Hewlett-Packard
at South Queensferry

Innovation in Silicon Glen





Volume One

Volume 1

Business, Work and Play – The HP Way

by

Hugh Walker

This volume is dedicated to all the employees at HP South Queensferry in Scotland.

About the Author

Hugh Walker was born in 1947 and brought up in Coventry. He has engineering degrees from Cambridge and Southampton Universities and joined HP at South Queensferry as a design engineer in October 1970. He had various design and management assignments in the R&D department, before moving to product marketing in 1982 where he had responsibility for analogue and digital transmission test. After a stint in the newly formed European Marketing Centre, he moved into marketing communications including PR in the late 1980s, and spent the remainder of his career mainly in this activity. In the late 1990s, he also assisted the management team with market research. After taking early retirement at the end of 2001, he spent a few years as a freelance consultant in technical marketing for Scottish Enterprise and university commercialisation projects. Hugh is married to Janet who was the HP South Queensferry librarian in the 1970s. Their son, Mike, also worked at South Queensferry for 10 years as an IT contractor until the factory closed in 2010.

Volume 1 Foreword by Finlay Mackenzie

It was in the early 1960s, while developing radar equipment at Ferranti in Edinburgh, that Peter Carmichael and I became aware of Hewlett-Packard (HP) measuring instruments, though we had no idea at that time that HP would soon play such a vital role in career development for both of us.

It is fair to say that Ferranti Edinburgh was the major player in Scottish Electronics at that time. They had large Research & Development (R&D) teams and good graduate training and apprenticeship schemes. The expertise of these teams was built up over years and passed on to new graduates. They had low R&D engineer turnover. Here was a base of talent that would help spread the Electronics Industry in Scotland and help establish Silicon Glen.

In 1965 Peter Carmichael and I joined HP in Bedford, knowing they were going to set up manufacturing and R&D in South Queensferry, Scotland, the following year. Our first product, the Microwave Link Analyzer, won the Queen's Award for Industry and convinced Bill Hewlett and David Packard that our Product Development Charter at Queensferry should be to develop Telecommunications Test & Measuring Equipment dedicated to meet the needs of the world wide Telecom System Developers, Manufacturers and Maintenance Organisations. Other divisions in HP were developing general purpose test instrumentation for a range of markets, but not specifically for the Telecom Market.

In this early period, Queensferry also invented two non-telecom products, which later migrated to a product line elsewhere in HP: a Pseudo-Random Noise Generator and a Signal Correlator, used in mechanical analysis. Understanding this theory of the Pseudo-Random Binary Sequence (PRBS) was invaluable to our move into Digital Communications later on.

This emphasis on developing our own Product Line ensured HP's Inward Investment was not a so-called "Screwdriver Plant". As a result of the business success of these product lines, which Hugh has described in this Volume, HP South Queensferry established a great reputation in

Silicon Glen. The Scottish Development Agency (SDA) used us very effectively to promote Inward Investment to Scotland. US Management Teams from Digital Equipment Corporation (DEC) and Motorola would land their helicopters at South Queensferry because the SDA wanted them to see what HP had achieved there.

We were happy to see people leave to set up their own businesses. Indeed, we encouraged them. The first group to set up was Fortronics, followed by Livingston Precision, and there have been others more recently. When we ran out of space we added a new building so there was spare capacity and we allowed small start-up companies to rent space in what we called Incubation Units. Cash flow is usually a problem for start-ups, but many survived during the period of developing their own product by getting some subcontract work from us. When they were established they moved to their own premises.

These are some of the ways we contributed to the growth of Silicon Glen. Hopefully, because of our presence, we were part of a “virtuous circle” that spread the R&D, Production and Product Marketing expertise of the Hewlett-Packard Company, which was “state of the art”, throughout the UK. Some managers left to devote their full-time career to giving Seminars on such topics as “The Process of Management”.

When we had 1000 employees at South Queensferry, Professor Donald Mackay of PIEDA Consulting estimated that the multiplier effect of our activity into the local and Business Community was over three times the above number. A decade after I retired there were over 2000 employees at Queensferry, creating thousands of additional jobs outside HP.

We were all enthusiastic and ready to tell anybody who would listen that we worked for a great Company. On work days, I always looked forward to going there and never missed a day through illness in over 25 years. There was such a feeling of “belonging and trust”. For example, when business was slack in the 1980s, we all went on a nine-day fortnight at reduced pay so nobody was paid off. The spirit of the place was such that employees were happy that “everyone hurt a little so that no one hurt a lot”. I also remember the owners of the Sealscraig Hotel in South Queensferry were astounded at how positive the production line girls were, on Friday nights, about their employer, when some other customers were typically running down their workplace. Going to work there was fun and never a grind.

From a business viewpoint, I soon realised on joining HP, that they put a lot of emphasis on Product Marketing. At HP South Queensferry we were spending 6% of our shipments on Product Marketing, excluding Field Selling costs. This really professional approach to the New Product Development Cycle is hopefully ingrained in the thought processes of the potential entrepreneurs who left HP/Agilent to set up their own businesses. Though HP South Queensferry is no longer there, perhaps Silicon Glen still benefits from the legacy derived from that “virtuous circle”.

