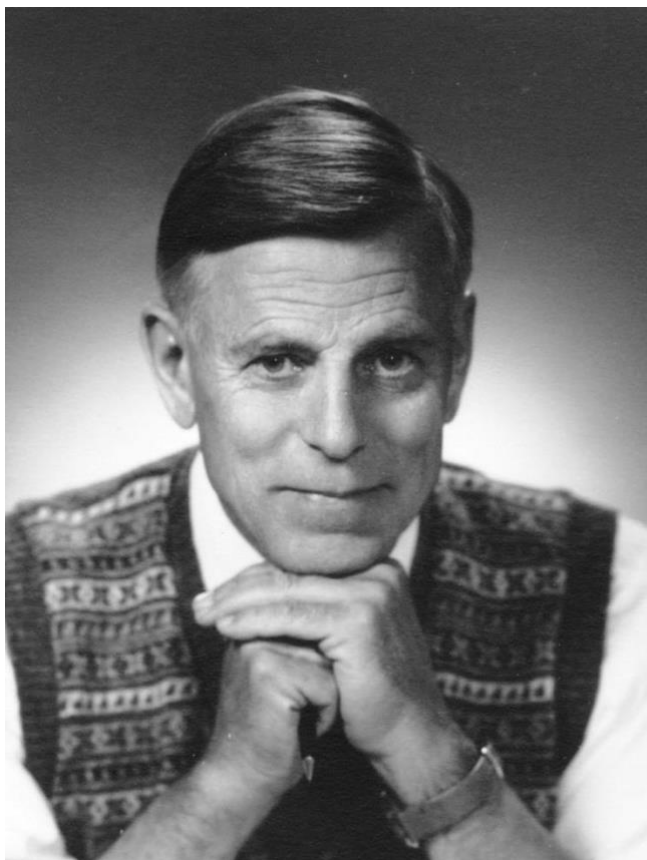


Narrative Biographical Memoire of Geoffrey Melvill Jones

MA, MB, BCh (Cantab), FRCS, FRAeS, FRS

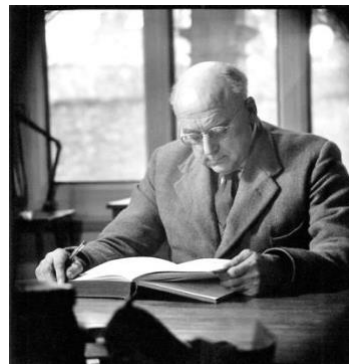
Written by Geoffrey Melvill Jones



Family Background

Father: Sir Bennet Melvill Jones: AFC, CBE, FRS, Hon FRAeS, Hon FCASI, Hon AIAA.

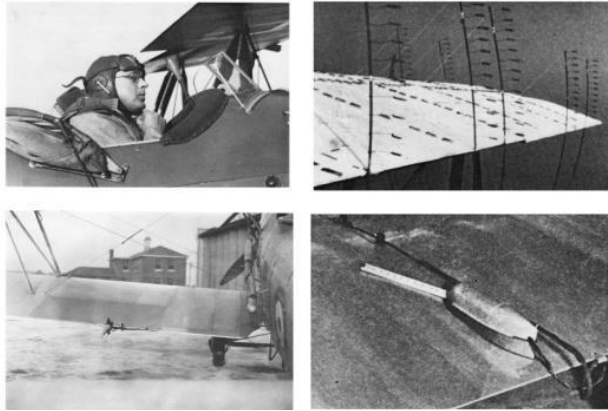
My Father (1887-1975) was a research aeronautical engineer who pioneered the early development of aerodynamic theory and practice as the inaugural Francis Mond Professor of Aeronautical Engineering at Cambridge, England (1919-1952). He was elected Fellow of the Royal Society in 1939, awarded the Royal Air Force Cross (AFC) in 1918 for his work on air to air combat (including active combat on the World War front, 1918), elected Fellow and Honorary Fellow of the Royal Aeronautical Society (Silver Medal, Gold Medal, Taylor Gold Medal) elected Hon Fellow of the American Inst of Aeronautics and Astronautics and Hon Fellow of the Canadian Aeronautics and Space institute. He was awarded CBE ('38)



BMJ at work in his later years

and in WW II Knight Bachelor ('42). In 1947 he was awarded a Medal of Freedom of America by President Truman in recognition of his definitive scientific work on air to air combat during WW II. A formal Royal Society Biographical Memoir is published in Vol. 23, 1977, authored by Sir Arnold Hall, FRS and Sir Morien Morgan, FRS, both of whom were his research students in their early years.

He was a keen exponent of real flight experiments, for example comparing full-scale aerodynamics with the small scale dynamics of wind tunnel models. For his in-flight studies the early Royal Air Force provided and serviced an experimental research flight, originally housed at RAF Duxford; later at Marshal's Airport, Cambridge. His primary interest was in the structure and behavior of the boundary layer which separates streamlined from turbulent air flow over an aircraft's surface. Perhaps his most significant contribution was to identify relatively simple, but quantitative, ways of comparing the actual and theoretically minimum aerodynamic drag over the surface of a newly designed aeroplane. This led to the concept of "The Streamline Aeroplane", published in J.R.Ae.S. 33, 357-385 (1929). The outcome led to dramatic improvements in aircraft aerodynamic design and performance, a timely contribution in view of the critical significance of aerial combat in World War II.



BMJ and early in-flight aerodynamic research

Father also made very significant contributions to the war effort in both WWI & WWII, on both occasions focusing on the science and practice of air to air combat. His WW II studies culminated in evolution of the famous Gyro-Controlled Predictive Gun-sight System which approximately doubled success rates just in time for the all-important D-Day European Invasion.



BMJ at Orford Ness, WW I

His parents were Benedict Jones, a barrister, living in Birkenhead (of which he was at one time a much loved Mayor of the City) and Henrietta (née Melvill) from South Africa. Significantly Benedict was an accomplished amateur mechanical engineer who sported a fine mechanical workshop of his own. Together with my Father as a senior school boy, they built amongst other notable engines a one cylinder motor car registered as FM 2. He (my Father) considered this a major factor in directing his professional life into Engineering (1st Class Honors in the Cambridge Engineering Tripos, 1909). Benedict, my parental Grandfather,

was the first academically educated member of our family line, having read for the mathematical tripos at Cambridge, in which I believe he too achieved first class Honors.

***Mother:** Dorothy Laxton*



BMJ & DLJ, Marriage, 1916

Dorothy, My Mother



My Mother was a lively and loving parent of three children, Margaret (mother of 6 offspring), Warren (WW II RAF pilot, killed in action 1941), & Geoffrey (present author). She was born in 1894 at Kidderminster, in the UK midlands to parents Frederick Charles and Mary Anne Jotham and married BMJ in 1916. She was the adventurous wife of an adventurous husband, participating in numerous rather exotic family expeditions throughout England, Wales and Scotland, sometime sailing en famille with Geoffrey



My Mother (Rt) & Stephanie Taylor at Sea

Ingram Taylor (my God-Father) and his wife Stephanie in the Northern Highlands of Scotland when I was but a babe in arms.

