

Gary Edward Orbell MSc (Hons), MNZIAHS, MRSNZ
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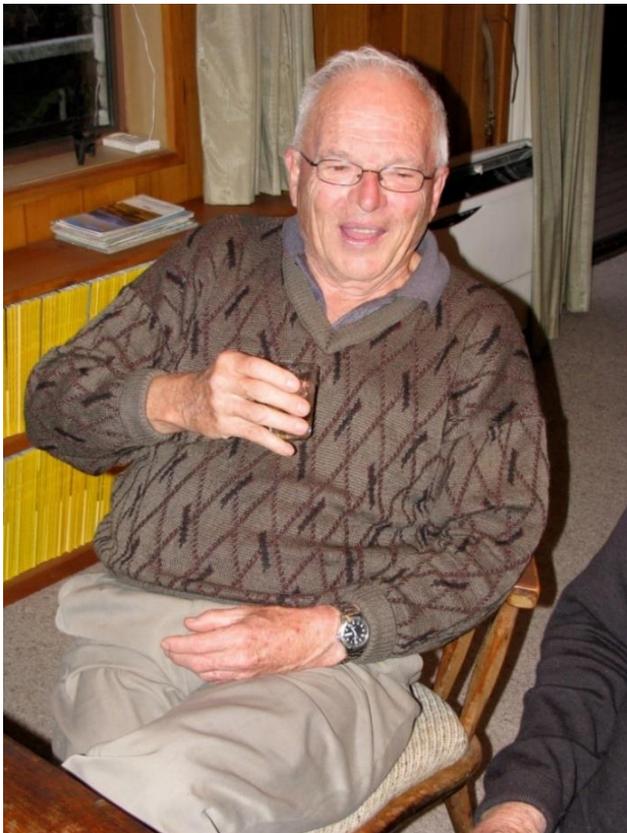
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Gary died after a prolonged period from cancer. He was one of the last remaining pedologists from the days of the Soil Bureau, DSIR, to have been employed by Dr Norman Taylor.



Gary was born in Hastings, the son of Nina and Arthur Orbell. The family owned a small dairy farm between Napier and Hastings that was impacted by a storm in early February, 1936, just before Gary was born. Only two years later the farm was very badly affected by flooding associated with the extreme 'Esk Valley' storm and floods over three days from 23–25 April, 1938. The family subsequently owned an orchard near Hastings (on Twyford soils) and agricultural contracting business, and Gary grew up helping in both businesses. The Orbells originated from a pioneering family settling in 1849 at Waikouaiti in North Otago.

Gary in conversation with John McCraw. Photo: Phil Tonkin.

Joining Soil Bureau, DSIR

Gary attended Victoria University College in Wellington, graduating BSc in 1959. It was at the suggestion of his Professor Bob Clark that he was interviewed for a position as a pedologist at Soil Bureau, then based in Molesworth Street, Wellington, opposite the Parliament Buildings. There had been a number of

pedologists recruited since the appointment of Mike Leamy but they had all left, and so Soil Bureau staff were desperate to find replacements. Gary was offered a DSIR scholarship to complete an MSc at Victoria University College with a project in the northern Wairarapa supervised by Professor Harold Wellman. He graduated with MSc (Hons) in Geology in 1961. Then he began a three-month period of training with the Soil Bureau, Molesworth Street and Taita. From Taita he spent time with Harry Gibbs, visiting an area of western Wellington being surveyed by Mike Leamy, and also the Greytown Horticultural Station in the Wairarapa. The training in soil survey was minimal until Des Cowie and Mike Leamy gave Gary instruction. In the summer vacation of 1958-59, Gary was sent up to Huntly to assist Bill Ward who was working on the survey of Raglan County. During this time Gary witnessed a major disagreement between Bill Ward and Harry Gibbs, the Chief Pedologist. In addition to the Raglan survey, Bill Ward was also undertaking an MSc in geology from the University of Auckland with a focus on the Hamilton Ash beds. For this field work Bill carried a geological hammer in his car and this was the focus of the dispute with Harry. The dispute was resolved by Bill completing his MSc and taking up a job offer as a pedologist with the CSIRO in Australia.

