‘The ‘Other’ Glasgow Boys: The Rise and Fall of a School of Palaeobotany’

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Text: 13,387 words
References: 82
Figures: 23

The ‘Other’ Glasgow Boys.

Abstract: With its longstanding coal industry working the measures of the Scottish central belt, fossil plants have long been known in Scotland. The earliest significant work dealing with Scottish palaeontology, David Ure's 'The History of Rutherglen and East-Kilbride' had been published in 1793, with its plates of *Equisetum*, ferns and bark impressions. But, as in Yorkshire and Lancashire, it was not until the industrial revolution's increased exposure of fossils was matched by the advent of the 'new European botany' (which in part grew from substantial improvements in the optics for microscopy), that fossil plant study began in earnest in Scotland.

In 1959, John Walton reflected on palaeobotany in Britain at the end of the 19th century, as "awakening from a long sleep". In Glasgow, this awakening centred on the University's Botany Department, and the development of the study of fossil plants closely parallels the growth of this department as a whole for much of its time. In the same city at this period, a collective of artists called the 'Glasgow Boys' were pushing the boundaries of representational painting. With Frederick Bower's own cohort of palaeobotanical 'Glasgow Boys' (David Gwynne-Vaughan and William Lang) facilitating the work of Robert Kidston, a veritable 'School of Palaeobotany' existed in the University at this time. John Walton himself was also destined to serve an unusual but critical later role in the preservation of Kidston's work.

The Seeds are Sown

In 1879, Isaac Bayley Balfour (Fig. 1) son of Sir John Hutton Balfour ('young woody fibre' and 'old woody fibre', as they were respectively known by their students), arrived at Glasgow to take up the Regius Chair in Botany, succeeding Alexander Dickson's (Fig. 2) eleven years in office (Walton 1952). Born in Edinburgh, he had graduated in science before medicine there in 1877. Balfour jnr. was one of a new breed of botanists that had been inspired by new styles of botanical teaching from the European mainland. The study of fossil plants had just undergone a major revolution, as a result of work done earlier that decade by Joseph Jackson Lister (1786-1869) and William Nicol (1768-1851). Around 1830, Lister published the first results from his development of the achromatic compound lens for use in the analysis of biological tissues at cellular level. Nicol is regarded as having developed a technique for producing palaeontological thin-sections, and viewing them, based on the work of the Edinburgh lapidary George Sanderson - although Nicol claimed that Sanderson's methodology was derived from a process Nicol himself had developed for preparing mineral thin-sections by grinding and polishing them while mounted directly on to plate glass, which he had personally demonstrated to Sanderson (Morrison-Low & Nuttall 1984). Regardless of the identity of the originator of this procedure, the results of Nicol's work were published in 1831 in Henry T. M. Witham's 'Observations of Fossil Vegetables, Accompanied by Representations of Their Internal Structure as Seen through the Microscope' (Walton 1959), notably featuring an understanding of plant cellular structure. This led to the first use of the words 'protoplasm' and 'nucleus' by Von Mohl (Bower 1938) and Brown respectively. These improvements in microscopy enabled the seminal treatise of Wilhelm Friedrich Benedict Hofmeister (1824-1877), in his 1851 'On the Germination, Development

and Fructification of the Higher Cryptogamia'. In this work, Hofmeister (1851) resolved the relationships of the gymnosperms to the mosses and ferns (albeit without recourse to fossil evidence), showing clearly the common nature of reproduction in these groups. The term 'higher cryptogamia' refers to the more derived members of the group of plants that reproduce via spores, so called because their reproductive parts were 'hidden' to earlier botanists, whose work pre-dated the invention of the microscope. There were some delays in English translations of Hofmeister's book (and other works) becoming available (1862 for Hofmeister). Not surprisingly, this meant that the new cellular approaches to botanical studies were more quickly embraced on the continent than in Britain. Consequently, any botanist in Britain that wanted to learn the new approaches had to travel to the continent to experience this European Enlightenment of a 'new botany'. Isaac Bayley Balfour had been in the vanguard of this scientific migration, and was committed to taking teaching at Glasgow from purely superficial systematics into dedicated laboratory and anatomical work.

The study of plants has a long tradition at Glasgow, dating back to the teaching of the *materia medica* around St. Nicholas' Hospital (established around the middle of the fifteenth century (From communications of several inhabitants 1793)) and its small attendant 'physic garden'. As elsewhere in Britain at the end of the nineteenth century, botany was taught through an exploration of "floristics and systematic aspects" (Boney 1993), but Balfour wanted significantly more. As Regius Professor, he was also a Director of the nearby Botanic Gardens, and he envisaged an institute of Botany built within those grounds. However, by 1885, when he left to take up the Sherardian Chair of Botany at Oxford, Balfour had made little progress towards this

goal. He had certainly revived the teaching of botany at Glasgow, due in large part to the acquisition of a teaching laboratory and preparation room (largely equipped out of his own pocket), but he had failed to form the institute that he desired. In his short time at Glasgow, Balfour had initiated the process of establishing laboratory teaching, but any hope of further progress in this regard would depend on his immediate successor, Frederick Orpen Bower (Fig. 3).

The Chief

Born 4th November 1855, Bower was a Yorkshireman, and like Balfour was heavily influenced by the new styles of botanical teaching that were in vogue 'on the continent'. His first experience of being taught botany was under the instruction of Sir Charles Cardale Babington at Cambridge (Boney 1993) in 1875, and Bower recalled it as altogether uninspiring, "wanting both in spirit and in substance" (Bower 1938). After being inspired by the production of the English version of Julius von Sachs' (Fig. 4) textbook 'Lehrbuch der Botanik' (which Bower (1938) later described as "a philosophical digest of the whole science") that same year, Bower met Sydney Howard Vines (Fig. 5) in the following. Also at Trinity College, and another acolyte of the 'New Botany', Vines advised him that in order to further develop he should seek tuition in a university abroad. So, before commencing the second part of the Natural Sciences Tripos, he travelled to Würzburg in June 1877, to be instructed directly by Julius von Sachs on laboratory methods for 8 weeks, Vines having travelled there himself 3 months earlier. With the conclusion of his studies at Cambridge, it was apparent that no vacancy could be expected there, and so in 1879 he travelled to join Vines and a "cosmopolitan group of post-graduate students" (Bayley Balfour had left shortly before their arrival) at Anton de Bary's laboratory in

Strasbourg (Bower 1938) (Fig. 6). There he stayed for an academic year, returning to London in Spring 1880 with a completely new outlook and approach to botany. Bower wished to bring the science out of a 'dark age' of purely systematic studies based on superficial criteria without recourse to anatomical and developmental observations. In 1959, John Walton described palaeobotany at the end of the 19th century in Britain as "awakening from a long sleep" (Walton 1959). It was undoubtedly this 'European Enlightenment' that first stirred it. On his return, Bower became an assistant to Daniel Oliver at University College London. By 1882 he was Lecturer in Botany under Thomas Huxley in South Kensington. He came second to Isaac Bayley Balfour in applying for the Sherardian post at Oxford, before being coerced into applying for the now vacant Glasgow Chair (a more full account of the bizarre circumstances surrounding this move are outlined in Boney 1993).

Bower, at first, was not happy at Glasgow. His new post was far removed from what he had experienced at Cambridge, Kew or even University College London. He suddenly found himself propelled into an environment where he had to teach a room full of medical students, and, like Balfour, he found the combination of two rooms and an attic herbarium quite inadequate for teaching the 'new botany', and campaigned long and hard for these facilities to be improved. After this 'baptism of fire', he was astonished to learn that his teaching was only required for the summer term, leaving the rest of the year free, and so he travelled to Sri Lanka for much of Autumn and Winter 1885-6 (Boney 1993). This journey renewed his spirit, and was to significantly inform his future policy towards his own staff.

Initially, Bower was isolated from the rest of the botanical research community. This only changed three years later, when Bayley Balfour returned to Scotland from Oxford (shortly after being the driving force for setting up the journal 'Annals of Botany'). Balfour was to take the Edinburgh University Chair of Botany with its responsibilities as Keeper of the Royal Botanic Garden – a post he held until the year of his death (1922). As Bower's research reputation increased, he swiftly became FRSE and then FRS, so that by the time that he gave vent to his characteristic fiery temper in this thinly veiled ultimatum to the Glasgow University Senate in 1893, he was someone of high standing within the University.

"no class room, no sufficient laboratory, no botanical museum or proper Herbarium. All this must be sooner or later provided or else Glasgow University will have to take the hindmost place as regards Botany: in which case it will hardly be worth my while to remain here." (Boney 1993)

His letter appears to have had the desired effect (at least, initially) as within twelve months the University Court was talking to architects about proposals. Unfortunately, the option for an institute in the Botanic Gardens had become impractical: mounting debts had resulted in the closure of the Gardens in 1887, with Glasgow City Council buying out the Garden from the Royal Botanic Institution, and although the Glasgow Boundaries Bill of 1891 had permanently secured the rights of the University to obtain specimens for teaching purposes, the Council could give no guarantees that the garden would remain in a location so convenient for the University (Bower 1926). This rendered any potential investment by the University in building works on that site as a financial risk. Consequently, the Senate produced a counter-proposal of a

new dedicated building for Botany in the grounds of the Gilmorehill campus of the University. Ultimately, the fears about the future of the Garden abated, and the Botanic Garden is still a resource for plant material for use by the University to this day. However, the investigations into possible sites within the campus became protracted, and entwined with a similarly dedicated building for Engineering. Eventually, in March 1898, Lord Kelvin himself intervened, bringing about the decision to build the Botany building on an old tennis court site for £19,000 (Boney 1993). It had taken some 20 years, but Balfour's vision of a botanical institute had come to pass, secured by Bower. It was indeed a step up for Bower and his department – from a "borrowed" lecture theatre, two rooms and an attic herbarium, he now had two large teaching laboratories, a herbarium and library spread over two floors, a museum spread over three floors, a 300 seat lecture theatre, and offices for himself and colleagues, as well as workshop facilities.