In 1930 my Mother found a latent fulfillment when, during BMJ's sabbatical year in Africa, she discovered and moved into an old (founded in early 1100s) ex-Church Estate, The Hinxton Old Parsonage, in the country village of Hinxton, some 10 miles south of Cambridge City. Here she and her husband brought up their family over the next 20 years or so, turning the establishment into a veritable "country estate" of some four acres area. Fronting the main highway connecting Cambridge and London were two fenced-in paddocks occupying between them some 50% of the estate. These were separated from one another by a driveway leading westward from the highway to the main parsonage building. A traditional HaHa "hidden fence" separated the larger paddock from a magnificent "front lawn". A striking feature of this paddock was a truly huge old walnut tree, in which of course we children built a series of lofty tree houses. About once in 3 years this tree would produce a bumper crop of fresh walnuts, which when ripe were systematically "beaten down" in traditional fashion with long 'beating poles'. At this stage of cropping, each "fruit" is enrobed in a soft greenish coat, the juice of which is a penetrating deep brown stain.



Hinxton Old Parsonage, facing the front lawn

Behind the parsonage, on its western face, were two large traditional English kitchen gardens surrounded by numerous "out-buildings", such as The Old Coach House (large enough to house our two old

HOP, South Face + little me in doorway

motor cars); The Stables; an Old Tithe Barn (for receiving the annual Tythe), a laundry shed, equipped with a huge copper water tub mounted over a wood burning fireplace; and a row of ancient outhouses. One of these was turned into a truly remarkable workshop, which housed a large old family lathe, descended from my Father's Father, Bennett Jones; the same lathe they used in building their home made motor car in the early 1900s. The right hand picture above must have been taken very shortly after we first arrived at Hinxton: One sees "little me" at about 8 years old, standing in the South facing door way. Two points of interest are worth noting here; first The Greenhouse. It was in remarkably good shape on arrival, containing in particular two very productive grape vines, one white, one red, the latter said to be derived from cuttings of the Hampton Court vines. Many strenuous hours were spent pruning these vines with a special pair of pruning 'scissors'. And above the greenhouse we see but one small window in the whole of the South face. This paucity of window area apparently stemmed from the fact noted elsewhere that in times-past, dwellings were taxed as a function of glazed window area. It didn't take long before our parents filled this wall with large windows glazed with a new form of ultra violet penetrating glass.



Here is a parade of typical H.O.P. "activities" before & during WW II



Circling clockwise from top left around these figures we see: 1. A typical tea party on the H.O.P. lawn in front of the East facing aspect of the house. "Greasy Pole" the "Wellingtonia" is seen at left and, typically, the stately attendance of a mini gaggle of geese, tiny bantam chicks in the background and our original Great Dane, Sarahchineska of Gammerton (Sarah'), being petted by a kneeling Margy. The significant guests are Ernest Relf and Clare Ratcliffe, two superb musicians who frequently came to stay for "a quiet weekend" and contribute memorable musical evenings. 2. Margy and Harry-the-groom, haying in the small paddock. 3. Monica, one of the East End wartime evacuees along with Bertha (Sarah's pup) and her own pups. 4. A rare picture of Warren, on leave from active service in RAF Bomber Command, enjoying a peaceful gathering of the evacuees together with another of the big dogs, Caesar. He (the dog) was a magnificent cross between Sarah' and a pedigree Bull Mastiff. 5. Another afternoon tea party in front of the orchard, with the Gardner family and their two boys Richard and John (Margaret Gardner was Mother's younger sister), engaging with a few young Ducklings and a flock of Guinea Fowl. 6. And finally, a recreational gathering of delegates from an International Congress of Aeronautical Sciences, held and organized by Father at his laboratories in the

Cambridge Department of Engineering. Here delegates and spouses are comfortably seated under the Plum trees on the H.O.P. front lawn. Among the crowd one can occasionally see us children doing duty, serving out goodies around the various guests. We are looking due north, and through the trees one can just see the South face of our old Hinxton Church, with the ancient grave yard separating the Church from us.

Marriage: Jenny Marigold (1953)

My wife, Jenny, was the daughter of The Reverend John Burnaby and Dorothy Helen (née) Lock. John Burnaby was a long time Fellow and Classical Scholar of Trinity College Cambridge, where he held among other positions: Senior Tutor, Bursar, Dean of Chapel and finally, the University Regis Professor of Divinity.

Jenny's mother, Dorothy Lock, stemmed from a line of Cambridge mathematicians. She was one of Cecil Sharpe's original team of early English folk dance and song collectors between WWI & WWII. Her uncle, John Burnaby's brother, Hugh Burnaby, was the well loved Dean of Chapel at Emmanuel College Cambridge (my alma mater) and classical scholar. He was also a college Tutor, a connection directly responsible for my later (1952) meeting his niece, Jenny, at one of Hugh's "ExKerpts" from the Gilbert and Sullivan operettas, performed at a "May Week" College Concert. Seated in the front row of the audience was the whole Burnaby family from Trinity. When an encore of their final item was called for, Jenny threw off her shoes, leapt up on stage and danced an impromptu Spanish *Cachuca* (from Act 2 of *The Gondoliers*) with the choral encore. For me it was Love at First-Sight ! Seriously smitten, I managed to persuade "Uncle" Hugh to do the unthinkable and invite his niece (a *Female!*) to join our customary post-performance séance in his college rooms (in those days there were no female students in college) ---and as they say, the rest is history: The knot was tied in June the following year!



Geoffrey & Jenny, Wedded



Geoffrey & Jenny, Wedded

Jenny, a Happy New Mother +Kitty

Jenny Marigold was a Royal College of Music graduate and Classical Ballet Dancer, tutored first in Cambridge by Mme Marie Bicknell (one time a member of Diaghilev's "between the wars" Ballets) and later in London by the illustrious Russian Premier Ballerina, Mme Vera Volkova, late of the famous Kirov Ballet and at that time Ballet Mistress of the Royal Ballet.

