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Biography

Lessons from an unplanned scientific and academic life

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1 Introduction

It is salutary, before reaching the middle of one's eighties, whilst time is still available and memory is still in good order, to review a long life in its highlights, so as to better appreciate the circumstances that shaped and steered that life through its many days. Besides this appreciation, such a review permits a listing of lessons learned through that life, its joys as well as its woes, in the hope that they may be useful to young readers of your story. Like all other such stories, mine was the story of an individual, who lived under unique circumstances and reacted to them in a unique way. My story is best treated in terms of where it was experienced, that being: Malta (1929 to 1952), Oxford (1952 to 1956), Singapore (1956 to 1960), Khartoum (1960 to 1965), and Saskatoon (1965 to the time of writing). Each transition was necessitated by its own circumstance, brought fresh challenges and sustained a global career with few regrets and much personal and professional satisfaction.

Figure 1: Francis Vella.

2 Malta

I was born into a lower middle-class Maltese family in the summer of 1929. At that time the country's economy and government were determined largely from being a British colony and a very important Mediterranean base for the British Navy and garrison. That status continued until 1964 when Malta became an independent republic within the British Commonwealth. By then, due to professional and family reasons, I had become a permanent expatriate.

I was the sixth of eleven children, of whom one died in infancy, and four were girls. Like that of all my siblings, my early education was at the school attached to St Joseph's Convent in Sliema. This was located a short walk from our house and close to the harbour that was frequently home to destroyers of the British fleet. I was considered a good student at that school and can say that my childhood, in those pre-World War II days was a happy, carefree one with lots of swimming in the summer time.

I was successful in my first attempt at the Lyceum entrance exam just before WWII broke out. I spent the four war years at the Sliema Lyceum and the first postwar year in the Valletta Lyceum. Things went relatively well in spite of the heavy bombing by the Luftwaffe and the frequent air raids, but in March 1942 my father died suddenly, early one morning during a day and night spent in an underground air raid shelter. This meant that I became unclear about where I was heading. Going to the Valletta Lyceum was a stroke of luck, as I acquired a different group of teachers. Even with the little contact he had with me in his Maltese language class that year, Mr Paul Zarb (popularly known as Esopu) was instrumental in me being selected to sit the Oxford School Examination, for credits that would get me admission into the Royal University of Malta in October 1945. This was very significant as that was the

year admission was available and if it were missed there would be a three–year wait for the next. Mr Zarb's unexpected, benevolent intrusion (in loco parentis) into my life was a life changer. His six words of judgement ("Even you Vella, if you want") have been with me ever since.

During the summer breaks of those young teen years, I often took a bus to Valletta on a Saturday to borrow novels from The Royal Malta Library. One of these was Ivanhoe by Sir Walter Scott. I was very impressed by a poem I came across there, which ran: "What thou wouldst do, Do when thou canst, For when thou wouldst, Thou canst". It was not just the 'wouldsts' and 'cansts' that had an effect on me, but the unusual expression of practical wisdom incorporated into the adage: "strike while the iron is hot". That quartet has quite often been foremost in my mind and still serves me very well in my everyday life.

The University of Malta in those days, historical as it was, was a small institution with about 300 students, who studied Theology, Law, Medicine or Engineering and Architecture. Admission was every three years and its facilities modest. The professors were capable and respected in their areas and teaching for them was a secondary occupation. In Medicine, most were clinical consultants who had taken higher studies in the UK or Italy. They did their best and were usually well liked.

Before the end of my first year at university I had acquired the necessary number of credits for admission and the required pass marks in Maltese Language and Religion at the Matriculation exam, to be considered a full time student for the M.D. degree. I worked very hard that year and was one of a small handful to pass all examinations at the end of it. I was greatly encouraged by the kind words (the vein of Mr Zarb's) of a Dr Oscar Zammit who taught us laboratory biology. I attribute this success largely to the discipline of studying with a slightly older colleague who had been recruited into the army in the latter part of the war and who lived close to our home. We studied every day, including most weekends, and indulged by going to a late evening movie about once a week. My examination performance was kept up in the following years. Because of my performance in the four pre-clinical years, I was exempted from payment of university fees over the next three. It was during this time that I became very interested in Physiology and the Biochemistry associated with it (as little as that was then). This was largely due to Professor Walter Ganado whose lectures, I found, were always well prepared and very stimulating. He was interested in nutrition and biochemistry as the key to understanding human disease. In my final three years, I maintained this interest. I also felt that the Rhodes Scholarship (of which one was awarded to Malta every year) could be my opportunity for exploring these two subjects further. It was very clear to me by now that I was more interested in the academic aspects of medicine rather than its day-to-day practice.

I was never much of an athlete, but I was a Rover Scout during my university years, loved camping and hiking with my colleagues, was a member of the rather successful rowing team, participated in soiree lyriques and even played a part in a one-act play. These and my consistent performance in examinations played an important part when I applied for the Rhodes Scholarship in my final year at University. My success against two other applicants was my first step in pursuing the rest of my life overseas.

My education in Malta was largely textbook-based. It emphasised memorisation and the authority that came from the position of the author or authors of those books. What was important was the conclusion rather than the results or methods they were derived from. It also largely assumed that understanding and a critical attitude to printed information would come naturally. It is these deficiencies that my teaching career would later on pay great attention to. That education provided me with very little laboratory experience, something I became more aware of with the passage of time. From it all, I came to appreciate what my talents were as well as where I lacked in some aspects, and the need to undertake only what was within my abilities.
This phase in my life taught me these lessons:

1. Do not leave for tomorrow what you can do today.
2. Whether we like it or not we are constantly being assessed, evaluated, weighed up, formally or informally. Often it is to our advantage to know the results of such assessments.
3. Life, with its joys and woes, has to be lived and enjoyed to the full.
4. Make the most of what you have talents for and of what your environment provides to do well, in spite of your deficiencies.