Palmerston North

Following his period of training Gary married Mary Gibson on New Year's eve, 1960, and together they moved to Palmerston North. Gary assisted Des Cowie on the survey of the Kairanga County, and they were later joined by Brian Kear, a geographer from Britain. Des Cowie was a good instructor, assisting both Gary and Brian. Brian subsequently moved to Christchurch to write up the Downs and Plains of Canterbury and North Otago survey although he had not been involved with the original soil survey team.

Alexandra office

Gary's next appointment was to the Soil Bureau office in Alexandra, for many years the seat of John McCraw together with others such as Des Cowie, Bill Ward, and Mike Leamy. Mike was in the finishing stages of the Upper Clutha survey prior to his taking up a Colombo Plan assignment in Malaysia. While in Alexandra, Gary had vivid memories of a winter trip by Landrover to the Upper Shotover catchment with Mike Leamy, Graham Anderson of the Otago Catchment Board, and two *Otago Daily Times* reporters. The road was icy and covered in snow and they ended up doing their survey in a foot [30 cm] or more of snow. The journey in and out by road under these conditions made quite a story for the reporters. Gary was to become the sole pedologist in the Alexandra

office, working on the survey of the mid-Manuherikia Valley, a survey initiated by Cliff Thompson on exchange from CSIRO Queensland.

The year in Scotland

The next move was a year in Scotland. This came about following a South Island soil science bus tour in 1962 (associated with the International Soil Conference held at Massey University that year) where Gary met up with Bob Glentworth of the Scottish Soil Survey. Subsequently Gary was asked by Dr Keith Dixon if he would like to go to Scotland in exchange with Martin Ragg, who was to be based in Dunedin with Ted Cutler. Soil surveyors in Scotland spent their summers working from caravans and in the winter went back to Aberdeen to write up. The survey Gary was working on was for Livingston Newtown between Glasgow and Edinburgh. This survey was to be used for interpreting soil information for a variety of land uses. The Orbell family had a twenty-two-foot caravan (about 7 m) equipped with a coal stove for heating. The family did a lot of touring in Scotland and Gary attended the British Society of Soil Science conference in Wales. At the end of the year the family travelled back to New Zealand on a five-week voyage by sea.

Pukekohe and Hamilton

Back in New Zealand, the Orbell family was sent to Pukekohe, an outpost of the Hamilton office with John McCraw, to undertake a soil survey of Franklin Country. This survey was identified by Harry Gibbs as a key to safeguarding the important horticultural soils around Pukekohe from a proposed motorway. This objective crystallized as they were completing the first set of maps when the planner for the Franklin County Council requested the draft soil maps for a council meeting. The matter of the motorway was resolved at this council meeting as it was moved elsewhere. Soon after this there were big changes in the Hamilton office of Soil Bureau with John McCraw moving to the University of Waikato (in 1969) as foundation Professor of the Department of Earth Sciences, soon to be followed by Harry Gibbs (in 1970). Joe Bell, the replacement (in early 1969) for Phil Tonkin, who had moved to Lincoln College at the end of 1968, was killed in a motor accident. Joe was the only remaining pedologist in Hamilton and so his unfortunate death meant Gary and family would be on the move again, this time to Hamilton. The Soil Bureau was not going to close the Hamilton office. Gary had been given an undertaking that the family would be in Pukekohe for at least five years, and at this time they had only been there three years. Gary had to go down to Taita for a meeting and Bill Hamilton, the Director General of DSIR, was there and enquired after Gary and family and the prospective move to Hamilton. There were some financial problems regarding

house loans and Bill undertook to look into it and get things sorted which he did. This was in line with Gary's reputation as a master of the Public Service Manual and how to get the best out of the system. The family finally moved to Hamilton in 1971.