She proved an outstanding wife and Mother, the basis of a

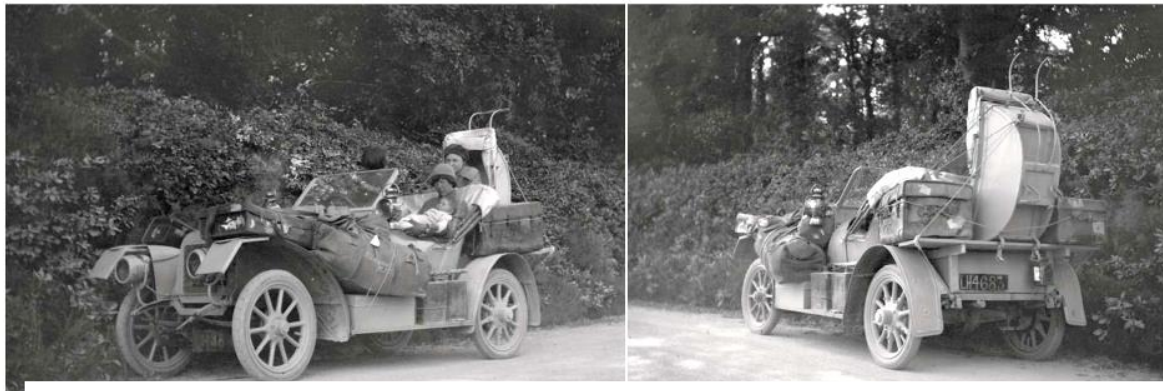


Jenny at Manor Lodge Farnborough, Cape Breton & Malta

very happy marriage and loving family. In particular she proved willing to emigrate across "The Pond" with her young family to Canada and begin an exciting new academic and family life at McGill University in Montréal during 1961. The reason for this was an invitation from The Canadian Defense Research Board to take up a new position as Professor of Physiology at McGill University and Inaugural Director of a new Canadian Aerospace Medical Research facility, as detailed later.

Memories of childhood:

I was fortunate to be brought up in a well-balanced and very congenial family home. As children we had close contact with conscientious parents who were our devoted friends as well as parents. Our mutual interactions and family accord was greatly enhanced by annual "University long vac" vacations of some 6-8 weeks duration under canvas, usually in S.W. Cornwall. Here Father would undertake much of his research writing. But this did not detract from the very close living relationships forced on the family by a primitive outdoor way of life.



Between the Wars, en route to various camp sites in S.W. Cornwall,. The babe in arms (top left) is Margy. Edie my nurse is a) in the pram & b) standing by a later car.. Note the Kayak-in-construction at bottom right



This regularly repeated experience instilled an aptitude for meaningful improvisation of practical working necessities, using strictly limited local resources. For example, our early tents were ingenious designs of my Father and sewn by Mother on the family Singer sewing machine, a wedding present from her sister, aunt Margaret. In the same vein, while in camp each of us boys built our own sea-going kayak, mainly from local materials,. In view of today's concern with safety it is somewhat awe-inspiring to recall that we would paddle these home-made kayaks far out to sea with no floatation gear either on self or in the boat. As an aside, these magical lonely "fishing" outings were one of the few times I can recall having been aroused to the point of writing poetry!



Home-made Kayaks at sea in S.W. Cornwall

Amongst other things, a large water dam was designed and constructed out of a small hillside stream of crystal clear water, using manual labour aided by Father's mechanical "engines", themselves constructed from local, mainly natural, resources. The emphasis was always on useful, effective working results. Thus the dam was divided into upper and lower components, the former for supply of drinking water (it derived from the small local spring up the hillside referred to above), the latter for washing and bathing. No doubt this background laid a foundation for any ability of my own to improvise novel and functionally effective laboratory apparatus and to make it serve a useful function in the experimental laboratory.



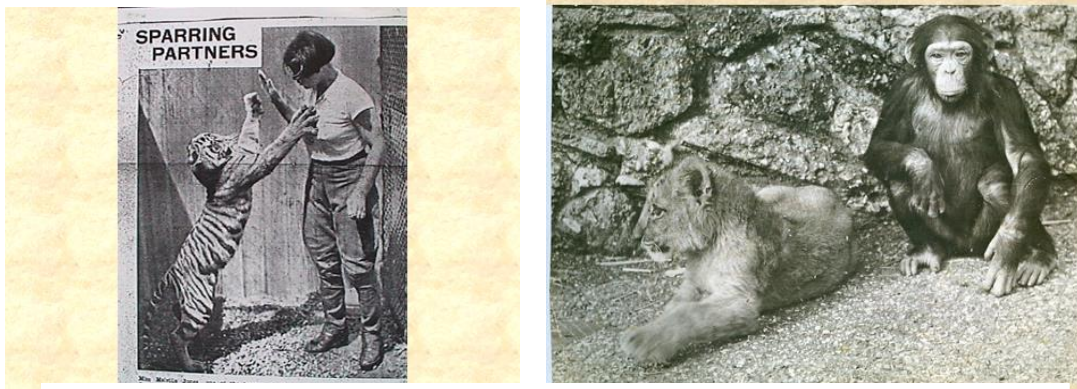
The camp dams

Back at the family home this outdoor vacationing was complemented by Father's active professional life. He enjoyed discussing his experimental work with us, not infrequently introducing us to his laboratory as young assistants, for example recording instrument readings from wind tunnel experiments. Sometimes outsiders would request help in the streamlining of their racing motor vehicles. Then he would arrange a weekend at the lab wind tunnels and engage us boys as technical assistants. On occasions this was to our personal advantage. I recall one year when a certain Captain Easton, aiming for the World Land Speed Record, brought a model of his vehicle for aerodynamic streamlining. As reward for our participation we found ourselves the recipients of a magnificent radio-controlled model speed boat (1930's!). Father never charged for these occasions, no doubt indirectly favoring our good fortune as participating children.

As noted above, Father was a keen exponent of real flight experimentation. Sometimes he would take us boys to the airfield (RAF Duxford, near Cambridge), when trial objectives would be explained and we would anxiously await his return landing and the outcome of the day's flying. I have to confess that on one occasion, while Father and his revered test-pilot-cum-University-Lecturer (Gp/Capt. Alec Haslem) were airborne, my brother and I were attracted by a newly arrived open cockpit machine in the hangar. While one of us climbed into the cockpit the other surreptitiously blew into the open-ended pitot tube which, wowie!, rotated the pointer of the airspeed indicator to unimaginable heights; the harder one blew into the pitot the greater the indicated speed in the cockpit --- 'till horror of horrors, the needle stuck fast at max velocity. Sadly this put a temporary end to our airfield visits: At least until much later, during early days of WW II. At that time (1941 that is between leaving school and entering University) I was invited to join his wartime Gunnery Research Unit as a "summer student" and participate in current flying experiments. Cine records of air to air combat would be projected and analyzed on the blanked drawing room walls of our temporary war-time home, located at the little village of Broadclyst near Exeter. I particularly recall acting as an in-flight observer in a loaned American aeroplane (was it a Mitchell?), when we were unwittingly threatened by a couple of Spitfires from a recently convened squadron of foreign pilots. Fortunately our experienced test pilot (later Air Marshall Sir Reginald Empson no less) out-maneuvered

the attack and we lived to tell the tale. Such was the “cushy” way of “academic” life in wartime.

