

THOMAS NEVILLE GEORGE

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Elected F.R.S. 1963

BY BERNARD E. LEAKE

THOMAS NEVILLE GEORGE, later renowned as a Carboniferous stratigrapher and palaeontologist and also as a geomorphologist, was born in Morriston, Swansea, on 13 May 1904, being the elder of two children and the only son of Thomas Rupert George (1873–1933) and Elizabeth George (née Evans, 1875–1937). The family background on both sides was dominated by school teaching driven by a deep-seated moral belief in the ability of education to improve and enrich the lives of otherwise impoverished folk. His father, Thomas Rupert George, had attended the University College of Wales at Aberystwyth and originally came from Port Eynon. He became a school teacher and eventually headmaster in a Swansea school but much of his time was given to Socialist politics, particularly in organizing the local Trades and Labour Council, of which he was an honorary secretary. Neville's mother, Elizabeth, was a school teacher from Swansea Training College and for a short time taught her son at his first primary school. She came from a chapel-going family, whereas his father did not, and Neville attended chapel sporadically until he was eight but not thereafter. Thomas Rupert George's father, William George (1844–1917), was a farmer's son from Pembrokeshire who settled in Port Eynon in the Gower Peninsula near Swansea and for 40 years he was the headmaster and solitary teacher in the village school. He significantly influenced both his son and grandson and two other of his children (in addition to Thomas Rupert) who became teachers so that there was a gaggle of teachers in the family with paternal grandfather, father, mother, sister, father's brother, father's sister – and later Neville's wife, wife's mother, wife's brother and wife's sister – an impressive pedagogical array which unquestionably contributed to Neville's life-long interest and support for education from curriculum to examination, from school to adult education and from professional training to cultural enrichment.

Neville's childhood was a contrasting alternation between the political ferment and Anglo-Welsh culture of the busy port of Swansea with its metal smelting, coal, steel and other heavy industries, and his vacations spent at his paternal grandfather's cottage in Port Eynon, a Gower village, wholly Anglicized, conservative, traditional, remote and almost exclusively agricultural but which allied itself to his nature and undoubtedly influenced his life-long dedication to the study of the rocks of Gower. Although not an impoverished family, the income was small and straitened



T. Neville George

circumstances were normal. Even when Neville entered university in 1920 his father's income was only £120 per year.

His schooling began in 1907 at the age of three when he entered the Pentrepoeth Infants' School in Morriston and in a very progressive way was subjected to learning by doing, drawing pictures with crayons and making pots with red clay that were fired in an oven. At six, in 1910, he went on to Morriston Boys' Elementary School where he found himself in his father's class and stayed there for four years. His father was a very good teacher both academically and in his well-balanced treatment of his son as a pupil who happened to be in his class. Unforced, in a home in which both parents were teachers, Neville was able, at ten years of age, to obtain a scholarship to Swansea Municipal Secondary School, later Dynevor School. The school was humdrum and he received a routine grounding in the usual subjects but Latin and Welsh he never mastered. His interest in discovery was awakened by an inspired chemistry teacher, David Davies, who encouraged him to investigate the rusting of iron and by so doing excited him with the prospect of studying science. In 1919 at the age of 15 he obtained a first class in the Oxford local Senior Certificate taking eight subjects, World War I having largely by-passed him apart from a brief period in the cadet force. In 1919 he transferred to the sixth form of Swansea Grammar School, a fee-paying institution of 17th century foundation. Here a group of outstanding teachers stretched him, particularly in chemistry and mathematics, introduced him to astronomy and eventually enabled him to gain university entrance.

STUDENT YEARS; SWANSEA AND CAMBRIDGE

The school wished Neville to stay on to attempt a scholarship to Oxford or Cambridge but the family finances could not afford another year's support and providentially the University College of Swansea opened in 1920 and offered a scholarship to local boys in penury. He sat and was successful as the first Senior Scholar of the College, entering the science faculty in 1920 at the exceptionally early age of 16. There were 89 full-time students in the whole college in the first session. He had intended to specialize in chemistry, but two weeks vacation work in a local chemical factory making sulphuric acid brought home to him the monotony of much industrial chemistry. Completely by chance, during that vacation, he met in Gower the Principal (Sir) T. Franklin Sibly, a geologist (formerly Professor of Geology in Newcastle and before that in Cardiff) and the first Principal of University College, Swansea. He introduced Neville to the wholly new world of geology, his views on biostratigraphy and tectonics and the existence of abundant Carboniferous fossils on Gower. This fired Neville with the possibilities of geology and it was wholly to his liking that the first year course compulsorily embraced geology, with chemistry, physics and mathematics. In 1921 he took and passed Intermediate B.Sc. (Wales) and Intermediate B.Sc. (London) the latter being an insurance of standards as it was not clear what the status of the new College's degree would be.

The first year at college confirmed him in his interest in geology despite excellent teaching in chemistry (J.E. Coats), physics (E.J. Evans) and particularly in mathematics

(Professor A.R. Richardson, F.R.S.). He also studied botany for one year and zoology for two years. Most enticing were the geology lectures by A.E. Trueman (later Professor and F.R.S.) who was himself a distinguished palaeontologist, a Carboniferous stratigrapher, an expert in landscape evolution and concerned with the importance of adult education, all of which enthusiasms he transferred to Neville George. Trueman had been taught by H.H. Swinnerton and strongly influenced by him and there is a clear thread of derived direction from Swinnerton to Neville George. Swinnerton had broad interests in palaeontology and evolution with exciting new ideas, was a stratigrapher ranging from Millstone Grit to post-glacial peats, was committed to adult education, to school management and to social service, wrote popular books and lectured widely in his home county and possessed the ability to teach in geology, geography, botany and zoology. Principal Sibly, with his Carboniferous interest, also maintained an interest in Neville and it was almost inevitable that the single prospective honours geology student should be guided into the fields of interest of his mentors, especially as they coincided with the rocks of his beloved Gower. Petrology and structural geology were not among the strengths of the early department. As a single honours student in a small department he was in very close formal and informal contact with Arthur Trueman and much of what he learnt from Trueman was acquired from close personal contact which reinforced the high moral standards with which he had been imbued by his parents. While still an undergraduate he first published (1)* on variations in the common cockle shell – an obvious suggestion from Trueman – and then on the stratigraphy of the Carboniferous Limestone in Gower, in which Sibly's influence is evident, but the latter paper (2) was joint with Trueman. It became apparent that here was an unusual undergraduate of outstanding academic potential. In 1924 he was the first student to graduate in Swansea with B.Sc. (Wales) with first class honours in geology. Professor O.T. Jones of Cambridge was the external examiner.

