DOUGLAS FAMILY

ALLIE V. DOUGLAS

SUBJECT FILES

Tributes to George Vibbert

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File 49

George Vibert Douglas

1892–1958

GEORGE VIBERT DOUGLAS who died on October 8, 1958, had been a fellow of the Society since 1944. He was born at Montreal in 1892, the grandson of the Rev. George Douglas, the first principal of Wesleyan Theological College, and of Captain J. A. Vibert, at one time the Port Warden of Montreal.

He was educated at McGill, then at the Royal School of Mines, and later returned to McGill from which he graduated with a Masters degree in Mining and Geology. While at McGill he underwent military training in the C.O.T.C., and during the First World War served as a lieutenant and later as captain in the Northumberland Fusiliers and the Royal Engineers. He was twice mentioned in despatches and was awarded the Military Cross.

In 1921 and 1922 he was geologist on the "Quest" expedition to Antarctica, led by Sir Ernest Shackleton. At this time he was granted the privileges of honorary membership at Emmanuel College, Cambridge, and much of his "Quest" report was written there.

Returning to America, he was for two years assistant to Professor R. A. Daly at Harvard, and then again he left these shores, this time for Spain and Rhodesia, as Chief Geologist to the Rio Tinto Mining Company.

Returning to Canada in 1932, he was the first incumbent of the newly established Carnegie Chair of Geology at Dalhousie University. This chair he occupied until his retirement in 1957, after which he lectured at the University of Toronto and engaged in geological consulting.

Besides this society, he was a fellow of the Geological Society of London, the Geological Society of America, the Arctic Institute of North America, and member of the Canadian Institute of Mining and Metallurgy, the Engineering Institute of Canada, and the Canadian Institute of International Affairs.

During his years at Dalhousie he did geological field work for the Province of Quebec, for the Colony of Newfoundland, and for the Province of Nova Scotia, for the last as Provincial Geologist for several years. He is the author or co-author of fifty-seven articles of a scientific nature, and on such diverse subjects as "Spectroscopy Applied to Mineral Determination" (1924); "On the Theory of Continental Drift" (1934); and "The Deposition of Gypsum and Anhydrite" (1957).

George Douglas had an eventful life. He travelled widely. He met and was a friend to many people. He wrote much and his voice was frequently heard in scientific conclaves. But in the opinion of this writer, his niche in posterity is most assured by the influence that he exercised on the students with whom he came in contact at Dalhousie. In them he instilled an overwhelming feeling of scientific curiosity and inspired them to a search for truth. He taught them to argue without rancor, and he himself was a firm

friend of many with whom he disagreed. Douglas had the ability to make geology come alive in his lectures, and he encouraged many of his students to make their maiden speech on the floor of the Dawson Geological Club which he founded in his second year at Dalhousie.

He was a man of unbounded physical energy, and this, coupled with his tremendous enthusiasm could and did result in feats of endurance that put much younger men to complete shame.

Professor Douglas was married in 1924 to Olga Margaret Crichton of County Sligo, Ireland, who survives. They have four children, Mrs. Elizabeth Cleasby, of Nottingham, England, and Mary, Patrick, and John of Toronto. They comprised a closely knit family unit and their home became the meeting place of those interested in art and in science. A sister, Dr. A. Vibert Douglas of Queen's University, Kingston, and a grandchild, Anne Cleasby of Nottingham, also survive.

L. J. WEEKS

GEORGE VIBERT DOUGLAS

Rio-Tinto

9th.October.1928

Dear Mr.Douglas.

With great pleasure ~~it~~ I have received your letter and postcard,but I have read,with sorrow that you will not return as soon as I hoped.

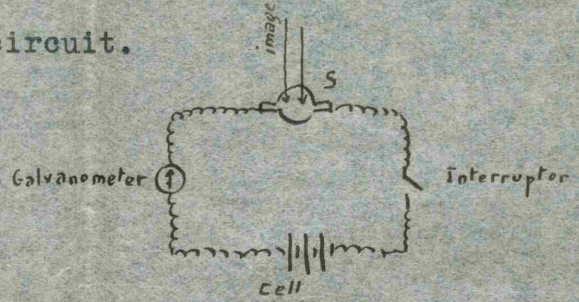
First at all I ougth to tell you that all is rigth in the Department and I have been working as well as I can do to acomplish your orders.The study of Rio-Tinto ores colected from 1926-1927 has been finished and I have prepared in colaboration with Williams a Mineralogical Report dealing with the posibility of installing a concentrating plant to treat the ores from North Lode group.Mrs.Callow and Palmer spent a morning at this office in order to study the problem.I have spent some days studying some products sent in to the Departmet

I was one day to check the work carried out by Violanta We were near la Umbria and I sow some ancient works and a vein mineralized with galena .All without importance.I have visited with Violanta Los Billares near La Granada,it seems to me an interesting region.There is a beautiful vein system streaking from N. to S.aprox. in some of them we have found quartz mineralized with malaquite,azurite and chryso-colla,but I think that veins have not real importance for the C°.

The instalation of the new polishing machine has just finished now I am waitting for the laps.

The Office has been cleaned and I am sure you will not recognize it when you come back.

I have imagine a procedure for the measure of brightness in polished surfaces a little better than the paper scale.It is based on the well known proprierty of the selenium that of the variation of the electrical resistence when the intensity of ligth is changed.The image of the polished surface is recived on a selenium piece S which is inserted in an electrical circuit.



The galvanometer index will be moved when the intensity of the ilumination is changed,and a siple lecture on the galvanometer scale,may give us the brigthness.I do not know if something similar has been published before,wat do you know about it?.If every mineral should have an special brightness when polished under similars conditions we migth admite the posibility of a new method in mineralsdetermination.I know that this question cannot be resolved easily,but do you not think a deep study of it would b e interesting ? . If we leave our imagination free to go to the dominions of the fantasy we can to have a glimpse of the posibility of a mechanical clasification of the opaque minerals by means of a galvanometer which would have instead of figures,the names of the differnt

minerals.To resolve this hipothetical question,is necesary the profound study of the influence that the different colours have on the selenium electrical resistence.

I have polished the crust which we got from the acid works The minerals found are:Troilite in grains about 0,005 to 0,02 mm diameter,some grains of galena & iron oxides.Troilite was only determined by means of its colour and magnetic proprieties,because Davy and Farnham do not speak anything about it.Herewith eclosed the index of the immersion liquids we have here.

I have been endeavouring with the separation of As.in iron ores,but I have only observed a few grains with the appearance of Symplesite($3FeO.As_2O_3.8\ H_2O$) and also some Pitticite($Fe_2O_3.SO_3.As_2O_5$).For being sure it is necesary more immersion liquids

I have stoped,now,the microscopic work ,because Doctors Forest and Puerta have recomended me to rest my sigth.I am awfuly sorry I have lost 1/2 dioptria hence January and at present I am considerably short sigthed.I have been at Seville to change my glases,and now I can see much beter from the distance but when I look through the microscope (I have been doing today for sending you the results of the polished crust) a great pain and tears invade my eyes.Perhaps I will be bound to change my work in the C°and go to another kind of job where do not is necesary to use the eyes as it is necesary in the mineralogical section,because I am sure it is a tremendous danger to neglect my sight I have only two eyes for all my life.I am young and can lead my activities through another ways.

I am waitting for you in order to speak about this questions My tastes are huge and wide I love also ~~xixtrixity~~x Electricity and if Fate pull me out mineralogy I should ~~lixxx~~ like to be specialized in Electricity.All this things I am telling you privat~~ix~~ely,now I am not writing to the Chief of the Geological Department in Rio-Tinto C°,I am doing to the most noble person that I have found in my life and to whom I shall be always very grateful for your teaching and tremendous kindness.I am sorry I cannot express myself as well as I should like to do,I have not mastered English yet.I hope you will excuse my very bad English.

Violanta has been at the office and send to you this postcard.I have tried ~~xxxixxxy~~ to translate that he wants to tell you.

With kind regards and best wishes,

Believe me,

Yours sincerely

J. Pons de Lima

My father in every letter sent his kinds regards to you

25/3/28.

My Dear George,

Here I am in Seville & feeling very lonely & depressed. Very many thanks for your letter which meant a great deal to me. To work will for me was not work to me but an absorbing interest & a pleasure, & I feel that what I have learnt of your method & outlook will be

of the greatest use to me throughout my life.

Your idea of a consulting partnership is a great one - but I still have a good way to catch up - perhaps in a few years time I may be worthy of it.

I shall look forward to reading everything that you publish. May you prosper as you deserve, which

will be greatly.

I shall never forget the example you have given me of all that is best in our profession.