3 Oxford

I was accepted into St John's College Oxford to read for honours in Physiology. This would also include some Biochemistry. I adapted to college life rather quickly. My tutor was a recently appointed Fellow who was also medically qualified. Every week, on Tuesday at 8.15 pm I would go to Dr Robert Torrance's college suite and read to him and answer questions on, an essay I had written on a topic he had assigned me. I attended lectures and laboratory sessions that he recommended and spent most of my time at the Science Library chasing

and reading such publications as were relevant to my essay. Textbooks were of no use as they rarely said much about the particular topic. My first few essays were based largely on the conclusions in papers I referred to. However, needless to say, I could not answer questions about methods or results on which those were based. I had to change my style of work. I now had to pay greater attention to methods and analysis of the actual results in each publication. I had to derive my own conclusions and check how they confirmed, or otherwise, those of the author or authors. This was difficult but it was the track that led to me becoming critical and scientific in my reading of other people's work. In effect, it changed me from a memorizer of textbooks dependent on other people for my ideas, into a critical and independent thinker whose thoughts were based solely on the analysis of evidence that was available to me. This was a slow process. I became aware of the changes that had occurred in me in a momentary epiphany that happened one beautiful sunny spring afternoon of my stay in Oxford. I will never forget the moment.

I spent the summer break of 1953 in the Clinical Biochemistry department of the Radcliffe Infirmary, through the good offices of Mr JRP O'Brien (Percy), who was to be my Biochemistry tutor for two terms in my second year. Again I attended the weekly essay reading and tutorial on Tuesday at 8.15 pm at Mr O'Brien's house. Most of the Biochemistry available then was on metabolism. I now met the book on 'Inborn Errors of Metabolism' that was made famous by Sir Archibald Garrod in the early years of the twentieth century. My interest in Garrod would increase several years later. I sat the honours examination at the end of my second year and achieved a second class degree. I was pleased with this result as I felt that it truly reflected my assessment of my own abilities.

It must not be assumed that there was no free time for fun in those years. Meals in college were an occasion for much camaraderie, as were brief coffee meetings with a group of college friends, after lunch or dinner. There were occasional social events at Rhodes House or invitations to dinner at other colleges as a result of friendships formed. Saturday evenings were reserved for a visit to the cinema or to the theatre and when the weather was fine, Sunday afternoon was optimal for long walks as they cleared the mind and gave time for the unconscious to do its work without additional clutter. In the breaks between terms there was travel to other parts of the country and hospitality arranged by the very resourceful and formidable Miss MacDonald of the Isles who generously provided this service to Rhodes Scholars from her London office.

After my exams in 1954, I took a vacation in Malta where I committed to be a witness at the summer wedding of a good friend from my university days there. I recall meeting Professor Ganado one day that summer and hearing from him about the concept of molecular disease. He suggested that I should try to get into that field. I was now 25 years old, time to think of getting married to a young lady I had met in England.

Mr O'Brien had accepted me into his department for my final year. I mentioned molecular disease to him, but he felt that Africa rather than Oxford was the place for that. He suggested that I try to investigate serum peptidase activity, so off to the library I went to review what was known, methods used, results of clinical significance and such like. That took several weeks to achieve. He suggested an untried colorimetric assay for serum peptidases based on a possible change in ninhydrin reactivity of the amino acids released by cleavage of a small peptide substrate. However, the results I obtained by this rather crude method produced little of significance.

I had decided that returning to work in Malta was unlikely and started to think of getting some form of employment so I could get married. I felt that setting up a home in the UK would not suit me or my circumstances and considered joining one of the newer universities in a British colony. I soon discovered that an Assistant Lectureship was available at the medical school of the University of Malaya in Singapore. After taking advice from Mr O'Brien I applied for this position and was offered it. Mr O'Brien arranged for me to be supported by a Mary Goodger Scholarship when my stipend from the Rhodes Scholarship ended and until I got married and left Oxford.

My wedding to Lena took place at the Jesuit Church close to the Radcliffe Infirmary on a very cold Saturday morning early in January 1956. This was the beginning of a new life for Lena and I and one full of new responsibilities. Later that month Lena and I flew to Malta and then to Genoa to board a slow cargo boat, which also carried a dozen passengers, to Singapore. During that voyage my coming teaching duties impressed themselves to me. I spent my free time on that trip reading the recently-published Textbook of Biochemistry by Fruton and Simmonds to expand my knowledge of the subject. I had no experience of lecturing but, with my youthful exuberance, felt confident that I would succeed.
My Oxford experience was a happy one, with its ups and its downs, it taught me that

1. Important decisions entail equally important consequences which, although barely thought about before they present themselves, have to be faced responsibly and usually on their own terms.

2. If your ways of doing things do not produce the desirable results, they must be changed.

3. What you learn, and especially what you learn to

do for yourself, is much more meaningful than much received knowledge.

4 Singapore

We arrived in Singapore on a very hot and humid Sunday morning early in April. The weather was a huge contrast to what we had left behind in Europe. I soon discovered that the department in the medical school consisted of a Professor (Australian), a Senior Lecturer (Singaporean), two Lecturers (one English, one Irish), and myself as Assistant Lecturer. It was responsible only for teaching medical students. This meant that my share of the teaching in the first year was small and consisted mainly of demonstrating in the laboratory class (a useful experience it turned out to be). This left me ample time for setting up a research program. The professor suggested that I consider looking for abnormal variants of human haemoglobin (Hb) about which he had read. So there it was, molecular disease, at last. Here was my chance to get into the field. I was assigned a technical assistant and I had to give him some work to do. For this I fell back on an assay for uropepsinogen on which I had information from my Oxford days. The assistant was Stephen Pang, a pleasant young man of about my age, who turned out to be a real treasure.