This degree and his personal record enabled him to be elected to an Eyton Williams studentship for 1925 and a university postgraduate award for 1926, both tenable at Swansea. He obtained an M.Sc. (Wales) in 1925 for his research on the North Crop of the South Wales Coalfield: a topic almost accidentally acquired as a result of a day excursion which revealed the sub-Visean unconformity. He also included work on brachiopod morphology and published, jointly with Trueman, on the correlation of the Coal Measures in the western South Wales Coalfield. The external examiner for the M.Sc. was again O.T. Jones. This led to the award of a Fellowship of the University of Wales in 1926 and with this support, and no doubt the encouragement of O.T. Jones, he became a postgraduate at St John's College, Cambridge. This transformed his hitherto local life, lived at home but largely spent in college, for his Swansea college life was not entirely academic.

During his six years as a student in Swansea he obtained a blue in hockey and had

* Numbers in this form refer to entries in the bibliography at the end of the text.

from time to time represented the College in soccer, rugby, tennis and cricket, even though this was sometimes prompted by an inadequate number of players being available in a small college to complete the number required for a team. In addition he served as President of the Literary and Debating Society and of the Political Union and as Treasurer of the Students' Representative Council. In short, he was heavily involved in college life. It was during his time at Swansea that he became colloquially known as 'TN' and this he retained throughout his life.

At Cambridge he did not become similarly absorbed by college life although he did play hockey in winter and cricket in summer. He missed the internal college activities that he had been so involved with at Swansea, no doubt in part because he came into St John's as an older student, a graduate with already two years of postgraduate experience, and perhaps also because the social background of most of the Cambridge undergraduates would have been rather different from those at Swansea. For the first time he lived away from home and he appreciated the paternal care of his college tutor, Mr J.M. (later Sir James) Wordie, the renowned Polar explorer. At the Sedgwick Museum his academic supervisor was Mr Henry Woods, F.R.S., whom TN regarded as a dry, unforthcoming man whose palaeontology was restricted to rather arid morphology and who, in complete contrast to the free-ranging open-minded curiosity of Trueman, considered speculation, even discussion of evolutionary principles, to be beyond the pale for any reputable scientist. TN, however, learnt much on technical morphology from Woods but got no inspiration. Indeed when TN submitted drafts of his Ph.D. thesis (on spirifers), Woods would say 'You've been immersed in the subject longer than I have and know more about it than I do; there isn't much I can tell you that would help and there isn't much I could tell you without presumption'. In fact Woods never read any part of TN's formal thesis. TN considered the main benefit he obtained from the Sedgwick Museum was derived from informal contact with other postgraduates and from the meetings of the Sedgwick Club although it should be pointed out that Woods's insistence on meticulous detail in morphological description, when combined with the interpretative inspiration he had received from Trueman, provided a powerful combination which was to influence much of TN's palaeontological researches. He received the 1927 Bonney Award for field geology while at St John's College, published three papers, two on Avonian brachiopods (3, 4) and a third, and most substantial (5), on the Avonian Carboniferous Limestone of the North Crop of the South Wales Coalfield, and in 1928 obtained his Ph.D. on Avonian spirifers with Dr F.L. Kitchin, F.R.S (palaeontologist to the Geological Survey) as examiner.

The next two years (1928–30) were difficult as very few suitable professional vacancies occurred and he applied for only four posts, none of which he gained. He returned to Swansea and maintained himself, by part-time demonstrating in the Department of Geology and Geography at Swansea College, on £150 a year. This demonstrating was 'all-purpose' and included lecture courses in structural geology, geomorphology, elementary meteorology, some stratigraphy and some palaeontology, in addition to laboratory work. All this was valuable teaching experience and enabled

him to keep up his research work and to continue publishing. In 1929 he became a Fellow of the Geological Society of London.

EMPLOYMENT WITH THE GEOLOGICAL SURVEY

In 1930 TN gained employment as a geologist in H.M. Geological Survey. His very first task from the first day was to advise on the problem of groundwater flooding along joints in the lead mines of the Flintshire Halkyn Field and this gave him his first experience of metalliferous mining and his first visit down a mine other than a coal mine.

His first mapping duties were in Shropshire where he mapped Old Red Sandstone and Carboniferous rocks in the north of the Forest of Wyre Coalfield and on the eastern flanks of the Clee Hills. In 1931 he was transferred to the country around Droitwich, Worcestershire, and for the three seasons, 1931–33 inclusive, he mapped New Red Sandstone and Pleistocene deposits which he found dull and uninspiring, largely because the solid rock was poorly exposed, unfossiliferous, never dipping more steeply than six degrees and with only a few simple normal faults. The only fossils he discovered in three seasons were in a scrap of Lias, which was a poor reward for a Ph.D. in palaeontology. It was symptomatic of the malaise that was even then gripping the mapping work of the Survey that the one inch (1:63 360) sheet (182) for Droitwich did not appear until 1960. The glacial and post-glacial deposits he found were interesting and linked with his already developed researches on the Pleistocene of Gower. His District Geologist, Dr Bernard Smith, F.R.S., proved a great help to him in reaching the high mapping standards of the Survey.

Economic problems were a new venture for TN but the three years he was in the Survey involved him in a project examining the potential for using slate waste as a filler in concrete, and required him to visit and examine most of the important slate quarries of Wales, including those of Pembrokeshire, the Machynlleth district, Portmadoc and Blaenau Ffestiniog, Caernarvonshire and of the Llangollen district. He advised on the phosphate deposits of central Wales, the gold workings of Dolgelley and Camarthenshire, coal mining in north and south Wales, water supply problems in Wales (Cardiff, Newport, Llanelly) and the lead mines of north Wales as already noted.