Yours Sincerely,

Patrick Watson.

PROCEEDINGS OF THE
GEOLOGICAL SOCIETY OF LONDON

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OBITUARY NOTICES

Reginald Aldworth Daly died in Cambridge, Massachusetts, on 19 September 1957 after several years' illness. He was born in Napanee, Ontario, on 19 May 1871, and received the A.B. degree from Victoria College in 1891 and A.M. and Ph.D. from Harvard University in 1893 and 1896. He continued his studies at Heidelberg and Paris. In 1903 he married Louise Porter Haskell. From 1895 to 1912 he was variously an Instructor at Harvard University, Professor of Physical Geology at Massachusetts Institute of Technology, and member of the Geological Survey of Canada. In 1912 he became Sturgis Hooper Professor of Geology at Harvard where he remained until his retirement in 1942.

At the end of the first quarter of this century Daly was the foremost of North American geologists, a man of great intellectual courage and bold imagination tempered by a keen appreciation of the complexities of geology derived from arduous years of field work. His early field experience was in New England. The mapping of Mount Ascutney in Vermont brought to his attention the problem of emplacement of igneous bodies and led to his hypothesis of magmatic stoping.

His survey of the Canadian-American boundary during the field seasons 1901 to 1907 is a monumental work. From the foot-hills in Alberta to the Pacific coast, over the rugged and inaccessible terrain of a great cordillera, he mapped the structure and stratigraphy, the igneous bodies and the metamorphic rocks. The varied experience thereby gained gave him the firm foundation which enabled him to move on into the realm of synthesis where he made his name.

Soon after becoming Professor at Harvard he was heard to remark that geology was "drowning in facts" and urged more concern about the theoretical framework to explain the processes which had gone on, or are going on, in the Earth. He followed his own advice with bold imagination and to the lasting profit of the science. He was one of the first to see the need for geology to progress on a more quantitative and experimental basis. In 1932, joining with colleagues in physics and astronomy at Harvard, he initiated a research programme in geophysics and experimental geology aimed particularly at elucidating problems of the interior of the Earth.

His early research was largely in the field of petrology. He was deeply concerned with the compositions and amounts of the various igneous rocks, with magmatic differentiation, and with the origin of alkalic rocks. The world-wide uniformity of basaltic magmas led him to the hypothesis of a glassy basaltic substratum, an hypothesis which he did not discard until very late in his life. To investigate basalts he travelled widely over the oceans, to Hawaii, Samoa and Ascension and St. Helena. He became interested in the origin of atolls and the coral reef problem. This resulted in his glacial control hypothesis. Though much of what he

wrote has become part of more valid theory today his hypothesis is no longer of general validity, though it does have limited applicability to many of the features of the marginal coral seas.

Daly was among the first to look upon continental ice-sheets as a means of assaying the reaction of the crust to loading and to deduce from post-glacial uplift something of the nature and properties of the crust and upper mantle. He also suggested that turbidity currents, previously observed in Swiss lakes, might have been the agents which eroded the great submarine canyons of the continental slopes.

So sound was his logic, so keen his imagination and so courageous was his approach to major problems of geology that even when his hypothesis later proved to be wrong, it nevertheless was an inevitable stepping stone to a better hypothesis. Many of the problems he sought to solve might well have remained dormant for decades had he not had the insight to attack them.

He was a superb lecturer and a source of stimulation to his students and all who heard him. Through his writings he had a profound effect on geologists the world over. He was the author of seven books. At least one of these is to be found on the book-shelf of any thoughtful geologist. It would be superfluous to mention here all of the many honours accorded him. It is enough to say that he was a Foreign Member of the Society.

H. H. H.

Professor Wilhelmus Josephus Jongmans, Foreign Member since 1928, died on 13 October 1957 at the age of 79. He had devoted his life to the scientific study of the stratigraphy and fossils of the Carboniferous, with special reference to the Coal Measures of western Europe, and was formerly Director of the Dutch Geological Bureau. Born in Leyden in 1878, he was educated at school and university in his native town; later he went to the university of Munich where he took the Ph.D. degree in 1907. Prior to this he had begun the study of the fossil plants brought up in the cores of borings made in connexion with the development of the coal mining industry in South Limburg. On his return from Munich he was appointed Curator in the Rijksherbarium at Leyden. Here he began work on two ambitious projects, both of which came to an untimely end owing to the 1914–18 war. These were an annual volume listing the publications dealing with fossil plants issued during the previous year, with an analysis of the species described, and a flora of the fossil plants from the Coal Measures of western Europe. The latter project brought Jongmans into touch with Dr. Robert Kidston, the eminent Scottish palaeobotanist, who was planning a similar work. Together they produced the first part of a systematic work on the Calamitaceae with an atlas of magnificent illustrations. This was published during the First World War but its promised continuation never materialized.

Jongmans became more and more concerned with the fossil plants and the stratigraphy of the Coal Measures of the Limburg area, and became associated with the research work of the Rijks Opsporing van Delfstoffen. The collections of this institute were moved to Heerlen in 1918 and Jongmans became head of the institute there in 1921. In 1924 this organization ceased to be a government institute and became a foundation supported mainly by the Dutch collieries. For many years Jongmans was director of this Bureau and he contributed very greatly to its organization and importance. Much of the work carried out by the staff was naturally of a practical nature; the detailed stratigraphy of the Coal Measures of the district was worked out, and the plant and animal fossils from all the shafts and cores were carefully studied. The mode of occurrence and distribution of the fossils, and the variation of form of the different species were investigated. In this way an exceptionally complete body of information about the organisms of Carboniferous times was built up. For comparison with other areas collections were made from countries where comparable Namurian and Westphalian rocks occur. Later a rich collection of fossil plants was made in the chief coalfields of the United States of America, and the collections made by Dr. Posthumus in Sumatra were added.

In 1926 an important annual publication, the *Jaarverslag*, was begun by the staff of the Bureau. This contains many interesting original papers on the stratigraphy, the fauna and flora of the Dutch coalfields, and there are many detailed sections of the strata, seismic records and other data. Much of the work described was from the pen of Jongmans himself, and dealt not only with local studies but also with the coalfields of other parts of the world. In 1934, after his visit to North America, he published, in collaboration with Professor W. Gothan of Berlin, an important paper on the floral succession and comparative stratigraphy of the coalfields of the eastern United States in relation to those of western Europe. Following his attendance at the International Geological Congress in Moscow (1937), Jongmans published in the *Jaarverslag* in 1939 a most valuable summary on the coal basins of the Carboniferous and Permian in the U.S.S.R. and East Asia. This gives a list of the localities where fossil plants have been found and of the species recorded at each place. Reference is made to most of the then-recent publications dealing with the fossils of this immense area, and much help is provided for the location of the different localities and for the assessment of their probable horizons.

In 1940 a detailed summary of our knowledge of British Coal Measures fossils was published. This was a general palaeobotanical survey with references to the more important publications on the stratigraphy and on the fossil floras and faunas. No similar work had previously been published and it filled a need felt by many geologists and palaeobotanists.

Before Jongmans began his work with the Mines Bureau at Heerlen comparatively little had been done towards the exact correlation of the Coal Measures of western Europe. The Upper Carboniferous strata were subdivided differently in different countries, lithological characters were valueless, and there were few criteria which could be used in the long-range correlation of coal seams or of groups of seams. The present position, and the possibility of making general correlations between the strata of widely separated areas is very largely due to Jongmans, who did much himself and inspired others to concern themselves with such problems. He travelled widely and was a great collector. He followed Kidston in insisting that it was necessary to compare the complete floras and faunas, and that it was seldom or never practicable to select some single plant species which could be used as a zone fossil. He published many papers

dealing with fossil floras, discussed correlation questions at several international conferences, and organized international congresses for the consideration of Carboniferous stratigraphy. The first of these was held at Heerlen in 1927. A second and larger gathering took place in 1935, immediately after the Sixth International Botanical Congress in Amsterdam. The proceedings of this conference were published in full, together with the papers read to the palaeobotanical section at the Amsterdam conference. These papers fill three large volumes and form a most valuable contribution to the literature of palaeobotany. A third conference of the series was held at Heerlen in 1951, when Jongmans was the Honorary President. It was attended by many geologists, palaeobotanists and palaeontologists from a variety of countries.

Among the many scientific papers produced by Jongmans two of special interest, written in collaboration with Gothan, were on the Upper Carboniferous plants found in Sumatra and other neighbouring islands. This flora is Euramerican in type, with some Cathaysian elements like *Gigantopteris*, but no *Glossopteris* forms. It raises some interesting palaeogeographical problems, since it is intercalated between the localities of the *Glossopteris* floras of India and those of Australia.