To begin with, most of my time was spent in the library and consisted of an up-to-date review of publications on the abnormal haemoglobins, which then included the relatively common Hbs S (for sickle cell), C, D, and E. Normal Human Hb was known as A1 (major adult), A2 (minor adult), and F (foetal). I became deeply involved in reading what was then called Cooley's anaemia (later thalassemia). I quickly found that I was delving into various kinds of anaemia and into haematology and genetics of which I had only what can be best described as a smattering. Here I was learning, completely on my own, what I needed to know because it was integral to the work that I would be doing. There being no photocopying systems available, I made extensive notes on everything that I read. My memory in those days was very good and I retained much useful information from what I read, including who had done or discovered what and when. I was lucky to find a very recent and comprehensive review, published in the New England Journal of Medicine, that described an electrophoresis system in which Whatman filter paper was sandwiched between siliconized glass plates (the 'evaporation – prevented' method). I also found a description of the method for the 'one-minute alkali denaturation' assay for Hb F. I recognized that all this was within my capability. I was ready to go.

I explained to Stephen what I planned to do. He liked it. He stopped work on the assay for uropepsinogen. There was a departmental technician who did glass blowing and other work for the department. He made plastic electrode troughs, power packs and found the glass plates we needed. Because of the hot weather we decided to run the electrophoresis inside a refrigerator in the laboratory, with the power packs sitting on a small table next to it. While this was on, I wrote up my literature review in the form of a paper for possible publication. After checking out the equipment, I felt that the professor was more interested in physicochemical measurements of the electrophoretic mobility of haemoglobin than on anything else, which I considered to be of greater interest. Luckily, he left for a long leave in Australia and very soon thereafter he returned to Australia for reasons of health. I was now on my own and could direct my own project.

The electrophoresis system worked well and reproducibly, with good mobility within 2 to 3 hours. This meant that we could have two or three runs a day, if I went back in the evening to switch off the third run. With nine specimens on each sheet of filter paper, three possible runs per day, four electrophoresis and four power pack units we could scan about 500 specimens per week. Preparation of samples could be effected while electrophoresis was in progress, required several bench top centrifuges and an adequate supply of glassware. I could lend a hand at preparation of specimens or setting up of electrophoresis runs as my other activities permitted. The supply of clean glassware was left to Krishnan (a very loyal and hardworking Indian). Stephen was a well-organised individual and enjoyed the work. We were equal to the task. The method for Hb F was a simple colorimetric one, which was quick, easy and reproducible.

Before long I came across a citrate - agar gel electrophoresis method which could better discriminate several types of haemoglobin. I tried it out and added it to our repertoire. I also found a method based on solubility, specific for Hb S. Since several variant Hbs had a similar electrophoretic mobility to that of Hb S, the test would be useful in excluding this type. Soon after I started this work, new variants had started to be described at a rapid rate, so it was essential that I keep up with the literature and keep a note of any developments.

It was essential for our purposes to have sources of already available blood samples. One good source was the Blood Transfusion Centre, of which Dr (Mrs) MMH Gibson-Hill was in charge. Her blood donors were largely from the British garrison and included significant numbers of Malay, Nepali, Eurasian, Chinese, Indian and European origin. She agreed to provide all 'pilot tubes' that were no longer required for the work in her Centre. All I had to do was send someone to collect them before the Centre closed for the day. This

was easy as Krishnan enjoyed this task and did it very responsibly. We received about 12,000 samples from her in my four years in Singapore. The very first abnormal samples we found came from Malay donors. They were easily categorized as containing Hb A1 (normal adult) and Hb E. This excited everyone in the laboratory, as it showed visible proof that we were not chasing ghosts. Very often, the refrigerator would be opened to inspect progress during a run and a call would go through the lab indicating the number of abnormal specimens that could be seen!

Those blood donor samples formed almost half of the samples examined. The rest came from two other sources in Singapore, Johore Bahru, Malacca, Kuala Lumpur, Penang and Sarawak, the result of having contacted interesting people who were eager to help. In addition, there were some 700 samples from hospital patients (including many children), who were being investigated for severe anaemia, and 2500 cord blood samples. We found numerous instances of heterozygous Hbs D, E, J, K, L, Q, S, and of Hb H disease, Hb E-thalassemia and classical Cooley's anaemia (or thalassemia major). Of these, Hb Q and J Norfolk were new discoveries. A very exciting find was a Chinese man with severe anaemia who turned out to have Hbs Q and H disease. Similarly, the finding of two unrelated cases of Hb H that appeared on one filter paper that contained nine samples. The latter, and others like them, were confirmed by supravital staining of erythrocytes with brilliant cresyl blue which produced characteristic inclusion bodies.

I felt a great need to inform the local medical profession of our findings and so published many results in two local journals (Proceedings of the Alumni Association and Medical Journal of Malaya), but also found publication in peer-review journals. Many of the variants were confirmed in collaboration with Dr Hermann Lehman, then at St Bartholomew's Hospital in London England, a collaboration that enhanced my scientific standing and lasted many years.

We spent part of our first leave in Malta. I recall being asked by paediatrician Dr Tommy Agius Ferrante to help make the diagnosis of Cooley's anaemia in 10-month-old twins in his care. I requested that he produce a blood sample from each. I made arrangements with the microbiologist and friend Dr E Agius and, in his laboratory, prepared the necessary sodium hydroxide and ammonium sulphate solutions and two haemoglobin solutions. I estimated the Hb F in each and found it to be very high, as was expected in Cooley's anaemia, much higher than it should be at that age in normal children. My experience of the previous two years was being put to use in Malta.