The Botany Department Germinates

Botany became the first of the University's science departments to be established in its own discrete building (Walton 1952) (Fig. 7) when it was opened by Sir Joseph Dalton Hooker on the 16th June 1901 (Fig. 8).

In these new facilities, Bower's department flourished. Bower was an energetic and enthusiastic lecturer, ensuring all teaching ran smoothly (Wardlaw 1948). Bower, a staunch Darwinist, insisted that the theory of evolution was fully accepted by all his students, as it was integral to the teaching and understanding of botany. His love of his subject shone through, and was an inspiration to many of his students, some of whom went on to work on his staff. Since 1889, he had been able to appoint

assistants. With the expansion of botany teaching beyond the realms of medicine, into the BSc and MA degree courses (as well as Queen Margaret's College), the increased lecturing load throughout the academic year meant that many of these assistants went on to become lecturers alongside Bower. This also meant an opportunity to expand the scope of botanical teaching, bringing the geological history of plants closer to the fore. John Christopher Willis was one of Bower's assistants from 1893-4, and then was promoted to Senior Assistant until appointed Director of the Peradeniya Botanic Gardens in Sri Lanka (one of Bower's haunts ten years before) in 1896. This led to two major changes amongst the staff within the botany department – firstly, William Henry Lang was promoted from junior to Senior Assistant, the junior assistant post then being filled by one David Thomas Gwynne-Vaughan.

Bower's Boys

Lang was born on the 12th May 1874 in Withyham, Groombridge in Sussex, his family having just moved there from Bridge of Weir in order for his father to practise medicine (Salisbury 1961). Unfortunately, his father died when Lang was two, and the family returned to Renfrewshire. Growing up in a rural setting, Lang became extremely interested in natural history. He moved from being Head Boy at Denniston School to enter medicine at the University of Glasgow in his fifteenth year, as the only means of gratifying this interest in the studies of animals and plants. Even at that age he was extremely dedicated; he attended evening classes at the technical college whilst studying medicine. At the University, he fell under the thrall of Bower (Andrews 1980), coming to share his fascination for, and later work in the field of, cryptogamic botany. By 1894 he had attained his BSc, and was offered the post of junior assistant in the Botany Department by Bower the same year, graduating in

medicine and surgery the following. By autumn 1895, he had been awarded a Robert Donaldson scholarship allowing him to start work at the Jodrell Laboratory of Kew Gardens (Walton 1960) under Dukinfield Henry Scott (1854-1934) (Fig. 9). There, on October 8th, he first met David Thomas Gwynne-Vaughan.

Born on 12th March, 1871, Gwynne-Vaughan came from an old Welsh family that claimed descent from Cradoc (a Knight of the Round Table) (Scott 1916). In October 1890, he entered Christ's College (Darwin's) Cambridge, obtaining a science scholarship there the following year. Passing through the hands of Vines as a botany teacher (Boney 1994), he received a first class in the first part of the Natural Science Tripos in 1893, but eschewed the second part in order to become a science schoolteacher. However, this evidently did not suit him, and after a year he was drawn from that profession to the Jodrell Laboratory of Kew Gardens to enter research. In October 1894, he was invited to work there by Sir Thiselton-Dyer, and went on to receive much of his research training under Scott (Boney 1994). His first research subject was the anatomy and morphology of the Nymphaceae, which commenced in January 1895. In May 1895, he began similar studies on the structure of *Primula*. Meeting Lang that October at the lab was the start of a lifelong friendship between them. Gwynne-Vaughan reported on the structure of Nymphaceae at the Liverpool Meeting of the British Association for the Advancement of Science in September 1896 (Bower 1917), so impressing Bower in the audience, with what he later described as a "peculiarly lucid preliminary statement" (Bower 1915), that after congratulating him on his paper, Bower, in an uncharacteristically impulsive move, offered him the junior assistant post at Glasgow there and then (Boney 1994). Starting at Glasgow in January 1897, Gwynne-Vaughan's research moved from

angiosperms to ferns. Mr L.A. Boodle at Kew was already working on ferns, so they politely agreed to partition the families of ferns between them so that there was no overlap in work. Gwynne-Vaughan received the more challenging families. For him to have a full understanding of the filiceans, Gwynne-Vaughan needed to be conversant with the fossil forms. Thus his palaeobotanical interest grew as he became acquainted with many fossil taxa.

It was at this time that Bower's experience of his first year at Glasgow served these junior members of staff in good stead, as he encouraged them to work abroad whenever possible. In October 1897, Gwynne-Vaughan took unpaid leave to prospect for exploitable rubber trees on the upper reaches of the Amazon, some 2,500 miles upstream (Scott 1916). Returning in September 1898, he wrote up his report to the commercial syndicate that had commissioned him back at the Jodrell Laboratory at Kew Gardens, again under Keeper Scott. Gwynne-Vaughan had enjoyed the rugged 'boys own' adventure of the trip, but bitterly regretted not fully availing himself of the botanical opportunities that had presented themselves, instead slavishly working against time to complete the commercial objectives of the trip. He expressed his regret in a letter to his half-sister, using the following quotation (noting that "an apt quotation is the best sort of excuse.").

> 'Ah, fool was I and blind;
> The worst I stored with *utter* toil,
> The best I left behind.'
> (Scott 1916)

This disappointment, although partly resulting from his own conscientious diligence to his employers, seems to have informed the nature of his next trip. In February

1899, he again was given leave of absence by Bower in order to join the Skeat Cambridge expedition to the Malay Peninsula as the botanist (Bower 1917) (managing to drop in on Willis at Peradeniya on the way (Boney 1994)). Returning in September, this expedition seems to have more deeply affected him in a philosophical way and he found it more difficult to return to everyday life in Britain: "I am glad to get back of course but really I am muddled and perplexed, appalled by the complexity of our Europaean [sic.] life, and I feel strangely that I am an outsider…" (Gwynne-Vaughan 1899).

During his visit he took pains to learn some of the Malay language, as Lang later did on his visits with Tansley in 1901. The two were known, on occasion, to fall into the language during conversations in the Glasgow lab (Boney 1995), and also to use Malaysian expressions in their letters to each other (Boney 1994).

Evident from personal descriptions of Gwynne-Vaughan, and his own letters, is his sharp and irreverent sense of humour, illustrated by his playful comments about Bower, although much more advanced in age, remaining a bachelor after Lang and Gwynne-Vaughan had married. There was clearly a close, informal friendship between the three.

In addition to his achievements in advancing the study of botany at Glasgow, Bower had, by the end of his career, amassed a respectable number of publications, which he took great pleasure both in writing, and, more unusually, in later reflecting on after publication. Wardlaw (1948), recalling his time with Bower for the obituary that Lang was to write, talked of Bower reading out to him passages of his own book that

he was particularly proud of each morning! In particular, Bower, inspired by Hofmeister, wrote on the evolution of land plants and how this was related to 'alternation' theory (Bower 1935). Bower was a supporter of the antithetic alternation of generations, where the sporophyte is believed to have arisen from the zygote independently of the gametophyte (Bower 1935). Bower's ideas were often argued through detailed anatomical and morphological studies of the 'Higher Cryptogamia'. Thus he made a significant contribution to the understanding of plant evolution, for which he drew heavily upon his palaeobotanical studies. His achievements were recognised in 1928 when he won the Darwin Medal for his lifelong work in botany (Boney 1995).

By the end of the nineteenth century, Bower (affectionately known to the rest of the department as 'the chief') had his core staff in place. Gwynne-Vaughan and Bower jointly-published the second edition of 'Practical Botany for Beginners' in 1902, and in 1905 Gwynne-Vaughan took over Lang's responsibilities of four years standing for the tuition of female students at Queen Margaret's College, Glasgow, with Lang starting to teach botany to trainee teachers instead (Boney 1994). The news came as a blow to the ever-sardonic Gwynne-Vaughan: "…this implies a course of about 75 lectures to be given next term…I feel very sorry for myself. Still it is not so much the lectures themselves that make me regard the immediate future with Terror; but the deplorable fact that they have to be given at the altogether unreasonable hour of 8 o'clock in the morning. I shall have to get up before 7 every blessed weekday for 3 appalling months. I abominate early rising. Its [sic] bad for you, it ruins your health & wrecks your morals." (Gwynne-Vaughan 1905)

However, the expansion in teaching and the rise of palaeobotanical study in the department created an enviable environment for the expansion of palaeobotanical research within it. Bower nurtured this environment by being careful never to impede his staff and students with his own ideas and interests – even outwith academic considerations, he did not enforce his personal fastidiousness for tidiness or non-smoking upon his subordinates (Wardlaw 1948). He never set tasks for his staff, merely occasionally throwing in suggestions, and he always encouraged them to develop their own ideas, even though they might come into conflict with his own (Wardlaw 1948). Furthermore, Bower was ever aware of the changing focus of botanical research and was open-minded to the broader view of botany. And in what John Walton (1952) described as the 'triumvirate' of Bower, Lang and Gwynne-Vaughan, everything was in place for a vibrant department to become an international beacon in the newly-expanding field of palaeobotanical research. As Arthur Boney observes in his 1993 account – "It was the association of Bower, Lang and Gwynne-Vaughan …which firmly set Botany in place as a subject for an Honours degree, and established the Department's high standing as a centre for research." (Boney 1993) The final addition of Robert Kidston gave the department unique access to a dynamic and fastidious fossil collector.