We were allowed to spend 10% of our revenue on R&D. The success of our first product enabled us to go on the UK University Graduate Recruiting rounds, and bring engineers, whom we felt had a good interface with people, back for final selection by technical grilling at the factory. I met Hugh Walker for the first time during one of these sessions, and was really impressed with how he dealt with very difficult technical questions.

He accepted the R&D job offer and soon progressed to R&D section manager. Later, he decided that he fancied a job in Product Marketing, where he was welcomed with open arms. I was disappointed he was leaving R&D. He knew he had other talents of which we were unaware, and also a sense of history that led him to write two books on the Dunfermline linen industry in the early 1990s.

All who worked at HP South Queensferry should be grateful that Hugh has the talent and the desire to record the history of what was achieved at the factory for the last 35 years of the 20th century. This has been a major undertaking and Hugh had the foresight to realise that much of the

documented information which still existed at South Queensferry was about to be shipped to the USA, probably never to surface again.

Hugh has done a remarkable job of capturing the challenges and achievements at the South Queensferry factory over the years, as well as the unique character of the HP workplace in the old days. Reflecting on my time as General Manager in the 1980s, I recall some of those challenges and achievements. We had good growth in the early 1980s with our new products, but it slowed down markedly in 1984 when the HP Corporation reorganised its global sales force. By then, HP had become a major player in the computer business and the CEO at the time, John Young, wanted to integrate HP's test & measurement and computer businesses to present a more unified face to the customer. This created a challenge for us, as the sales force became defocussed and we lost over 40 specialists covering telecom accounts worldwide.

I'm proud of what we achieved on quality and reliability. A decade earlier our product failure rate was not good, but with all the attention we gave to quality processes using Total Quality Control (TQC) principles in the 1980s, we achieved one of the lowest failure rates in the Corporation, and won a Gold Star Award.

Our biggest challenge was the future product strategy. The telecom market was evolving rapidly in the 1980s with the transition from analogue to digital communication. I had to resist pressure from our corporate bosses and the sales force to produce new improved versions of what we already had, as I knew we needed to move on with what customers were telling us and follow the market. There were many new opportunities. In the late 1980s, we moved into signalling, gigabit per second digital measurements and test sets for the new generation of optical transmission, which I believe led to business success in the 1990s, as Hugh has described.

One measure of the internal strength of HP during the period of this history can be seen in the way friendships have continued, spanning decades and extending long after the factory closed. Hugh has been the catalyst who has brought out a purposeful enterprise from all these willing friends.

--Dr. Finlay MacKenzie CBE, D.Eng, C.Eng, FIET
HP South Queensferry General Manager, 1982 to 1990.

Volume 1 Preface by Hugh Walker

I well remember my first glimpse of the Hewlett-Packard factory at South Queensferry. It was a morning in late March 1970, and it was from the cab of a truck as it made its way down the hill from Dalmeny Village to Station Road. "*There it is*", I said to the driver, as I spotted a modern building across the fields. I'd been invited up to Scotland for a day-long grilling at the factory, following an interview at Southampton University. But why was I in a truck?

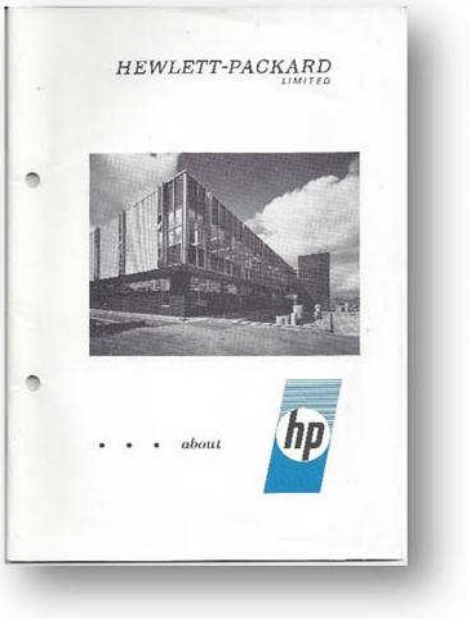
Things hadn't gone quite to plan. I'd spent much of the previous day travelling up from the Midlands by train. It was the first time I'd been to Scotland. Unbeknown to me, in those days the train divided at Carstairs and I ended up in Glasgow Central at rush-hour. I got the first train to Edinburgh, a slow train via Shotts, packed with commuters. I remember being fascinated by the unfamiliar landscape and the late afternoon sunlight which has a different quality in these more northerly latitudes. Eventually we got to Haymarket Station, still grimy and lit by gas lights. It did seem like a different country. HP had booked me into the nearby Grosvenor Hotel (now the Hilton), but gave no instructions on how to reach the plant. I should have taken the train, but didn't know.