During some 18 months of indoor seasonal work at the Museum of Practical Geology (then at 28 Jermyn Street) he was engaged in the preparation of exhibits illustrating the geology of Wales for the intended new Geological Museum in South Kensington. This required him to make a detailed study of the geology of Wales including field excursions to various parts, chiefly the mountains of north Wales. He was an obvious choice to prepare a revised synthesis of the geology of central Wales in the form of a new edition of the quarter inch (*ca.* 1:250 000) sheet (14) for central Wales (1934). Other maps in which he assisted included one of northwest Wales and the coalfields of Britain. From an already well-developed knowledge of the geology of south Wales he became expert on the geology of the whole principality and undoubtedly the most notable feature of his time in the London office of the Survey was that he was asked to write the first editions of the *British regional geology handbooks*

of north Wales (1935) with B. Smith and also of south Wales (1937) with J. Pringle (6, 7). These were a new venture to accompany the opening of the regional geology displays in the prestigious new Geological Museum and Survey headquarters in Exhibition Road, London. To be asked to coauthor two of these new publications was not only an accolade but was particularly appropriate because it tapped a resource that distinguished TN throughout his scientific career; his ability to synthesize his intimate knowledge, to generalize and to present a clear picture unobscured by distracting detail, a characteristic undoubtedly promoted by the example of his closest mentor, A.E. Trueman. The handbook series proved to be enormously popular and he subsequently undertook several revisions of the two Welsh ones and they put a clear stamp on his ability to instruct and communicate with the non-expert.

While in the London office of the Survey in the winter of 1930–31 he continued postgraduate research at Birkbeck College, where he had some slight association with George McD. Davies, on the construction of palaeogeographical maps, an aspect he later followed in more detail. In the three years he was in the Survey he gained enormously from the varied tasks involved, became an expert on the geology of Wales and under the instruction of B. Smith and T.H. Whitehead gained the ability to record precisely field observations onto a geological map.

In 1932 he gained his D.Sc. (Wales) for his researches into Lower Carboniferous rocks and fossils, with Professor H.L. Hawkins and Dr W.D. Lang as examiners. At this time he had 14 publications on the subject.

Also in 1932 he married Sarah Hannah Davies, formerly a fellow-student (graduated 1928) at Swansea College, in a registry office followed by a ‘reception’ in an ice-cream parlour, for both TN and his wife were totally non-religious, TN being a rationalist. Sarah was a teacher, an M.A. (with distinction) of Wales (1932), later a Ph.D. of London, and she went on to be a tutor (lecturer) in the Extra-Mural Department of the University of Bristol, with responsibility for Wiltshire. Later Sarah became a tutor in English in the University of Glasgow and part-time tutor in the Glasgow School of Drama and was for many years on the Board (and for a time chairman) of the Glasgow Citizens’ Theatre Society. She insisted on being known as Dr Sarah Davies at a time when it was unusual for a married woman not to bear her husband’s name and this created several oft-quoted occasions when respectable hotels balked at allowing joint occupancy of one bedroom. There were no children and her pickled excised ovaries were proudly displayed on the mantelpiece of their home to the chagrin of less medically inclined visitors. Good natured, but quite persistent argument, even in public, characterized their close relationship and the torrents of instructions ‘Nev’ received while driving, in later years, would have fuelled the vehicle indefinitely, if converted into petrol. They remained devoted companions until TN’s death.

PROFESSOR AT SWANSEA

In 1933 A.E. Trueman resigned the Chair at Swansea to take the Channing Wills Chair of Geology at Bristol, vacated by S.H. Reynolds. TN applied for the Chair of Geology and Headship of the Department of Geology and Geography at Swansea,

and was appointed at the extraordinary age of only 29. His printed application included testimonials from four Fellows of the Royal Society of London, Sir John Flett (Director of the Geological Survey of Great Britain), B. Smith, H. Woods and F.L. Kitchin together with Professor H.L. Hawkins of Reading, and his referees were Sir John Flett, T.F. Sibly (then Vice-Chancellor of the University of Reading), A.E. Trueman and O.T. Jones, F.R.S.; an impressive backing. In research he had published 24 papers concerning chiefly Carboniferous stratigraphy and palaeontology, with theoretical palaeontology and Pleistocene and recent physical geography of part of the coast of south Wales being subordinate. In theoretical palaeontology he had considered relations between the life-history and evolution and the development of certain Jurassic ammonites (8) and also of Carboniferous spirifers (9, 10). He was writing a book on mimetic evolution (the phenomena of convergence and parallel evolution) but this never appeared under that title and although it was claimed to be nearly completed in 1933, did not appear until 1951 and was then titled *Evolution in outline* (11). His most lasting contributions at this stage were his detailed papers on spirifers (and already he was investigating the Carboniferous brachiopods of France, Belgium and western Germany) and the structure and zonal successions of the south Wales Carboniferous Limestone.

Viewed dispassionately, the appointment of a man who had spent only five years away from Swansea was surprising and TN himself ascribed it to the weakness of the competition for a post in what was still a very small provincial college with only 400–500 students, the sentimentalism of ‘local boy makes good’ in a parochial Welsh environment and the inadequacies of the funding, facilities and accommodation in the Department. The College was still housed within the confines of a country house in which the sole geology laboratory was a converted bedroom, the workshop an old linen room and the professor’s room a former maids’ sitting room. Funds and staff matched this accommodation but as a former student and demonstrator TN’s expectations were not high and he expected to do research and teaching with minimal support. No doubt his by now wide knowledge of the geology of Wales; his locally based research which called for little expenditure; his amiable character; his significant experience of teaching Swansea students both in geology (intermediate to honours standard) and geography (physical geography and geomorphology) and in field excursions, including student mapping parties in various parts of England, Wales and Ireland; his evident ability as a fluent speaker who could give a lucid exposition of a complex subject; his Geological Survey experience and his prestigious degrees, publications and backers, convinced the selectors of his fitness for the post.