In the nineteen-thirties Jongmans held the position of Extraordinary Professor of Palaeophytology at the University of Groningen, and the importance of his work became widely recognized at home and abroad. He occupied the position of President of the Palaeobotany Section at the Eighth International Botanical Congress, when he read an important paper on uniformity and diversity of the floras of former geological periods. In his own land he was created Knight of the Order of the Nederlands Lion, and also Officer in the Order of Oranje Nassau. He was survived by his wife and eight children. H. H. T.

Thorolf Vogt, Professor of Mineralogy and Geology at the Norges Tekniske Høgskole in Trondheim, died suddenly in his institute on 8 December 1958. He was born in Hedmark, south-eastern Norway, on 7 June 1888, into a family with both scientific and literary interests. His father was the eminent geologist J. H. L. Vogt (a Wollaston Medallist of the Society), in his time one of the leading authorities on ore geology and a pioneer in theoretical petrology.

Thorolf Vogt was a student at the University of Oslo, where his father was at that time professor in the School of Mines and W. C. Brøgger professor in the Department of Mineralogy and Geology. Vogt also studied abroad, petrology with Professor Becke in Vienna and physical chemistry with Professor Tamman in Göttingen. He became an assistant geologist at the Geological Survey (Norges Geologiske Undersøkelse) in 1909, and state geologist in 1914 which position he held until in 1929 he succeeded his father as professor in Trondheim, the school of mines in 1910 having been incorporated in the new technical college. During the years 1915 to 1923 he was also a Fellow of the University at Oslo.

Vogt was a highly gifted scientist with very wide interests. While still a very young man he was well versed in chemistry, mineralogy-geology, and also botany, and his scientific output has covered a great number of different subjects. When he was nineteen years old he published his

first paper, on barytes from Norwegian occurrences, and many later papers also deal with mineralogical topics. In 1923 he described a new mineral, yttrofluorite, and during his last years he worked on the chemical character of the minerals of the hornblende group.

At the Survey Vogt had northern Norway as his particular field and he made most important contributions to the knowledge of the Caledonian geology of that extensive part of the country. Especially well known is his comprehensive study of the geology of the Sulitjelma pyrite-bearing district (1927), in which he applied the mineral facies principle to the metamorphic rocks. In other papers he dealt more generally with the main stratigraphical and tectonic features of the Caledonian zone of northern Norway. After he had settled down in Trondheim, Vogt took up detailed research work on the geology of the districts around the Trondheimsfjord. Among other results, he cleared up the stratigraphy of the Cambro-Silurian sedimentary and volcanic series of the Hølonda–Horg district, where fossils from different horizons give a basis for age determinations and correlations with other Norwegian Caledonian regions.

Vogt also made important contributions to the knowledge of the Old Red deposits of the coastal districts near Trondheim, his discovery of occurrences of Devonian plant fossils being particularly valuable. He had in 1928 summarized the orogenic history of the Norwegian Caledonides and introduced the term " the Svalbard phase " for the posthumous movements which had affected the West Norwegian Downtonian–Devonian continental series ; in later papers he pointed out the influence of this relatively young orogeny on the adjacent inland districts. Vogt did excellent work also on the rock formations of the sparagmite district at Lake Mjøsa.

A publication of special interest to British geologists, written in 1924, deals with the interpretation of current-bedding structures in quartzites of the Ballachulish district and their importance in the determination of the original stratigraphical sequence. Sir Edward Bailey in 1930 referred in print to this small paper as " one of the most important and welcome contributions that has ever been made to the interpretation of the Scottish Highlands ". Here also Vogt's suggestions concerning the structural connexions between Norway and Great Britain should be mentioned.

Vogt published a number of papers on ore geology and in later years took up geochemical soil studies and geo-botanical methods for tracing ore bodies. He was very interested also in Pleistocene geology, especially in shore-line phenomena. He studied these phenomena in Spitsbergen and Greenland as well as in Norway, countries which he had visited for research purposes. A small but important paper deals with the theoretical background of shore-line oscillations as a result of combined isostatic (crust) and eustatic (sea-level) movements. In other fields of geology also he did important work.

Vogt became a Foreign Member of the Geological Society of London in 1950 and a Corresponding Fellow of the Edinburgh Geological Society in 1958. He was a member of the Oslo Academy of Science and Arts from 1930. In the scientific life of Trondheim Vogt was a leading personality. From 1950 until his death he was President of Det Kongelige Norske

Videnskabers Selskab in that city, the oldest academy of Norway. This tells of the high esteem in which he was held. O. H.

Frances Elizabeth Somerville Alexander (*née* Caldwell) died in Ibadan, Nigeria, after a brief illness, on 15 October 1958.

Dr. Alexander was born in Surrey in 1908. In 1909 her parents moved to India, where her father, Dr. K. C. Caldwell, was firstly Professor of Chemistry at Patna Science College and later its Principal. At the end of the 1914–18 war, she returned to England and was a pupil first at Nuneaton High School and then at St. Swithun's School, Winchester. In 1928 she was awarded the Charlotte Mary Yonge Scholarship, and entered Newnham College, Cambridge, where in 1931 she took a first-class degree in Geology in Part II of the Natural Science Tripos and gained the Harkness Prize. She then began a period of intensive research on the main outcrop of the Aymestry Limestone, and proceeded to the Cambridge Ph.D. degree in 1934. An account of her stratigraphical results was published in the *Quarterly Journal* in 1936 ; this paper, although some of its conclusions have been disputed or amended by later workers, was nevertheless one of the foundations for the post-war proliferation of systematic research on the shelf-deposits of the Ludlovian. Her Aymestry research also led to a series of palaeontological papers on brachiopods and corals.

In 1936 she was married to Dr. N. S. Alexander, and in the following year, on her husband's appointment as Professor of Physics in Raffles College, she went with him to Singapore. There, in the course of a general study of the geology of the island, she developed a special interest in the tropical weathering of rocks and eventually presented a paper on this topic to the Society in 1958.

During 1940 and 1941 Dr. Alexander was engaged on scientific wartime work in Singapore in connexion with radio direction-finding. Her three children had been born during the years there and in January 1942, shortly before the surrender of the island, she took them to New Zealand. Her husband stayed in Singapore and was interned until the end of the war. In New Zealand she joined the Department of Scientific and Industrial Research (N.Z.), working initially, as the founder of the first Operational Research Group in that country, on the performance of radar installations. She was then made responsible for the development of radio-meteorological studies, and in this connexion served for a time in Australia, at Darwin, as the representative of the New Zealand Government. This work culminated in the organization of the " Canterbury Project ", a large-scale radio-meteorological experiment carried out jointly by the New Zealand and British Governments.

At the end of the war Dr. Alexander rejoined her husband and resumed her geological work in Singapore. In 1948 she was appointed Registrar of the new University of Malaya, during its period of planning and foundation. When this was completed, she became Geologist to the Government of Singapore, with a main task of surveying the island's resources of granite and other useful stone, and in 1950 she published a report which included the first reasonably complete geological map of Singapore Island.

She subsequently worked as a consultant to the Singapore City Council and to commercial firms on problems of water supply, quarrying and foundations.

In 1953, after moving to Nigeria, where her husband took up the Chair of Physics at University College, Ibadan, she was appointed Lecturer in the Department of Agriculture of that College, a post which she held until her death ; and in 1958 she also organized and undertook the teaching of geology in the Department of Geography of the College.

Dr. Alexander's perpetually full and energetic scientific life, so valuably productive in many ways, never obscured her personal qualities of warm friendliness and humour ; and those who once had the pleasure of working in her company will not forget the generous readiness with which she would always turn from her own work to help and encourage others.

A. J. B.

William Joscelyn Arkell died at Cambridge on 18 April 1958 at the age of 53.

The son of James Arkell, he was born at Highworth, Wiltshire, in June 1904, the youngest of a family of seven. He was educated at Wellington College and New College Oxford, where he took a first-class degree in Geology in 1925 and was awarded the Burdett-Coutts Scholarship. Here he commenced a lifetime of geological research and in 1933 he was elected a Senior Research Fellow of New College and took the D.Sc. degree. In 1947 he was offered a similar appointment in Cambridge at Trinity College, and was elected a Fellow of the Royal Society.

Living on the outcrop of the Corallian and spending his holidays at Swanage on the Dorset coast, his youthful interests inevitably turned to a study of the Jurassic rocks. In 1926 he joined his tutor, J. A. Douglas, in an investigation of the Cornbrash along the whole outcrop from Dorset to the Yorkshire coast, and the first of their three joint papers appeared in the *Quarterly Journal* in 1928. During the winter seasons from 1926 to 1929 he accompanied the survey led by K. S. Sandford in Egypt to investigate the Pliocene and Pleistocene deposits and evidence of Palaeolithic man in the Nile Valley and Red Sea coast, on behalf of the Oriental Institute of Chicago.