The work resumed with vigour after our return. Soon thereafter, I received a copy of a dye-decolourization test for glucose-6-phosphate dehydrogenase (G6PD) deficiency, a defect that underlies primaquine-sensitivity hemolytic anemia, for which I was trying to set up an assay based on determination of glutathione in erythrocytes. The test was simple, worked as expected, and was added to our routine for diagnosis in special anaemic patients. It gave interesting results in young patients with kernicterus of unexplained origin. We later also established a starch block electrophoresis system for assay of Hb A2.

All of the expenses involved in this work were paid for through departmental funds. This was a remarkable attitude of that young university towards support of research by its academic staff.

My reading introduced me to the work of Professor Ezio Silvestroni and Dr Ida Bianco of Rome, who had used very extensively a hemocytometer-pipette-based test for increased erythrocytic osmotic resistance in thalassemia minor (which they called microcythemia). I entered into correspondence with them to arrange a visit to their laboratory when I was next on leave.

Political and other developments in Singapore at that time were a cause for concern and Lena and I decided that it would be best if we made our next leave the final one. During our stay there we had become parents of three young children. It happened that the university encouraged its junior faculty to write up their research work as a thesis to be considered for the award of the PhD degree. I opted to do this and worked very hard over my final six months to produce this thesis, being successful in my efforts.

While waiting for the offer of a suitable position during my final leave from Singapore, I spent two weeks with Professor Silvestroni and Dr Bianco (his wife), very charming people totally dedicated to, and immersed in their work. That proved a very useful experience. On my departure, they provided me with enough Tyrode solution to embark on a small survey (conducted with the help of former colleagues who were school medical officers) in school children in Malta where we were spending part of our leave.

In the short time available I was grateful for an offer as Senior Lecturer (I had been promoted Lecturer after my first year in Singapore) at the medical school in Khartoum starting in July of 1960. This was going to be a big change for us during the tenure of a five-year contract, but it offered new challenges and opportunities and yearly three-month leave, which could be spent in Malta where our children could be registered for a term at the convent school that I had attended. This would provide me with time to pursue my academic interests. This phase of my life taught me

1. Do not waste opportunities that may present themselves to you. Their life may be very short and it is

not likely that they will come again.

2. Professional friendships at home or abroad can be very productive and life-long.

3. The scientific world offers many opportunities which are usually of little or no monetary value but rich in professional rewards.

4. Time is short, the science is hard, but the satisfaction and rewards it provides can be without measure.

5 Khartoum

This hot, recently independent, widely-spread city, in the middle of a desert at the junction of the Blue Nile with the White Nile, had a small medical school housed in a new building close to government laboratories and a General Hospital. Its Arab culture and gentle, friendly, people were easy to adapt to and enjoy. The city was by no means a fast one and largely offered the basic essentials and commodities. There was a large European expatriate community. Lena and the children were soon able to fit in and make friends, and the children attended a small play school.

The department was on the third of three floors, cooled by overhead fans, but quite open to sand and rodents. The faculty consisted of a head (British, in the position of Reader, who was very supportive and offered me every possible help), a technician (British) responsible for the students' laboratory, a technical assistant (Egyptian, named Emile, willing but not the equal of Stephen) who was assigned to help me, and a happy young Arab man called Bashir, who ran errands and did odd jobs, who was very interested in helping when he was not otherwise occupied. Secretarial assistance was provided by the dean's office, and Lena would often help me at home with typing. Conditions were primitive compared to those in Singapore.

My teaching duties were not heavy and were shared with the head. My first attendance at a laboratory class showed that the student manual needed to be corrected and upgraded. I did this during my free time at home. In my lectures I tried to give simple explanations, be up-to-date, and on occasion, go beyond the textbook. Most students were very interested and eager and often came to my laboratory for further explanation or information. Within a few weeks, when I had established my laboratory, I started to welcome small groups to demonstrate to them what I was doing, its theoretical background and its significance. The effect that this had was demonstrated when at least four of them took up Biochemistry as a profession, later acquired a Ph.D. in the subject and joined faculties in Khartoum, Saudi Arabia, Kuwait or Oman.

It did not take long for me to acquire enough table top centrifuges, commercial electrophoresis tanks and power packs so that I could start my work. My laboratory could perform electrophoresis on agar gel and starch block, erythrocyte sickle cell preparation, Hb S solubility test, Hb F determination and G6PD testing. All electrophoresis was performed inside a refrigerator or a cold room when this became available. Blood samples that were no longer needed were derived from the government laboratory located just across the road, and blood samples were sent for my attention by clinicians at the General Hospital. Emile slowly learned the techniques from me and very often Bashir was eager to help with preparation of hemoglobin solutions for analysis. One of the problems I faced was to convince clinicians when my results indicated that their patients had sickle cell disease or thalassemia. This arose from the cultural attitude that Arabs are not black people and therefore cannot have the former, and that thalassemia occurred only in countries around the Mediterranean and therefore not in the Sudan. Slowly, my reasoning based on genetic admixture became accepted and my value in the eyes of these clinicians increased appreciably.

It was government policy to sponsor, for specialty training overseas, interested and capable recent medical graduates. One such graduate(Dr Saad Ibrahim) presented himself to the department and became attached to my laboratory. He quickly learned the various techniques and increased the working capacity. He would also help demonstrate in the student laboratory. Arrangements were soon made for him to proceed to London, England where he completed a Ph.D. degree and then returned to head the department. Many years later, we met again when both of us were external examiners at the medical school in Tripoli, Libya.