An Ex-banker

Robert W. Kidston had already been involved with the study of fossil plants for some time, prior to beginning his joint work with members of Bower's department Crookall 1938). He was born on the 29th of June, 1852, in Bishopton, Renfrewshire, and educated at Stirling High School. From there he went to work at the Glasgow Savings Bank, attending lectures in the evenings in Glasgow, some by William Crawford

Williamson (Fig. 10). These first guided him towards fossil plants as a field for study when he subsequently left his job at the age of sixteen, for a life dedicated to palaeobotany (Andrews 1980). This choice was open to him, unlike many others, as he was of independent means, so was able to follow his own interests without the financial and commercial constraints of most palaeobotanists - an extremely advantageous position.

From that point on, he devoted his time to fossil plant work, virtually to the exclusion of all else. Details of the period immediately after this are somewhat sparse, but around 1878, he seems to have attended Edinburgh University botany classes given by Sir John Hutton Balfour (Fig. 11) (the publisher of one of the earliest palaeobotanical text books to be written in English, and father of Isaac Bayley Balfour), gaining a "first class certificate and medal in practical botany". From 1879 he began to keep records of his scientific excursions - not merely examining surface spoil heaps, but even going down the mines for specimens, most of which at this stage were diatoms (Lang 1925). Bower later reflected on Kidston's abandonment of diatoms that "no doubt [feeling] its limitations he desisted from such work, and later he presented the collections he had made to Glasgow University" (Bower 1924*b*). At some point around this time, he was also demonstrating in the University of Edinburgh's botany department (Seward 1924).

The year 1880 was pivotal in Kidston's new career. With the retiral of Joseph Dalton Hooker, Ben Peach, the acting palaeontologist on the Geological Survey staff in Scotland, approached Kidston (Bower 1924*a*), at 28, to become their honorary Palaeozoic plant consultant for the identification of their material - a notable

achievement and a testimony to the flair he had for the subject, despite relatively little formal palaeobotanical training. With the consequent increase of his exposure to the collections arriving at this august institution, his knowledge broadened, and his reputation grew. His first palaeobotanical publication ("On the structure of *Lepidodendron selaginoides* (Sternberg) from the Coal-Measures, Halifax, Yorkshire", Journal of the Royal Physical Society of Edinburgh), challenged the conclusions of a man that was probably his earliest inspiration on fossil plants – W. C. Williamson – surely a sign of his growth in confidence.

In terms of the regard in which he was held, Kidston was approached by the British Museum (Natural History) (now the Natural History Museum, London) to catalogue their substantial Palaeozoic plant collection. Commencing this work in February 1883, he was in receipt of a Royal Society grant that helped fund his travels over the following two years to examine the relevant collections held throughout Britain, and conduct some fieldwork. During this exercise, he collected some 250 specimens (mainly from Radstock, in Somerset), which were (under the terms of the Royal Society grant) donated to the British Museum. These specimens are something of an anomaly, as, other than a handful in the Hunterian Museum, the Royal Scottish Museum (Stace et al. 1987) and the museum of his hometown Stirling (Cleevely 1983), all other hand-specimens (over 7,000) were given to the Geological Survey on his death some forty years later. The 288 page monograph was finished in 1886 (although his later work made it obsolete with relative rapidity (Lang 1925)), and he subsequently performed a similar feat reviewing the Palaeozoic collections in Dublin (Kidston 1888*a*) and Liverpool (Kidston 1889).

The year following the publication of his British Museum monograph, in Glasgow's newly-opened Victoria Park, a small disused quarry in the hill known as Quarry Knowe was being landscaped, when the stumps of five Carboniferous trees with their root systems were uncovered (Gunning 1995). As further stems were exposed (Fig. 12), Kidston, who had just received his first award from the Murchison Fund, became involved with the excavations of the Victoria Park Fossil Grove (MacGregor & Walton 1948). In early March 1888, he visited Victoria Park and examined the trunks and associated fossils, concluding that the trees were of a lepidodendroid type (specifically *L. veltheimianum* (Kidston 1888*b*)) rather than *Sigillaria* (Young & Glen 1888). Even today, recently restored and refurbished, it still serves as a striking insight into the appearance of a Carboniferous forest.

Already holding (since 1890) the Neill Gold Medal for investigations in Palaeozoic Botany from the Royal Society of Edinburgh, he was made a Fellow of the Royal Society in 1902. On his application, the list of those endorsing his work from 'personal experience' is an impressive list of correspondents: aside from the more general luminaries of Henry Woodward, Ben Peach, John Horne, Ramsay Heatley Traquair and Harry Govier Seeley are the signatures of Thiselton-Dyer, Dukinfield Henry Scott, Albert Charles Seward, Frederick Orpen Bower and Isaac Bayley Balfour.

Over 1902-3 his ideas on the stratigraphical classification of the Palaeozoic by the use of fossil plants coalesced: in the 1902 Geological Survey Memoir on the Geology of Lower Strathspey, he stated that the fossil plants of the Old Red Sandstone showed a clearly defined three-fold division of the formation; in 1903 he asserted this idea with

reference to the British Carboniferous rocks, in an address to the Royal Physical Society, where he made the first presentation of characteristic floras for subdivisions of the British Carboniferous (Horne 1924).

Hybrids: A Collaboration with Kidston

Kidston first came to the attention of Lang and Gwynne-Vaughan on the 28th November 1899 when they attended his lecture on Carboniferous Lycopods and Sphenophylls to the Glasgow Natural History Society (Kidston 1901), but they only properly met him while attending the British Association for the Advancement of Science Cambridge congress in Summer 1904 (Fig. 13), when they encountered him in E.A.N. Arber's rooms (Boney 1994). Kidston had been dealing for some time with macroscopic characters, and so he determined to work on more anatomical studies (Seward 1924). To this end, following on from the friendships newly-made in Cambridge, he began, in Winter 1904-5, to attend laboratory courses given by his friend Bower, visiting the department on a weekly basis. He brought his knowledge of fossil flora in exchange for learning about the structure of contemporary plants. Lang later recalled: "He was as much at home in the assistants' room as in Prof. Bower's, and his genial presence as a luncheon guest was keenly in demand by all the members of the Department. At this period, also, there were visits of Gwynne-Vaughan and myself to Stirling to be shown fossil plants in the collections." As mentioned earlier, Bower was a vehement anti-smoker (even establishing no-smoking areas within the University (Hutcheson & Conway 1997)), but this attitude did not seem to extend to the pipe-smoking of his friends – one of whom Kidston quickly became. Kidston's visits led to his partnership with Gwynne-Vaughan, whose skill as a structural anatomist and preparator complimented Kidston's gifts as a draughtsman

and photographer (Seward 1924). First hinted at in an acknowledgement in a 1905 paper by Kidston on the internal structure of *Sigillaria elegans* (Kidston 1905), Bower later reflected that their collaboration on this probably laid the foundations for both their close friendship and their later work. Thus, when Kidston received from New Zealand a "remarkable button-shaped pebble…which bore clear evidence of being the apex of a massive stock of some upright fernlike plant", it was to Gwynne-Vaughan that he turned for plant anatomical assistance (Bower 1924*c*). From such an inauspicious beginning, grew their joint *magnum opus* on the *Osmundaceae* ferns (Fig. 14). This was a pivotal event in the development of palaeobotany and the foundation of a partnership few have surpassed. Its success speaks for itself in the subsequent history of collaborative research and ensuing publications. Bower was later to reflect: "Seldom have two minds blended their results more effectively. The one brought to bear a wide knowledge of fossils from the stratigraphical and systematic point of view. The other supplied critical and expert anatomical experience, based upon study of living plants. The result is a series of beautifully illustrated memoirs..." (Bower 1915). Lang, in particular, later noted that Kidston's association with Gwynne-Vaughan had appeared to raise "an inhibition that had rested on [Kidston] publishing the observations he had made on the structural part of his subject" on his own, pointing to later solo work from Kidston in this regard. Lang concluded of this association, that "The co-operation of the palaeontologist and the plant anatomist, both masters in their craft, resulted in the production of what is recognised as a botanical classic." (Lang 1925)

Kidston was somewhat *avant-garde* for The Establishment in his use of photographic plates for scientific publications (Fig. 15). Following one rebuff from the Royal

Society of London regarding his 1906 paper ‘On the Microsporangia of Pteridosperms’, Bower (1906) had to write in support of him “The author would, I understand, prefer the figures to stand as they are. I am of the opinion that he is quite right in keeping as far as possible to photographic methods of representation, and I see no sufficient reason to doubt that if carefully reproduced the photographic figures should come out well.” Bower later reflected that Kidston was "an expert photographer, he used all his art in producing illustrations that present the details even more perfectly than the unaided eye itself could see" (Bower 1924*c*).