From 1929 to 1948 much of his time was occupied in the compilation of two large monographs for the Palaeontographical Society, on the Corallian lamellibranchs and ammonites, the illustrations of which are an example of his outstanding technical skill in photography. During vacations he travelled widely in Europe, visiting type sections of the Upper Jurassic under the guidance of leading Continental geologists, and studying collections at the principal museums.

It was, however, in 1933 that Arkell established himself as a leading authority on Jurassic stratigraphy and palaeontology by the publication of his *Jurassic System in Great Britain*, a monumental work of nearly 700 pages with copious plates, a remarkable achievement for a man not yet thirty years of age. It contained not only a detailed account of the stratigraphy but embodied a historical review of the principles of classification and correlation enunciated by d'Orbigny, Oppel, Buckman and others, together with a demonstration of the relationship between sedi-

mentary facies, troughs of deposition, and axes of folding. In the same year he read a paper entitled *Analysis of the Mesozoic and Cainozoic folding in England* before the International Congress held in Washington. Work during the war with the Ministry of Transport from 1941 to 1943 was ended by a serious illness and for several years he was unable to undertake any strenuous outdoor activity. However, he was able to complete two further books, *The Geology of Oxford* (1947) and *Oxford Stone* (1947); the latter a history of the various building stones used in Oxford since Norman times. His help had also been sought by the Geological Survey in the publication of the Weymouth and Witney memoirs.

Improving health once more allowed him to travel abroad on the Continent and North Africa, where he met or corresponded with almost every worker in his own field, until in 1956 he published a second major work, *The Jurassic Geology of the World*, an exhaustive treatise of universal appeal. In the autumn of 1957 Arkell suffered a severe stroke by which he was completely paralysed on the left side and was left with impaired vision. His wonderful spirit, however, remained, and with the help of friends he attempted to carry on his work, even completing the final part of his monograph on the *English Bathonian Ammonites* before his death in the following April. His wife, Ruby Lilian Percival of Boscombe, whom he married in 1929, and three sons survive him.

Arkell was elected a Fellow of the Society in 1925, was awarded the Wollaston Fund 1935, the Lyell Medal 1949, and served on the Council from 1937 to 1942. He received the Mary Clark Thompson Gold Medal of the National Academy of Sciences Washington in 1944 and the von Buch Medal of the German Geological Society in 1953. He was an honorary member or correspondent of the Linnean Society of Normandy and of the Geological Societies of France, Germany and Egypt and of the Paleontological Society of America. Tall and good-looking, Arkell was a conspicuous figure at Society meetings, but a rather dignified and austere manner tended to give him the appearance of being somewhat aloof and not easily approachable. This, however, was far from being the case, for he was a most delightful and cheerful companion in the field, and always ready to make his knowledge available to all those who sought it. Although not addicted to competitive sports his great love of the country made him an ardent follower of the New College beagles.

It is impossible to do justice here to the varied nature of his researches, but he probably had more publications to his name than any geologist of his generation. That he should be cut off at the peak of his career was indeed a sad misfortune for the Geological Society, as for his numerous friends and colleagues at Oxford and Cambridge.

J. A. D.

Professor William Noël Benson, F.R.S., who died on 20 August 1957, was one of the most distinguished geologists who have worked in New Zealand. Born near London on 26 December 1885, he was soon taken to Australia, where he was educated in the Friends High School in Hobart and at the universities of Tasmania and Sydney. While in his subsequent career he applied himself with devotion to heavy teaching duties, his life-long passion was for research. His first paper was published in 1907, the year he graduated B.Sc. Well over a hundred scientific

articles by him appeared during his life-time, and further manuscripts will lead to posthumous publication.

After a year at Adelaide, where he relieved Mawson as Lecturer in Mineralogy and Petrology in 1908, Benson returned to Sydney as Demonstrator under Sir Edgeworth David and there began his studies of the Great Serpentine Belt of New South Wales. The resulting long series of papers included work on rugose corals and other fossils as well as his better-known contributions to the spilite and serpentine problems which culminated in a comprehensive memoir, *The Tectonic Conditions accompanying the Intrusion of Basic and Ultrabasic Igneous Rocks* (1926). In this he examined the world evidence for Suess's generalization that "the green-rocks form sills in dislocated mountains, that sometimes follow the bedding-planes and sometimes the plane of movement." Benson proposed a classification of basic complexes and included in it his "alpine type", embracing most of Suess's green rocks and Steinmann's ophiolitic group of serpentines, gabbros, diabases and pillow lavas. He suggested that the basic and ultrabasic intrusions are in fact emplaced along major planes of shearing in geosynclinal zones, while submarine pillow lavas may be pressed out at the surface in front of the advancing overthrust. This work was advanced during the tenure of an 1851 Exhibition Science Research Scholarship (1911–1914) in Cambridge, where he came under the influence of Harker, Marr, Bonney and Miss Elles, a group for whom his regard in later life rivalled his deep reverence for his old chief, Sir Edgeworth David.

He returned to Sydney in 1914 and was appointed Professor of Geology and Mineralogy in the University of Otago in 1916, a chair he was to hold until his retirement in 1950. At Otago he completed his Serpentine Belt papers and soon produced reviews of New Zealand geology and of the structural features of the Australasian margin. Soon after his arrival in Dunedin he commenced an investigation of the petrology and general geology of the Dunedin volcanic complex. This occupied him virtually until his death and it is a matter of the greatest regret that although he published a number of papers relevant to the study, his major memoir on it was not to appear during his lifetime. But Benson's geological interests were extraordinarily wide and his writings covered a spread of subjects that few geologists of the present generation would try to emulate. He proposed subcalcic augite as a member of the pyroxene family, he wrote on problems in engineering geology and (with Sir Charles Hercus) on soil iodine in relation to endemic goitre, and he made particularly important contributions on Ordovician stratigraphy and graptolitic faunas. One of his last papers recorded the discovery of the first known Cambrian rocks in New Zealand. Observations on summit levels in the extremely rugged and remote areas of Ordovician beds in Fiordland helped to lead to his widely accepted concept of double peneplanation of southern New Zealand. Detailed mapping of the erosion surfaces concerned helped in turn to develop a picture of progressive deformation during the period of late Tertiary volcanicity in the Dunedin district. An interest in the interplay of tectonic activity and magmatism, originating in his early days in New South Wales, thus remained until the end.

With his students Benson always insisted on a high standard both of

field work and laboratory investigation; to him neither was complete without the other. The result may be gauged by the research tradition he kindled and the success of his students in geological posts in many parts of the world. Benson's great output was achieved with a minimum of assistance and at a cost of long hours and a denial of pleasures that many take for granted, but he was always willing to relax into an anecdotal mood which was the delight of his friends. Some indication of the affection in which he was held lies in the wealth of happy legends which surrounds his name, many of them connected with his reputation for absent-mindedness and many undoubtedly apocryphal.

He received the Lyell Fund from the Society in 1923 and the Lyell Medal in 1939 D. S. C.

Theodore Gervase Chambers was elected a Fellow in 1892 and attained Senior Fellowship in 1952. He was born in 1871, educated at Tonbridge and St. Paul's, and went on to the Royal School of Mines (1888–91). He edited the first edition of the *Register of the Associates and Old Students of the Royal College of Chemistry, the Royal School of Mines and the Royal College of Science* (1896). This was a volume of some 360 pages and included historical accounts of the colleges and biographical notices of the professors, past and present.

After a short tour of duty as Assistant Engineer at Las Minas de Ollin, Navarra, Spain, Chambers in 1893 entered practice in London as a surveyor and architect. His work, however, tended towards matters of public administration and became increasingly divorced from mining and geology. During the First World War he was appointed Secretary and Controller of the National Savings Committee, on which he served, successively as Vice-Chairman and Vice-President, for many years. He served also on numerous Treasury and departmental committees on the financial aspects of housing, old-age pensions, agricultural credits, rent restriction, and on garden cities and satellite towns, and he was chairman of the Ministry of Health Rents Tribunal from 1922 to 1927. He was created K.B.E. in 1918. He died at Balnain, Inverness-shire, on 20 November 1957.

Arthur William Vincent Crawley (1876–1959) trained as a mining engineer and in connexion with his profession travelled widely in Africa. He went to South Africa originally with the Canadian Mounted Rifles in the South African War, and was attached as Special Scout under D.M.I. on Lord Roberts's staff. Although he remained a Fellow of the Society until his death (he was elected in 1910) he forsook mining for farming, settling at Macheke, Southern Rhodesia, in 1914, and living there for the rest of his life. He was M.P. for Marandellas Constituency from 1934 to 1938. His military services were recognized in the award of the D.C.M.; he was also Chevalier de l'Ordre du Lion and held the Etoile de Service du Congo. S. H. S.