I had come across, in a Journal of Chemical Education, a very simple assay for blood catalase activity. This involved measurement of the temperature change (with a sensitive thermometer) that occurred quickly, on addition of hydrogen peroxide to a dilute haemolysate. With human blood this could reach 8 or 9 degrees Celsius. I recalled reading about cases of acatalasemia in some Japanese dental patients, reported in the 1940s. I had also read that hamsters could inherit a gene for hypocatalasemia. Dr. Saad quickly located a colony of hamsters at the Veterinary School in Khartoum North and made arrangements for us to test the colony to confirm the findings, which we did. We also measured catalase activity in some other animals. This was an interesting diversion.

I was in frequent demand by young medical graduates to present seminars to them as they prepared themselves for the primary examinations of the Royal College of Surgeons from her London office. These

would be on topics in molecular genetics, inborn errors of metabolism, molecular haematology, chromosome abnormalities, endocrinology, plasma lipoproteins, and other matters of current research interest. They would take place once a week, early in the evening and be attended by 6 to 10, usually male, doctors. They were presented on a voluntary basis and deemed helpful for success of these young doctors in those examinations, an event that was celebrated with great conviviality.

One year, arrangements were made for me and two medical students to go to El Fasher (Western Sudan), during a term break to conduct a sickle cell survey. We arrived with a good supply of glass slides and cover slips, solution of sodium metabisulphite and a microscope, and set out just before daybreak on two mornings to a local clinic run by a governmental medicine assistant where a lineup of patients formed quickly. One student would register the name of a patient after he had been seen by the assistant, the patient would then proceed to the second student who mixed a drop of the patient's blood with one of metabisulphite solution on a slide, covered it with a cover slip and placed it in its proper order on a tray. I would then collect such a tray every 15 to 20 minutes and look for sickle cells on each slide under the microscope. We screened about 200 people per day before the sun was too high and the lineup had disappeared. The students quickly learned to recognize sickle cells and to distinguish them from normal cells. The students (and I) were impressed by how quickly the assistant formed a clinical evaluation of each patient based on his intimate knowledge of the local people and their common ailments. Equally impressive was that he used the same small amount of Benedict's solution to test for glycosuria in 6 to 8 patients, or until a positive result was obtained. The Benedict's was very precious to him as he was provided with an HP Sauce bottle full of the solution once a month! We also tested the patients in the small local hospital. The two young doctors in charge were surprised that I diagnosed sickle cell anaemia in two of them and the sickle trait in several others. We obtained blood samples from these hospital patients, and on our return to Khartoum the two students prepared haemoglobin solutions and submitted them to paper electrophoresis and Hb solubility tests to confirm our results from the microscopy testing.

Each year the annual summer leave from Khartoum was put to good use. In one, I extended the thalassemia survey in Malta, in another I carried out a search for inactive X-chromosomes in young men who fitted a diagnosis of Klinefelter (XXY) syndrome using a simple staining method on buccal epithelial smears, and in another I did library research for an essay on Gregor Mendel. Another required many mornings spent at the Royal Malta Library in Valletta scanning local papers published between 1914 and 1920 for anything that contained the named Archibald Garrod. This arose from my discovery that Garrod was the possessor of an M.D. 'honoris causa' from the University of Malta. My scan revealed a treasure trove. I also found relevant letters and information from the University Archives and interviews of elderly gentlemen who had known him or worked under him during the Great War of 1914-1918. I copied out the relevant items from the papers and made copious notes, which were eventually the basis of publications.

Years later, now in Saskatoon, I was approached to make this material available to Professor Alexander G. Bearn (Rockefeller University, New York) who used them for a chapter on "Malta: The War Years" in his book "Archibald Garrod and the Individuality of Man" (Clarendon Press, Oxford, 1993). The end of this story came in 2004, when I delivered the St Luke Day Lecture organized by the Malta branch of the British Medical Association at the medical school in Malta. My lecture was on the unique graduation ceremony, at which Garrod and three other distinguished British medical specialists who served with him in Malta during the war were awarded honorary M.D. degrees. I took that opportunity to pay my respects to Sir Archibald, by presenting to the University a portrait painted by a local artist from photographs that I supplied. That was the longest gestation period (almost four decades) of one of my lectures.

Early during my final year (now promoted to Reader), I received a letter from a former Khartoum colleague who had taken up a position in Anatomy at the University of Saskatchewan in Saskatoon. He informed me that two positions in Biochemistry were available in the medical school there and that the dean had been told about me and my possible interest. Lena and I decided that this would be a good move for us, so I applied and was offered a position as an Associate Professor that was to be confirmed after my arrival. I accepted the offer and we started proceedings for migration to Canada.

Those five years passed quickly. I had shown local clinicians the occurrence of sickle cell disease, Hb O Arab, thalassemia and G6PD deficiency in their population. I had contributed to the future wellbeing of the Sudan and made other cultural and academic contributions, until it was time for us to find a permanent home. The Sudan had given to me and my family very generously and graciously, despite its poverty and for that we were very grateful.

Lessons learnt from these experiences were:

1. Sometimes family, or other serious considerations, may require adjustments by making temporary changes to how your life proceeds. This is what adventure is about.

2. Be happy when your knowledge and your skills are being used for the benefit of the community.
3. You may never know when and how information you have acquired may become useful to others.
4. Friendships, professional or otherwise, based on mutual esteem and respect are life-long treasures.

6 Saskatoon

We arrived in Saskatoon late in June of 1965 after a 3-day train journey from Montreal where we had landed after the overseas journey from Liverpool, England. The addition of a fourth child, a three–month-old daughter, made the whole trip a real adventure. Saskatoon proved to be a very attractive bridge city with huge green trees, neat grassy front lawns, a blaze of flowers, and the university campus with its impressive Greystone buildings which was a delight to walk around, especially in the summertime. Arrangements for schooling had to await the reopening of schools early in September. Meanwhile, we were advised to make the most of the rather short summer in preparation for the cold and snow in the winter.

