the Father of English Geology,' gathered fossils beneath the romantic cliffs of Whitby and Scarborough, but that in 1824 he had the good fortune to become acquainted with two of the most valuable of all his early friends, Mr. William Bean and Mr. John Williamson (the father of the future professor), and to profit by their admirable collections of recent and fossil shells, crustacea, echinida and corals, dredged from the neighboring sea, or hammered out of the adjacent rocks. The father naturally trained his son William to pursue studies which were so fascinating to himself, and, in consequence, the father and the son became inseparable companions."

But the Williamsons were not people of

great means, and the young scientist had to be apprenticed to a surgeon in Scarborough, where he remained from 1832 to 1835. It was during this period that he furnished the data above mentioned, to Lindley and Hutton's Fossil Flora, but he also published over his own name a number of papers on various other subjects, which displayed a wide knowledge of nearly every branch of natural history. These contributions gained for him the curatorship of the Natural History Society of Manchester, where he remained the next three years. He studied medicine and surgery, and in 1840 became a member of the College of Surgeons, and held several important positions, including that of Active Surgeon to the Chorlton-upon-Medlock Dispensary. In 1851 he became Professor of Natural History and Geology at Owens College, Manchester, and from that time until 1892 he followed the fortunes of this noted institution. Then, at the age of 76, he retired from professional labors in order to give himself up exclusively to his great work on fossil plants.

Professor Williamson's labors were by no means confined to vegetable paleontology, and his contributions to other branches of natural history are only less celebrated than those in this field. Mr. Bailey has passed these labors in review in a very satisfactory manner, and I must refer the reader to this sketch for an account of them, confining myself to the only subject on which I am at all capable of expressing an opinion. In 1842 he wrote upon the 'Origin of Coal,'\* and in 1854, he returned to the study of the cycadean plant, *Zamia gigas*,† of which he had furnished the sketch for Lindley and Hutton,‡ and upon which

\* Brit. Ass. Rept., 1842, Pt. 2, p. 48.

† For such he still modestly called it, although in the paper that immediately follows his in the Trans. Linn. Soc., Mr. William Carruthers renames this plant *Williamsonia*, thus founding one of the best marked genera of fossil plants.

‡ Foss. Fl., Vol. III., p. 45, pl. clxv.

he finally published an elaborate memoir in 1870.\* This was his principal contribution to the external parts of fossil plants. Being an adept at the microscope he turned his attention to their internal structure, and found this study so fascinating and so profitable as to allow it to engross almost his entire energies from about the year 1869 to the end of his life.

An important paper appeared in 1869 on the 'Structure and Affinities of Some Exogenous Stems from the Coal Measures,'† and in quick succession during the same and the following years a number of papers describing his studies on the genus *Calamites*.‡ These papers constituted the natural prelude to his great series on the 'Organization of the Fossil Plants of the Coal Measures,' the first of which related to the genus *Calamites* and appeared in 1871.§ From this date these memoirs continued to appear in the Philosophical Transactions at the rate of a little more than one each year, so that the last memoir, of which he was the sole author, is No. 19, and is to be found in the 184th volume, published in 1893.

After his removal to London, in 1892, he associated with him the accomplished structural botanist, Dr. D. H. Scott, Honorary Keeper of the Jodrell Laboratory at Kew, and they worked together in the preparation of an additional memoir, which was laid before the Society on December 30, 1893, and an abstract of which appeared in the Proceedings of the Royal Society, Vol. LV., 1894, without illustrations. This

memoir relates to *Calamites*, *Calamostachys* and *Sphenophyllum*. At the Oxford Meeting of the British Association Dr. Scott laid before the Botanical Section the principal results of this investigation, accompanied by profuse illustrations projected on the screen. As I had read the abstract before leaving America, I was naturally deeply interested in this paper, which it was my good fortune to hear. I had written to Professor Williamson that I intended to attend the British Association, and had received a reply in which he stated that he would not be present and begged me to visit him at his country cottage in Sussex, which, to my great regret, I was unable to do. But at Oxford I received another letter from him, renewing his invitation and alluding in no uncertain terms to certain tendencies in modern science which he had always deplored. This part of his letter contains so clear an expression of his views on this question, which he had never published, that I cannot do better than to quote it here.