Arthur Morley Davies, Fellow of the Society since 1891, and latterly a Senior Fellow and the doyen of British palaeontologists, died in a nursing home on 12 March 1959 in his ninetieth year.

Born in Swansea on 25 December 1869, son of D. I. Davies, an inspector of schools, he was educated at Bristol Grammar School and the Normal School of Science (later called the Royal College of Science), South Kensington, which he entered at an early age to read biology under T. H. Huxley. He was awarded the Edward Forbes Prize and an Associateship in biology at the age of eighteen; three years later he gained an Associateship in geology, also first class. After a further three-year period spent as a demonstrator in geology under J. W. Judd he left in 1894 to teach zoology and geology at the University Correspondence College until 1904, when he became a Demonstrator in Geology in King's College, London. In 1906, when W. W. Watts took over the chair from Judd at South Kensington, he recalled Davies to become a Demonstrator in Palaeontology, and it is clear that Davies's efforts contributed materially to the undoubted success of Watts's school of geology. As the Geology Department expanded, Davies was appointed Lecturer in 1912 and Assistant Professor in 1920; later, until his retirement in 1935, he became Reader in Palaeontology in the University of London at the Imperial College of Science and Technology, of which the Royal College of Science forms part. Also for many years, until 1917, Davies, a D.Sc. of the University of London, gave evening lectures at Birkbeck College.

Davies's first paper published in our *Journal*, in 1894, was an account, in co-authorship with J. W. Gregory, of the geology of an area in the Italian Alps near the French frontier. His geological interests developed over a wide range of subjects. In our *Journal* he wrote concerning the Upper Jurassic of Buckinghamshire (1899, 1907); the Calvert boreholes and the sub-Mesozoic floor in South-East England (with J. Pringle 1913) and the recognition of Miocene strata in Ceylon (with E. J. Wayland 1923). In other journals he ranged far beyond palaeontology, treating, amongst other topics, with the earth's crust, isostasy, Wegener's theory, the Himalayas and the Gangetic trough, entrenched meanders, and the water supply of London. He was particularly knowledgeable concerning his adopted county Buckinghamshire, writing on its geology for *Geology in the Field* in 1909 and its geography in the *Cambridge County Geographies* in 1912. In stratigraphy he studied especially the Jurassic System and its faunas, recognizing S. S. Buckman as a prophet born before his time. His original work in palaeontology was chiefly undertaken on lamellibranchs and to a lesser extent on the larger foraminifera.

Much of Davies's life was devoted to teaching and he wrote books to give a wider audience the benefit of his thoughts. His first venture of this kind dated from his days with the University Correspondence (later Tutorial) College, when, with his South Kensington contemporary H. G. Wells, he wrote a *Text-Book of Zoology*. This was very successful; first published in 1898 it went into seven editions (helped by several revisers) and the nineteenth impression appeared in 1945. The excellence of the college collections which he had amassed and his *Introduction to Palaeontology* (1920, second edition 1947) enabled him almost to dispense with systematic lectures to his advanced palaeontology students at the Royal College of Science in the 1920's, though he developed a special course of lectures and practical work on Tertiary palaeontology designed for oilfield and other palaeontologists concerned with the discrimination of species.

This course led to his erudite presidential address to the Geologists' Association (1929) on post-Cretaceous faunal migrations and to his two-volume work *Tertiary Faunas* (1934, 1935) which completed publication in the year of his retirement. Other books included *Local Geology* (1923, second edition 1933), a guide to sources of information on the geology of the British Isles, and there was also his refutation of D. Dewar's criticisms (1931) of the theory of organic evolution. This book was entitled *Evolution and its modern critics* (1933) and G. G. Simpson has characterized it as " both charming and learned and worthy of a less trivial cause ". To the *Handbook of Geology of Great Britain* (1929) Davies contributed the article on the Jurassic System and also a tectonic map of the British Isles.

Davies was precisely and quietly spoken and of a somewhat retiring nature ; he was kind, sincere and conscientious and he had an encyclopaedic and retentive memory, particularly for references to geological papers. Always a keen supporter of the Geologists' Association, he conducted many field meetings between 1895 and 1949, he edited the Association's *Proceedings* from 1893–6 and was President from 1928–30. He served for many years on the Council of the Palaeontographical Society and was a member of the Geological Society's Council from 1917–21 ; he received the Murchison Fund in 1912 and the Lyell Medal in 1929. He was President of the International Paleontological Union from 1948–52, an Honorary Member both of the Royal Geographical Society and of the Geologists' Association, also a Corresponding Member of the Geological Society of Belgium. C. J. S.

George Vibert Douglas died in Toronto on 8 October 1958, at the age of 66. He was an explorer and geologist endowed with immense energy and enthusiasm, a figure about whom legends grew and flourished. But his life was not without its vicissitudes. His university education at McGill in Montreal was interrupted for four years by the 1914–18 war, in which he won the Military Cross. After graduating in 1921 he went as geologist on Shackleton's last expedition in the *Quest* and for a year must have been tantalized by brief visits to islets and stays at islands set far apart between England and Antarctica. This was followed by a year's study at Cambridge in the Scott Polar Institute. Thereafter he taught physical geology at Harvard for three sessions before going to Spain in the summer of 1926 as chief geologist at the Rio Tinto mines. He removed to Rhodesia in 1930 and spent eighteen months there whilst the search for copper was at its height.

He returned to academic life in 1932 as Carnegie Professor of Geology at Dalhousie University in Halifax, Nova Scotia, where he stayed until he retired in 1957. This post allowed time for field work and exploration in the summer and Douglas made full use of the opportunities to survey in Nova Scotia, Newfoundland, Labrador, New Brunswick, Quebec and other provinces in Canada. He also travelled extensively outside Canada, to the United States and the Caribbean area besides visiting Europe on several occasions.

His more important writings were chiefly economic and showed that he believed in cause and effect. An ore deposit in his view was the result, not of chance, but of some demonstrable geological structure. This

accounted for the formation of a channel guiding the mineralizing emanations. But he also was concerned with general geological explorations, of which his writings on Labrador and of the islands touched by the *Quest* are examples. In his later years he became interested in the broader and more theoretical aspects of geology and published a number of brief comments about some of them.

He was a great personality of unusual and sometimes unorthodox views. For his students he spared no effort and they in return were almost fanatical in their devotion to him. He had strong likes and dislikes and was a man with intense loyalty to his friends. His widow and a family of four survive him. J. V. H.

Joseph Fowler was born in Wakefield, Yorkshire, in 1872 and died at Freshford, near Bath, on 19 December 1958. He received his early education at Churcher's College, Petersfield, and after graduating in the University of Durham took Holy Orders and was for some time Vicar of Milton, Portsmouth. Subsequently he opened a preparatory school at Avisford in Sussex, where he found ample time for teaching and research in his favourite subjects, namely history and geology. During this time he became a Roman Catholic.

Mr. Fowler was elected a Fellow of our Society in 1917 and in 1931 he read a concise and useful paper on " The 100-foot raised beach between Arundel and Chichester " which was published in the *Quarterly Journal* in the following year. In 1934 he retired and went to live at Sherborne in Dorset, where he soon began to dig deeply into local history and geology. There soon followed his *Sherborne behind the Seen* and numerous shorter papers down to 1951, when his monumental work *Mediaeval Sherborne* was published.

No local temporary section, however small, ever escaped his notice ; he was a careful and discriminating collector of fossils and was most happy and enthusiastic when demonstrating his beloved countryside to young amateurs or experts, singly or in parties. Mr. Fowler was numbered amongst those worthy local geologists whose ranks have become increasingly depleted in modern times. V. W.

Edith Goodyear was born in North Finchley, London, on 8 September 1879, and resided in the same house, her parents' first home, during her entire lifetime. Her family took an active part in local affairs, though Edith herself was only interested in the early history of the district. She was educated at Highbury High School, and entered University College London as a student in 1898. In 1902 she was awarded the Morris Prize in Geology, and she obtained an honours degree in that subject in 1903. The following year she was appointed assistant to Professor E. J. Garwood, and later became honorary assistant Lecturer in Geology in 1930, a post she retained until 1944.

In 1926 she was appointed Tutor to Women Students, a position which brought out the best of her qualities, and when sections of University College were evacuated to Aberystwyth during the Second World War she was largely responsible for the harmonious relationship which prevailed between the two universities.