In the wake of Kidston’s own success, though, he did not forget his younger colleagues, and astutely looked after their interests. It was Kidston’s prompt to Bower in a December 1910 letter (regarding Gwynne-Vaughan’s application) that resulted in Lang receiving his FRS (Kidston 1910) – something that Kidston had previously chased Geikie about in February of the same year (Geikie 1910).

Dispersal

In 1907, Gwynne-Vaughan was elected a Fellow of the Linnean Society, and left Glasgow to become Professor and Head of Botany at Birkbeck College (Bower 1917). To symbolise his continuing ‘spiritual presence’ with his colleagues, he left a black enamelled tea caddy (perhaps alluding to his time in the Far East) bearing the legend ‘Given to the Botanical department by Professor D.T. Gwynne-Vaughan in 1907’ in the Departmental Common Room (Boney 1994). Tradition dictates that it is passed to each new senior member of staff (excluding the Regius Professor) that comes to the department. He was replaced in a more ‘human’ capacity by Abercrombie Anstruther Lawson, who contributed some work on the evolution of gymnosperms, before

becoming Professor of Botany at the University of Sydney in 1912 (Boney 1993). For his part, Gwynne-Vaughan was far from happy with the move, describing it to Lang in the following terms around September 1907:

"I have finally accepted the Birkbeck post & it really appears worse than ever. About as bad as it can be. The accommodation is despicable. No privacy of any kind is possible. The whole thing is low grade polytechnic – I do not exaggerate – much lower than the Glasgow variety of the same article. It is needless to say that I am harried by vain regrets. I am fairly sure that it is a mistake but, whether or no, I must see it through now. Although it will take me all my time to keep a stiff lip. The chief is getting a little worried over it also but is in otherwise good form." (Gwynne-Vaughan 1907*b*) As someone who was Secretary of the British Association, his mood is clearly affected when he adds: "The B.A. is like all B.A.s – wondrous dull & stupendously futile…" He signs off his letter thus: "I am suffering from an acute V-shaped depression & I believe that by this time next year I shall be reciting Kipling's 'That Day'. Yours (God Forbid) Ever, Birkbeck."

Things did not immediately improve. In a later letter that will have resonance with many who move to large cities to work today, he writes: "I am still very miserable and depressed. It is nearly hopeless to get decent rooms at a moderate price in Town." The job still vexed him: "Damn the bally Birkbeck! …If I can only stand the worry of the College (I bar the word Birkbeck) I believe I shall stand the rest of existence all right." He closes with these words: "Up to now I should think that 'Damn!' accurately represents the situation." (Gwynne-Vaughan 1907*a*)

Lang rallied to his friend's support, but, not for the last time, Lang's handwriting posed something of a communication barrier: "Thanks for your postcard, I can't read some of it, but I believe you mean well." (Gwynne-Vaughan 1907*b*)

Given his very evident discomfort and unhappiness, Gwynne-Vaughan's reasons for taking the job are still unclear. However, they were probably related to a promotion 'glass ceiling' in Glasgow – after eleven years at the department, his pay was only £175 per year (in comparison with Lang's £250 per year) (Boney 1994), he was ready to become a departmental head, and Bower clearly intended to remain in post for some years. The change of Birkbeck clearly had an impact on him, as it involved a heavy teaching load, with evening as well as day classes throughout the academic session, as well as being a Recognised Teacher and Internal Examiner for the University of London. This was in marked contrast to what he was used to at Glasgow and later his wife, writing on his life's collection of slides, noted that his output of slide production is remarkably small for the two years he was at Birkbeck (Gwynne-Vaughan 1916). Although he continued to progress the joint work with Kidston, it is clear that this schedule left little time for such research, and so it is perhaps unsurprising that he chose to move to Queens University, Belfast in July 1909. He wrote of the anticipated change, referring to the intensity of the "much too hard work" he had had to do in London (Scott 1916) – although he had met his future wife, Helen, there and she succeeded him as head of the Birkbeck department (they married in December 1911 (Boney 1994)). Helen Gwynne-Vaughan née Fraser was a mycologist from an aristocratic Scottish family, a founding member of the University of London Women's Suffrage Society and became commander of the Women's Royal Air Force (Edwards 1984) – clearly a remarkable woman for her time.

The same year as Gwynne-Vaughan moved to Belfast, Lang left Glasgow (becoming an FRS in 1911) to become the first Barker Professor of Cryptogamic Botany at Manchester. In returning his departmental keys, Lang confided feelings to Bower that were strongly similar to Gwynne-Vaughan's fears some two years earlier: "Thanks for all your kindness – I shall never have as good a slice of life again…I am sick at heart to go out into the rude world which I do not know" (Boney 1994). Gwynne-Vaughan wrote to Lang: "Congratulations. Manchester has done itself proud and (aside) you haven't done so bad either....The chief will be pleased to have got off one of his daughters so well. Mine was a mesalliance that the family decided to do the best with."(Gwynne-Vaughan 1909*b*) The two of them remained in close contact, despite neither remaining in Glasgow, Lang sending specimens to Gwynne-Vaughan, and Gwynne-Vaughan complaining about both his facilities ("I hate to disturb the Universal peace but I must have a laboratory of my own that does not smell of ultra-putrescent Skate." (Gwynne-Vaughan 1909*a*)) and Lang's handwriting:

"Dear Lang, What I like about your letters is that one does not just read them and then the matter is over and done with. They remain with me as a continual feast. I got one from you a little time back and since the first two or three inspections satisfied me that no one was dead or dying, it has been waiting until I had leisure, as I have tonight, for a serious attempt at deciphering. When I put my mind to it I flatter myself I can read your script against any authority living. What I most admire about your hieroglyph is the tricky way you dot your 'i's. In a four page letter simply reeking with 'i's there are only four marks that can be regarded as dots. One of these on prolonged study turns out to be an apostrophy [sic.] another is an abortive attempt to cross a 't' (very misleading for you only sporadically cross your 't's). The other two are really dots,

but one of these came so late that it is over the next word. The other has only missed two letters but since it is over an 'e' it adds to the general interest…I am getting to thoroughly enjoy your letters when I have time. But if it is anything really urgent for heaven's sake send a wire." (Gwynne-Vaughan 1911) Despite this communication problem, Gwynne-Vaughan and Lang served as each other's 'best man' at their respective weddings – indeed, on Lang's wedding day, they nearly quarrelled over an aspect of fern stelar anatomy whilst waiting for the bride in the church (Boney 1994)!

Once in Belfast, Gwynne-Vaughan's teaching schedule was closer to what it had been at Glasgow. Although he had to give all the lectures, the pattern of a heavy summer term teaching load and two comparatively light terms gave him more opportunity to conduct research. Gwynne-Vaughan's reputation continued to climb, as he was elected a Fellow of the Royal Society of Edinburgh and received the MakDougall Brisbane Medal for Research from the Royal Society of Edinburgh in 1910 (Bower 1917) (based on what he had published in the Society's 'Transactions') and in 1912 he was elected a Member of the Royal Irish Academy.

Gwynne-Vaughan, as a skilled structural botanist, perfectly complemented Kidston's fossil knowledge and understanding. In 1911, they produced what Dukinfield Henry Scott regarded as the first significant attempt to examine the Cretaceous tree fern *Tempskya,* but the core of their collaboration was the series of critical papers on the fossil Osmundaceae ferns, which they described between 1907 and 1914 (the original manuscripts and plates reside with the Hunterian). This joint work, published in five parts, resulted from wide-ranging studies of Osmundaceae fossils from around the

world, tracking the evolution of the lineages through their stem anatomy back through the Permian to suggest a Carboniferous origin (Andrews 1980).

The Fall of Gwynne-Vaughan

Gwynne-Vaughan stayed at Belfast until he became Professor of Botany at University College, Reading, in July of 1914 - the same year, he became External Examiner to the University of Glasgow (Scott 1916). By this stage, his health had begun to deteriorate, due to a chronic condition of neuralgia, and he was not eligible for national service for the war. Although the Reading post meant a cut in salary, Gwynne-Vaughan had known that it should leave more time for research, and had chosen to take it. Thus, rather than have a respite period (as he would have had through the low winter teaching loads at Belfast), Reading returned him to the workload spread throughout the year. His health deteriorated throughout spring, and by July 1915, he was stricken by the rapid onset of tuberculosis, making him bedridden. Following a bad haemorrhage at the start of the month, by mid-August his wife was writing to Bower that he had developed "'phthisis of the upper right lung" as a complication to the neuritis. She commented that it had probably been dormant for some time, and Boney (1994) observes that it might have been a latent infection from his travels in the Far East. Gwynne-Vaughan wrote to Lang: "I have been uncommonly unwell for over a year with my neuritis etc & last term I was very hard put to carry things out to the end. However, I just managed to do it somehow or other & then came to pieces rather completely." (Gwynne-Vaughan 1915) Detailing his illness further, he indicates that any recovery will be very protracted (and clearly his

choice to reveal his illness after so long indicates how severe he now assessed it to be) then writes: “Between you & me I'm very much afraid I am on the scrap heap”. He died on September 4th 1915, aged 44. Lang had been with him, but had left earlier that day believing Gwynne-Vaughan’s health to be improving slightly from a collapse earlier in the week, although still critical (Lang 1915*a*). Tragically, this was not the case, and he died shortly before midnight.