Returning to the home front, as senior school boys we used to engage in meaningful mechanical exploits of our own, under paternal supervision. For example, using the same versatile lathe that had been employed in building the early motor car mentioned above, my brother and I designed and built a small cannon, firing solid lead balls of some $\frac{3}{4}$ inch diameter (dare I say, molded from lead “found” on the ancient Hinxton church roof top). Our objective was to set up a ballistic pendulum into which the bullets were fired so that we could calculate the speed of the missile from the displacement of the pendulum; a speed of around 600 mph was achieved I believe.



Sister Margaret and her animals at Regent's Park Zoo, London, just before WW II

Another notable feature of the between wars' domestic scene was a close association with domestic animals. The family collected a large pack of dogs (at one time 7 Great Danes plus a number of other breeds), cats, horses (including a stallion and mare for breeding), goats, chickens, geese, turkeys, guinea fowl. Sometimes my sister Margaret, then working at the Regents Park Zoo, would bring home exotic animals; a couple of marmoset's, a couple of baby lion cubs (awesome great paws!), a young chimpanzee. We were brought up to treat these animals with great respect. Hence, when I came to engage in neurophysiological experiments with alert behaving animals, they were always treated with respect, indeed as laboratory pets. For example experimental cats would be trained to step voluntarily into their temporary housing to take their morning food-and-drink, remain passively through the experimental session and finally, when released step casually onto one's shoulder 'for a bit of TLC'.



Education

Schooling (1926 – 1941):

GMJ with "Lady The Cat", McGill

Early elementary schooling was at Miss Wilson's kindergarten school in Chesterton Lane, Cambridge, followed by primary "prep" schooling at Kings College Choir School during 1931–36, then under the headship of the famous Mr. Fiddian. I recollect finding mathematics the most interesting subject, probably due to a particularly effective teacher of the subject, Mr. Hemmingway. In this class I received my first academic prize, a beautifully bound copy of Kipling's "Kim", still residing in my home bookshelves at the time of writing (2017). During this period I came to realize that I was a slow learner, but that there was a tendency to become deeply embroiled in a subject that caught one's fancy. In passing, I recently uncovered a couple of the kindergarten school reports in one of which I was described as "a happy little fellow, good at arithmetic and dancing" !

Senior schooling was at Dauntsey's School, in Wiltshire (1936 – 41). At that time this school was a newly developing "public" school supported with supplementary Government aid. The school has a long past history, having been endowed some 400 years earlier by a certain Alderman Dauntsey, explicitly for the free education of local farmers' boys. I consider myself fortunate to have attended at this lively and active period of its early transition into a modern private school. There was an atmosphere of freshness, with young teaching staff having a fine *esprit de corps* and a good deal of independence to develop their own methods of teaching. I was a generally average student, until perhaps 6th form studies began. At that level we had to choose between Arts or Sciences, with no option for subsequently crossing the disciplines. Hence, since a career decision had been made to aim for Medicine, it proved obligatory to settle for the four full science subjects of Physics, Chemistry, Zoology & Botany to the exclusion of all else. In these subjects the order of my interest was clear-cut: Physics, an easy first, followed by Chemistry as a close second. Zoology and Botany settled a rather distant third and forth. The senior physics master (Mr. George Barron) strongly encouraged a spirit of enquiry, paying particular attention to any student striving after a conceptual grasp of physical principles. Personally I relished the experimental probing of these basic principles, eagerly anticipating the next laboratory practical class. The principles of mechanics and properties of matter were my strongest area, perhaps reflecting a similar aptitude in my Father, who could "see through" problems in mechanics with uncanny lucidity and economy. I found that I too could "see" the way through a problem without formulation of words, working backwards from a "thought" solution to the written rational. This aptitude seems to have stayed with me during the subsequent scientific career, exemplified perhaps in a study of the functional and evolutionary significance of semicircular canal dimensions, which resulted in my first Royal Society Publication (Proc. Roy. Soc. B, 1963: 157, 403 – 419). There seemed to be little problem in staying at head of my school class in Physics; generally 2nd or 3rd in Chemistry, but usually average or less in the biological disciplines.

My main non-academic strength at Dauntsey's school lay in sports, with Physical Education, Rugby Football, Tennis and Swimming predominating roughly in that order. The apparent aptitude in Physics and Physical Education led to prizes in these subjects. In sports I won a medal for diving, became captain of the school tennis team and was promoted to the annual inter-public school "seven aside" rugby competitions as a wing "¾". Promotion to "School Prefect" occurred in my last year; probably a good preparation for future team leadership. At the end of this period, a reasonable academic performance served to obtain exemption from the 1st M.B. pre-medical examinations, which together with the then necessary Latin, served to gain entrance to Cambridge University at Emmanuel College in 1941.

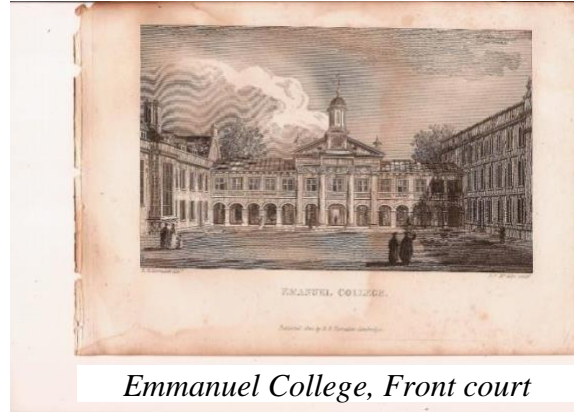


and other school sports; tennis, cricket and rugby

sports activities suffered somewhat from the pressure to sacrifice field games (Rugby, Field Hockey, Cricket) to the digging of bomb-shelter trenches. However, we never did encounter live bombing, and before long found ourselves filling in those troublesome trenches once again! This being said, I do recall one rather exciting wartime-event: During a routine 11 o'clock "break-at-the-tuck-shop", whisp-slap-bang and a Ju 88 enemy bomber screamed overhead at ground level, pumping a few machine gun bullets into the playgrounds. Fortunately there were no casualties. But in no time there was another whoosh and a racing RAF Spitfire tore across the scene, chasing after the enemy. Well, at next morning assembly we learned that this Spit did indeed shoot down the offending Ju 88 a moment later, leaving it a burned-up wreck on the edge of nearby Salisbury Plane. To our astonished delight the Head Master (Mr. Olive) announced a full day's holiday, organized ground transportation to the crash site and celebrated the unlikely fact that the pilot of our chasing Spit *was an Old Boy of our own School!*