The staff of the Department were indeed limited in number, being Alan Stuart, who later became Professor of Geology at Exeter University, and Brian Simpson. He suffered psychologically from the fact that so many of his colleagues in science, even Alan Stuart, had been his teachers, a problem exacerbated initially by the disconcerting experience of having to teach his sister, Marion Thelma, who at his parents’ home provided a running criticism of his defects as a teacher. However, to TN’s relief she transferred to Aberystwyth to graduate in zoology, subsequently becoming a school

teacher and then a lecturer in Bangor Training College (Y Coleg Normal). The teaching duties in geology and geography were heavy with six or more hours of instruction each day, there were field excursions at weekends and an annual Easter long excursion to places such as Dolgellau, Church Stretton, St Davids, Frome, Gloucester and Eire. These excursions were mainly by train and then on foot, for the motor coach only entered the scene for long excursions in the latter part of TN's time in Swansea. Apart from his teaching duties he seemed to spend a minimum of time in the Department and was regarded as a compulsive researcher. He never held staff meetings of a formal character; a few words at the beginning of the session allocating courses was as far as meetings went. He was not one to waste time on social gatherings and rarely attended for tea or coffee so that in some respects he was rather remote, a circumstance partly the result of his desire to concentrate on research and partly triggered by the rather difficult psychological position he first found himself in upon his return to Swansea. He would meticulously fulfil his wide-ranging teaching and other duties and then disappear to his Gower retreat or into the field. He and Sarah are well remembered by many students for their hospitality at home to small groups of more senior students and he was generally regarded as affable, helpful and generous. Thus he paid all the costs of taking his final Honours students to London for six days to visit the museums and, in the evenings, the theatres. He loved debate and his seminars and tutorials were lively discussions of a wide range of topics. In the field he could exist all day on a bar of chocolate and was reluctant for either himself or others to lose time with lunch but in his younger days he ate heartily at the table; subsequently in Glasgow he became almost ascetic, eating neither lunch nor a substantial meal at other times. Already he had an almost touching faith in the ability of his staff to substitute for him at short notice on almost any subject with little or no briefing. For example, 'I'm off to London, please take my palaeo. lecture, I'm doing the ammonites' was all the guidance Brian Simpson would get.

Professor Howel Francis writes:

To undergraduate students just before and during the first years of World War II he was a totally scintillating mentor and teacher: as likely to engage us outside the classroom on the relative merits of Beethoven and Wagner as to illuminate his lectures by bodily contortions designed to show how the long-vanished soft parts of fossilized animals might have functioned. Staff shortages of the time obliged him to teach widely on geographical as well as geological topics and all were elucidated to the total fascination of his listeners. In the evenings he lectured extra-murally on equally diverse subjects and to such effect that he is still remembered with awe in the south Wales valleys.

In the field the students were more tolerant of the flap cut idiosyncratically in the top of his pork-pie hat for ventilation than they were of the time he begrudged them for lunch. Students who subsequently achieved distinction included D.R.A. Ponsford, E.H. Francis, T.R. Owen, G. Thomas and J.C. Griffiths.

During his years in the Chair in Swansea he gave generously of his time and effort to the Workers' Educational Association, served as chairman of the Extramural Committee of University College and on the University Extension Committee, and gave courses of lectures on a broad span of subjects from science to music, philosophy

and even art. From 1940–44 he was a governor of Coleg Harlech. Adult education remained a passion and duty to him throughout his life and there can be no doubt that his family and his wife's pedagogical backgrounds imbued in him a self-imposed responsibility which never left him. Other duties associated with his post included a spell as Dean of the Faculty of Science (1936–39), member of the Court of Governors and of the College Council (1937–40) and he was at times chairman of the Swansea Association of University Teachers and president of the Swansea Scientific and Field Naturalists' Society. During World War II he continued teaching and was (1940–45) geological adviser to the Lord President of the Council and also (1937–46) an honorary curator of geology in the Royal Institution of South Wales. All these activities, particularly his heavy internal and external teaching duties, seriously slowed his rate of publication so that during his 13 years in the Chair at Swansea he published 15 papers (compared with 24 in the preceding nine years) although four of these, the two regional handbooks of Wales (6, 7) and two lengthy papers in the *Quarterly Journal of Geological Science* (12, 13) were major studies that involved a great deal of work. Of his first 43 years he spent no fewer than 38 in Swansea.

PROFESSOR AT GLASGOW

In 1937 Professor A.E. Trueman left Bristol on being appointed to the Chair of Geology at Glasgow University, vacated by the appointment of Professor E.B. Bailey, F.R.S., to the directorship of the Geological Survey. In 1946 Trueman resigned the Glasgow post to become Vice-Chairman (and subsequently Chairman) of the University Grants Committee, and TN succeeded him in Glasgow, a most curious coincidence of successions. TN arrived, as an experienced professor of 14 years standing, to a well-founded Department with very many more students (200–250 in the first year alone) and an established staff of nine and was to stay in Glasgow until his death. It was in Glasgow that his prodigious energy and abilities radiated into an incredible range of activities.

For 27 years he commanded his Department in every detail, culminating in the achievement of securing – after 15 years of negotiations and planning – a splendid five-storey purpose-built new geology building, completed in 1976, shortly after his retiral in 1974. His output of published work, in view of his committee work, was stupendous: about 100 articles during his time at Glasgow, still mostly concerned with Carboniferous stratigraphy and palaeontology, evolutionary concepts in palaeontology and landscape evolution; all topics which originally stemmed from Trueman whose lectures (and writings) on landscape development in particular were extremely popular. TN was a most assiduous worker, unflagging in his consistency of effort and continuing so after his official retirement at the age of 70, so that he lectured abroad, taught in the University and wrote until a stroke with partial paralysis affected him in September 1977. Even after this, although confined to a wheel-chair, he continued to teach and write until his death from heart failure on 18 June 1980 in Glasgow.