She was a woman of wide interests and had a very sane and balanced judgment. She was never happier than when she had a group of young people around her. She was always ready to help others, and many students have profited from her kindly advice and interest in their welfare and studies.

Although she is only joint author with Professor Garwood of two geological papers, " On the geology of the Old Radnor district, with special reference to an algal development in the Woolhope Limestone " published in the *Quarterly Journal* in 1918, and " The Lower Carboniferous succession in the Settle district " published in the *Quarterly Journal* in 1924, Miss Goodyear took a keen interest and played a most active part in Professor Garwood's field work in other regions, and assisted him in building up the extensive rock and fossil collections, which she also arranged in the departmental museum of University College. She was a life-long friend of Professor Garwood, who acknowledged a considerable debt of gratitude for her unfailing loyal support and help especially in his later years. Just before his death she was working with him on their extensive collections of calcareous algae, which she subsequently presented to the British Museum (Natural History).

In 1946 she was elected a Fellow of University College, and maintained her keen interest in college affairs until her death on 4 February 1959, after a short illness.

Miss Goodyear was elected a Fellow of the Geological Society in 1922, and was awarded the Lyell Fund in 1927. The Garwood Fund awarded annually by the Society was founded by Miss Goodyear in his memory from money bequeathed to her from the Garwood estate.

H. M. M-W.

Albert Jowett was born on 15 November 1875 at Horton, Bradford, and educated at Bradford Technical College and Bradford Pupil Teachers' Centre, from which he entered Yorkshire College, now the University of Leeds, in 1894. In 1898 he was awarded first-class honours in Geology and in the following year joined the staff of the College for one year. At the end of that time he was appointed (1899) Principal of the Pupil Teachers' Centre and later of the Secondary School at Bury, Lancashire, and served there until 1911. Some time before, he had collaborated with H. B. Maufe on a paper on glacial geology in Wharfedale, published by the Yorkshire Geological Society in 1904.

It was mainly during his stay at Bury that he carried out his thorough and well-known investigations on the glacial geology of East Lancashire (1914, *Q.J.G.S.* **70**, 199–231). In 1911 he was appointed to a post in the geological department of the University of Manchester under Sir Thomas Holland. During that period he investigated the volcanic rocks of the Forfarshire coast (1913, *Q.J.G.S.* **69**, 459–83). In 1913 he was awarded the degree of Doctor of Science by the University of Leeds. In 1915 he left Manchester University for India, where he carried out an intensive survey of the Karanpura coalfield for Messrs Bird and Company, Calcutta, at first under the direction of Sir Thomas Holland. Later he built up a research department for the company, which had varied and widespread interests in India. The survey of the Karanpura coalfield was published

by order of the Government of India in 1925 (*Mem. Geol. Surv. India*, **52**, 1–144) under the title, " The geological structure of the Karanpura coalfields, Bihar and Orissa."

In 1924 he left India because of chronic asthma and in 1926 went to New Zealand with the idea of settling there. However, he returned to this country in 1929 and thereafter lived an outdoor life on a hill farm which he purchased at Downside, Wrington, near Bristol.

About that time, in collaboration with J. K. Charlesworth, he renewed his interest in the glacial geology of the Pennine area and their joint work on the glacial geology of the Derbyshire dome and the western slopes of the southern Pennines was published in the *Quarterly Journal* (1929, **85**, 307–34).

He was twice married : in 1903 to Mary Brunskill, who had a son and died in 1907, and in 1909 to Lilias A. Lord by whom he had two sons and a daughter and who, as well as all his children, survives him.

I am greatly indebted to Mrs. Jowett, who has supplied the above-mentioned particulars.

O. T. J.

Sir Douglas Mawson died at his home in South Australia on 14 October 1958. He had been a prominent figure in Australian science for fifty years but was best known in other parts of the world for his exploration and knowledge of Antarctica.

Mawson was born in Yorkshire in 1882 but went to Australia with his parents at an early age. He entered the University of Sydney as a student of mining engineering and graduated in 1901. He had, however, fallen under the spell of Professor T. W. Edgeworth David and he returned to graduate in science with geology as a major subject in 1905. This was after he had shown an early interest in scientific exploration by spending two years on geological work in the New Hebrides.

In 1905 he began his long association with the University of Adelaide, where he was appointed Lecturer in Mineralogy and Petrology. He was very quickly attracted by the great area of Pre-Cambrian, richly mineralized rocks which stretch from eastern South Australia into New South Wales, where they contain the famous Broken Hill ore-body. This region held much of his interest for many years, despite major interruptions caused by expeditions to Antarctica.

In 1907 Mawson accepted an invitation to join the Antarctic expedition led by Ernest Shackleton, in which his duties were to be those of physicist. He was a member of the party which made the first ascent of Mt. Erebus and, with Professor T. W. Edgeworth David and Dr. A. F. Mackay, made history by locating and reaching the south magnetic pole. Soon after his return to Adelaide in 1909 he began organizing the Australasian Antarctic Expedition which in 1911 under his leadership established its main base in Adelie Land. This expedition's aims were entirely scientific ; it made no attempt to reach the pole and the scientific rewards were extraordinarily great. Mawson himself displayed superlative courage and endurance when, both his companions on an inland sledging journey having perished, he fought his way back to his base through the most appalling conditions. The expedition returned to Australia in 1914 and publication of its results were delayed by the outbreak of war. Mawson

volunteered for army service and was commissioned as a staff officer. His main duties were concerned with the supply of munitions to the various fronts. Later expeditions which Mawson led to Antarctica in 1929 and 1931 were mainly concerned with the geodetic and geological mapping of a great sector of the coastline. This work made an outstanding contribution to our knowledge of the Antarctic continent.

Although Mawson is known to an immeasurably greater number of people for his Antarctic explorations, there is very little doubt that he regarded his geological work in South Australia as of prior importance. In 1920 he was elected to the professorship of Geology and Mineralogy in Adelaide. This entailed a more or less complete rearrangement of courses and a consequently heavy burden of teaching. However, he still managed to carry out a great deal of field and laboratory work. At this time much of the large state of South Australia was still geologically unknown except in the most general way, but Mawson was able to examine a large proportion of it using varied means of transport—bicycle, horse-and-cart, camel and, later, motor truck. Whenever possible he gave his students the stimulating experience of accompanying him on these trips.

Mawson's earliest work was in the fields of mineralogy and petrology and he was particularly interested in the physico-chemical aspects of these subjects. It was undoubtedly the wealth of minerals which first attracted him to the area around Broken Hill. He recognized two divisions in the Pre-Cambrian rocks of the region and later work has shown the soundness of his field work and deductions. In the newer rocks he recognized the presence of glacial beds, an event which was to have great significance in his later work.

Mawson's knowledge of Antarctica had given him a deep interest in glaciology and he now found that the Proterozoic glacial beds, first found by W. Howchin in the valley of the River Sturt near Adelaide, were of even wider occurrence and greater importance than had formerly been believed.

The notable occurrence of uranium ores at Radium Hill in the region in which Mawson had been working had stimulated his interest in the minerals of the rarer elements. It was natural that when other important occurrences of uranium minerals were found near Mt. Painter at the north-eastern extremity of the Flinders Ranges, he should immediately visit this locality. In addition to the exciting nature of its mineralogy, Mawson also noted that the region of the Flinders Ranges had wonderful exposures of the Proterozoic sediments of the Adelaide System and that glacial beds were prominent. From this observation developed the work which was Mawson's great contribution to South Australian geology and to our knowledge of Proterozoic glaciation. For about thirty years he made one or two field trips every year to the region. Some of it was extremely difficult of access but to Mawson this seemed an added attraction. He published a series of papers showing carefully measured sequences at various places in the Flinders Ranges and his knowledge of the whole large area was unrivalled. Apart from the importance of this contribution to Australian stratigraphy, there was the knowledge of the extraordinarily wide extent and the long duration of the Proterozoic glaciation.

Although Mawson's principal contributions to geological knowledge were in the fields of mineralogy and petrology, Pre-Cambrian stratigraphy and glaciology, his interests were very widespread and included such diverse subjects as the activities of algae and the origin of carbonaceous sediments.

Mawson became a Fellow of the Geological Society in 1918 and was awarded the Bigsby Medal in 1919. He received a great number of honours from other scientific bodies, from universities and governments of many countries. Notable among these were the honour of knighthood in 1914, fellowship of the Royal Society in 1923 and the presidency of the Australian and New Zealand Association for the Advancement of Science in 1935–1937.