I went to introduce myself to my new department. I was shown the laboratory space that had been assigned to me, still to be uncluttered so that I could see what useful space there was. This would also be my office space. The faculty consisted of an elderly (very hypertensive) Professor and head, and two Associate Professors who had recently been promoted to that rank in anticipation of my arrival. Any laboratory assistance I needed, including glassware cleaning, was my responsibility to find funds for. What an unexpected civil service attitude and monetary approach compared to that I had experienced over my previous nine years in two less endowed and less developed countries. I had committed myself to settling in Canada and decided to grin, bear it, and hope for the best. I cleared out the laboratory space assigned to me and cleaned it (raising some eyebrows in the process). I looked around and made enquiries to find what equipment there was that I could use in setting up my laboratory. I visited the dean who had been instrumental in my appointment. I explained to him that I was interested in looking for variant human Hbs and was almost told not to waste my time. I replied that there are rare variants to be found and that these could be of the highest interest. He was happy that I would teach the medical students and was prepared to be as supportive as possible.

It did not take long to set up one paper electrophoresis unit. Barely three weeks had passed when I received a blood sample from the Haematology department at the University Hospital from a very recent Jamaican immigrant, who required investigation for complaints he had experienced during his travel. Some technician had noted what looked like sickle cells on a smear of his blood. My diagnosis from an electrophoretic pattern of Hbs S and F (confirmed by a solubility test and a determination of Hb F) was sickle cell disease. This was the first time the diagnosis had been made in the province. This justified me before the dean and raised my profile and the appreciation of my usefulness. It also meant that I would receive blood samples from patients with anaemia of undetermined origin to investigate for abnormalities of haemoglobin and G6PD deficiency. With modest funds provided by the dean, I acquired more electrophoresis chambers and power packs and part-time help for the preparation of haemoglobin solutions and cleanup of glassware (a problem for quite some time).

My first teaching duty was a course on Biochemistry in Medicine. Here my previous experience proved very useful and I was well received by the students. Four years later this was recognized by myself receiving the Pre-Clinical Teacher of the Year award.

Our three older children had been registered in school, were doing well and enjoying themselves. Lena and I had acquired the beginning of a social life, focused mainly on university colleagues and friends we made at church. It seemed that I had faced my worst tribulations in my new country, but there is a price to be paid for everything. I searched for variants in leftover samples from the Haematology department. It was not until about two thousand had been processed that the first variant appeared. This convinced my assistant and those around me that there were interesting findings to be made and that only patience and determination were required. We maintained our efforts and increased the pace of our screening process.

I applied for a modest research grant from the Medical Research Council of Canada. I was granted enough to pay for necessary supplies and for a full-time technical assistant. This position was filled by a recent high school graduate (Albert Labossiere) who appeared at my laboratory seeking a job. He was very interested in science, not afraid of work, eager and capable of learning quickly and on his own. I hired Albert on the spot and also maintained the part- time assistant who had responsibility for preparation of haemoglobin samples. This help expanded our repertoire of analytical techniques which later included fingerprinting of peptide digests of globin. This system was tried out by a medical student as a summer project on globin derived from a Great Horned owl supplied by a clinical colleague who was a dedicated ornithologist, compared with human globin.

Teaching of Biochemistry to science students was still very much in its infancy in the department and consisted essentially of the basic course also taken by the

medical students, and one or two more advanced courses thereafter. I attended the first few laboratory classes and found them not to focus on scientific principles but to consist essentially of repeated colorimetric assays of inorganic phosphate (all in the name of accuracy and reproducibility of results). I therefore made my views known that this needed upgrading. Luckily, soon after, the head decided to vacate his position, the older of the other two faculty members died in a car accident and another (an American) had been recruited from California and was very supportive. An acting head was recruited part-time to administer and prepare the department for the new head, who arrived in time for the next academic year. The new head (a new Canadian, of Scottish origin) set out to bring life to the department, increase the faculty complement, enhance the research capability, and establish an honors program for science students. Change had finally arrived, and the Great Depression, inward-looking, very conservative attitudes were gone. I became involved in planning courses and contributed by teaching the protein section in an advanced two-term course on Biomacromolecules.

Soon after arriving in Saskatoon, I started personal subscriptions to the weekly journals: Science, New England Journal of Medicine and the Annual Reviews of Biochemistry. These I read in my spare time at home and supplemented my brief visits to the medical library. They kept me reasonably abreast of current scientific developments and became essential for my teaching activities. It is fair to say that everything I was teaching in biochemistry, I had taught myself through private reading and study.

The eight years for which I had modest financial support, produced a wide variety of rare haemoglobin variants and several previously unknown ones. The latter included Hb E Saskatoon, Hb Winnipeg, Hb Deer Lodge, Ottawa, G Norfolk, J Broussais, and St Claude. Their characterization, except for Hb Deer Lodge which was achieved largely by Albert, involved collaboration with Professor Herman Lehmann (now at Cambridge, England), Professor Titus Huisman (August, Georgia) and many others largely unknown to me. It had been an exciting search, but new technological developments that were becoming essential for such studies were beyond my technical skills and my capacity to find funding to employ suitable personnel. I had to be satisfied with my work of the previous sixteen years and move on.