TN was an excellent lecturer, inspiring and at times dramatic with a good sense of

timing and feel for what could be taught within a given period, although this latter facility was learnt by experience (Alan Stuart remembered TN's first lecture as Professor in Swansea ending after 30 minutes when he had run out of material; an inconceivable circumstance later). He had a quite remarkable pedagogical eloquence; the felicitous phrase flowed with euphony, precision, rhythm and slightly muted Welshness. He could think while lecturing and express the results in interesting but well-structured English. His wide-ranging lectures were, like Trueman's before him, eagerly attended by several hundred students at a time in Glasgow and he loved expository teaching both in the University, in extramural classes and in the field. Teaching brought out his ability to synthesize, whether verbally or in writing. Although his teaching hours were reduced in Glasgow compared with Swansea he always carried a heavy load, including the first year class which in those days required great commanding ability because of the tradition of unruly first year student behaviour; many lecturers dreaded being drafted into lecturing to the first year class. TN's personal notes show that he neither relished the prospect nor found it easy which belied his off-hand dismissal of the problem ('wayward enthusiasm') to his colleagues. At times even he had to threaten abrupt truncation of the course but the force of his character was sufficient to quieten the dissident elements. The occasion of a Scotland versus Wales rugby match in Scotland found the lecture theatre unexpectedly lavishly decorated with leeks to which upon his entrance he immediately responded with a five minute lecture on the commonality of the Gaelic roots of the Scots and Welsh with Strathclyde being a Welsh-speaking Kingdom until the 10th century. This so defused the competitive issue that the class gave him an approving round of applause at the end. To the despair of his students, who had to make their own choice as to whether to listen to his lecture or copy his drawings, at times he would take up to 20 minutes before a lecture, and before the class had entered the lecture room, to meticulously fill the blackboard with carefully drawn fossils. His heavy committee duties forced him periodically to ask his staff to substitute for him and in his later years he would supply notes on the lecture content but it was usual for these to be a mere skeleton of the facts so that addition, repetition or embroidery of a few basic facts was called for if the lecture time was to be filled, for his own lectures were not catalogues of facts.

His marvellous ability to give a stimulating lecture, drawing entirely on his personal knowledge, impressed, for instance, the 90 geologists trapped with him by snow in Srinager, Kashmir, in 1964 in a pre-meeting excursion of the International Geological Congress, held in India that year. Sir Anthony Laughton, F.R.S., recalls an impromptu lecture by TN, using newspaper as a blackboard, which was among the best of the talks given. His lecturing genius provoked a stream of invitations both from British universities and from abroad, especially those with ex-students or staff. He was Woodward Lecturer at Yale University and visiting lecturer at Columbia, Indiana and New Mexico in 1956, Senior Foreign Fellow at Northwestern University in 1964–65, Visiting Professor at the Universities of Witwatersrand, Cape Town and Natal in 1967, visiting lecturer at Princeton, Pennsylvania State, Cornell, Harvard and Columbia Universities in 1970, distinguished visiting lecturer at the Universities of Saskatchewan

(Saskatoon and Regina), Calgary, Edmonton and British Columbia in 1974, and in addition, numerous lectures were given in Europe and Britain and extra-murally in Scotland. Sir Charles Connell recalls TN telling him that the Ministry of Information asked TN when he first came to Glasgow if he would give lectures outside the University and one of his first assignments was at a small village hall in the island of Lewis. He talked to his audience of the formation and movements of the rocks over millions and millions of years to form the Earth as we know it today. His lecture was received with polite attention but not much enthusiasm. The local minister, who was in the chair, told those present that the lecturer had agreed to answer any questions but added 'If he does answer them, don't believe a word he says'.

During his 27 years in the chair in Glasgow he maintained an immense committee load of administration and policy making at a time of unprecedented university expansion. He served on the Finance, Fabric, Technicians, Disciplinary, Honorary Degrees, Equipment, Museums, Academic Development and other committees too numerous to detail, was convenor of the Extra-Mural Education Committee for more than 20 years, Dean of the Faculty of Science (1951–55), Senate representative on the University Court (1965–69) and Chairman for various periods of the Library, Television, Museums Management, Governors of Horslethill Hall of Residence, Board of Studies in Geology, Geography and Archaeology and the Joint Glasgow and Strathclyde Audio-Visual Aids committees.

His service to bodies outside the University was astonishing for its breadth and intensity. He maintained an interest in the British Association for the Advancement of Science because of its role in promoting the dissemination of science to the general public and was President of the Geology Section in 1953, Vice-President of the Botany Section and Chairman of the Committee on the Teaching of Geology in Schools. He was, for varying periods, Chairman of the Newbattle Abbey College Governors and for many years a governor, a member of the National Broadcasting Council (Scotland), of the Universities Council on Adult Education, of the Scottish Institute of Adult Education and the Chairman of the Scottish Field Studies Association; all of which were related to his continuing support for adult education. He was President of the Glasgow Association of University Teachers (AUT), the AUT Scotland and the National Association of University Teachers (1959–60), President of the Association of Teachers of Geology (1970–71), the Geological Society of London (1968–70), the Palaeontological Association (1962–64) and the Geological Society of Glasgow in its centennial year (1957–8). He was at various times a member of the Nature Conservancy Council, the Mineral Resources Consultative Committee of the Department of Education and Science, the Geology and Geophysics Committee of the Natural Environment Research Council (NERC), Oceanography and Fisheries Committee (NERC), Unit of Coastal Sedimentation (NERC), the Mineral Resources Panel (Scottish Council), Geological Conservation Council, the Council of the Royal Philosophical Society, the Universities Grants Committee (UGC) Geology Panel, the Geological Survey Board, the Science Committee of the National Museum of Wales, the Scottish Marine Biological Association, the Scottish Wildlife Trust, the Field

Studies Council, numerous Geological Society of London committees, especially on stratigraphy and the teaching of geology. He was also, at different times, chairman of the UNESCO Commission on the teaching of geology in universities, an expert adviser in 1966 on the establishment of the Faculty of Science in the University of Jordan, a UGC equipment assessor in geology for eight universities in England and Wales, on the Council of the Royal Society of Edinburgh (Vice-President 1959–61), chairman of the Royal Society of London Geology Sectional Committee, Geology Grant Board and a member of the British National Committee for Geology and Geophysics, in addition to the demands on his time as an assessor for appointments to readerships and chairs in geology and for the Scholarships Committee of the Association of the Universities of the Commonwealth and for the Coal Industry Social Welfare Organization; he was also a Commissioner for the Exhibition of 1851.