Cambridge University (1941-1945):

In the fall of 1941 I entered Emmanuel College of Cambridge University as an undergraduate in the Natural Sciences program, reading “½ Math”, Physics, Chemistry and Physiology. Owing to illness in the spring of 1943 I was unable to take the Tripos Pt I honors examinations of that year, but was allowed to begin a new phase of study in the Fall of 1943, with the aim of taking the necessary degree examinations in 1944. For this a full subject in Anatomy replaced ½ Math. This was a stressful year since it entailed working simultaneously through both 1st and 2nd year syllabuses in the Department of Anatomy, while at the same time maintaining Physics, Chemistry & Physiology at degree level without further class work. In the event I was awarded the B.A. honours degree in the above four full subjects, at the II/1 level. To my delight I



Emmanuel College, Front court

was accepted into the Pt II course in Physiology for the following year. There were five of us in that class, the other four being Victor Amassion, Robert Comelin, John Mander & George Harvey. It was an exhilarating year. Professor Edgar D. Adrian (Nobel Laureate, Later Lord Adrian of Cambridge and Master of Trinity as well as President of The Royal Society (1950-55) was in the chair at that time, coping with a serious wartime dearth of staff, many of whom left the University to engage in War work.

As a result we were ‘treated’ to two series of lecture and practical classes given by physically/chemically oriented scientists from “the other side of Downing street”. One of these was a young and as yet unknown member of the Physics Department then under chairmanship of the younger Bragg. His name was Dr. Max Perutz who at that time was exploring the application of X-ray analysis in unraveling structure of biological molecules. Dr. Perutz subsequently inaugurated the high profile Cambridge Molecular Biology Unit of the Medical Research Council, was elected FRS in 1954, gaining numerous Royal Society awards, later to be awarded the Nobel Prize (Chemistry) as well as the Order of Merit, Britain’s highest civic recognition awarded at the discretion of the reigning monarch. His lectures proved a most exciting experience, and opened one’s mind to the application of physical methods in biological research.

Dr. Perutz’s course was paralleled by that of another physically oriented academic, Dr. J. H. Schulman from the Department of Physical Chemistry. He introduced us to the use of the Langmuir Trough in the study of molecular monolayers simulating biological membranes. An added “war bonus” was a remarkable series of lecture demonstrations by Wilhelm Feldberg (FRS) during his famous war-time stay in Cambridge as a refugee. He treated our Part II Physiology group to a masterly display of the laboratory techniques he was then using in his classical work uncovering the early neurochemistry of synaptic action. We were of course also treated to a stimulating course on contemporary neurophysiology given by Professor Adrian himself. Beyond the realm of neurophysiology we also engaged in much interesting and contemporary laboratory exercises in other biologically oriented departments.

In the final Tripos Part II examinations I was foolish enough to focus on only two of the allowed number of questions (“you may answer up to three questions”), concentrating on writing two serious and extended essays on topics that particularly appealed to me. The outcome was a Tripos Pt II placement at the level II/1. However a significant factor in the evolution of my subsequent career in the neurosciences was an uplifting personal letter from the chief examiner, my own Professor, E.D. Adrian. I quote this letter to illustrate the reason for this statement:

A Letter from Professor E.D. Adrian dated 13. 6. 45, The Athenaeum, Pall Mall, S.W. 1.

Dear Geoffrey,

Although we couldn't quite manage a first, your performance in the exam was so promising that I can congratulate you on it very favourably indeed. A lot of it was definitely first rate and I formed the impression that you ought certainly to have a dig at research of some kind --- the kind will suggest itself to you soon enough when you have done your medical work.

I am afraid you may be a bit disappointed at not being actually in the first class, but as I have said, you were in fact so nearly in it that you have clearly put
.... (unreadable) work.

I have to start for Moscow tomorrow morning at 5 AM so must organize my luggage.

Best Wishes, yours E.D. Adrian

Apparently my performance in the practical laboratory tests of the examinations was especially effective, reflecting what later became one of the greatest joys in my life; the evolution and execution of a feasible, laboratory oriented, research project. I certainly did enjoy the two weeks of these laboratory examination exercises. As an example of the kind of exercises we were offered I might mention Professor Adrian's end-of-year Part II neurophysiology exam question. It simply read:

“Investigate the effect of temperature on nervous conduction”.

With two full days in which to do our work, we were initially presented with bare laboratory benches, but could ask for any equipment of the kind we had used in class work during the year. We were free to roam the department and use the library without restraint. It was an awe inspiring, but thrilling experience!

The combination of the Pt II year under Prof Adrian's direction, the thrill of the advanced, research-like, practical classes and the strong personal encouragement of Prof. Adrian undoubtedly predicated the course of my subsequent research career.

During those student years at Cambridge I made lasting friendships, four of whom have continued to enrich my subsequent life. A musical connection with our Dean, Hugh Burnaby, was a strong one. In particular he held a weekly gathering of “The Emmanuel Singers”, in his College rooms, where we would “drink coffee” (a serious ritual !) and sing our hearts out. My “administrative” role in



Dean Hugh's Emanuel Singers "at Work"

this group had the impressive life-time title of “Kernel”, responsible for drumming up weekly attendance. I played one of the two Violas in the college orchestra, the other viola player being Thomas Burnaby, John Burnaby’s eldest son and my late wife’s elder brother. Sports of course were considerably attenuated during war time. However I contrived to play tennis moderately seriously, eventually serving as Skipper of the war time Emmanuel College team, and obtaining a “reserve” wartime “Blue”, ‘though never actually promoted to a “Full Blue”! A happy year of Judo instruction was undertaken together with a graduate student friend from the Chemistry Department, Charles Kemball, later FRS (1965) and Professor of Physical Chemistry at Queen’s Universities of Belfast and Edinburgh .

He introduced me to the Cambridge University Natural Science Club, a small group of undergraduate, graduate students and post-docs. There were but five, later six, of us during my war-time tenure. This too played a significant role in my professional development, since continued membership was contingent upon delivery of at least one full and original oral presentation per term (usually in the speaker’s own collage rooms), an excellent preparation for later public lecturing to critical audiences. Critical, Yes! We were “put on our metal” on these occasions since any of the august body of past “Honorary” Members were liable to attend. At that time these included my own Professor, Edgar D. Adrian and one of my Father’s closest working colleagues, Professor Sir Geoffrey Ingram Taylor FRS, OM; “Uncle G. I.” as he was known to us as children, and indeed he was one of my two God Fathers Hence my first name of Geoffrey. Names such as Barcroft, Hopkins, Dale, Aston, Bragg, Bertrand Russell, Rideal provided incentive to take great care in the preparation and rehearsal of one’s presentations. At one time or another I held the positions of President, Vice President and Secretary of the Club, although this was somewhat inevitable in view of the few members at that time of war!