Although Mawson was offered attractive positions in universities in several continents he preferred to live and work in Adelaide. Of striking appearance and friendly nature, he gained both the respect and the affection of generations of students, many of whom had accompanied him on field camps. To his colleagues in the University he was the most delightful of companions with a great sense of fun. A wide section of the Australian public mourned the death of a man of great personality and great achievement. By order of the Prime Minister of Australia he was accorded a State funeral, a very rare honour for one who was not an official servant of the State. A. R. A.

Dr. Felix Oswald died on 3 November 1958 on his ninety-second birthday. Little is known of his early years but under his father's influence he worked for and gained the B.A. degree of London University, and then entered the Civil Service. Following his own inclinations he now studied geology, botany and zoology and passed the B.Sc. degree examination with first-class honours. He was particularly interested in petrology and his artistic skill was often enlisted for the illustration of papers. A good example of his work is to be seen in J. J. Teall's *British Petrography*, for which Oswald produced a number of coloured drawings.

In 1898 he was given a special extension of his vacation period that enabled him to accompany H. F. B. Lynch on his second tour of Turkish Armenia. On the journey Oswald made abundant observations on rocks and other natural objects and upon the precise positions of important topographical features. He also made a close study of the volcano Nimrud. Arising out of this journey he wrote *The Geology of Armenia*. Finding that the cost of making duplicates of this massive work for use as a thesis was prohibitive, he set up a press at home and, as he told the present writer, printed and bound two hundred copies. The figures and maps for these he coloured by hand. The volume was issued in 1906 and shortly afterwards he gained the degree of D.Sc. Later he exhibited a geological map of Armenia at a meeting of the Society. In 1907 he was elected a Fellow and was awarded the Murchison Fund in recognition of his work on Armenia. His interest in palaeontology is indicated by two articles in *Science Progress*, " The degeneration of armour in animals " (1909) and " The sudden origin of new types " (1911).

In the winter of 1911–12 he went, on behalf of the British Museum, to Kenya to investigate some newly discovered mid-Tertiary beds con-

taining vertebrate remains, situated in the country south of the Kavirondo Gulf near Karungu. An account of this work was published in the *Quarterly Journal* (1914, **70**, 128–62). The fossils he collected were described by C. W. Andrews, who dealt with the Mammalia and Chelonia, and by R. B. Newton, who did the same for the Mollusca. He also wrote an interesting account of his experiences on this expedition in a book entitled *Alone in the Sleeping Sickness Country*.

In 1915, following a request from the Russians, Oswald was sent out by the Government to help in the search for new sources of oil in the Caucasus. In this he was successful, and he also produced a new geological map of the Caucasus. In 1918 he lectured to the Society on " The Nimrud crater in Turkish Armenia " and exhibited a coloured geological model of the volcano.

On his appointment as Probate Officer in the East Midlands in 1905 he moved to Nottingham. From 1910 onwards he became progressively involved in excavating Margidunum, a Roman station on the Fosseway ; a task which he continued until his retirement twenty-six years later. Together with the associated studies this activity robbed geology of a scholarly and brilliant geologist, but placed him in the front rank among students of Roman archaeology. In 1926 he retired to Solva in Pembrokeshire where, during the next twenty years, he enriched the literature of the subject with his contributions and was often consulted by archaeologists who sought the benefit of his profound knowledge and experience.

H. H. S.

Geoffrey Alan Peet, who was elected a Fellow of the Society in 1948, died on 6 April 1959 at the age of 37 years. He took the geology course at the Working Men's College in 1947–8, after service during the Second World War in the R.A.F. Air-Sea Rescue Section, in which he was a motor-boat coxswain. From 1948 to 1958 he was, first, Senior Beacon Inspector and afterwards Mining Warden in the Department of Mines, Tanganyika, transferring in 1958 to the Department of Commerce and Industry as a Commercial Officer.

Peet's principal scientific interest was speleology, and he made many contributions, mostly relating to the origin of limestone and other caverns, to *The British Caver* and the *Records* and *Proceedings* of the London Speleological Group. Two papers on Tanganyika caves were published locally. He also made surveys of caves and old mines in Great Britain of which there were no existing records. He was for a time Secretary of the London Speleological Group.

The above information was kindly supplied by the Commissioner for Mines, Tanganyika, through Mr. C. C. Bisset.

Marie Carmichael Stopes was the eldest daughter of Henry Stopes, solicitor and archaeologist. Born in 1880, she spent the years 1900–1902 at University College London, under the stimulating influence of F. W. Oliver, graduating B.Sc. with honours, later taking her doctorate and eventually becoming a Fellow of the College.

She studied in Munich for the next two years, being the first woman to work in the botanical department under Goebel, and was awarded

a Ph.D. In 1904, as demonstrator and later as lecturer, she joined F. E. Weiss's department at Manchester, where she was the first woman to be appointed to the scientific staff of the University. She immediately began to work on the great collection of fossil plants housed there, examining the mode of occurrence of " coal balls ", and publishing (in collaboration with the present writer) an account of their distribution and mode of origin in the *Philosophical Transactions* (1909, **B200**, 167–218).

A year or two later, at the suggestion of Professor Fuji of Tokyo, then working in Manchester, she visited Japan to hunt for "coal balls" ; finding none, she collected a number of plants with well-preserved structure from calcareous nodules full of Cretaceous ammonites, and published various papers on them in the *Annals of Botany*, thus continuing in that journal the series of papers begun in 1903. This work led to a wider study of Cretaceous plants, resulting in a catalogue of the British Museum collection (published as parts V, 1913, and VI, 1915, of the *Catalogue of the Mesozoic Plants*).

In 1914 she examined the fossil plants from the " fern ledges " of Nova Scotia, and published an account of their fossil flora. In 1918, with R. V. Wheeler, she published a *Monograph on the Constitution of Coal*, introducing the terms " fusain ", " vitrain," etc. as names for commonly recognizable elements in sections. This work gave her an international reputation, for it was, in a modified form, accepted as the basis for the classification of coals at the Third International Congress on Coal in Heerlen in 1935.

Dr. Stopes's scientific work thus falls into three parts, the consideration of the mode of formation of " coal balls ", the nature of the Cretaceous flora, and the structure of coal itself. It covers a wide field, and is all accurate and interesting. Her later activity in public affairs tends to obscure her place in the world as the author of important scientific work.

D. M. S. W.

Samuel Hazzledine Warren, who died on 27 March 1958 in his eighty-sixth year, was an amateur geologist and prehistorian of international repute, noted for his flair for discovery and his independence of outlook.

Born on 30 June 1872, at Claremont, Goffs Oak, Hertfordshire, he was the only child of the second marriage of Stephen Warren with Hannah Mary Hazzledine. He was educated privately and for a time joined the family business, that of wholesale provision merchants, first in Whitechapel High Street, and later in Tooley Street, London.

Warren had no formal education in geology. He once said that he had no idea what turned his attention to the subject, for he could not remember a time when he had not the spontaneous impulse to collect stones. His later interest in the fracture of flint was preceded, he said, by his fascination in the curious conical structures (" cone-in-cone ") which as a boy he had observed in anthracite stored for the greenhouse stove. Although he devoted the greater part of his life to the latest geological formations and their associations with early man, he began by studying mineralogy and the rocks of the earlier periods. At the age of seventeen he spent a considerable time in North Wales and, lacking any personal guidance or

help, he gained greatly, he said, from his determination to puzzle out for himself the geology of that country, with the Survey Memoir by A. C. Ramsey as his only guide. At the age of twenty-five he published his first geological paper, which dealt with rubble-drift at Portslade in Sussex. He soon displayed that independence of outlook for which he became so renowned, and at the age of twenty-eight he exhibited flints at a meeting of the Geologists' Association, to show that the so-called " eoliths " could be of natural origin.

As a result of prolonged field observations, supplemented by ingenious experiments in his workshop, Warren showed how natural agencies such as soil-creep, sub-soil and sub-glacial pressure can fracture flint in ways simulating human work. These investigations led him to adopt a cautious and eventually extremely critical attitude, not only towards the classical eoliths but to the chipped flints regarded by many as " pre-Palaeolithic artifacts " in and below the Crag deposits of East Anglia. He was one of the leading figures in that acrimonious controversy which raged over the Sub-Crag flakings during the first quarter of this century. At one time his view was that of a small minority, whereas now it is shared by the majority of prehistorians. He showed that nearly fifty per cent of the flints in the Sub-Crag Stone Bed are flaked to some extent. As the deposit covers several hundred square miles, his logic was really irrefutable when he said that " a widespread natural cause was probably responsible ". The striations and bruisings shown by many of the flints are consistent with his idea that the chief cause of the flaking was the grounding of local pack-ice which jammed together flints strewn on the floor of the shallow Crag sea in Early Glacial times.