In 1971 I was promoted to Professor. Two years later I was awarded a sabbatical year which I spent at The Abnormal Haemoglobins Research Unit in Cambridge, England. This provided a great opportunity for family contacts for my family (including our newest son), for writing up results which I felt deserved publication, for rest and a lot of scientific reading, attendance at lectures, seminars, a Conversazione at the Royal Society in London, several dinners at High Table of Sidney Sussex College, and thinking of my academic future.

On my return to Saskatoon, the head graciously accepted that I now concentrate on teaching, on the condition that I also undertake teaching in the honors program. I cannot assess how much my increased teaching time helped increase research productivity in the department, but suspect that it had no effect. I now became a regular visitor to the library where I focused mainly on looking for reports that I could use in my teaching. As the laboratory component for medical students caused a lot of concern to the department and the students themselves, I suggested that we discontinue a hands-on requirement but use the time available for alternative teaching approaches. I was already recommending a textbook that offered a 'Case-Oriented Approach' to Biochemistry in my teaching to medical students, so I sought published case reports that incorporated significant research on the molecular basis of disease and used them for my alternatives. In this way the case-oriented style had changed largely to a case-based approach.

I developed what I called Structured Learning Experiences (SLEs) for use in an interactive, small-group approach. An SLE was a publication that was rewritten in student-friendly language to provide an introduction, objectives, methods and materials used to meet the objective, and results obtained. Each section was followed by questions that required understanding of the information provided there or obtainable from a textbook. All answers were then written down, which could be individual or derived from the small-group discussions. Answers were to be handed in within two days and assessed by me. This was extra work for me but it was very worthwhile. For further variety I developed 'diagnosis - making games' (that I called Jepsons, after the person who first described the approach) in which information from a case report was provided to small groups, at intervals, and in a sequence that started with the clinical presentation, and went on to results of routine laboratory testing, then to special testing, until a molecular abnormality was identified. Each Jepson ended with my overall review and explanation of the reasoning involved in the particular case. The preparation of Case Reports, SLEs and Jepsons was my responsibility and proved to be an exhilarating yet demanding undertaking. The students attended these sessions and appreciated my efforts in helping to develop a deep interest in a scientific approach to medicine. My American colleague (Dr R.O. Martin), a great supporter and collaborator in these approaches, and I reported our experiences in the journal Biochemical Education (BE). This produced more than a score of requests for samples and for further information from overseas.

During my reading, I developed the habit of keeping notes on words or phrases that were not familiar to me. Later I would send these to the editor of B.E. Many were eventually incorporated into the Oxford Dictionary of Biochemistry and Molecular Biology (First Edition). This experience was put to further use during my retirement (see later).

I always found time to speak to representatives of publishers who had books that could be recommended in departmental courses. This meant that I received copies of many new textbooks. These I would look at closely at home with a focus on new ideas and approaches, errors, style and usefulness. I would then write a brief review of each book. Many of these were also used in B.E. I was now becoming known, outside my university, as an educator.

I received an invitation, through the kindness of one of my former Khartoum students, to be an examiner at the medical school in Tripoli, Libya. As I would be required when I was free of teaching responsibilities, I accepted the invitation. This led to receiving regular invitations for that purpose, and sometimes also for short periods as a visiting professor, in Tripoli. Another of my Khartoum students later invited me on several occasions as examiner to the medical school in Kuwait and in Oman.

I had an invitation from Professor Peter Campbell (London, England) to help him and two others to present a workshop on Biochemical Education in Karachi, Pakistan. Peter was then Chair of the Committee on Education of the International Union of Biochemistry (IUB) and had founded the journal B.E. I was granted permission by the head to accept the invitation. I travelled to London and with Peter proceeded to our destination. Peter explained his plan to me and it appealed to me. It so happened that during our stay in Karachi, Peter developed a condition that made him very dehydrated, in addition to having what looked like a perforated ear drum. He was reluctant to use the local medical facilities, so I took matters in my own hands, bought two dozen fresh oranges, squeezed the juice out of them and managed to get Peter to drink it all. He soon became better. This was my introduction to the international world of biochemistry. When Peter's term as Chair was due to expire, he recommended me as his replacement in that position on the committee. His commendation was approved, which opened up a new world for me.

I was very impressed by Peter's understanding of the problems of biochemical education around the world. I resolved to continue and expand on initiatives he had started. The idea of workshops at the invitation of national Biochemical Societies was pursued and resulted in a score being presented in almost as many countries over the nine years of my tenure. For these I could draw on the help of a group of dedicated and interested professors and in particular that of Professor Alan Mehler (Washington D.C., USA) and Professor Ed Wood (Leeds, England). The former had organized a workshop on Principles of Biochemical Education, to which I was invited, that was held just before the beginning of my term and the IUB congress in Perth (Australia) in 1982. The latter was Editor of B.E., with whom I already had dealings, and met in Perth when it became clear that we had several things in common (including that he had taught biochemistry in Malta several years previously). For some of these workshops I, or those helping me, often sought outside funds which helped fill out the committee's budget and increase its activities. I also encouraged organization of educational activities at international or national meetings and pre-meeting workshops for travel fellows at such meetings. Such events have now become routine. I initiated a small scheme for provision of current textbooks or review literature to departments in need in the developing countries. An important activity was my chairing of a small group responsible for publication of 'Standards for the PhD Degree in Biochemistry and Molecular Biology' (1989), which received a good reception by the international community. Such standards had not been formulated before. At the instigation of the President of IUBMB, I later undertook a revision of these Standards in the form of 'Standards for the PhD Degree in the Bimolecular Biosciences' (2000) and also participated in the third edition of these (2012).

Recognition came with the Master Teacher Award of the University of Saskatchewan, in 1984, the year the award was instituted, and an honorary D.Sc. (for contributions to international biochemical education) from the University of Malta in 1989. These were, naturally, occasions for sincere congratulations, but also for some resentment (I considered the latter to be a rather generous compliment), but life is like that and we have to take the different attitudes of colleagues in our stride.