In Hamilton, Gary became the District Soil Scientist taking over the vacated role of John McCraw. After a period of grace used to familiarise himself with the geography and soils of the Waikato and wider King Country regions, Gary began with the completion of the soil survey (at a scale 1: 25,000) of the Waikato lowlands north and east of the Waikato River. This survey had a long and checkered history beginning in the mid-1930s and restarted by John McCraw and Phil Tonkin from the mid-1960s. With the departure of McCraw and Tonkin from Soil Bureau, and the other changes in the Hamilton office, it fell to Gary to pick up the unfinished survey and bring it to completion. Ironically, although the map was formally published (as two sheets) as late as 1992 (Orbell, 1992), the associated bulletin (text) seems to have never been published, and only came to light when Gary gave David Lowe the original typescript (and maps) in a ring-binder during David's visits to see him in early 2021. (With Gary's permission, David had the text and maps scanned, with files of both then being sent to Manaaki Whenua and to the Library, University of Waikato, to provide a secure, permanent record.) Malcolm McLeod did publish two Waikato District soil maps (at scale 1: 31,680) and text as a district office report (McLeod, 1984), and so the near-equivalent maps have been available since then. Gary's 1992 bulletin summarises the mapping history, with all those involved with the survey being named and acknowledged on the maps, and provides a detailed taxonomic key to identify the soil series and types.

During Gary's time as a district soil scientist he was at times joined by Colin Pain, Alistair Wilson, Beryl Barratt, Peter Singleton, and Malcolm McLeod, who were all involved in soil surveys. Colin subsequently moved to Havelock North with Elwyn Griffin, Alistair moved back to Britain before rejoining the Soil Bureau in Kaikohe and Auckland, Beryl finally moved to Auckland with Ted Cox and Alistair Wilson, and Peter Singleton moved to Environment Waikato (Waikato Regional Council), with Malcolm McLeod the sole remaining pedologist from the Soil Bureau days.

The role of the district soil scientist was varied. In addition to soil surveys of Franklin, Waikato, Hauraki, and Matamata regions there were many smaller maps prepared for Hamilton City, Bay of Islands, and Mangere Environs as well as the interpretation of soils for various land uses. Gary also prepared the tour

programme and guides for tours of Northland for the 1968 and 1981 International Soil Conferences held in Adelaide, Australia, and Palmerston North, respectively. Prior to the shift to Hamilton, Gary was invited to join the Royal Society Cook Bicentennial expedition to the South Pacific in 1969 and this was his introduction to and subsequent involvement in soil surveys in the islands of Tonga. He presented a paper on this topic at the 12th ANZAAS conference in Canberra in 1971. After the conference, Gary took a side trip to Brisbane to see Bill Ward and Cliff Thompson.

Soil surveys in the Kingdom of Tonga

Following on from earlier surveys by Dr Les Grange, Dr John Widdowson and Harry Gibbs, and Gary's Royal Society trip, David Ives, together with Gary and John, were asked by the Director of Soil Bureau to carry out further work in the Kingdom of Tonga as part of a bilateral programme. A large team was assembled with Dave Ives as logistical director and Gary as Pedologist in Charge. Once the survey phase was completed there was a continuing series of trips back to Tonga to conduct field trials overseen by Dr John Widdowson and Dr Phil Hart. Gary recalled some 20 visits to Tonga over the years. As well as around half-a-dozen soil survey reports, Gary published a small book on the soils of Tonga (Orbell, 1983). The last workshop in which Gary was involved was in 1992 just prior to his retirement from Soil Bureau, with Cowie et al. (1991) one of his final outputs. David Leslie took over the supervision of soil surveys in the Pacific and was for a period based in Fiji.