His best known discovery was the Clacton spear—the oldest known wooden artifact in the world. He found this in 1911 in the *Elephas antiquus* Bed at Clacton-on-Sea, associated with an industry of flint flakes and chopper-cores which he was the first to recognize as representing a distinct early Palaeolithic tradition, for which he proposed the name "Clactonian" in 1927 (this term was subsequently adopted by Professor l'Abbé Breuil).

Largely through spending a week or two each year combing the foreshore exposures, Warren built up an enormous collection of flint artifacts and fossil material (seeds, molluscan shells and mammalian remains) from the Clacton beds, which he recognized as filling an old channel of the Thames. After the Second World War, he gained the co-operation of Dr. H. Godwin in applying new techniques to their study. In 1950, using a grant from the Gloyne Fund, Warren superintended boring operations on the front at Clacton, which provided material for systematic pollen analysis of the various layers. The results of this research, published in the *Quarterly Journal* (1955, **111**, 283–307), led to the conclusion that the Clacton Channel deposit belonged to the interglacial now known as Hoxnian.

The late Pleistocene " Arctic Beds ", rich in fossil remains, which form part of the Upper Flood-plain Terrace at Ponders End and elsewhere in the Lea Valley, were discovered by Warren in 1910 and led to another important series of papers in the *Quarterly Journal*. His collections from these beds, including seeds, mosses, shells and insect remains, as well as

mammalia, are a tribute to his skill as a collector. After the Second World War, he discovered a further series of deposits, including peats, exposed by gravel diggings at Nazeing near Broxbourne, and these provided a link between Late-glacial and early Post-glacial times. Pollen-analysis was applied to these layers, which were the subject of a long paper by Warren, in collaboration with others, in the *Philosophical Transactions of the Royal Society* (1952, B**236**, 169–238).

For over half a century Warren carried out innumerable geological and archaeological investigations in Essex, where he had gone to live about 1904. When he received the Prestwich Medal in 1939, the President said that an interesting feature of Warren's work was the way in which he had carried the methods of Lyell into the field of archaeology : that is to say, he studied present-day analogues in order to throw light on prehistory. For example, his studies of the primitive huts of the charcoal burners of Epping Forest were used to elucidate observations on prehistoric hut-circles. Again, his observations on the fracturing of flint now occurring through movements in the Bullhead Bed below the Thanet Sands at Grays served to confirm his doubts on the human origin of eoliths.

His investigation of the submerged land-surface (the " Lyonesse " surface) on the Essex coast led to a number of important archaeological finds. He also conducted archaeological enquiries further afield, notably in Norfolk, Lincolnshire, the Isle of Wight, Cornwall, North Wales and France. Returning in 1919 to the geological stamping ground of his youth, he discovered at Graig Lwyd, on the northern slopes of Penmaenmawr, the first Neolithic axe-factory known in Britain outside the flint country. Finished axeheads of the Graig Lwyd greenstone (augite granophyre), forming Group VII of the nomenclature introduced by the Committee on the Petrological Identification of Stone Axes, have been found at widely scattered localities in England.

Many students of prehistory and Pleistocene geology, young and old, benefited from the friendly hospitality of Warren and his devoted wife (who died in 1937). He was always ready to give students the opportunity of examining his extensive collection stacked with such ingenuity in his small private museum at " Sherwood ", Loughton. Part of his collection, including all the Pleistocene mammalia, was acquired by the British Museum (Natural History) in 1936. He bequeathed the remainder of his collections to the British Museum, where they have been divided between the Department of Palaeontology and the Department of British and Medieval Antiquities.

Warren was elected a Fellow of the Society in 1898, and served on the Council from 1917 to 1920. He was awarded the Prestwich Medal in 1939. He served as President of the Geologists' Association (1922–24), of which he was made an Honorary Member and from which he received the Henry Stopes Memorial Medal. He was one of the earliest members of the Prehistoric Society and was elected an Honorary Member. He served for many years on the Council of the Royal Anthropological Institute, and was twice President of the Essex Field Club (1931–5, 1940–42).

A complete list of Warren's published work (1897–1958), which included seventy papers of major importance, is being published in the *Essex Naturalist*.

K. P. O.

Errata

Proceedings No. 1566: p. 40, l. 20 from bottom: *for* Dr. J. M. VAN DER VLERK *read* Dr. I. M. VAN DER VLERK.

Proceedings No. 1570: p. 111, l. 18 from bottom: *for* LENSON *read* LENSEN.

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PROCEEDINGS

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SESSION 1958–1959

Nos. 1564—1572

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1959

QUEEN'S UNIVERSITY
KINGSTON, ONTARIO

December 12, 1958

Mr Monty Berger.
McGill Graduates Society

Dear Mr Berger

I have just read the notice of the death of Professor G. Vibert Douglas in the latest McGill News. Miss MacDermot wrote me that because she had compiled this paragraph (obviously without reference to Who's Who or the family) you would not publish the sketch I sent. My reasons for writing you are: (1) no mention of his military service. Though he was in the McGill O.T.C. 1914-15 and was called to the Northumberland Fusiliers by Col Ankland Geddes & Capt Percy Nobbs and he was away from his undergraduate course for 4 years. All this and his being awarded the M.C. + twice Mentioned in despatches was overlooked in compiling the McGill war record where he is not mentioned. (2) That a McGill man was Chief Geologist

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(3) That a man holding the position of Carnegie Professor of Geology for 25 years at Dalhousie should be referred to as having "lectured in geology" is misleading and for a university publication is inadequate

(4) No reference to Fellowship in Roy. Soc. Can. or Geological Society of London

Could you not take the sketch I sent you, add it & put that on return from the Antarctic. Professor Douglas presented McGill with the beautifully preserved King Penguine now in the Redpath Museum. Add, too, that his kindness and generosity to needy students and refugee professors was almost without bound. and include this in the next issue.

Please do not dismiss this note without showing it to Dr J.T. Donald & to Dr D.L. Thomson.

I remain Yours very truly

A. Richard Douglas.

December 12, 1958.

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McGill University,
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AVD:BJT.

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A. Vibert Douglas.

AVD:BJT.

George Vibert Douglas, M.C., F.R.S.C.

b. Montreal 1892. d. Toronto 1958.
McGill B.Sc. 1920 M.Sc. 1921

War Service: From McGill COTC (1914-15) at request of Col. A.C. Geddes and Capt Percy Nobbs to 17th Northumberland Fusiliers 1915 April - 1919 Sept. Capt. (on loan to Royal Engineers) M.C. Jan. 1918 Twice mentioned in dispatches.

Geologist on Shackleton's "Quest, R.Y.S." Expedition to Antarctic 1921-22. Reports on geology of South Georgia, Elephant, Gough, Nightingale islands, Tristan da Cunha and St Paul's Rocks.

Chief Geologist, Rio Tinto Co. 1925-31 in Spain and Northern Rhodesia (Zambia)

1st Carnegie Professor of Geology at Dalhousie University 1932-1957

G. V. Douglas - cont.

Acting Provincial Geologist (honorary) N.S during 2nd War - 1940-45, in search of minerals for war needs.

Leader of Newfoundland Expedition up Labrador coast to Cape Chidley

Special Reports for Defense Research Board, Ottawa, 1948-51.

Fellow of Royal Society of Canada
Member Eng. Inst. Can.
Am. Ass. of Mining & Metallurgy
etc

A great teacher and leader of men.

BIOGRAPHICAL SKETCHES OF DECEASED MEMBERS

GEORGE VIBERT DOUGLAS

George Vibert Douglas, a founding member of the Mineralogical Association of Canada, died suddenly in Toronto on October 8th, aged 66. Montreal born and a McGill University M.Sc. he later did research at Cambridge and Harvard Universities. Gallant in the true sense of the word he won the Military Cross and was mentioned in despatches in World War I. Never happier than when in the field, his geological investigations took him to Antarctica with Sir Ernest Shackleton, to Rio Tinto, Africa, the Caribbean and many areas in Europe, United States and Canada. In 1932, he was appointed Carnegie Professor of Geology at Dalhousie University and held that chair until his retirement in 1957. He had moved to Toronto and established himself as a consultant geologist. An inspiring teacher and untiring researcher he enthusiastically endeavoured to guide his students on a never-ending search for truth. Professor Douglas is survived by his wife, two sons and two daughters, to them go the Association's deepest sympathies.

N.R. Goodman

Taken from THE CANADIAN MINERALOGIST
Journal of the Mineralogical Association of Canada
Vol.6, part 3, 1959

New Arts Building,
Queen's University,
September 17, 1962.

Dear Dr. Douglas:

With reference to our conversation this morning I am sending you the above memorial about your brother.

Sincerely,

Ina Speers.