The bereavement was a major blow to Gwynne-Vaughan’s friends. There is an overwhelming sense of loss in the correspondence between them. In a letter to Bower six days after Gwynne-Vaughan’s death, Kidston wrote: “I am very glad that you were able to attend Gwynne-Vaughan’s funeral – I cannot yet quite take in that he is gone – I see him so readily sitting here before me – His death is a terrible loss” (Kidston 1915*a*). His response to Bower’s request to provide an obituary is illuminating in terms of how he viewed his dead colleague: “As to writing an obituary of G.V. for the Roy. Soc. Edin. – I cannot do it. You are the man – I did not know him in his earlier days but just jumped into his life at his prime ”. Another letter to Bower, written later the same month, reveals the depth of Kidston’s affection for Gwynne-Vaughan, in which he expresses his pleasure that Gwynne-Vaughan’s collection of slides (2,290 in total) had been offered to (and accepted by) the University of Glasgow Botany Department: “It was perhaps childish but I somehow wished them to lie some day beside my fossil slides – I am sure they will have a warm feeling to each other - so I am very glad they are going to you - One may say what they like but Gwynne-Vaughan's happiest days were in your lab.-.” (Kidston 1915*b*) This was clearly a man who felt he had indeed been lucky, both personally and professionally, to know David Thomas Gwynne-Vaughan.

Bower ultimately provided an obituary for the Proceedings of The Royal Society of Edinburgh in which he observed that Gwynne-Vaughan "may be said to have run in harness till within two months of his death." (Bower 1917). Four uncompleted fern thin-sections (cut from specimens of *Pteris lanciniata* sent to him by Bower) were left on his workbench, a testimony to the speed with which he was laid low. Lang completed the thin-sections (2197-2200) for his dead friend (Gwynne-Vaughan 1916) on the 18th September, two weeks after his death. The cut-throat razor was sent to Bower by Gwynne-Vaughan's widow, with the mark 'G-V' almost worn away through years of intense use (Boney 1994).

New Growth

Although Gwynne-Vaughan only left twenty-nine publications with his passing, written over some twenty years, some of them were (and still are) extremely important, especially those he had produced with Kidston. Kidston and Gwynne-Vaughan had planned further collaborations on Berwickshire's Lower Carboniferous flora, following on from their 1912 study on *Stenomyelon tuedianum*, as well as new material from the Devonian of Aberdeenshire (Edwards 1984) which Kidston had already had sectioned (Kidston 1913). But in the wake of Gwynne-Vaughan's sudden demise, it was left to Kidston to seek Lang's help in describing the material excavated from Rhynie some two years earlier. It seems certain that had he lived longer, the works on this material would have made the partnership of Kidston & Gwynne-Vaughan, rather than Kidston & Lang, world-famous.

This was no new relationship for Lang, as like Gwynne-Vaughan, Lang had first seen Kidston in 1899, becoming a close friend at the Cambridge British Association meeting in 1904, and with Gwynne-Vaughan had built up his relationship with the Stirling collector, visiting him at his home. Kidston (smoking his white pipe) would meet both of them at the railway station, and they would proceed to his home (Lang 1925). Once there, it was not all study on the collections, as they actively socialised with his family; Lang was apparently a skilled competitor at 'tray-racing' down the stairs of the family home in Clarendon Place, and the only recipient of his skill at general practice since he qualified as a medical doctor, would appear to have been Kidston's daughter Marjorie – whom he once treated for chilblains (Edwards 1984). These visits were reciprocated, with Kidston's entire family attending the occasional staff-student gatherings at Lang's house. Lang worked on liverworts and ferns, and later came to use Kidston's collections of stigmarian material to seek examples of forms of contemporary quillwort root development in ancestral forms of lycopods, thus reinforcing the relatedness of the two groups. Lang later wrote that: "In my own case, and I am sure in Gwynne-Vaughan's also, the most important and valued influence in our mature scientific lives was the privilege of working with Kidston." (Lang 1925).

Lang, grieving for both his mother who had died a few days after his friend, somewhat reluctantly (out of respect for Gwynne-Vaughan), took his dead colleague's place, visiting Kidston to view the *Rhynia* slides within a couple of weeks of the funeral (Salisbury 1961). This was to the evident pleasure of Kidston, who wrote to Bower "I am glad to tell you that he is going to take G-V's place and carry on the memoirs we were working at" (Kidston 1915*c*). It is apparent from a letter to Bower

in October that Lang wanted to keep his collaboration with Kidston respectfully distanced from Gwynne-Vaughan's work on the ferns and Berwickshire material (although he had helped Kidston with sectioning a fern in February 1909, before leaving for Manchester), and it seemed that the 'pending' work on the Rhynie material fulfilled his requirements in this regard: "I made it as clear as possible to Kidston that I could in no way fill G-V's place with him; no one could! But I said I should be glad to try and do some joint work with him and we discussed starting later on some subject quite apart from the work that Kidston + Gwynne-Vaughan had been engaged upon. We considered some early Devonian remains with structure." (Lang 1915*b*). With Kidston noting to Bower (on 14th of October 1915) that it was the first time Lang had stayed at his home since he had moved to Manchester, it was clear that an old friendship had been renewed through this time of mourning.

Their new collaboration was not an easy one to find time for with the impact of the First World War. Kidston was commissioned to prospect "the moors north of the Forth" for *Sphagnum*, to be used for surgical dressings in the field, and took charge of a group of collectors to collect the material (Bower 1924*c*). Furthermore, the nature of academia during wartime meant that Lang could only pursue his examinations of the Rhynie chert material in the evenings and weekends (Salisbury 1961). In contrast to the doctrine of suspending research activities during wartime, Bower argued forcefully for research to be continued in some form, so that it would be that much easier to restart full activity in better times (Boney 1995). He had intended to collaborate with Lang on a new book 'Botany for Medical Students', but with the restrictions in place on academic research in Manchester, and his absorption with the Rhynie material (understandable, given its importance today - in a letter to Bower, he

described it as taking up the hours “from 9.30 in the morning to 12.30 at night”), Lang was unable to make progress on Bower’s initial draft. Eventually the book was abandoned (Boney 1995), and Bower published ‘The Living Plant’ independently. But despite the demands on their time, Kidston and Lang published a series of papers on the flora of the Rhynie chert – erecting the higher taxon Psilophytales for an excellently preserved “new class of vascular plants…showing external form and internal structure, belonging to the earliest known land flora." (Horne 1924). The group name was chosen to reflect the original member, the rather fragmentarily preserved *Psilophyton*, reported by Sir James Dawson from Gaspé in Québec (Andrews 1980) – and, as a tribute to their fallen colleague, their first paper, in 1917, had type material of a vascular plant that bore the species name *Rhynia gwynne-vaughani*. In addition, they named and described *Rhynia major*, which they also believed to be among the first vascular plants. It was held as an early example of such for sixty years, but following reexamination, its vascular tissue was recognised as being more similar to bryophytes, lacking tracheids. As such, although it was subaerial, it was not an early vascular plant, and was transferred out of *Rhynia* to the new genus of *Aglaophyton* by David S. Edwards in 1986 (Stewart & Rothwell 1993). The Rhynie chert is still regarded as containing the best preserved plant (it also contains animal, bacteria and fungal remains) material over 400 million years old in the world, allowing detailed examination of the internal anatomy. It is thus critical to the understanding of early land plant evolution, and the work of Kidston and Lang provided a sound basis for the understanding of this important assemblage, Bower later reflecting that although their joint work was “produced under the shadow and after-effects of the Great War, the results were, through the wise generosity of the Carnegie Trust, presented with a wealth of illustration that carries vivid conviction to

the reader. The impressions and sections were photographed with Kidston's well-known skill and present the actual structure of these Devonian plants without the intervening hand of any artist." (Bower 1924*c*).

Kidston had continued other avenues of research, in 1911 completing a major study of the Carboniferous plants of the Hainaut Province in the Royal Museum Brussels, Belgium. He also collaborated with W. J. Jongmans of the Netherlands on European species of *Calamites*, published in both 1915 and 1917 (Walton 1959) by the Dutch Government (Crookall 1938). But it should not be thought that Robert Kidston insisted on being first or even joint author on works based on material held in his collection – as stated earlier, Lang used his collections of stigmarian material to seek examples of forms of contemporary quillwort root development in ancestral forms of lycopods (thus reinforcing the relatedness of the two groups). Dukinfield Henry Scott (Scott 1924) also published his 1897 piece on Kidston's specimens of *Cheirostrobus pettycurensis* (Calder 1959), following Kidston approaching Scott after his 1896 presentation to the British Association (Lang 1925).

In the last few years of his life, Kidston was pulled back from the Old Red Sandstone plants by the Geological Survey – in 1901, the Director (J. J. H. Teall) had approached him to produce a monograph encompassing the British Carboniferous floras (Crookall 1938). By 1920, the Survey had finally obtained the necessary funding to produce the ten volume series of memoirs that would serve as a lasting monument to his life's work, and so Kidston deferred the intended fuller account of the Rhynie flora (Lang 1925). In the process of this project, Kidston had begun to work with David Davies, the noted South Wales collector of Gilfach Goch, whose

approach in looking at Carboniferous plants as overall communities had interested him. In June 1924, he travelled south, to visit Robert Crookall's collection of fossil plants at Bristol University (Fig. 16), leaving him for Davies apparently in excellent health, but was taken ill soon after arriving at Gilfach Goch, and died on July 13th. Only four of the volumes of his British Carboniferous monograph had been published by then, with two further completed volumes of the Survey series being posthumously produced (guided by C. P. Chatwin). The task then fell to Crookall to finish the rest, with a further six parts being published between 1955 and 1970, drawing heavily on the illustrations, notes, and photographs already compiled by Kidston and bequeathed to the Survey on his death. These works are extensive and still a valuable resource for studies of the British Carboniferous today. In it, his skills as a photographer and illustrator are clearly evident. Along with detailed descriptions of fossils from each assemblage are Kidston's own interpretations and information. It was obviously a labour of love as the care he put into producing it shows through in the quality of the final work.