King Country soil resource survey

In the late 1970s after Gary had taken time to familiarise himself with the soils and landscapes of southern Waikato and King Country, a request was made by the Lands and Survey Department for a National Soil Survey of the King Country at a scale of 1: 500,000. The general Soil Survey of the North Island had been mapped at a scale of 1: 254,000, and so these maps were used to generalize information as soil associations and the resulting soil map at 1: 500,000 was published as a National Resource Survey. Gary had to produce a legend for the map rating soils for preferred land use. This went through to Des Cowie, the Chief Correlator, Mike Leamy, the Chief Pedologist, and Bruce Miller, the Director of Soil Bureau. The interpretation was controversial as a lot of the land was being developed by the Lands and Survey Department for farming. Gary's interpretation of the generalized soil information caused an uproar and Federated Farmers and the politicians got involved. The then National Prime Minister Muldoon implemented a more detailed survey to resolve the conflicts. The new survey was to be multidisciplinary involving Soil Bureau, Geological

Survey, Botany Division, Lands and Survey (for the land holdings), Māori Affairs (for Māori lands), and the Ministry of Works Water and Soil Division. Gary's task was to oversee and correlate the soil survey. There was a big team of soil surveyors drawn from throughout New Zealand and many from the South Island had little previous experience of soils formed in tephra. Groups were given individual blocks to survey and this was to present problems when correlating between surveying parties. Des Cowie and Gary had the task of bringing the survey information together. At the same time, the leader of the Water and Soil Division was requesting soil map information as the template for their Land Use Capability (LUC) mapping. This conflict led all the way up to questions being asked in the House of Parliament. The outcome of the soil survey was that the original interpretation of marginal land more suited to forestry or conservation management was upheld. Further, the Treasury became involved and associated staff recognized that there was significant overlap between the work of the soil surveyors and the LUC survey team.

Within the decade following the publication of this survey, with three soil maps prepared by Wim Rijkse and Hugh Wilde, there were major changes afoot with the demise of the DSIR, and the reorganization of other agencies such as the Soil Bureau and Botany Division of DSIR, and elements of the Water and Soil Division and the Forest Service into reconstructed new Crown Research Institutes (CRIs) such as Landcare Research (Manaaki Whenua). That change took place on 30 June–1 July, 1992.

Gary retired from Soil Bureau in 1991 (after 33 years of service) and for several decades (25 years in total) worked as a private consultant from Hamilton, preparing >2000 reports.

Comments by David Lowe

I first encountered Gary when our lecturer in pedology in the Department of Earth Sciences, Prof Harry Gibbs, introduced Gary to us on a visit to the University of Waikato campus, probably in 1974. From memory, Harry simply introduced "Mr Orbell" as the district pedologist. Gary was presumably visiting the campus for other reasons. I recall he was smartly dressed in a dark suit and with an umbrella, and looking compact and assured. At the time, I thought that he did not seem dressed for field work (despite the umbrella), not really appreciating that his job would entail more than 'simply' mapping soils.

It was two years later that Gary offered summer work out of the Hamilton office (which was at the corner of Anglesea and Collingwood Streets, now demolished,

but with some desk-derived rimu timber salvaged by Malcolm McLeod serving as a mount for the N.H. Taylor Auger from 2013, given temporarily to the N.H. Taylor Memorial Lecturer each year as part of the award). Two Waikato graduates, Peter King and David Burns (known as Davey), worked with Gary over the summer of 1976-77 on the Waikato lowlands survey. The following year, I (David Lowe) joined Davey Burns and we worked for Gary over the hot and dry summer of 1977-78 on the Matamata County survey. Beforehand, Gary interviewed us and took us into the field to check our soil texturing skills. We may have looked at a Kainui soil (previously known as Hamilton soil) and so a 'silty clay loam' may have been the correct answer for one test. I recall Gary asking me what experience I had and my response, something like, "The same as Davey Burns", was met with a typical Gary retort, "No, he has had a summer working for me and so has more experience".