The following morning, I asked about buses to South Queensferry. The Edinburgh buses went as far as the Barnton Hotel, so I got one of those. I didn't see any other buses heading out to Queensferry, so I just started walking. I must have looked quite bizarre marching along the grass verge at the side of the A90 in my interview suit, carrying a small brown leather suitcase. I'd reached the Dalmeny slip-road and was going over the bridge, when a truck driver pulled up and asked if I needed a lift. "*Yes, I know where that is. Jump in, I'm going that way.*"

I arrived late. When I explained I'd walked part of the way, it was met with incredulity. The first interview with Finlay Mackenzie went well – we were on the same wavelength with analogue circuit design. Next, I met Brian Finnie. Brian was one of the key inventors of the famous Correlator product and was steeped in noise statistics and correlation. I didn't have a clue what he was talking about! I recall looking out of the window at the Forth Bridge as I was presented with another unanswerable question, and thinking, "*I'm never going to get a job here.*"

Soon it was lunchtime and the R&D Manager, Gordon Roberts, took me and the other candidates to the Hawes Inn. Back at the plant, I got a tour of the factory by one of the engineers, Bryan Lewis, and then a final quite lengthy interview with Gordon Roberts. "*How are you getting home tonight?" "I've got a return ticket on the train." "Don't worry about that, we'll get you on a flight back to Birmingham.*" First, I took the train from Dalmeny to Edinburgh, where a bus took us to Turnhouse Airport for a noisy journey south to Elmdon Airport on a BEA Vickers Viscount. As the train approached Haymarket down that long straight track, I could see Edinburgh Castle through the front windows of the old DMU, highlighted by the setting sun. I remember thinking that this was a special place and if I got offered a job I would definitely come to Scotland, even though it was hundreds of miles from where I lived. It was a day crammed with new experiences which I will never forget. Nearly half a century later, and looking once again at the graduate recruiting brochure I'd been given, a job at HP still seems like an interesting and exciting prospect (see Appendix 18).

A few days later, I received a letter offering me a job as Engineer in the R&D Department at a salary of £120 per month. It enclosed a copy of this booklet, "*About HP*". On the first page it had a statement of the HP Philosophy, which I believe held true for many years:



hp philosophy

Hewlett-Packard's philosophy is simple, direct and known to all who have contact with the Company. Basically, it is to strive for leadership in its field by producing only those instruments that contribute to the art of measurement - and do so on the basis of value, quality and dependability at reasonable cost. Hewlett-Packard believes that profits are an essential means to all the Company does for its stockholders, its customers and its people, and that the Company should re-invest a substantial part of profits into continuing research and modern manufacturing facilities, so long as such re-investment provides for the continued prosperity of the Company.

I remember receiving that letter at home in Coventry and showing it to my parents. I was 22, and it was a pivotal moment in my life.

I've recounted this personal story because I'm sure many hundreds of other former employees can look back on similar memories of being offered a job at HP South Queensferry. Most employees stayed with HP for many years, maybe their whole career, so joining the Company was a momentous event in the story of their lives. A few people have mentioned to me that they have never given the place a second thought since they left, but I think they are a minority. For most people, their memories of working there will be with them until the end of their days. Several former employees have commented that the factory was like a second home, and the HP workforce was like a big family – a sense of belonging. It was an integral part of their lives. Many folk made friendships there that have endured long after the factory closed. Some even met their future wife or husband there, as I did when I fell in love with Janet.

Some, like me, arrived at the factory to start their first job after graduating from university, while for some it was a move from another company as HP seemed to offer better prospects. The majority of employees came from the local area, young school-leavers, starting work on the production lines, in admin or as an apprentice. In the early days, a lot of the employees had moved up from HP's first factory at Bedford in the south of England when the new factory opened at South Queensferry in 1966. The fact that around half the Bedford employees decided to move to Scotland was testament to the attraction of working at HP. When I circulated some old photos of the factory, one of those employees recalled the excitement and sense of adventure, moving several hundred miles north to a different country:

"Thanks for the images of our dear old building. They recall for me the excitement and anticipation of those heady days, with the prospect of (almost) emigration to another country, and a new chapter in the life of our small family."

One of the admirable facets of HP as a company was that it operated largely as a meritocracy. There were very few "glass ceilings" for either men or women[1]. It mattered little where you came from or what paper qualifications you had, your prospects were all down to your ambition and ability to do the job, so you could go a long way in the company and develop your career. That's why people stayed so long. One colleague I worked and travelled with for many years in Product Marketing and Business Development was Robin Sharp, who had started as a production worker:

"I joined HP SQF on 18th September 1967 as a Mechanical Assembler on the newly formed MLA line. Little did I know then, that I was starting on a journey with a company that would take me through 36 years of employment. Fantastic years, great memories and great friendships."

There was something special about HP, and the South Queensferry factory seemed to act like a magnet, attracting people from all over the UK and even further afield. Part of that was HP's reputation as one of the leading high-tech companies in the world and a founder of "Silicon Valley". I heard it referred to as the "Rolls Royce" of electronics companies.

"*HP South Queensferry was a unique place*", was the perspective of Mike Crawford, who worked for Scottish Enterprise and was involved with the Scottish Software Partners Centre hosted at the factory in the 1990s. "*It seemed full of larger-than-life characters, people like Chuck Acken who I found refreshing and enthusiastic. It was a privilege to work there with these people. HP had a unique atmosphere."*

Did HP attract these larger-than-life characters or did it make them? Probably a bit of both. To my mind, there is no doubt the HP Way encouraged employees to develop their talents and gave them more confidence in their abilities – what psychologists call "self-actualisation", referring to the need for personal growth and development throughout one's life. Chuck Acken

was a fine example. He'd joined HP in the USA in 1961 where he was involved in mechanical assembly. He worked his way up through the ranks, while earning his engineering degree, and then became Production Manager. Various jobs in marketing followed, before he was appointed General Manager at South Queensferry.