Kidston's Legacy

It is difficult to encompass the breadth of Kidston's impact on palaeobotany in his lifetime. H.N. Andrews' review of fossil plant workers ('The Fossil Hunters: In Search of Ancient Plants') refers to him as "one of the greatest contributors to our knowledge of the plant life of the past" (Andrews 1980). In his obituary, Seward drew particular attention to Kidston's longstanding support of the Geological Survey, observing that "to him more than to any other man the Survey is indebted" (Seward 1924). Kidston's role as an undoubted catalyst to the success of Glasgow's Botany Department is beyond question, and the careers of those that spread beyond it are

further testimony to how he brought life to palaeobotany at the turn of that century. The renowned Russian investigator M. Zalessky gave the international perspective on Kidston's passing: "He was the head of palaeobotanical work in your country, and that Scottish sun by its luminosity lit all the palaeobotanists of the universe and drove them to new research." (Lang 1925)

His vigorous labour for his subject was inspirational; the tale that he had a special desk constructed so that he could even work while in the bath (Walton 1959) might well be 'academic myth', but his industry clearly was not. Kidston published 181 palaeobotanical papers, many dealing with the stratigraphic significance of the science, and in his final volumes (harkening back to his work at the start of the century), Kidston wrote: "it is no longer necessary to defend the employment of fossil plants as a means of zoning or dividing the Carboniferous Formation" (Edwards 1984). This was echoed by Seward, when he noted that Kidston had demonstrated the stratigraphic value of plants more than any other person (Seward 1924), and this work was later built upon by workers such as Emily Dix (who was given a bound volume of Kidston's stratigraphic papers by her collaborator, John Pringle, in 1930), to develop the concepts of broad correlation of the Carboniferous on the basis of biostratigraphic zones of floras (Dix 1933).

In terms of his more tangible legacy, there are, of course, his collections. In his time, Kidston acquired so much material that the floors of his Stirling home had been reinforced to accommodate the load of over 7,000 hand specimens (Edwards 1984). These had, in part, been collected by himself, but he had also benefited from the industrious activities of James Lomax (1857-1934) and Walter Hemingway, two

noted collectors and dealers that he frequently worked with (Andrews 1980). It was from Hemingway that Robert Kidston obtained the fructifications that allowed him to publish the first complete description of a Sigillarian cone – but this relationship was not without its tensions. At one point, Kidston had given a specimen to Hemingway for sectioning, on the understanding that the sections derived were for Hemingway's own use. Ever the businessman, Hemingway tried to sell the slides to the British Museum (Natural History) in 1909 (Hemingway, DF100/47, The Natural History Museum Official Archives. By permission of the Trustees of The Natural History Museum, dated 29 September 1909), which Kidston took exception to, primarily because he had intended to do the descriptions of the specimen in question. This apparently did no long-term damage to their relationship, as Kidston was still using him for sectioning the Rhynie material some years later (Kidston 1917).

Kidston's extensive collection of hand-specimens went to the Geological Survey, along with some 4,000 negatives he produced in the course of his studies (Edwards 1984), eventually to be displayed in the Reserve and Study Gallery of their museum. As Andrews notes of Kidston's collection: "It is a model for any museum to follow. The specimens are superior, carefully labelled, and readily available for study." (Andrews 1980). In 1986, these specimens were moved, along with the rest of the Survey's collections, to the new facility at Keyworth, Nottingham.

Back in Glasgow, Kidston's death in July 1924 had caused a furore. Two months earlier, Bower, now 69, had declared his date of retiral would be September 30th that year, anticipating that Lang would return from Manchester to replace him as Departmental Head (Boney 2001*b*). But, as when Bower and Balfour had conspired

to secure Lang the Aberdeen Regius Professor of Botany (Boney 2001*a*), Lang's Manchester University employers quickly made him the proverbial 'better offer', this time converting the Barker Professorship into a dedicated research post, and giving Lang the time for his own work that he had wanted for so long. Amidst this disappointment, Bower had to arrange for Glasgow to receive its part of the bequest (Bower 1925) (unknown 1924): all of Kidston's collection of 3,481 thin sections representing some 341 species (Calder 1959), containing many figured sections of type specimens. This was despite the fact that all of Kidston's old colleagues had now left the Department - perhaps it was by way of a 'thank you' for the Honorary degree of LLD given to him in 1908 by the University (Bower 1924*c*), although he had also received an honorary DSc from Manchester in 1921, no doubt with no little instigation from Lang. In 1916, he had been given the Murchison medal by the Geological Society, at which point he referred to the 1887 award he had received from the Murchison Fund, which he had used to purchase reference books, "in the hope that the books will eventually be placed where they will be of help to others" (Lang 1925). To this end, he similarly deposited his library of palaeobotanical literature (which was described at the time as being "almost complete to the time of his death" (Crookall 1938), of around "…200 or 300 volumes, some of which are extremely rare" (unknown 1924) and as Bower notes "very valuable"(1925)), along with his slides, in the Botany Building of the University of Glasgow.

Of the palaeobotanical 'Glasgow Boys', only Lang now remained academically active. However, he did not forget his times with Gwynne-Vaughan and Kidston, as exemplified in a candid photograph of a relaxed moment from the 1930 International Congress of Botanists in Cambridge (Fig. 17). Bequeathed all of Kidston's

microscopic apparatus (Lang 1924), he continued to work on Scottish pre-Carboniferous plants, but moved away from the Rhynie assemblage, working instead on material he collected from around Thurso and the northern isles – an area that had marked the start of Kidston's study of Old Red Sandstone plants in 1893 (Lang 1925). Following in Bower's footsteps, he worked on 'higher cryptogam' anatomy using information from fossils. In the 1930s, his work extended to include the *Baragwanathia* flora of Australia with Isobel Cookson (later a noted palynologist), two years later establishing the genus *Cooksonia* in her honour in 1937 (Salisbury 1961). Lang retired in 1940, receiving an honorary LLD from the University of Manchester two years later. He was awarded a Linnean Gold Medal in 1956, dying four years later on the 29th August.

Back at Glasgow, Bower's retiral had been further delayed. Changes in pension payments came to light at the start of June 1924 that effectively meant a significant cut in salary for Regius Professors over forty years old (Boney 2001*b*). It was this development that first caused Lang (who had gone so far as to discuss buying Bower's house from him as part of returning to Glasgow as Regius Professor) to hesitate about taking up the post. This change had also led to the successful candidate, Henry Horatio Dixon of Trinity College Dublin, to withdraw from the appointment process. This meant that Bower remained in post until 31st March the following year, when he was given an honorary LL.D. by the University of Glasgow (who also commissioned a portrait of him to be painted by his cousin Sir William Orpen (Fig. 18) in 1926). He retired to his family's hometown of Ripon, where he had been born, to die on 11th April 1948 at the age of 92. A successor was found in Cambridge graduate James Montague Frank Drummond, who had previously gone to

Glasgow from Newcastle as a replacement assistant when Lang moved to take the Barker Professor Chair at Manchester in 1909. Drummond had left Glasgow in 1921, when he had become Director of the Scottish Plant Breeding Station, where he had stayed. Young enough to avoid significant financial impact from the pension changes, the corollary was that Drummond had what he himself described as a "feeble research record" (Boney 2001*b*). Unsurprisingly, this marked a sudden shift in both research and teaching away from fossil plants and plant evolution studies, and towards agricultural botany (Boney 1993). In particular, Drummond promoted the teaching of genetics; a subject that grew to have Dr Guido Pontecorvo as Genetics Lecturer to the University in 1945, becoming a fully-fledged degree subject two years later. Drummond served as Regius Professor from 1925-1930, at which time John Walton took over the post.

The Artful Custodian

Walton was one of the last generation to be directly inspired by the teachings of Albert Seward (and, indeed, Hugh Hamshaw Thomas, a specialist in examining 'compression type' plant fossils) at Cambridge (unknown*b* 1962). Born on the 14th May 1895 in London's Chelsea, he was the son of Edward Arthur Walton, a former Royal Artist and President of Royal Scottish Water Colour Society (unknown 1971). But E. A. Walton was most famous for his membership of the 'Glasgow Boys' group of painters. His younger brother, George, was a successful designer and architect, contemporary to Glasgow's most famous artistic and architectural son, Charles Rennie Mackintosh, and the family regularly visited the area around Walberswick (where Mackintosh painted his renowned flower study watercolours after leaving Glasgow) and had a holiday home at nearby Wenhaston. This exposure to extremely

talented artists in this idyllic environment was to have a lasting impact on John Walton's power as a teacher, and other more surprising aspects of his future career.