Gary explained that although draft maps for Matamata had been prepared, he lacked underpinning detailed soil profile descriptions of the many map units and so our job was to generate them. Gary told us that Matamata County was one of the largest in New Zealand and the only one in which every road was tar-sealed, implying the wealth derived from farming the extensive Allophanic Soils (Yellow-brown loams in those days) in the county was partly responsible for that state. Davey and I used to set out from the Hamilton office each morning and head to Matamata, starting in the far north of the county near Waitoa and Waihou and, once we got going, managed to dig (by hand) and describe a pit each, sometimes two, per day, before having to head home to meet the approximate 5 pm deadline set by Gary. We used to take turns talking to farmers before entering their properties and soon learned they had a wealth of information about their soils and landscapes. Invariably they asked, "When will we get the results?".

Gary introduced us to two dominant series, Waihou and Waitoa, and said these could be compared with the approximately equivalent series in the Hamilton lowlands, Horotiu and Te Kowhai, respectively (the trick to remembering, never forgotten, being the 'h' and 't' letters common to each series pair). The Matamata survey results were later published by Malcom McLeod (McLeod, 1992). In chatting to Malcolm recently, he said the descriptions are on file and were helpful.



Representative of Waihou series (Allophanic Soil) exposed in a gravel and sand quarry in the Hinuera Valley on the corner of SH29 and Taotaoroa Road (the quarry is the type location of the Hinuera Formation). The soil is formed from about 0.8 m of accumulatory tephra (weathered partly to form allophane) overlying volcanogenic alluvium (Hinuera Formation), i.e. the soil to 1 m depth is formed in both parent materials. The upper profile formed by developmental upbuilding pedogenesis (i.e. the soil horizons, weakly developed, were forming whilst thin tephra layers accumulated slowly, millimetre by millimetre over c. 23,500 years) so that the land surface has been rising slowly since the Hinuera Surface was abandoned c. 23,500 years ago when the ancestral Waikato River switched direction (avulsed) to flow into the Hamilton Basin. Photos: David Lowe.

One thing we learnt working for Gary was how we could wangle a day in the office when we felt like a bit of a break from the field work, perhaps on a miserable rainy day (not that there were many that summer). We would simply ask Gary a ‘political’ question. His answer and discussion would potentially extend to an hour or so, at which point Gary would state, “Oh, boys, look at the time. There is no way you can go into the field now and be back in time to clock off at 5 pm and so, because that would breach the labour laws, you’d better stay in the office for the rest of the day”.

Another aphorism from Gary was framed in a question, “How much office time is required to take in the results of a day in the field?” His answer was two, the idea being a day in the field generated two days (or more I suspect) in the office as a rule of thumb.

On another occasion, Gary was asked to undertake a large-scale soil survey of a farm property near Hamilton (possibly off the Morrinsville Road). We were able

to follow him around as he marked an air photo, picking up valuable tips, before he then assigned us precise spots to dig pits to undertake soil profile descriptions. Gary's most important and firmly stated comment has stuck with me ever since then (and has been conveyed to countless students subsequently): the scale of a soil map can be reduced to generalise about map units, but a map cannot be enlarged to gain more detail – instead, accuracy will be lost. I note that nowadays in digital mapping the concept of scale changes with the ability to zoom in and out (as available in Smap). By zooming in (enlarging scale), it is the *scale of visualisation* that is changing, not the data density nor intervals of observations of the original on-ground surveys or modelling. Although the scale can be changed visually, the accuracy remains dependant on the scale of the original mapping and the degree of soil spatial variability.

That work along with the Matamata descriptions gave me the confidence to take on a contract, my first, to undertake a large-scale (1: 1,250) survey of Steele Farm, near Hamilton Airport, in 1979 (the redrawn map was published in Lowe and Balks, 2018, p. 11). The survey was commissioned by Bruce Willoughby who was leading a research programme at the Ministry of Agriculture and Fisheries, Hamilton, into grass grubs (brown beetle larvae, *Costelytra zealandica*).