As I've described in Chapter 5, HP ran a constant stream of training courses for employees including vocational training as well as personal development. HP's philosophy of Management by Objective (MBO), rather than Directive, gave employees a degree of freedom to decide how a task should be done. This devolved decision-making went from the top of the organisation to the bottom. It gave the individual a sense of control, a feeling they could make a difference, and extroverts became "larger-than-life" characters.

This focus on the individual's freedom to make decisions seemed to decline slightly in the 1990s. HP became a massive company wishing to exercise a greater degree of central control, and the old HP Way may have given too much latitude in a complex and overlapping organisation. You will probably get a sense of that in the narrative, as the old Management by Objective philosophy got watered down. Another interesting change was the way employees' pay was set and their performance evaluated. Formerly, this had been done on an individual basis by evaluating how well a particular employee had performed against set objectives. By the 1990s, HP adopted a relative ranking system whereby the individual's performance was scored against other employees. This reached its nadir in the decline after 2001, when employees were scored against each other to decide who should be made redundant. Surely that was a far cry from the old HP Way of showing respect for the individual.

As I embarked on this mammoth project in 2010, some folk commented that it was "a labour of love" and that I must have been a real "company man". But I wasn't really a "company man" in the way some of my colleagues were. Only they will know how much of their mental energy, creativity and personal time they devoted to HP out of hours. I felt it wasn't a healthy life balance, but it was part of the ethos. I could see it was easy to get sucked-in. People found the environment intoxicating – the relative freedom of action meant you could have a lot of influence on the way things turned out, steering the future direction of the Division, even for relatively young employees. It felt like you owned the business, and in the old days there was a superb international network of HP folk who we worked with and knew personally. I remember going on foreign business trips with colleagues and the chat in the bar and at dinner was often about company politics, product and market strategy, new telecom technology and how we could defeat the competition. These "company men" probably became over-committed to HP and its business, but sadly there is now little left of their legacy.

I started work as a design engineer, and by the late 1970s was one of the lab managers with about 25 staff in my team. Initially, I really wanted to be in charge and help define the strategy, but soon found it very stressful, so in the early 1980s I moved sideways into marketing. I was offered more senior positions on a couple of occasions, but declined. When you've turned down the opportunity once or twice, you don't get asked again, so for most of my HP career I was a middle-management "also ran", rather than a "company man". I had other interests outside work which I wanted to pursue, and usually made a point of heading home to my family most days around 5 pm. I think the "company men" took a dim view of this – it demonstrated insufficient commitment!

If you side-line yourself, you sometimes get side-lined, so from time to time I wasn't very happy at South Queensferry, but only considered leaving a couple of times in my 31 years there. The most serious was right at the end, in the spring of 2001. My career felt pretty much at the end of the road and the future of the Division looked distinctly uncertain. For the previous three years or so, we'd used the services of a San Francisco-based market research firm, Ryan Hankin and Kent (RHK). I knew the European Sales Manager very well, and he intimated to me they were planning to set up a European office in London and were looking for analysts to join the team. I

went to London for an interview and was offered the job of European Director of Switching and Routing for £85k, somewhat more than I got at Agilent, however, for various reasons[2] the deal fell through. I was initially disappointed, but think I had a lucky escape, as three months later Queensferry started looking for redundancy volunteers. I decided to take the package and do my own thing as a freelance consultant for a few years, leaving Agilent at Christmas 2001. I did shed a tear on that last day as it all came to an end.

Being a middle-management "also ran", rather than a "company man", has certainly had advantages when writing this history. I had a fair knowledge of the overall business, the markets and the company politics, and could observe without feeling obliged to defend management decisions. I've been immensely fortunate to have a wide circle of former HP colleagues who have helped with this project, and I also count them as friends, probably because of my relatively lowly status. Sometimes, the higher up an organisation you go, the lonelier it gets as inevitably you have a greater influence on other people's lives, for good and bad.

So, why have I written this history? The motivation was the closure of the factory in 2010. In the spring of 2010, I'd been invited in to help go through the archives and old photos. The plan was that once we'd gone through the material, it would all be boxed up and shipped out to the USA to be held in the archives, thousands of miles from Scotland maybe never to be seen again. Back at home that evening, my wife said to me, "*You're very quiet. What's the matter?*" I was thinking we were about to lose everything. The factory was closing and the record of what was done there was about to go too. That was the moment I decided to try to preserve some of the story. I kept back a selection of photos and some key documents which I might need. The rest did indeed go to Agilent Archives[3] in Santa Clara, California.