Walton's parents returned to Edinburgh so that he could study at Daniel Stewart's College – thus allowing one obituary writer to say of him that, despite his Chelsea birth, he was "ever a Scot" (unknown*b* 1962)! He then entered St. John's College Cambridge, in 1914, where he became the Hutchinson Research Student. His studies were interrupted by the onset of war, and, as a Quaker, he served with the Friends' Relief and Ambulance Services in France and Belgium from 1915 to 1918. Returning to Cambridge his intention was to read for a degree in Chemistry, but like many before him, he was inspired by A.C. Seward to pursue palaeobotany. Ultimately, this relationship not only led him to take the second part of the Natural Sciences Tripos in Botany, but also Seward's daughter, Dorothy, as his wife. Graduating in Botany in 1921, he went with the first Oxford Expedition to Spitzbergen as their botanist, returning to Cambridge as a junior demonstrator (unknown*b* 1962).

Walton took a position as Senior Lecturer at Manchester University's Botany Department in 1923, and this was a highly productive time for him. In this year his description of the balsam 'transfer method' for examining both surfaces of delicate fossil material (wherein the specimen was affixed in balsam, and hydrofluoric acid used to dissolve the matrix away from the reverse side) was first published (unknown*a* 1962). Similarly, in 1928 he published the peel technique that he had developed in conjunction with R. G. Koopmans of Utrecht, for producing sections of fossil plant material. Originally a poured solution, he later refined this to the sheets of cellulose more generally used today.

In 1930, he spent a short time as acting Professor of Botany in Birmingham, before becoming Regius Professor of Botany at Glasgow the same year, succeeding Drummond (unknown*b* 1962). Throughout the previous decade he had published extensively on fossil liverworts and mosses, the key research area that had been developed so effectively in Glasgow - and this made him a natural choice to continue the traditions of palaeobotanical excellence within the Department. Plant evolution became a significant new addition to the curricula, and with limited resources available to academic departments throughout the depression and war years, palaeobotany (as a relatively low resource science) was once again able to flourish more than most, underpinning the Botany Department's overall success (Boney 1993). This led to two phases of building work: firstly, Seward himself opened the Stevenson Laboratory for plant physiology and mycology in 1937, on the east side of the Botany Department building; secondly, post-war staff increases added pressure to the building resulting in 1950 in a significant reduction in the size of the museum to create seven additional rooms for a library, laboratories, staff and advanced students. Indeed, by the time he retired in 1962, staff numbers had doubled under John Walton's tenure.

Walton significantly enhanced the collections while at Glasgow. In 1932, he began the palaeobotanical Figured Slide Collection in the Department of Botany, noting on the first page of its catalogue: "This collection includes not only type sections and figured specimens but also sections of special interest for research and is a continuation of the Kidston Collection." (Walton 1932). This new collection consisted of almost 2,000 slides by the time he left, and in collecting (both singly and

jointly with colleagues) and donating 1,000 hand-specimens, he had acquired over a third of the Hunterian's collection of fossil plant specimens. Albert Long, the noted fossil plant peel-maker and world authority on early seed morphology and anatomy (coincidentally inspired by Lang at Manchester during his undergraduate degree), made almost 600 of the slides between 1959 and 1964, while he was still a schoolteacher at Berwickshire High School, in Duns, before he became deputy curator at the Hancock Museum (Long 1996; Waterston 2000). In addition, Walton left over 700 palaeobotanical slides of his own. Today, his hand-specimens still form a significant part of the five thousand strong palaeobotanical collection.

His diagrams during lectures testified to his artistic background, ambidextrously conjuring forth great chalk murals (Andrews 1980). He was also Honorary Curator of the Hunterian Art Gallery (unknown*a* 1962) (where a portrait of his sister, painted by his father, hangs today), functioning as gallery administrator on a day-to-day basis. During this period, he secured several important new acquisitions (e.g. James Abbott MacNeill Whistler had been a next-door neighbour and family friend in Chelsea, and Whistler's sister-in-law, Rosalind Birnie Philip, donated the art bequeathed to her to the Hunterian, along with his private correspondence (Walton 1961); William Davidson presented a group of flower drawings by Charles Rennie Mackintosh to the Botany Department, which were then transferred to the Hunterian Art Collections).

It may be this connection with the Hunterian's collections that gave Walton an awareness of the need for Botany's fossil plant collections to be cared for. He demonstrated this understanding in a number of ways: firstly, by employing Dr. Mary Calder to catalogue Kidston's collection of thin sections in the early thirties (Calder

1959), and secondly by introducing the post of Assistant Palaeobotanical Curator. This was first occupied by Charles Hopping from 1950-55, who during this time produced the taxonomic catalogue of the University's fossil plant collections (Hopping 1957). But Walton went further than merely dedicating staff resources to these collections – both before and after he retired. In order to understand this, it is important to actually review some of the terms of Kidston's bequest to the University.

As reported in the University Court minutes of 9th October 1924 (unknown 1924), Kidston's Will specified that his "collection should be kept in a Fire-proof Safe or Press and be accessible at all reasonable times to the officials of said Department, and at such times as may suit the convenience of the official staff of said department to experts from elsewhere… That students should only be entitled to use said Collection when the Professor of Botany in the University or one of his accredited assistants is present, and….Any regulations which may be made by the Botanical Department of the University in regard to the use and the preservation of said Collection should not preclude the loan to Prof. William Henry Lang, F.R.S., Baker [sic] Professor of Cryptogamic Botany in the University of Manchester, of such slide or slides from the Collection as he may wish to borrow." On 20th March 1925, reporting in a letter to the Secretary of the University Court that he and Lang had assessed the slides (which had all been placed within cabinets in the safe), Bower introduced further regulations (which the Court agreed to) that "access to the slides for purposes of study may be granted to duly qualified visitors for purposes of scientific investigation, but subject always to the control of the Professor of Botany", and that "no slide….shall be removed from the Botanical Department, except….should any exceptional case arise where it is desirable in the interest of science that slides should be lent to any other

investigator at a distance, the express permission of the University Court must be obtained on each occasion" (Bower 1925). Within these terms, Bower also made provision (in the spirit of Kidston's Will) for Lang to borrow whatever slides he might require. He also suggested that the same regulations apply to the examination and borrowing of volumes from the Kidston Library.

In his first change, John Walton ordered the Kidston safe containing the slides to be left unlocked – the reasoning behind this, was the potential damage that might be caused if an ill-informed burglar were to attempt to blow the door of the safe open (Edwards 1984) in search of somewhat more traditionally valuable and transferable assets. One could see that such a change would, in the circumstances suggested, increase the chances of preservation of the material, and therefore be in keeping with the spirit of Kidston's will and Bower's arrangements.

But not long after Walton's retiral from the post of Regius Professor in 1962, he had decided to go a lot further in 'bending' the terms of the bequest. With the appointment of a non-palaeobotanist (Percy Wragge Brian) as his successor (unknown*a* 1962), Walton became concerned about the care and use of the collections held in the Botany Department. In consultation with the Hunterian, he arranged for all of the hand specimens so painstakingly curated by Charles Hopping to be transferred to the Museum in July 1964, to be stored with the rest of the University of Glasgow's collections (Rolfe 1964). On 24th November 1966, all the Kidston slides, similarly cared for by Mary Calder, followed (Rolfe 1966).

It is unclear why Walton felt this was necessary. Clearly, from his activities in connection with the Hunterian's Art collections, he understood the need for safekeeping of materials, and respecting bequests. Perhaps he felt that the heyday of fossil plant teaching in the University had come and gone, and he wanted to ensure that these materials were preserved for future generations with a resurgent interest in the subject. Perhaps he felt that the Hunterian had more experience of understanding the value of such a collection, and acting as its custodian for the future, than an academic department. The Museum certainly had other significant geological holdings (William Hunter's own collection apparently includes the amber upon which Fothergill (1744) first based his revolutionary proposition, that this material was actually fossilised tree resin (Durant & Rolfe 1984))– and the Museum, as recipient of many bequests, and the repository of all collections of the University of Glasgow, was used to the occasional unusual condition being attached to a donation. But Walton's decision remained a somewhat controversial one. *Contra* Edwards (1984), there was no requirement in either Kidston's will, or the arrangements set up by Bower and the University Court, that the slides be kept in the Regius Professor's room – but there was a requirement for it to remain within the Botany Department.

At the time, the Hunterian requested that the precious Kidston Library be moved with the collections, but, sadly, this request was refused.

Although Walton returned to serve as Dean of Faculties from 1967-1970, he died on 13th February 1971. In his time, in addition to moving the collections from the Botany Building to the Hunterian he had developed important new techniques for examining fossil plant material, written the definitive textbook on the subject ("An

Introduction to the Study of Fossil Plants"), and published on every major plant group bar the angiosperms, his researches covering the Lower Devonian through to the Cenozoic (the Devonian and Lower Carboniferous being his principle areas of interest) (Andrews 1980). Of particular note is his work on fossil liverworts, the structure of pteridosperms, the Carboniferous trees of Arran and the plant assemblages of the Kilpatrick Hills (Braid 1973).

Scorched Earth

John Walton was the last palaeobotanist to hold the Glasgow Chair of Botany. During the 1970's, a further programme of building alterations resulted in the large lecture theatre being split into three separate floors, the second floor being two lecture theatres, the larger named the Bower, the smaller the Walton. From then onwards, the focus of the Botany Department moved away from palaeobotany to plant physiology and biochemistry, palaeobotany diminishing in importance to a component of ecological teaching, and research becoming more and more marginal (e.g. late and post-glacial deposits) (Boney 1993). The Department was absorbed into the Institute of Biological and Life Sciences in an administrative restructuring in 1994, the Botany Building being renamed the 'Bower Building' in the process.