"I had intended coming to Oxford to utter my final protest against the growing multitude of Paleobotanical species mongers who are reducing the study of Paleobotany to a state of inextricable confusion. But I concluded that I should only expend my breath for nought and become engaged in angry controversies, hence I resolved to leave the entire race who find pleasure and renown in attaching the mystic 'mihi' to the vast number of unidentifiable fragments that have now been accumulating from the days of Artis, Sternberg and Brongniart to the present day. I refuse to recognize any one of my names given in my numerous memoirs as being *specific*. They are merely convenient terms helping us to identify certain types of organization—any one of which may embrace an indefinite number of true species, if indeed any such have a real existence."

\* Trans. Linn. Soc., Vol. XXVI., 1870, pp. 663-674, pl. lii.-liii.

† Monthly Microsc. Jour., Vol. II., London, 1869, pp. 66-72, pl. xxii.

‡ Proc. Lit. Phil. Soc. Manchester, Vol. VIII., 1869, pp. 36-38; 153-155; Vol. IX., 1890, pp. 7-9; 76-78; Mem. do., 3d Ser., Vol. IV., 1869, pp. 155-179; 1871, pp. 155-183; 284-265; Vol. V., 1871, pp. 28-46, pl. i.-iii., etc.

§ Phil. Trans. Roy. Soc. London, Vol. CLXI., 1871, pp. 477-510, pl. xxiii.-xxix.



To the discussion of Dr. Scott's paper considerable scope was given, and the question involved in the above extracts from this letter occupied the attention of the members. Being called upon by the courteous President of the Section, Prof. Isaac Bailey Balfour, to make some remarks, and having little to say further than to express my great interest in the subject, I felt that I could not better contribute to the discussion than by reading the above extract, which I took the liberty to do.

Although Professor Williamson's labors were so largely confined during the last 25 years of his life to the preparation of this series of memoirs, it must not be supposed that this was all he accomplished. The number of his minor contributions during this period is very large indeed, and several of these papers are of great importance. Especially is this the case with his Monograph of the 'Morphology and Histology of *Stigmaria ficoides*,' published in 1887, which is by far the most complete treatise thus far known on this subject. The total number of his titles, so far as I have been able to collect them together, does not fall far short of 150. This is exclusive of all papers relating to other branches of science, of which there is a great number, including many addresses and lectures. But nearly all of his papers are devoted to setting forth the results of special investigations, chiefly microscopic, upon a great variety of material, which, by the aid of a large corps of trusted collaborators and collectors, he had accumulated in his cabinet. He rarely indulged in philosophic discussion, but on one or two occasions he took a broad view and expressed himself on the larger subjects connected with his lifework. This was notably the case in his address on 'Primeval Vegetation in its Relation to the Doctrines of Natural Selection and Evolution,' published in a volume of Essays and Addresses by Professors in Owens College, Manchester,

in 1874, and reviewed by Dr. Asa Gray in the 'American Journal of Science' in the same year.\* To the same class also belonged his 'Primitive Ancestors of Living Plants and their Relations to the Doctrine of Evolution,' published in the 'Revue internationale des sciences biologiques' for September, 1883, but there was scarcely a subject in the whole range of paleobotany which had been prominently brought forward by other writers upon which he had not expressed his opinion.