Years pass, and for many who worked there it all now seems like another life as memories of it fade into history like a dream. It is astonishing how quickly time wipes the slate clean. It's easy to forget the factory that occupied the site of the Dalmeny Park housing estate, and I imagine few of the residents in the new houses there have any knowledge of it. I have written this history, hoping that HP South Queensferry will not be forgotten in the years to come. For me and many other employees, it was a major part of our lives. It was harrowing to see the buildings being torn down and to think about the loss of everything that had been built up over so many years. I wanted to give a voice to all these varying emotions, and to get closure through writing this story.

In this long history project, the last two chapters were the hardest, as it is difficult to write about failure. I'm aware that behind the facts and figures, there was hidden damage to hundreds of people. The skills and knowledge that had taken decades of effort to accumulate and refine, were dispersed in a few years. I thought when I left at the end of 2001, it was a short-term correction. I would have been horrified if I could have seen into the future with a further 1500 jobs gone and the place reduced to a pile of rubble. I got out pretty well unscathed, but there were others who were deeply hurt by what happened and felt they were hung out to dry after all the effort and commitment they'd put into the place over the years. Some still don't want to talk about it today.

I've tried to avoid apportioning blame for the calamity that engulfed the South Queensferry factory. It's far too easy with the benefit of hindsight to criticise the decisions that were made by management under the pressure of extremely difficult business conditions. I feel slightly guilty now that I abandoned the sinking ship, not that I could have done much about it. When I mentioned this to Gil Reeser, former HP Executive, he commented, "*You should never feel guilty in the slightest for the timing of your leaving. Instead you should congratulate yourself on your judgement. Yes, many were hurt, but there is nothing you or I could have done to change this.*"

Industrial histories are rare, and when they do get written it is often many years later by academics working from historical records. So this history is quite unusual as I lived through a

major part of this story and experienced it personally, as did many of the colleagues who have helped me with their recollections and opinions. Their memories have brought this narrative to life. Because we were directly involved in running the business, a significant number of old planning documents and business records have come to light, documents that individuals have kept for personal interest. This has given me unprecedented access to an extraordinary amount of contemporary business information about HP at South Queensferry. We also managed to compile an almost complete collection of the employee newsletter, *Readout* (later *QUIP*), from its inception in the mid-1960s. This has been a great help in identifying the chronology of events at the site.

My idea of writing up the history presented a challenge. How would I be able to combine a more general history of life and work at the factory, the social and business aspects, with the technical detail needed to do justice to the products? A former colleague, Magnus Hunter, suggested writing two books and that is what I have done. This volume, a chronological business history, has relatively little detail on the products and technologies, while that is covered in much more depth in Volume 2 on Product Families.

The structure of this volume is mainly chronological, starting with the early days in Bedford. There are major chapters on the 1970s, 1980s and 1990s when the factory expanded, and new businesses and technologies evolved. Apart from this business history, there are four core chapters (Chapters 5, 6, 7 and 8) which describe respectively working life at the factory, the social life, how we developed products and the manufacturing processes. These chapters are self-contained and may appeal to those readers less interested in the overall business history, though they are cross-referenced in the main narrative.

Who have I written this book for? My primary audience is former employees at HP South Queensferry who may wish to relive some of their working lives, or find out more details about what happened there over the years. From a personal point of view, that is why I researched and wrote this book. Longer term, I'm thinking of local historians who may be researching the story of South Queensferry. Or, perhaps academics studying the phenomena of Silicon Glen, that important epoch in Scottish industrial history, which saw the rise of hi-tech as the old heavy industries declined in the second half of the twentieth century. HP South Queensferry was preeminent among the inward investment companies in Silicon Glen, and mirrored its rise and fall.

In my view, manufacturing industry isn't given enough importance in social and historical research. At the official opening of Building 5 in July 1990, the Duke of Edinburgh spoke of the importance of industry for the well-being of society:

"Manufacturing industry is the first and most important social service in any country because, if you come to think of it, it pays most of the corporate and personal taxation out of which all the social services and all the other pleasant things in life are provided. On top of that, it allows individual people to make the best use of their talents and to make themselves a good deal more prosperous. I congratulate Hewlett-Packard on their contribution to our economic, social and cultural welfare."

The Duke was probably exaggerating for his audience, as the service and financial sector make large contributions too. However, in employment terms, a good job in manufacturing industry is one of the most satisfying. Designing and building a high-quality product, and then seeing it shipped out to the world market is very rewarding, and that is equally true for the production workers as the R&D design boffins. HP South Queensferry was a microcosm of human endeavour and social interaction.

One question remains, did it all have to end the way it did? Could there have been other scenarios? Some have said to me that if Bill Hewlett and Dave Packard had still been around this

would never have happened. It poses the question, what would Bill and Dave have done? Although they had some very enlightened management principles, they were at heart business people and would have been very unhappy about losing money. In the stringent business climate after 2001, they would have been forced to close operations and lay off staff, however reluctantly.

One thing they might not have done, was to break up the highly successful division structure where design, marketing and manufacturing operated as a unified interactive organisation under one roof. Agilent's decision to centralise manufacturing in Penang effectively ended that. Gil Reeser was not a fan of this strategy:

"Agilent tried to save a few percent on costs with Asian manufacture. Actual labour costs were around 5% for our instruments and cutting that in half was not the answer. We lost all the goodwill and presence round the world for 2% less cost. High-tech companies around Silicon Valley are bringing back final assembly and test. That is not where the labour is anyway, and it is very valuable to have it next to R&D."