The topics of my three contributions were, “Sleep and Things”, “Synthesis in the Thyroid” and a presentation of some of the recent and current experiments of Professor Adrian on “The Neurophysiology of Vision” (with his permission).

A feature of war time Cambridge was the obligatory two half days a week for military training. If I recall rightly, there were two grades in these ‘devotions’, the first being essentially Army drill conducted by traditional Guards’ NCOs; “Wot’s this ‘ere long

string of stuff I'm a steppin' on: *Get yer 'air cut laddy*". On successful graduation at this level we were given a choice of specialties from which I chose "Signals". This proved quite entertaining; we would take a truck out into the country, lay miles (literally) of telephone cable at up to 30 mph (literally !) and engage in well... communications! I fear this not infrequently included "defects" in the equipment, allowing us the delights of basking in spring sunshine while our supposedly faulty equipment was supposedly being repaired. A year later I joined a small group of motorcycle dispatch riders, intended as the last ditch communication line of Will Spens, Master of Corpus Christi College, at that time Regional Commissioner for Civil Defense for the Eastern Region in the likely event of military invasion. Heading this little group was an ex-Part II Physiology student of the previous year, later a Royal Society Professor of Physiology at Cambridge, Dr. Horace Barlow FRS. Our task was to familiarise with the country lanes and by-ways throughout East Anglia, for which we were allocated privileged petrol coupons for weekly Sunday explorations. This too had a significant impact on my eventual choice of career, since of course we took time to pause in our travels and "talk of many things" predicating our respective futures.

Medical Training, Middlesex Hospital (1945-1948):

In those days (early 1940s) there was no medical school at Cambridge. Consequently most of us destined for medical training moved on to one of the Central London Teaching Hospitals after attaining the Natural Science Degree (Hons BA) of Tripos part I. In my case I moved just after end of WW 2 in the fall of 1945 to The Middlesex Hospital, where one stepped straight into the awesome phase of clinical training. This phase of my education was quite straight forward, except that midway through the 4-5 year course I was approached by one of the two physics-oriented scientists noted above (Dr. Schulman, of the Department of Physical Chemistry) with an offer to become a research assistant in his department, in particular supervising the installation and application of a new exciting Ultra Centrifuge, later used in early stages of the then new field of molecular biology. The offer posed a difficult problem: To complete the remaining two years of the medical training and hopefully emerge as a qualified medical doctor; or cast that aside and break into an "instant" biophysical research career? Naturally I sought the advice of my previous University teachers, especially the head of Physiology, Professor, E.D. Adrian, later Lord Adrian and Master of Trinity College. He generously invited me into his lab for discussion, and there offered the definitive advice which has stood me in good stead ever since. He made it abundantly clear that, although an attractive offer, there would be more to come after completion of the medical training, with the added advantage that if research didn't turn out for the best, one could "fall back" on a useful career in medicine. I returned to London with a clear decision to stick with the medical course. As a result I finally graduated with the Cambridge degree of Bachelor of Medicine and Surgery (MB, BCh) in 1948.

Perhaps rather strangely the most engaging phase in my medical training was in the field of obstetrics and gynecology. Together with a close student friend, Donal Francis Magee (later Professor and head of Gastroenterology at Omaha, Creighton University USA), we took an elective at the famous Rotunda Hospital in Dublin. There our major

task was the home delivery of quite a large number of babies in the heart of the slums of Dublin over the course of a couple of winter months. After a mere week of supervision we were on our own. In pairs we would be called out to patients living in indescribable poverty; up to perhaps as many as three families living in a single room. It was an experience of a lifetime, casting us straight into the throws of a practical application of our recent academically oriented studies.

Professional Career

Hospital House Jobs (1949-1951):

After graduation the young doctor was required to gain clinical experience in hospital “house” jobs, roughly equivalent to Internships in N. America. In my “houseman” years I held three consecutive positions, first for 2 months in Orthopedics, and then 6 months in General Surgery, both at Middlesex Hospital. Then followed a further year’s appointment to a “senior” house surgeon position in the Department of Otolaryngology at (the old) Addenbrooke’s Hospital, back in Cambridge. I greatly enjoyed, and benefited from, these hard-working experiences, but come 1951 I found myself caught up in the post-war military draft (see GMJ Research Narrative Memoir 2019).

RAF Institute of Aviation Medicine, Farnborough (1951-1961)

After “a bit of covert personal homework” I contrived to have myself drafted into the RAF rather than the Army, aiming for a posting to the RAF Institute of Aviation Medicine (IAM), located at the Royal Aircraft Establishment (RAE) in Farnborough, Hants. However my first posting was as Station Medical Officer at A&AEE Boscomb Down, still to this day (2017) a primary RAF test flying establishment. Here one’s primary duty was care of flying personnel, although the work extended to general family practice in the extensive married quarters, which proved an excellent and rewarding experience.

It was here that I first developed a real enthusiasm for aviation physiology which subsequently carried me through a life-time’s career in this field. Before long I was able to persuade the test pilots to take me up with them as a “flight observer”, leading on to personal instruction in the practical art and skill of actually flying a modern aircraft. Eventually I was indeed posted to the IAM, where there was at that time an active fleet of service aircraft, tended by a small crew of fully trained service medical test pilots. Enthusiasm for flight research led on to acceptance of a 5 year extended commission and a formal RAF flying training up to Service level in jet combat aircraft. As a result, after some 18 months training I too became one of the team of medical test pilots known officially as Flying Personnel Medical Officers (FPMOs). This involved generating and flying experimental studies in fields such as high altitude escape and descent, long duration flying stress in Shackleton aircraft of Coastal Command, pilot disorientation in Fighter Command and finally physiological aspects of pilot disorientation in the aerodynamic spin. Details of these studies at IAM are elaborated later under the general heading “Résumé of Experimental Research”.

Strictly speaking my Service career in the RAF only lasted from 1951 to 1956, during which time my rank progressed from Flying Officer through Flight Lieutenant to Squadron Leader. But at that point I chose to retire from the Service and switch to a specially contrived civil appointment as an External Scientific Officer of the Medical Research Council, which allowed one to continue working on the same AvMed research problems as before, while at the same time embarking on early family life as a civilian, at least until 1961.

McGill University Montréal (1961-1991):

At that time there came a life-changing letter from the Defense Research Board of Canada, inviting me to inaugurate and direct a new Aerospace Medical Research facility in the Department of Physiology at McGill University in Montréal. By then we had acquired a small family of three children and a decision was not easy. But in due course we both agreed to take the plunge and emigrate, thus commencing a future academic career as a Professor of Physiology. I was greatly encouraged in this by our beloved RAF Commanding Officer (Group Captain William Stuart, M.D., RAF, AFC), who had recently returned from a sabbatical year of leave in the McGill Department of Psychology, then under the chairmanship of now legendary Professor Don Hebb, FRS. One may guess that “Bill” Stewart was largely responsible for recommending the appointment!