This plethora of committees and responsibilities led to him being confidentially approached in 1957 to ascertain whether he would allow his name to go forward for the Principalship of University College at Aberystwyth. He agonized over this but finally concluded that geology held more attraction than administration, that he was not yet a scientist *manqué* (and never became one), that his lack of Welsh would make his duties difficult and that he preferred his Chair in Geology in Glasgow. Two years later the informal approaches were repeated when the same senior post became vacant at Swansea. This time the agonies were more prolonged as Welsh was not essential and Swansea was particularly attractive to him as a town and college. He went so far as to visit and allow his name initially to go forward only to finally withdraw it largely because geology was more appealing than administration and also because the delay in making a decision signalled to him disagreement within the appointing committee. It is difficult to understand why he agreed to serve on quite so many committees with all the rail travelling and distractions that were involved. His continuing efforts for extramural work and the teaching of geology were clearly duties he felt he ought to do, but many of the other extensive commitments, both intra- and extra-university, were less clearly the result of a particular purpose. He obviously found refusal difficult.

TN was a brisk, neat and tidy man: 5' 10" (178 cm) tall, his eyes glinting behind small spectacles, balding even before he left Swansea but never completely bald, and possessed of a puckish sense of humour. He loved an oral or even written tussle and would provoke one from time to time especially in the staff room in Glasgow, for he was more sociable there than in Swansea; and 4 o'clock tea was an event his staff missed at their peril, for it was there that essential departmental information was given. In his Department, as he firmly treated it, he determined the syllabus in content, scope and flavour. New lecturers were required to go over the contents of their lectures with him for approval and modification as he saw fit, although later on, when more democratic procedures had seeped in with new staff appointed in the 1960s, this was resisted. The final honours classifications were decided entirely by TN and the external examiner, who jointly received marks from the staff but remained closeted until the written notice of the results was produced by TN, so that the staff never knew how their marks were used or modified or what was the basis on which the decisions were

made. Staff meetings were reluctantly accepted when the University ruled that each department should hold them. They enabled members of the staff to express their views but acceptance or implementation depended entirely upon TN's judgement and he resisted, for instance, the introduction of any options into the undergraduate course. He was extremely parsimonious in expending public money on new equipment or even on running costs and prided himself on consistently running his Department economically even though this sometimes seriously hampered research or teaching. 'Evidence of frustrated need' was normally required before approval for expenditure could be squeezed out of him and the typing of letters on departmental matters, and even the postage costs, had for a long period to be approved individually by him. When departmental budgets were introduced into the University in the 1960s he usually returned unspent some of the allocation. In this respect his vision failed to match the changing role of geology or the enlarged opportunities of a major department in a well founded university. As a brilliant individual whose research depended on nothing but the simplest of equipment (such as a hammer, hand lens, a map and a microscope) he was reluctant to foster more sophisticated methods but nevertheless did introduce both geophysics and geochemistry, decidedly expensive disciplines, into his Department, probably without appreciating the continuing running costs involved. Geophysics was introduced in 1948 with the appointment of D.M. Boyd, and firmly established with the arrival of Dr A.C. McLean, in 1954. Geochemistry began in conjunction with the experimental petrological studies of Dr N. Holgate, expanded markedly with the appointment of Dr D.R. Bowes in 1956 but it was not until 1964–65, when TN spent a sabbatical year as Senior Foreign Fellow at Northwestern University and Dr D.R. Bowes was acting head, that there was major expenditure on capital equipment in this field. It became a departmental joke that the cost of any piece of equipment was assessed relative to the number of geological hammers that could be purchased with the same sum, with imaginary visions of piles of hammers causing TN to blanch in horror.

He was kindly, very well liked by his students who long remembered his teaching style and emphasis, but in his later years in Glasgow his autocratic management, combined with a changing climate in universities provoked disagreements with his staff, although it is clear that his multifarious activities could not have been sustained if time-consuming democratic procedures had occupied his energies in the Department. Intellectually he possessed the modesty of the true scholar and was undogmatic in his search for scientific truth. His absolute integrity as a man was so evident that self-interest rarely intruded. He had the highest moral standards and was respected by student and fellow-professor alike. He lived in rented university houses, owned no 'second' house, managed with one modest car shared with Sarah and showed no interest in the accumulation of wealth. In later life he was rather ascetic, an abstainer from alcohol and smoking, extremely restrained in his eating habits and within the University he radiated a rather austere image, broken by a quick injection of a humorous quip or phrase, but outside the University, and especially abroad, he would unbend completely and become a most entertaining companion. As a relaxation

he enjoyed playing the piano, conversation was always a pleasure to him and western American cowboy films were enjoyed, not only for the geological scenery in the background.

Coupled with his post in the University was that of Honorary Keeper of the Geological Collections in the Hunterian Museum, which, because the Museum then had no overall director, meant that he was responsible for the academic and technical staff in the geology section, for the geological displays and for the storage and curation of an immense collection (nearly 750 000 specimens) of geological material; a much more onerous task than now and one that could hardly be satisfactorily fulfilled by one person already over-extended with other responsibilities. Arguments over resources and space with those caring for other disciplines in the Museum were common because of ill-defined limits of responsibility and because of the personalities involved, but TN relished verbal sparks, and disagreements were vigorously pursued although progress with new exhibitions was slow.

His love of tussle spread into short notes which, because of his frequent absence from the Department during normal working time, he resorted to as a means of communication with his staff. Professor G.Y. Craig's protracted oral dispute with TN over the correct plural of *Lingula* which continued by letter and culminated in mutual exchanges in verse, has been documented in the *Year Book of the Royal Society of Edinburgh*, 1981, pp. 18–19.