Whatever the merits of these arguments, the fact remains that several of Queensferry's competitors are still in business, albeit in merged and consolidated form, producing similar products. Tommy Cook has built his successful company, Calnex, from a small segment of Queensferry's business, and manufactures the products for the global market in Scotland. Most tellingly, Agilent's successor, Keysight Technologies, now has a major focus on the markets that South Queensferry once served.

Finally, I must acknowledge the contribution of many former colleagues and HP people who have willingly helped with my research over recent years. This ranged from answering a couple of questions by email to agreeing to an extended interview. Some have even produced their own narrative, and a few of these I've included as Appendices in both volumes.

It would be impractical to mention all the contributors here, so instead I've acknowledged them by name at the end of each chapter that they helped me write. I will mention a few people whom I'm particularly indebted to. When HP set up in the UK in the early 1960s and then moved to Scotland, I was still at school, so I've relied entirely on others for information. I've been very fortunate to tap into the memories of John Doyle, David Simpson and Hugh Smith, all of whom are well advanced in years. At the other end of the story, I've also relied on the testimony of other people after I left Agilent in 2001. I'm very indebted to Boyd Williamson, Ron McDowall, Andrew Wilson, Tom Walls, Alastair Walker and Hamish Butler who gave me many insights and candid opinions on the politics and the players during the final few years. In several cases, they agreed to lengthy interviews, and I remember particularly a fascinating session with Tom Walls at the end of 2018 when so much of the end game came into focus.

I must mention Finlay Mackenzie, the first person I met when I was interviewed at South Queensferry in 1970. I remember many years ago, he suggested I was the person to write the story of the factory. He's given me a number of inputs and documents over the years and was very open about his time as General Manager in the 1980s, which was a challenging period in the Division's history – challenging because of HP's reorganisation and the need to evolve product strategy to meet structural and technical changes in the telecom market.

I'm also grateful to Graeme Stewart, who started with HP in the mid-1960s, and who has read over the hundreds of thousands of words I've written, checking for typographical and grammatical errors. I don't imagine we've picked up all of them, but the text is a lot cleaner following Graeme's "eagle eye".

[1] In the 1990s, HP, in common with other companies, wanted to have more women in senior positions, but being an engineering company there was a preponderance of men. In order to meet the goal, HP appeared to operate a degree of “positive discrimination” which caused some resentment at times.

[2] Following the job offer, they asked me to go to RHK head office in San Francisco to meet the staff. It was an eye-opener. The place seemed a bit chaotic with folk running around, while I was parked in a meeting room. Despite having paid for me to come 5000 miles to see them, nobody seemed to know what was going on. I met one senior executive who seemed shattered and visibly stressed-out, a bit unnerving. It also emerged they expected me to travel to San Francisco five or six times a year – I’d imagined working from home and going to London a few times a year. When I got back, I discussed it with a work colleague. He suggested trying to get better remuneration for the added expectations. He pointed out that although the salary was good, it was far less than they paid their US staff. Negotiation was a mistake, as they immediately rescinded the offer. Not sure if they got cold feet about me or the business, but within a year they were laying-off staff.

[3] When the Test & Measurement part of Agilent was spun out as Keysight Technologies in 2014, the archives relating to that part of the business (including material from Queensferry) was transferred to the Keysight headquarters in Santa Rosa. Unfortunately, it seems a significant part of this archive was destroyed in the wildfires of October 2017, and this may have included the Scottish records.

--Hugh Walker
Dunfermline
August 2019

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https://btcloud.bt.com/web/app/share/invite/TLXV3jnGgh

Volume 2
The Product Families

Volume 2 Preface by Hugh Walker

In the spring of 2010, as the old HP South Queensferry facility entered its last few months, the site librarian, Mayumi Hepburn asked if I would come back to help look through the archives and photos stretching back 45 years and decide what should be done. My afternoon visit was timed to coincide with that of a librarian from Agilent Archives in Santa Clara, California. The plan was that once we'd gone through the material it would all be boxed up and shipped out to the USA to be held in the archives, thousands of miles from Scotland maybe never to be seen again. Back at home that evening, my wife said to me, "You're very quiet. What's the matter?" I was thinking we were about to lose everything. The factory was closing and the record of what was done there was about to go too. In the words of the Joni Mitchell song, "You don't know what you've got 'til it's gone", or in this case nearly gone!

My association with the South Queensferry plant in Scotland goes back to 5th October 1970 when I joined HP as an electronic design engineer to work on the Microwave Link Analyzer (MLA). I'd just graduated from Southampton University and earlier in the year some HP engineers came round the university looking for new recruits. In March, I came for an interview at South Queensferry. It was a long way from home, but that didn't seem to matter.

Hewlett-Packard was the world's premier test equipment manufacturer, and many viewed it as the Rolls Royce of electronics companies. I first became aware of HP at college in the late 1960s when a friend returned after the summer holidays with photocopies of the circuit diagrams from an HP oscilloscope (probably a 140 series). We spent hours poring over the transistor circuits trying to work out what the designers in Colorado Springs had done. Later at Southampton, I used a new 3420A Differential Voltmeter and was impressed not only by its accuracy but by the quality feel of the controls and the meter. Designing equipment like that was an opportunity not to be missed, so when I was offered a job I didn't think twice about moving north.