At another time, when we were driving through the Karapiro area, Gary remarked that Hamilton should have been built on the tephra-draped greywacke hills nearby (Whitehall area) rather than on the highly-productive and easily managed soils on the flat land in the Hamilton Basin. At the time I did not really follow his reasoning but understand now.

Gary was asked by Head Office to collect a set of samples from the 'Hamilton soil'. We went to the Soil Bureau reference site for the so-called (at the time) Hamilton clay loam in Church Road, Te Rapa, then a gravel country road but now a well-to-do suburban street flanking a sea of houses and manicured lawns. The Hamilton soil (NZ Soil Bureau 1968, pp. 90-91) is now referred to as a Kainui silt loam (see Lowe, 2019). Davey and I were intrigued and impressed by the way Gary sampled the profile: he worked systematically and carefully downwards, sampling each horizon from top down (rather than sampling the vertical profile horizontally), then cleared soil material from near the boundary before exposing the top of the next horizon for sampling. He used a hearth brush to sweep it entirely clean before sampling, studiously avoiding the boundaries.

My path subsequently crossed that of Gary's from time to time in the next 40+ years, mainly at conferences, where his presence was always reassuring, and he invariably made solid contributions. When we met at the annual N.H. Taylor Memorial Lecture on campus, he was proud to mention that he was one of the few pedologists left in New Zealand who had met and been in the field with Norman Taylor (also Les Grange). He admired both, Grange being undoubtedly a 'good guy'. Taylor, he said, was rather brusque and distant in the office situation but transformed into a completely different person in the field where he was a caring and decent colleague only too pleased to pass on his wisdom and knowledge. Maurice Fieldes, another director, was described by Gary as 'tough but very helpful with students' (including helping Gary during his MSc thesis work that involved some XRD analysis and interpretation).

Sometimes we met in the field, including in the 1980s. The photo below of Gary with Roger Parfitt was taken in the early 1980s and is at the reference location for the Tirau silt loam in Hetherington Road near Tirau (NZ Soil Bureau, 1968, p. 80-81). Gary contributed the soil stratigraphy (following Pullar and Birrell, 1973) and was a co-author of what I consider to be a benchmark paper outlining the silicon leaching model for the formation of allophane (Parfitt et al., 1983; summarized in Churchman and Lowe, 2012). I featured this work by Parfitt et al. in my N.H. Taylor Memorial Lecture in 2002 in Wellington (Lowe, 2002), including the photo of Gary, whom I later learnt was very appreciative of the acknowledgement and was heard to say with some justifiable pride, "I was his [David's] first boss!". I did learn a lot from Gary in that single summer and have always appreciated his support, steadfastness, and reliability.



Gary Orbell (left), compact and assured, and Roger Parfitt at the Hetherington Rd reference site for the Tirau soil. The seminal paper, Parfitt et al. (1983), was to emerge soon after. Photo: David Lowe.

In the early 1980s, I invited Gary to give a talk entitled ‘What was the King Country survey?’ to our departmental Graduate Colloquia series and I recall he was asked a question by Harry Gibbs. Gary (unlike some) was not at all intimidated by Harry, and responded by commenting words to the effect “Harry, we don’t use thick black beauty pencils these days for drawing map unit boundaries – we use dotted lines to indicate gradational boundaries or uncertainty”. In the 1990s, Gary gave a lecture to my third-year pedology class on the application of GIS. Despite being somewhat ‘old-school’ and even perhaps old-fashioned (in terms of being ‘by the book’ and consistently reliable), Gary also had a modern outlook and embraced new technology including buying his own GIS system well before GIS became widely used.