TN possessed an extraordinary reputation for his skill as an examiner and he acted as external examiner for the first degree in geology, at one time or another, to almost half the university geology departments in Britain. For years he served in London University but he also acted abroad ranging from Brisbane to Kharapur to Nairobi to Northwestern (Illinois). He was renowned for his oral examination of geological mapping. He would examine the map and accompanying report for only about 20 minutes (usually because he was already familiar with the area), seize on the essentials and identify the obvious (to him) errors and in the subsequent viva the questions were deadly in their precision for identifying whether the student understood the significance of, or appreciated the error in, the information conveyed by the map or cross section. He knew all the tricky ambiguous points of areas commonly mapped by undergraduates and would apparently innocently ask about the evidence where some of it had been omitted from the map by either design or careless work. His willingness to mark piles of examination scripts, year after year, gave the impression he almost avidly consumed examination work.

His foreign travels at various times, as partly detailed above, took him to Canada, India, Jordan, Cyprus, South and East Africa and the Sahara, several times to the U.S.A., and of course Belgium, France and Spain in his study of the Carboniferous rocks. He greatly enjoyed the various geological excursions he went on abroad, but, with the exception of northwest Europe, they do not seem to have enticed him away from his primary scientific interests and made negligible impact on his published work. His unpublished papers include a moving account of the entry of the Russians into Prague in 1968 which disrupted and prematurely ended the International Geological

Congress, and includes an account of how he got back to the West. Many have commented on how his nature seemed to change when he went overseas especially in North America. His formalities of dress and precise behaviour became relaxed, his sense of fun would bubble out, he could even be seen jacketless wearing a vivid multicoloured shirt, and his rather puritanical 'home image' dissolved away and only those who knew him quite intimately would have recognized the traits that surfaced. His style of departmental management was often viewed with incredulity by North Americans who heard of it, as it seemed incompatible with the character of the affable companion that they knew.

Active and robust, he would exhaust those not accustomed to a 15 mile walk as part of a day's fieldwork, yet his only regular exercise was a short walk to and from the University, for Sarah and he lived in university houses quite close to the Department. Professor G.Y. Craig writes, 'it was a great pleasure to have him as a companion in the field. He saw everything and believed nothing. His dress was often a suit, trousers tucked in his socks, hammer spinning in the air with a juggler's dexterity as he walked along the road. He had learned this circus act during his long strolls between outcrops ... in the Geological Survey. His only flaw was that he would not eat lunch but wait patiently while his companion(s) hurriedly wolfed theirs. He told me he had once dined with a member of a well-known chocolate family, who asked him about his lunch-time habits and he replied, "Oh I don't eat lunch but when I have a break I have a Kitkat". That phrase was subsequently taken up and became a nationally famous advertising slogan. Ruefully TN added that he didn't get a penny out of that famous line.' He could be instantly decisive and Professor D.M. Ramsay remembers him walking past a cottage while leading a student field party and, noticing an excellent fossil (presumably a brachiopod) weathering out on the cut Carboniferous Limestone windowsill, to the utter astonishment of the cottager standing by his door, he knocked it off with one smart blow, pocketed the sample and continued without pause or permission!

In his early years as a professor he is reputed to have insisted that all papers written by his staff be approved by him, but it is hard to see that he could have applied this to such senior staff as Dr G.W. Tyrrell. Certainly his editorial checking of manuscripts and thesis drafts was a nerve-racking experience for all postgraduate students; neat, pertinent and impertinent comments peppered most pages and it was unusual if considerable rewriting was not required. Nevertheless, he could be equally severe on himself if he deduced, or it was pointed out to him, that his own writing could be improved, but this did not necessarily extend to his writing on evolution.

Through his Department passed a flow of students (including R.B. Wilson, C.A.M. Wilson, W.G. Aitken, K. Myint, J. Spence and D. Harkin) who generally went on to become Survey or oil company geologists, particularly strong contingents being found in the Colonial Geological Survey and in the British Petroleum Company, with fewer entering academic life. His insistence on a broad unspecialized curriculum with a strong emphasis on field work continued an established tradition in the Department. Similarly, there was a stream of talented staff largely because of the existence (until

the 1960s) in Glasgow University of a system of fixed-term, non-renewable, assistantships. Lecturers, demonstrators and assistants who partly made their reputations or received some or all of their training in Glasgow under TN included A.T.J. Dollar, L.R. Moore, D.M. Boyd, G.Y. Craig, G.M. Bennison, B.C. King, A. Williams, I.M. Simpson, R.H. Cummings, W.G. Jardine, A.M. Honeyman, D.H. Oswald, J.A. Wright, E.K. Walton, T.W. Bloxham, H. Pantin, D.A. Bassett, N. Rast, F.G. Larminie, A.T.V. Rothstein, T.C.R. Pulvertaft, G. Voll, A.J. Ames, W.G.E. Caldwell, D.M. Ramsay, B.W. Evans, I.B. Paterson, W.W. Bishop, F. Whyte, A.E. Wright, K.A.G. Shiells, A.N. Hutton, J.A. Turner, J.M. Anketell, J.D. Bradshaw, M.S. Lewis, O.A. Dixon, J.D. Keppie, I.A. Penn, J.W. Oldham, D.S. France, J. Addison and I.R. Vann, in approximate chronological order of their time in the Department. The staff in the Glasgow Department and the Geological Section of the Museum in 1946–47 were G.W. Tyrrell, J. Weir, D. Leitch, B.H. Barrett, A.T.J. Dollar, W.R. Flett, L.R. Moore, E.D. Currie, M.H. Latham, N. Holgate, A.C.M. McKinlay, D.M. Boyd and G.Y. Craig. When TN retired in 1974 the number had expanded to 20 but the postgraduate numbers remained small (7).