On Wednesday 24th October 2001, a fire started in the roofspace of the Bower Building (Fig. 19). The emergency services arrived swiftly, but the fire had already taken hold. Staff from the University Library, Archives and the Hunterian worked tirelessly to retrieve material, but the losses were massive. Wax teaching models, displays, botanical work in progress, portraits of Walton (Fig. 20) and Bower (Fig. 18) were all destroyed. Fortunately, the Herbarium had been moved from the Bower

in 1996, and installed in an extension to the nearby old Zoology building, named the Thomas Hopkirk Laboratory for Plant Taxonomy and Archaeobotany, so it survived. But the palaeobotanical heritage lodged in the building was one of the great irreplaceable casualties of the resulting blaze. Gwynne-Vaughan's lifetime collection of slides was salvaged intact (and has since been placed with Kidston's slides, as per the wish noted earlier), but the documentation for Walton's slides and the Walton Library (John Walton's attempt to continue Kidston's complete library of palaeobotanical literature for the period he was Regius Professor) was decimated – the top row of the shelves containing his offprints collection in the Walton lecture theatre was destroyed, leaving only the bottom row intact. Soaked by water from the fire emergency services extinguishing the blaze, they were hung out to dry by Hunterian staff in the Museum's Kelvin Gallery, so that they resembled a rather complex art installation (Fig. 21). In the corridor outside the Walton Lecture Theatre, Kidston's own priceless library, painstakingly assembled by him as a complete collection of the world's palaeobotanical literature was not even that lucky: it was incinerated behind its locked glass doors. John Walton's decision to move the collections from the Botany Department had indeed proven a fortuitous, if controversial one. If only a similar decision had been made regarding Kidston's library, it might still be in existence today.

By a similar quirk of fate, four examples of Allen Thomson's fossil plant thin-sections (Fig. 22), probably produced by Sanderson (Morrison-Low & Nuttall 1984) or Nicol in 1830-1, also survived the Bower fire, by virtue of being on research loan. We are indebted to Alison Morrison-Low (National Museums of Scotland) for their safekeeping and subsequent return.

The gutting by the fire was a sad end to a building (Fig. 23) that had fostered a critical generation of palaeobotanists since 16th June 1901, and a few years short of the planned 2004 tercentennial celebrations of botany teaching at the University of Glasgow. But by the time of the fire, virtually no palaeobotanical research had been conducted there for over twenty years (Andrew Scott's analysis of Palaeozoic floristics, Donald Brett's work on coal balls, and Jim Dickson's work on Quaternary material standing out as notable exceptions) – a sign of the shift in emphasis in botanical teaching throughout the U.K. In 1959, Walton had descried the fact that fossil plants were more studied by botanists than geologists in Britain – which was at odds with the trends in Europe and the United States (Walton 1959) – and perhaps this was one of the factors that led to its marginalisation as a science at the end of the twentieth century.

Palaeobotanical teaching is currently a minor component of the botanical curriculum at the University of Glasgow as it approaches its tercentenary (counted from the improved 'physic garden' in 1704 and the appointment of an individual dedicated to oversee it, John Marshall (Boney 1988; 1993)), and the subject may indeed be returning to the "long sleep" that Walton spoke of, but the impact of the Golden Age of its 'School of Palaeobotany' around the world continues to this day. Even though the Bower Building may have been devastated by fire, while the work and collections of its staff still exist, there is still the possibility that, if the wheel turns again for fossil plant research, then Glasgow again can be a world leader in the field.

Acknowledgements:

The authors wish to gratefully acknowledge the contributions of expertise given by the following: A. J. C. Brown, P. Robertson, M. Jewkes, J. Dickson, M. A. Taylor, A. D. Morrison-Low, L. Clarke, H. Mackay, M. Rankin, G. Gardiner, T. Graham, W. D. I. Rolfe, J. Hilton, J. K. Ingham, M. Evans, A. Howell, A. M. Berrie, C. J. Cleal, P. Davis, and P. Tucker. For use of photographs related to the Bower fire: G. Durant, and G. Stewart are gratefully thanked. In addition, A. Dulau is thanked for translation of Zalessky's pronouncement, and A. J. C. Brown, M. Jewkes and J. Hilton read through earlier versions of this text, and made sound suggestions for changes.

Figure Captions.

Figure 1

Isaac Bayley Balfour, Bower's predecessor as Regius Professor of Botany at Glasgow 1879- 1885. Glasgow University Archive Services GB 0248 GUA 2116/15/013.

Figure 2

Alexander Dickson, Head of Botany at Glasgow University 1868-1879. Glasgow University Archive Services GB 0248 GUA 2116/15/019.

Figure 3.

A caricature of Frederick Orpen Bower that appeared in the University Magazine, with lettering done after the style of Glasgow's own Charles Rennie Mackintosh's hand-drawn characters. Osborne Henry Mavor, 1925, ink on paper, GLAHA 43178. Photograph © Hunterian Art Gallery, University of Glasgow.

Figure 4

Julius Von Sachs in 1876. Glasgow University Archive Services GB 0248 GUA 2116/07/004.

Figure 5

Professor S. H. Vines (1849-1934). Glasgow University Archive Services GB 0248 GUA 2116/10/023.

Figure 6

Bower (far left) as part of Anton De Bary's work group, Strasbourg winter 1879-80 with Anton De Bary (middle front) and his students including S. H. Vines (back middle in white hat). Glasgow University Archive Services GB 0248 GUA 2116/12/020.

Figure 7

The Botany Building c.1925 from the memorial book presented to Bower upon his retiral. Glasgow University Archive Services GB 0248 GUA 2116/15/014.

Figure 8

The official opening party of the Botany Building on June 16th 1901, attended by many eminent academics of the time. Amongst the assembled group are Isaac Bayley Balfour, Lord Lister, Sir Joseph Dalton Hooker, Lord Kelvin, Dukinfield Henry Scott, Bower (in classic profile) and far right, David Thomas Gwynne-Vaughan. Lang appears to have been away on the Arthur George Tansley expedition to Malaysia and Sri Lanka at the time. The drawings above the blackboard were used by Bower as teaching aids and some of them survive today. Glasgow University Archive Services GB 0248 GUA 2116/18/001.

Figure 9

D. H. Scott (1854-1934), keeper of Jodrell Laboratory, Kew. Glasgow University Archive Services GB 0248 GUA 2116/10/031.

Figure 10

W.C. Williamson (1816-1895), inspired Kidston to work on fossil plants. Glasgow University Archive Services GB 0248 GUA 2116/10/032.

Figure 11

John Hutton Balfour, Regius Professor of Botany 1841-1845. Glasgow University Archive Services GB 0248 GUA 2116/07/008.

Figure 12

A partly excavated Fossil Grove in Victoria Park, Glasgow c1887-89. © Glasgow Museums.

Figure 13

Bower, Gwynne-Vaughan and Lang at the 1904 meeting of the British Association, in Cambridge. Kidston, also present and a keen photographer, might well have been behind the camera. Glasgow University Archive Services GB 0248 PH/PR565.

Figure 14

Kidston and Gwynne-Vaughan, complete with pipes, working on the *Osmundaceae* at Kidston's home in Stirling. No doubt this photograph was posed for posterity, as there are other views of the same scene. Glasgow University Archive Services GB 0248 GUA 2116/10/019.

Figure 15

An original plate from Kidston and Gwynne-Vaughan's study of the *Osmundaceae* Part II. This shows Kidston's skills as a photographer and an illustrator - his drawings were markedly less 'stylised' than those of some of his contemporaries. Glasgow University Archive Services GB 0248 UGC 088/A/2/2.

Figure 16

The last known photograph of Kidston, still working on specimens. Taken by Crookall at the Bristol Laboratory. Glasgow University Archive Services GB 0248 GUA 2116/15/015.

Figure 17

Lang and Helen Gwynne-Vaughan at the International Congress of Botanists in Cambridge, 1930. Glasgow University Archive Services GB 0248 GUA 2116/15/028.

Figure 18

Portrait of F.O. Bower on his retirement (1925), by his cousin Sir William Orpen. Held in the Botany Building, it was also destroyed in the fire. Ironically the portrait and the building named after Bower went up in smoke, though Bower himself disapproved of the habit. Oil on canvas, Sir William Orpen, 1926, GLAHA 44153. Photograph © Hunterian Art Gallery, University of Glasgow.

Figure 19

The Bower Building on fire in 2001 Photograph © Graeme A. Stewart, 2001.

Figure 20

The portrait of John Walton destroyed in the fire. Oil on canvas, Alberto Morrocco, 1962, GLAHA 44333. Photograph © Hunterian Art Gallery, University of Glasgow.

Figure 21

Hung out to dry. Items salvaged from the wreckage of the Bower Building drying out in the Hunterian's Kelvin Gallery. Photograph © Graham P. Durant, Hunterian Museum, 2001.

Figure 22

The four fossil wood thin-sections from the Allen Thomson collection, believed to date from 1830-1. The thin-sections were spared from the fire only through being on loan to researchers at the time. Photograph © J. J. Liston, 2004.

Figure 23

The remains of the Bower Building. Restoration is currently underway. Portraits and collections may have been destroyed but the memory of the Glasgow palaeobotanists will endure. Photograph © Graeme A. Stewart, 2001.

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