I also spent another fruitful time with Gary in 2011 when we set up a new farm-scale soil and LUC mapping programme for our graduate soils paper based at Tokanui Farm (about 10 km south of Te Awamutu), where Gary had mapped the soils and LUC classes on behalf of AgResearch who ran the property as a research dairy farm. I spent a morning with Gary asking him about the intricacies of LUC definitions and other aspects of LUC surveys. We still run that very successful graduate paper today.

It was a privilege and pleasure to visit Gary from time to time over about nine months after he was diagnosed with terminal cancer in 2020. My visits would tend to start with Gary just a little morose but within a few minutes he was full of life and just as he was >40 years ago. We never ran out of conversation despite being of different generations, our common interests in soils and landscapes and other topics, including classical music, history, and politics, made for chats that I found always interesting and compelling.

I gave Gary a copy of our new book “The Soils of Aotearoa New Zealand”, with a little bit of trepidation (Hewitt et al., 2021). Although he was not keen on the use of ‘Aotearoa’ in the title, that was not dwelt upon at all, and he seemed to appreciate the book and our efforts in writing it (although Gary never told me directly what he actually thought of it – I never quite got around to asking him!).

At one point I said to Gary that he was very brave the way he was handling himself in the wake of his negative prognosis. Gary’s response: “I don’t feel brave” – which clearly indicates to me that his demeanour and steadfastness over the last few months of his life were courage personified. At Gary’s funeral service (Thursday 21 October, 2021, held under Covid-19, level-3 conditions), Gary’s grandson, Callum McKenzie, read two quotes by Wendell Berry and

Charles Kellogg. I was familiar with the words of Kellogg but must confess I had not heard of Berry. (So, still learning from Gary even at his funeral.)

Wendell E. Berry (American writer, poet, farmer, and environmental activist):

“The soil is the great connector of lives, the source and destination of all. It is the healer and restorer and resurrector, by which disease passes into health, age into youth, death into life. Without proper care for it we can have no community, because without proper care for it we can have no life” (from ‘The Unsettling of America – Culture and Agriculture’, 1977).

Dr Charles E. Kellogg (third Chief of USDA’s Bureau of Chemistry and Soils and instrumental in shaping the National Cooperative Soil Survey Program of today):

“Essentially, all life depends on soil. There can be no life without soil and no soil without life; they have evolved together” (from ‘USDA Yearbook of Agriculture’, 1938)

I appreciate how Gary generously helped shape my own career, I respected him greatly, and I miss him.

Graham Shepherd

Gary was present at my interview with Michael Leamy for the Soil Bureau position I applied for in 1976. Mike thought that my masterate thesis was a bit too analytical and theoretical for what he was looking for, but Gary pointed out that the study did include quite a bit of profile description work and field work, so I guess I have Gary to thank for my appointment. In hindsight, the Earth science and chemistry papers I took at the University of Waikato prepared me well for the years ahead.

I was appointed to the Palmerston North office to map and trial the USDA ‘Soil Taxonomy’ at Moutoa, an area where Wim Rijkse had been working. Gary was also familiar with this area having spent a bit of time in the Palmerston North office (noted above). While I was not at all that keen on Palmerston North, Mike did mention that the appointment could be for just 3 to 4 years and then the department would send me to somewhere where there were volcanic ashes, possibly the Rotorua office. Being in close association with the other DSIR divisions and Massey University in Palmerston North, however, they decided to leave me where I was. I was reasonably happy with this because I had become quite absorbed with the effects of monoculture cropping on the soil compared to pastoral grazing and developing indicators of soil quality.

Gary will be missed and I always enjoyed popping in to see him.

Conclusion

Philip, David, and Graham join together in this farewell to our colleague and friend Gary Orbell. Gary's wife, Mary, died in 2020 only a few weeks before Gary was diagnosed with cancer and he was devastated by her loss. Our condolences go to his three daughters, Alison, Kathryn, and Claire, who always greeted David warmly on his visits, and to other family members. We also thank these three generous sisters for providing information helpful in our compilation of this obituary.

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