In 1996, with my 67th birthday pending, I decided to retire from the university, as some circumstances were not to my liking and I had now completed 40 years of professional employment at three universities. Before my retirement took effect, I had accepted an invitation from the organizer of the ASBMB/IUBMB Congress in San Francisco (1997) to organize and conduct a pre-Congress meeting for 150 travel fellows sponsored by those organizations. I had also accepted to speak at an Education Symposium at the annual meeting of Federation of European Biochemical Societies in Barcelona. During the first eighteen months or so of my retirement, I had the freedom to accept several invitations to lecture overseas and to take a couple of travel vacations. Lena had, on occasion, accompanied me on some of my travels and now came more often.

This retirement was changed completely when in mid-February 1998 I received a phone call from Professor W.J. Whelan (Miami, USA), the new president of IUBMB. I had invited Bill to be one of two distinguished speakers at the pre-Congress meeting the previous summer. We were good friends as he had been General Secretary when I was appointed Chair of Education. He told me that the General Secretary (normally elected at a General Assembly) had resigned with immediate effect, almost three years before his term was to end. Would I be prepared to fill the voluntary position in which only expenses were paid by the Union? Astonished at this development, I said I would give him my reply the next day. This I did with encouragement from my family and was told to equip myself quickly with a fax machine, a computer and printer, machines that I had no first-hand knowledge of using. I had to convert a room at home into an office and arrange for part-time secretarial help to do all my typing. One son-in-law bought and set up the machines for me, while a daughter gave me her simple instructions for use of the computer with focus on operations connected with e-mail. Where would I have been without their patience and assiduous help? My learning curve was the steepest one of my life. Suddenly, faxes, e-mails and phone calls became constant arrivals. Patience, not deferring correspondence to the next day, and not wasting time, were essential to adapting to the new regime.

Within a month I had made quick trips to Berlin, Germany (for handing over from my predecessor) and to Miami (to meet the President and the Treasurer and plan for the next annual meeting of the Executive Committee in July 1997). The President (Bill) was a fountain of help. The annual meeting (in Copenhagen, in association with the Federation of European Biochemical Societies meeting) came and went. Then the Treasurer resigned and a replacement was found to complete his term. Bill and I started to produce a quarterly report and also to revise and upgrade the Union's Standing Orders which described procedures and responsibilities within the Union's organization.

By now, ASBMB started inviting me to conduct a one-day program for its travel fellows before its annual meeting. The first time, this coincided with the meeting of the Executive Committee (EC) of IUBMB in San Francisco in 1999. The following year the General Assembly of the Union was to meet in Birmingham at the International Congress. At the Assembly my successor as General Secretary was to be elected to assume duties beginning in 2001. This Assembly meant a lot of extra work for me, but I had learned well how to apportion my time and continued to be well served by the secretarial service that I was using. It was a busy but exhilarating time which brought many new friendships around the world. Appreciation for my contributions was formalised when the E.C. of IUBMB presented me with the Union's Distinguished Service Award and then invited me as its guest when it met in Budapest in 2005. That year the University of Saskatchewan Retirees Association also honored me with its Prime of Life Achievement Award.

I had kept up my interest in keeping notes on words and phrases from biochemical literature. This was rekindled when my term at IUBMB ended and bore fruit when I was invited to be an editor of, and contributor to, the Oxford Dictionary of Biochemistry and Molecular Biology (2nd Edition) and also to contribute a Glossary to Devlin's Textbook of Biochemistry with Clinical Correlations (6th and 7th editions). Both of these brought me appropriate royalties. I also found my assistance to be requested more frequently to assess, and help improve, manuscripts submitted for publication in the journals: Biochemical Education, Hemoglobin, Balkan Journal of Genetics, Turkish Journal of Biochemistry and IUBMB Life. These voluntary activities have kept me involved in my science and gave me the opportunity to assist numerous unknown colleagues, nearly all of whom came from developing countries.

I have contributed, at the request of their authors, to the improvement in manuscripts for at least four textbooks. I have done the same, during my retirement, for three PhD and one MD theses, and for the autobiography of a grateful former student. Such activities have enriched my life.

Lessons I learned from my experience in Saskatoon:

1. "To thine own self be true, and it must follow, as the night the day, thou canst not then be false to any man". Shakespeare (in Hamlet).

2. In the academic life expect to meet envy of, and resentment at, your successes. Take these as a compliment to your skills and achievements.

3. Learn from your mistakes and your weaknesses.

4. The expatriate life presents many challenges but constitutes opportunity for personal growth and often turns out to be a very significant advantage.

5. Go forward in confidence and give the very best of yourself in whatever you undertake.

7 Coda

The journey has been long and adventurous, tortuous and strewn with a variety of hurdles along the way. It was supported by the religious faith I had acquired from my parents and place of birth. I have been a scientist, educator, scholar, world traveller and family man, who enjoys what the world and life have to offer. Riches

or ambition have not been high among my priorities. Without Zarb, Zammit, Ganado, Lehmann, Huisman, Campbell, O'Brien, Whelan, Wood, Mehler, Pang or Labossiere, my life would have been very different. It would have been much more so without the constant support of Lena.

My life unfolded in the context of constraints from within me and from my environment, which I had to adapt to as necessary. I may not have lived up to some challenges, indeed I have deliberately avoided a few for some appropriate reason , but I only did what I knew I had it in me to do and could do under the circumstances in which I found myself. I am satisfied with that.

I am grateful to Graham Parslow, Associate Professor, Department of Biochemistry, University of Melbourne, Australia for comments on this essay.

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