Only once was it my good fortune to meet Professor Williamson. On the occasion referred to, when I met Dr. Scott at Oxford and had appointed a day to examine with him at the Jodrell Laboratory the microscopic slides of *Bennettites Gibsoni* and other species prepared by Count Solms-Laubach, which were in his hands, Dr. Scott, without my knowledge, notified Professor Williamson of this appointment, and when I reached Kew, to my great delight, I found him there. The two or three hours which I spent in his society can only be characterized as charming. Many subjects were discussed, among the most interesting being his friendly differences with the French paleobotanists, and he related in a playful manner how he had gone about it to secure the publication of one of his most telling replies to the French School in the 'Annales des sciences naturelles,' in which they themselves chiefly published—a bomb, as it were, in the enemy's camp. In parting he said to me with moisture in his eyes, "We shall never see each other again." And so it has proved.

If I were to specify which one of the many important discoveries that Professor Williamson has made in the field of paleobotany ought to be regarded as the most valuable, I should not hesitate to name his demonstration of the existence of exogenous structure in the Carboniferous Pteridophytes, or, more broadly stated, the irrefrag-

\* 3d Ser., Vol. VIII., pp. 150-151.

able proof which he has brought forward that exogenous structure is not confined to the Spermatophytes. That it is so confined was simply a dogma of botany, and when Brongniart, in his classical memoir on *Sigillaria elegans*, published in 1839, so clearly proved that the genus *Sigillaria* sometimes has such a structure, influenced by this dogma alone, he inclined to place it in the Gymnosperms, and so great was his authority that until very recent times, and to some extent still to-day, his followers in France have labored to sustain that view. Long after Professor Williamson had overthrown it definitively the French School continued to defend it, and it was for this reason that he was induced to contribute the paper above referred to in the 'Annales des sciences naturelles.'\* He was determined that they should not have the excuse that his researches were in a language with which they were not familiar, and therefore associated with himself Dr. Marcus M. Hartog, of Victoria University, Manchester, and with the aid of a literary friend of Dr. Hartog in Paris, who put the paper into the very best of French, he set forth in the clearest manner the leading arguments in opposition to the old doctrine, and thrust it directly before the eminent defenders of that doctrine. The effect was instantaneous. The article was read and repeatedly answered, but without weakening the argument, and to-day, with perhaps a single exception, Professor Williamson's conclusions are accepted by the French paleobotanists.

LESTER F. WARD.

WASHINGTON, D. C.

JAMES C. PILLING.

JAMES CONSTANTINE PILLING, a well-known student of the languages and litera-

\* Les Sigillaires et les Lepidodendrées, Par. MM. W. C. Williamson et Marcus M. Hartog. Ann. Sci. Nat., Bot., 6e Sér., Vol. XIII., Paris, 1882, pp. 337-352.

ture of the Indians of North America, the bibliographer in the Bureau of American Ethnology, died of locomotor ataxia July 26, 1895. He was born in Washington, November 16, 1846, and passed through the public schools and Gonzaga College. At twenty he was a court and Congressional stenographer. In 1875 he became connected with the United States Geographic and Geologic Surveys of the Rocky Mountain region, under Major J. W. Powell. While in the field he displayed notable skill and zeal in the collection of the vocabularies of the native tribes, his experience in stenography proving of great service. By his aid the Director of the Survey was able to collect a large number of myths and traditions, and to record ceremonials with a fulness of detail which would have been impossible without the use of shorthand. In 1881 Mr. Pilling became chief clerk of the Geological Survey and the Ethnologic Bureau, retaining this arduous position until 1891, when failing health compelled discontinuance of a part of his work; thereupon he resigned from the Survey, discontinued administrative work, and devoted his remaining energies with remarkable persistence and success to bibliographic researches. These researches were continued until April last, when he finally became incapacitated.

Mr. Pilling was widely known as a bibliographer of the native languages of North America. Nine parts of his great bibliography have been published, viz.: the Algonquian, Athapaskan, Chinookan (including the Chinook jargon), Eskimo, Iroquoian, Muskogean, Salishan, Siouan and Wakashan. These volumes comprise about 1,700 pages, including over 6,000 titular entries. The work is regarded as a model by bibliographers generally; the successive parts have been favorably reviewed in scientific journals in many countries. Much additional material was prepared, including a