Initially I was appointed as an Associate Professor in the Department of Physiology, at that time chaired by Professor Frank C. Macintosh, FRSC, FRS. My duties included setting up and running the new AeroSpace Medical Research Unit (AMRU) and engaging in regular Physiology teaching at all levels; in short, an ordinary academic professorship with the special feature of engaging in self-generated research on basic and applied aspects of AeroSpace Medicine. In view of the then rapidly emerging era of human space flight this was an exciting and challenging prospect.

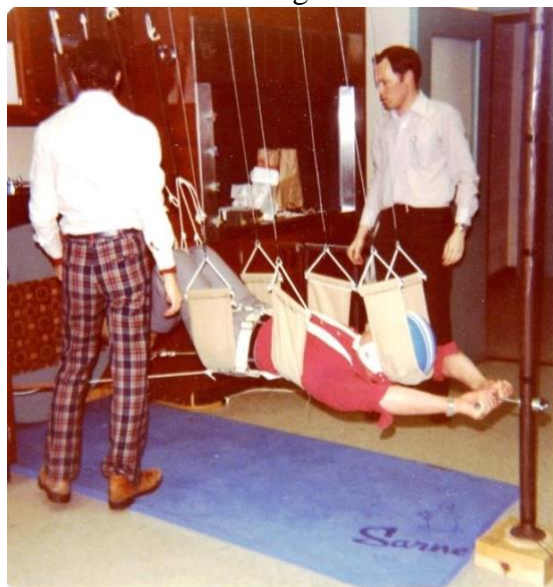


The McIntyre Medical Sciences Building

In 1968 I was promoted to full professorship in the Faculties of Science and Medicine. Later, in 1979 I was promoted to a named research chair, the Hosmer Professorship, possibly a kind of reward for refusing the following tempting offer !



In that year I was indeed faced with another serious career decision, namely an invitation to take a senior position in the Department of Physiology at Oxford. After ten hectic days on site my wife and I jointly decided to stay with our current family, home and position at McGill, rather than up-heave us all and return to England. It would have entailed separation from our four children since it was decreed that there would be no National educational support at the University level for the first 3 years of a returning resident, during which time our four children would be passing through University education. Furthermore, it was a particularly exciting time in the field of Aerospace Physiology, in view of our early involvement in developments of the NASA Space Flight Program. Indeed, our new research unit (AMRU) was responsible, under the aegis of staff member Professor Douglas G. Watt (MD, PhD) for generating some of the early in-orbit neuroscience experiments, and in training both NASA and Canadian astronauts in the theory and practice of our experiments, for which they performed as both human subjects and their own technicians when in orbit.



*Prof. Doug Watt "at work" training US Astronauts in our AMRU labs for his in-orbit "Hop-&-Drop" experiments, in collaboration with NASA.
Photo Dorothy Jones.*

1979 was indeed a high spot in my professional career. It is the year in which I was elected to Fellowship in both the Royal Society of London and the Royal Society of Canada: All of which occurred at a time when I was due to conduct sabbatical leave in Paris, as detailed later, under "Résumé of Research". It was also the year of publication of a book entitled "Mammalian Vestibular Physiology", published by Plenum Press, under the joint authorship of myself and Professor Victor Wilson, head of Neuroscience at Rockefeller University, USA. This quickly became a standard work on the subject, remaining as such for a further couple of decades.

In 1988 I yielded up directorship of AMRU to one of my early graduate students, Professor Douglas G. Watt, MD, PhD, seen in the above photo of “at work with astronauts”. However I continued to hold my professorship in the Physiology Department and to carry on an active research program in a reduced area of the AMRU space on 12th floor of the McIntyre Medical Sciences Building on Campus. In this capacity I supervised three more graduate students (see “Bibliography”) until 1991, when I retired from McGill with Emeritus status to join the Faculty of Medicine at University of Calgary, Alberta, in the foot hills of the Rocky Mountains. This change of venue was largely due to the fact that my wife, Jenny, died of a serious and protracted illness in December 1989 (Primary idiopathic pulmonary hypertension and its complications), while our 4 offspring were now all located in Western Canada.

University of Calgary: (1991 -)



In 1991 I was appointed to an “Adjunct” Professorship in the Department of Clinical Neurosciences at the invitation of Prof. Robert [Bob] Lee MD, inaugural Head of the Department. The terms of appointment were to continue an active research program in collaboration with a small team focused on integrative action between vestibular, oculomotor and locomotor sensory-motor systems. The program has been consistently led by Professor William A. Fletcher MD, FRCPC, Professor of Neurology, with clinical specialization in Neuro-Ophthalmology & Neuro-Otology. Electrical engineering support has been consistently provided by Edward W. Block, PEng, an Electrical Engineering graduate of our University. As always, a changing population of graduate students, post-doctoral fellows and summer research students complete the scenario of a normal working laboratory.

Initially we were supported by the Canadian Medical Research Council (MRC) and later by the American National Institute of Health (NIH) in collaboration with a group in Portland Oregon, USA, headed by Professor Fay Horak of Oregon Health & Sciences University (OHSU). Meanwhile I personally settled comfortably into a small Calgary home, resolved to remain an independent widower, catering for myself, but in constant touch with our four “Westernized” offspring and their growing families.

As noted earlier, the product of our published research at U of C is outlined in later sections under “Résumé of Research”. Briefly, following my previous focus on vestibular – oculomotor interaction, our new direction set out to move down the body’s long axis to the locomotor system and its spatial control of body movement and orientation. Initially we decided to probe mysteries of the sailor’s postural adaptation to the ever tilting deck of a ship at sea and its mirror image on return to land (Mal de Debarquement). For this we devised and built a servo-controlled rotating disc-shaped platform capable of sinusoidally changing its angle of tilt while rotating. We then asked subjects to “walk-in-place” (i.e. body stationary relative to space) along a



The early Calgary team: L->R, Edward Block, Prof. W. Fletcher, Grad Student Kim Weber



Collaboration with Prof. Fay Horak (bottom right) and student Gammon Earhart



My Little Calgary Home

concentric circular path on its surface while the disc rotated for prolonged periods. To our surprise it transpired that after this, a blindfolded subject could no longer walk in a straight line on the stationary ground. On the contrary, when trying to do so the actual locomotor trajectory consistently described an involuntary circular path of maintained radius, but notably *without subjects being aware of the fact, even though the incurred body's rotational movement was well above the threshold of vestibular sensation*. Furthermore, with continued walking, trajectory curvature would exponentially decrease towards zero with a time constant of about 10 minutes. As might be expected, trajectory curvature increased systematically with increase of the preceding turntable angular velocity.