Today HP is recognised as a major supplier of computers, IT equipment and software, but in the old days it was famed for its technology and measurement instruments, the finest in the world particularly for RF and microwave measurements, signal analysis and frequency and time standards. That was HP's reputation in the golden age from the 1950s to the 1980s, and that's what drew me to the place.

On my first day at the factory, I was given the circuit diagrams for the MLA and told to familiarise myself. I remember being totally in awe of the analogue transistor circuit design and the inventive way it had been done. I wondered if I would ever be able to design anything like that. The MLA was only one of many remarkable products invented at South Queensferry over the years, innovation that was remarkable even by the standards of HP. There was some of the earliest use of digital electronics to generate and analyse noise plus the use of digital filters in the Dynamic Signal Analysis products of the late 1960s. There was the first direct digital waveform-synthesised signal generator in the 3770A Group Delay Test Set in the early 1970s, and then the first instrument in HP and probably the world to use an Intel microprocessor (3745 Selective Level Measuring Set). Alongside this, the tradition of outstanding circuit design in the MLA continued in several products for radio and analogue communications systems, some using in-house thin-film circuit technology.

In the emerging market of digital communications, South Queensferry engineers designed the world's first high-speed Pattern Generator and Error Detector (3760/61) and a few years later,

their PCM Test Set (3779) made a breakthrough use of a menu-driven display and took digital signal analysis to new heights by using a proprietary HP computer chip, making it the most software-intensive instrument of its day. They stretched the technology of the time to its limits, and complemented this with some highly inventive ideas for solving measurement and communication problems. Not without reason, the Division was nicknamed inside HP, “The University of South Queensferry”.

How did these innovations, and many more described in the following chapters, come about? Partly it was the ethos of the Company instigated by Bill Hewlett and Dave Packard. One of the design engineers from that time, David Dack, recalled the role of Peter Carmichael and Finlay Mackenzie, the inventors of the MLA. “Finlay and Peter did exactly what Bill and Dave always advocated. First, collect a bunch of bright newly-qualified engineers – so new that they did not realise what they wanted to do was ‘impossible’. Then let them get on with it, with minimal interference.” Some from the R&D lab will remember the lengths we went to each year, trawling round the UK universities looking for the brightest engineering and computer science graduates. Of course, we just took it for granted at the time, but with hindsight it was undoubtedly one of the powerful drivers of the business.

Returning now to that archive meeting in the spring of 2010, and the question of what I could do to save something from this dying business. I took early retirement at the end of 2001 along with a hundred other old-timers, as the first wave of redundancies took place. At that time we employed about 2300 at the site. By 2010, following numerous further lay-offs there were just 200 staff remaining. As the place contracted, large areas of the factory were taken out of use. It was obvious that much in the way of documents and equipment had already been lost.

For the next couple of months I visited the factory once or twice a week and went through all the remaining documentation, and with the help of Mayumi Hepburn, copied what I thought might be useful as a record. There were thousands of photographs, mostly negatives, of products, people, events and views inside the factory. Fortunately, for nearly 40 years we had resident professional photographers at the site, so there were plenty of really good pictures. I scanned hundreds of these to provide a permanent photographic record. Coincidentally, I discovered another employee, Chris Burden, had scanned a large number of photos, so between these two archives we have an excellent pictorial record.

Former colleagues brought round one or two old instruments and this formed the nucleus of a small collection. With some other instruments we found in the factory basement, we had a collection of around 14 items covering the 40 year history of the place. We put on a final product show in June 2010 and, with the help of Yvonne Mackie (site general manager), invited a curator from the National Museum of Scotland who agreed to take all of these instruments into the national collection. These are listed in Appendix 4.

In the final days, I found three ring binders abandoned in a cupboard that the product support department had compiled over the years. These had the product support plans and obsoletion notices for many of the instruments we designed. Information on dates, numbers produced and so forth. A goldmine that helped me produce the catalogue in Appendix 1.

My idea of writing up the history presented a challenge. How would I be able to combine a more general history of life and work at the factory, the social and business aspects, with the technical detail needed to do justice to the products? A former colleague, Magnus Hunter, suggested writing two books and that is what I have done. This book, Volume 2, describes the product families in some engineering detail, while Volume 1 is a more general chronological history about the business and social life at the factory, with much less technical information.

I should mention what’s in this book and what’s not. The product families are all those of the main Division at the site, which started in 1965 and went through until nearly the end. Originally it was

the South Queensferry Division (SQD) and was Division 14 in HP's corporate organisation. After the operation focussed exclusively on Telecom Test, it became the Queensferry Telecom Division (QTD) and had the designation Product Line 63 (PL63). In the 1990s, it became Queensferry Telecom Operation (QTO) for a while, and then finally Telecom Network Test Division (TNTD), during which time it became part of Agilent Technologies in 1999 when the old HP was split up. The two other divisions on site, Queensferry Microwave Division (QMD) from 1985 onwards and the Telecom Systems Division (TSD) from 1994 onwards, are not included in this volume. The stories of these businesses and their products are covered in Volume 1.