As the years passed honours showered onto him from various directions. He was elected a Fellow of the Royal Society of Edinburgh in 1948 (Vice-President in 1949–52 and 1959–61); Hon. D.-es-Sc. Rennes (1956); Fellow of the Royal Society of London (1963); Lyell Medal of the Geological Society of London (1963); Honorary Fellow of the Geological Society of Edinburgh (1967); Medal of the Charles University Prague in 1967 on the occasion of his chairmanship of the IUGS Committee for the Teaching of Geology, which was meeting in Czechoslovakia; Honorary LL.D. Wales (1970) on the fiftieth anniversary of the opening of the University College of Swansea; Sc.D. (Cambridge) in 1970; Clough Medal of the Edinburgh Geological Society (1973); Corresponding Member of the Geological Society of Belgium (1974); Hon. Member of the Geological Society of Glasgow and also Kelvin Prize of the Royal Philosophical Society, both in 1975; Neill Prize of the Royal Society of Edinburgh (1978) following, in 1977, his appointment as a Leverhulme Emeritus Fellow.

SCIENTIFIC EVALUATION

His published scientific output totalled nearly 150 papers with nearly another 100 obituaries, reviews, contributions to discussions, etc. The principal scientific group was concerned with Carboniferous research, especially Dinantian stratigraphy and depositional environments, mainly in south Wales and the Welsh borders and to a lesser extent in Ireland, complemented by related palaeontology, partly of corals but mainly of brachiopods with some sedimentology and structural analysis. He had a life-long devotion to unravelling the depositional environments and palaeogeography of the Lower Carboniferous and this led him into the new subject of sedimentology and papers on limestones and dolomites (14), on the classification of Avonian limestones (15), sedimentary structures and processes (16). His last substantial paper, written when he was 73, on mid-Dinantian (Chadian) limestones in Gower (17) was a study of limestone fabrics. His published work on the Scottish Carboniferous rocks was

surprisingly sparse and mainly concerned palaeogeography and the evolution of the Midland Valley in a centennial presidential address to the Geological Society of Glasgow (18); a masterly synthesis of considerable length that is still quoted as the best pre-plate-tectonic synthesis. Plate tectonics 'arrived' as TN was in his sixties and there is no doubt that he would have produced syntheses of much more lasting value had he been younger when the revolution in thinking occurred. Perhaps because of the differences between his stratigraphical deductions based on macrofossils and those of others (especially Dr R.H. Cummings) based on microfossils, his studies and those of his students, of the admittedly extensive Lower Carboniferous rocks of Ireland finished in the late 1950s (with vast tracts unsurveyed) when TN, W.G.E. Caldwell and D.H. Oswald completed their studies of parts of northcentral and northwestern Ireland and TN completed his of Wexford (19); I.M. Simpson was left examining parts of western Ireland. In his last years, as the theory of major control over Carboniferous sedimentation by eustatic sea-level changes became popular, he disputed this (21) and only shortly before his death he had agreed to write a discussion paper with Dr W.H.C. Ramsbottom, who expressed the opposite viewpoint, but this was never completed. Although the interpretation of TN's work on Carboniferous stratigraphy, sedimentology and palaeogeography has naturally been substantially modified by plate tectonic and basin analysis studies, some (but not all) of the basic data remain as solid facts to be reused in newer models.

A second stream of papers was concerned with palaeontological theory, especially of evolution in relation to classification, systematics and morphogenesis (see, for example, 22, 23) summarized in a largely impenetrable presidential address to the Geological Society of London (24). As an immense admirer of TN, Professor Gordon Craig commented: 'It is astonishing that a man who had such extraordinary abilities with the English language could choose that powerful weapon to be so abstruse when he came to writing philosophical articles on evolutionary concepts. He had two quite different styles: one in which he wanted to be understood (his geological articles), the other in which he quite deliberately chose arcane terminology, almost as if it were a solitary exercise in self gratification.' Numerous palaeontologists have expressed puzzlement at the difficulty of understanding his writings on palaeontological theory. It was almost an intellectual exercise in which his masterly ability to produce a whole paragraph in one perfect grammatically correct sentence was allied with abstruse and little-known terms to defeat all but the most persistent intellectual who could find his way through the maze of words to the ultimate meaning. It is not clear what his lasting contribution to evolutionary thought was – if anything at all – and this may have been the reason for the prolonged gestation of his 1951 book, its small size and the little impact it made; he rarely referred to it himself.

A third stream of papers concerned geomorphology, beginning with coastal and beach forms in south Wales (25), the genetic development of river systems and its dating and the correlation of rejuvenation and river capture (13), followed by an extension of the method into southern Scotland (26) and culminating in a conspectus of the Cainozoic evolution of landscape in the British Isles with special emphasis on

western Scotland (27), Ulster (28) and Wales (29). His last paper (published in 1980, after his death) returned to landform and structure in south Wales (30). Professor D.Q. Bowen writes: 'Other than Clement Reid's suggestion that a shoreline to the 430 foot platform at Zennor in Cornwall could be identified, Neville George was the first man to indicate on a map the run of shorelines for the 200é, 400é and 600é platforms in Wales. In fact it was the first such map (31) to be produced anywhere in the British Isles. In doing this I think he concentrated the debate and led it away from vague generalizations about plateau surfaces at different levels, and in due course I believe it led to his wider views relating drainage evolution to the higher plateau surfaces throughout the British Isles.'

A fourth and rather wide final stream concerned his broad-ranging syntheses, as an educator, exemplified best of all by the two handbooks of the geology of north and south Wales (6, 7), which he saw through three editions, the last appearing in 1970, but also for instance, in the Palaeozoic growth of the British Caledonides (32) and in the geological growth of Scotland (33), in a series of pedagogical articles in *Science Progress* (14, 16, 22, 34, 35), and most of all in his lectures. This approach joined with his voluminous written and verbal efforts on adult education (for example, 36) and the teaching of geology in schools and universities (37, 38). He was also a prolific contributor to discussions (for example, 39).

In summary, a reasonable retrospective evaluation of his main contributions would value most his Carboniferous palaeontological and stratigraphical studies, his written and oral geological syntheses, his inspiration, high standards and unflagging industry conveyed to undergraduate, postgraduate and adult students, the fine Geology Building he negotiated and the undefinable, intangible influence he exerted for good in the range of activities that he was involved in, especially his concern for education in all its varied aspects.

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