With these novel, but highly consistent, findings we had found our niche for research in the new lab. After first concentrating on the adaptive phenomenon itself we gradually moved towards fundamental mechanisms in the normal control of trajectory curvature. More recently we have been applying the new findings to the study of clinical neurological deficits in collaboration with Prof. Fay Horak and her students.

Sabbatical Leaves (1970s):

While at McGill I was privileged to enjoy two spells of active “sabbatical” leave as outlined below. As before, experimental aspects of the studies involved are reviewed later under “Résumé of Research”.

In 1971-72, the family moved to California where I was awarded a fully salaried US National Academy of Sciences Senior Postdoctoral Research Associateship. This included the following two primary commitments:

1. Resident Scientist at NASA Ames Research Center, Biotechnology Division, at that time headed by Dr. John Billingham MD, PhD, a previous colleague at IAM Farnborough in the 1950s. Here the commitment was to engage in collaborative research into Basic and Applied Aspects of “Physiological Response to Linear Acceleration”. On the one hand this entailed generating a new neurophysiological work station for microelectrode recording of single central nerve cells responding to multidirectional oscillations of the whole body systematically imposed by means of a combined spring-swing platform. On the other hand, the Applied Studies employed both the Ames Research Vertical Human Linear Accelerator and an experimental Lear Jet aircraft, the latter for application of extended acceleration profiles.



GMJ at Ames vertical accelerator

2. Two Stanford University Visiting Professorships in a) The Dept. of Physiology, teaching neuroscience of the special senses to 2nd year medical students and b) The Dept. of

Aerospace Engineering Sciences, lecturing on problems of human spatial orientation and disorientation on earth, in flight and in orbital space.

In 1979 I engaged in a collaborative study with Prof. Alan Berthoz and his team at le Collège de France, Paris. This too involved a lecturing commitment, including weekly public lectures in French on a theme termed “Les Systèmes Vestibulaires”. Here our experimental work focused mainly on “Adaptive Plasticity in the 3-D Human Vestibulo-Ocular Reflex Arc”. Family participation was an integral part of these rewarding sabbatical exploits.



Dr. Berthoz & Son + Self & Jenny, Paris

Extra-Curricular Interests

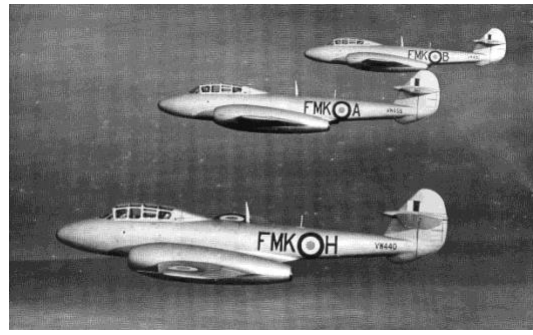
At school I was moderately active in sports, having been at one time or another a member of the school teams of Cricket, Rugby Football, and Tennis (see above). Although war time attenuated the role of sports during university years, I continued an interest in Tennis, holding a position as Captain of College Tennis during my final year at Emmanuel College, Cambridge.

There was a subsidiary interest in music during both school and university years. At school this comprised both choral singing and instrumental playing in the school orchestra as a viola player. Both these interests were continued at university, where I was one of two viola players in the college orchestra and sang with a male choral group, the Emmanuel Singers, under direction of our college Dean, Hugh Burnaby, as also noted in more detail above.

Again as noted elsewhere, during my term as a serving officer with the RAF Institute of Aviation Medicine I underwent a full service flying training. A ‘fall out’ of this training was a keen interest in gliding with high performance sailplanes. Many years later this sport was again taken up when relocated at the University of Calgary, in Alberta, Canada. Soaring over the Rocky Mountains proved a uniquely engaging and challenging pastime!



RAF 12 UAS Wings Parade 1951



Next, Meteor Jets at RAF Oakington, Cams



Mountain Soaring at Invermere BC 2014



And then, up-n-over the Rocky Mountains

In 1997, at the age of 80, I decided to start learning to play piano, an interest partly stimulated by the fact that my wife left me a fine Steinway Grand, built in Hamburg, 1879. More recently I have taken up the violin, both classical and folk fiddling. These past-times have played a significant role in one's latter years, not least in the sense of enhancing interest in, and enjoyment of listening to, both classical and traditional music. These activities reflect a concerted effort to exercise the aging brain-mind. An additional element to this end included an introduction to the art and crafts of sailing, to which end my two sailor offspring (Andrew and Dorothy) and I acquired a heritage wooden sloop of the Danish Spidsgatter class and enjoyed family sailing throughout the beautiful Gulf Islands of Western Canada.



Learning to play the Burnaby Steinway at age 80



And learning to sail Doxy in the BC Gulf Islands

But the most significant element in this 'endeavour of the mind' is the continuance of an active experimental neuroscience research program; professional, yes, although without salary, in the capacity of an emeritus (adjunct) professorship in the Department of Clinical Neurosciences at the University of Calgary. At the time of writing (2017) this continues to be a reasonably productive on-going activity, yielding a continuing series of original experiments in the neurosciences, together with a number of book chapters and articles covering work in progress.

In 2013 two of my U of C colleagues, Dr. 'Bill' Fletcher (Clinical Neuroophthalmologist) and Mr. Ed Block (P.Eng, Electrical) assembled my professional publications to-date in the form of a traditional Festschrift, presented at a dedicated Scientific Symposium held at McGill University. The symposium itself was painstakingly arranged by past graduate students and post docs under the leadership of Profs. Henrietta Galiana, and Daniel Guitton, at that time heads of Biomedical Engineering and laboratories of The Montréal Neurological Institute respectively.



Receiving the Festschrift from Bill Fletcher and Ed Block at McGill, 2013

The Festschrift was presented in 4 volumes amounting to some 1700 pages, while the actively participating delegates amounted to some 60-70 past students and research colleagues from around the world. It was a very happy occasion, as may be seen in the symposium assembly below, photographed by my son Francis at close of the meeting.



Delegates at the McGill Festschrift Symposium of 2013: photo by Francis Jones

Before leaving this section, I have to add that one of the most rewarding activities in my life has been, and continues to be, active interaction with our four children and their (thus far) 9 offspring, all of whom live sufficiently close-by to have maintained intimate contact throughout the latter years. Indeed, working with young people has been one of the major joys of an academic life, in which despite the passing years, one's students obligingly tend to remain at roughly the same young age from year to year !



80th Birthday celebrations of 2003 on Savary Island BC - and then there were ???

Words 8477, Photos 59