The chapters about the product families are mostly self-contained, however some are intended to be read as a group, to avoid repeating a lot of background information. Chapters 2, 3 and 4 on Microwave Radio are one example, and the chapters on Telephone Line Analyzers and the RATES system are similarly related. Chapters 9 and 10 on Digital Transmission are intended to be read in sequence.

Have I viewed the past through rose-tinted glasses? I think I've given a fair assessment of the strengths and weaknesses of our products. Although well designed and built, they weren't all winners in the marketplace. However, the other facet of the development process was the disagreements and arguments between the various Division players in R&D and marketing. You might call it "creative conflict". Certain cliques formed around particular product areas and quite a bit of politicking went on promoting them, which could be a disadvantage if you were on the other side of the fence. On the other hand, one could say it showed that people cared and wanted to defend their ideas. As one former colleague put it, "They simply cared passionately about the place and the work they were doing – apart from the obvious buffoons, that is!" It was pretty competitive when it came to allocating resources, and projects sometimes got cancelled.

In the earlier years, many of these arguments revolved round the analogue versus digital communications market. In later years, another popular topic was the relative merits of stand-alone instruments versus network monitoring systems, which we called the "systems versus boxes" debate. There were also the inevitable personality conflicts between engineers with strongly held ideas and egos to match. Speaking to former colleagues while writing this book, it is surprising how quickly these old rivalries have resurfaced, even after 30 years or more. I've stayed away from this subjective stuff in the narrative as I don't want to reopen old wounds or offend people. In that sense, I've taken a charitable view of history.

So, what is special about the HP factory at South Queensferry in the context of Scottish industrial history? It was part of that enormous growth in high-tech industries in Scotland from the 1960s onwards – part of Prime Minister Harold Wilson's vision of a New Britain, "forged in the white-heat of the technological revolution"[1]. Many inward investment companies in the electronic sector set up in the central belt, attracted by government subsidies, and it became known as "Silicon Glen".

What set the HP factory apart from many of the other operations in Silicon Glen was the high level of product development – most of the goods produced at the site were also designed there and around 90% were exported. In later years nearly a third of the employees were involved with new product development. Scottish Enterprise saw it as a "Jewel in the Crown" of inward investment and I remember as PR manager in the 1990s, regularly hosting visits by foreign journalists and industrialists eager to see what we did. Finlay Mackenzie used to say that our product development capability gave us deep roots, meaning that it would be hard to uproot the operation and transplant it somewhere else. But even deep roots need nourishment and in the end a change in the market and lack of corporate interest meant the South Queensferry plant withered away and now it has gone.

Years pass, and for many who worked there it all now seems like another life as memories of it fade into history like a dream. History is made every day, but I feel sometimes there is too much emphasis on things that happened a very long time ago (how many more books on Mary Queen

of Scots do we need?). The recent past gets less attention, particularly industrial history. I hope that HP South Queensferry will not be forgotten in this way. David Dack, one of the design engineers, summed it up with this quote from Shakespeare's Henry V:

Old men forget,

Yet all shall be forgot,

But we'll remember with advantages,

What feats we did that day.

As I write this Preface in the spring of 2013, Central Demolition is tearing down the buildings where these "Engineering Feats" were done. Soon there will be nothing left to mark the spot where so many original products were invented and manufactured. All that remains are living memories, the many photographs of life and work at the factory, this written record, and last but not least the products themselves as they are the embodiment of what the place was about and why we went to work there every day. In that respect we are fortunate as the instruments are mostly compact and highly concentrated examples of design and manufacture, and are a testament in themselves.

Of course, many of our earlier instruments are now completely obsolete as the changes in electronics and communications have been so dramatic in the last 30 years. Indeed, it would probably be hard to find telecom equipment anywhere in the world that they could still test! Instruments from the early 1990s onwards are compatible with modern networks and many are still in use today. All of these instruments had a part to play in the development of the worldwide communications network we take for granted. They were the tools of the trade and, although rather obscure and specialised, everyone has benefited from them indirectly.

So, this volume in the history of HP at South Queensferry is written for the engineer and I hope does justice to all these inventions. It is dedicated to the staff who designed, manufactured and marketed these products in South Queensferry for the global market. Their ingenuity and dedication made a great deal of money for HP and later Agilent Technologies. They were wealth creators, and it is something of a mystery why Agilent couldn't exploit this highly-tuned design and manufacturing capability, and just let it go. The site grew large and successful mainly through the ideas of these people. One can't help feeling that they, and their legacy, really deserved better.

I would like to thank the numerous former employees whose memories, insights and anecdotes have brought this volume to life. I have acknowledged the particular individuals at the end of each chapter. I would especially like to thank Finlay Mackenzie for his help and encouragement and for dredging up all kinds of memories from the "recesses of his mind". Finally, many thanks to Agilent Technologies for giving me a lot of access to information and equipment at South Queensferry in the final months, and allowing me to wander around the place at will.

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[1] Speech at the Labour Party Conference, October 1963

--Hugh Walker
Dunfermline
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