RECOLLECTIONS

By John C. Mallinson

FOREWORD

This book contains a collection of essays that I have written in the hope that you, the reader, will find them both amusing and interesting.

It can only be considered as my Partial Memoires. Many large periods of my life are not addressed because, in the main, they strike me as being too tedious to be of general interest.

Additionally, I have decided not to write about my four marriages even though I think many would find the subject interesting and, perhaps, even fascinating. It seems to me that a full account of the topic could hardly fail to distress some of the living, in particular my daughters.

Most of the material is previously unpublished. “My Biography” and “My Swansong” were published previously by the IEEE and “Publish or Perish” by Academic Press. “Nocturnal Goings on at University College 58 years Ago” is due to appear in *University College Record, 2011.*

Finally, I would like to take this opportunity to thank my wife, Phebe, and my good friend Jerry Miller for all the time they have spent improving my essays. Also, I am especially indebted to Jerry for his expertise in the layout of all the text, pictures and diagrams.

John Mallinson
San Francisco, California
15 June 2011

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MY MOUNTAINEERING CAREER

When I was about 12 years of age, my cousin Leslie started taking me walking in the Derbyshire Dales and the Peak District. We typically walked about 10 to 12 miles a day and saw a lot of very beautiful countryside.

By age 15, however, I wanted to try rock climbing. A difficulty presented itself—my father had ordered me not to go climbing! I persuaded him that the climbing boots I had bought, festooned as they were with tricounis and hobnails, were merely for walking, but that clearly would not work with 100 feet of rope! The rope had to be kept at the house of Brian Wooding, my schoolmate and climbing partner.

In 1947, we started going to Laddow Rocks, a Millstone Grit outcrop about 5 miles from Glossop. The climbs were nearly all single pitches about 50 to 80 feet high. The guidebooks of the day classified the difficulty of the climbs as Easy, Difficult, Very Difficult, Severe and Extremely Severe.

Laddow Rocks, near Glossop

We started on the Easy climbs and rapidly moved up to trying the Very Difficult ones. We were teaching ourselves. In fact in the late 40s, I don't think that any rock climbing schools existed. If the VD climb had moves that were too intimidating, we climbed back down and tried it again with the security of a top rope.

All of our climbing was entirely without aids—no pitons, bolts or expansion nuts. Millstone Grit is a very coarse sedimentary rock and when

dry, friction is good. As you may imagine, however, the climbs were often not just damp but more like a waterfall.

Kinder Downfall

I listened to the BBC Aviation Weather forecasts on the radio at home and when I heard the splendid news that the freezing level was to be below 2,000 feet, I called up Brian and we made plans. Our target was the Kinder Downfall, a 200-foot high waterfall that drains the Kinder Scout plateau.

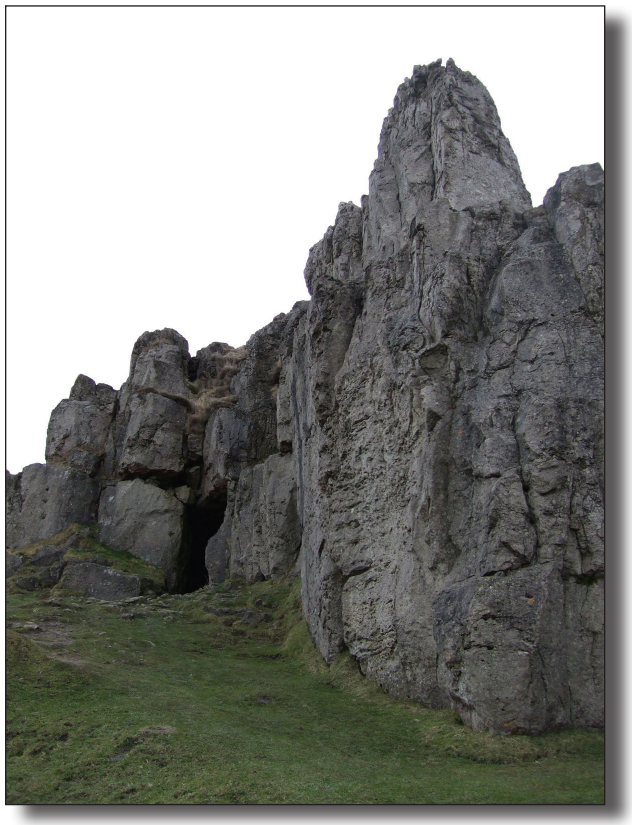
Our intention was to try our hand at ice climbing and, for this, we had to get some special gear like ice axes and pitons.

I recall that usually the Downfall was not frozen solid and there was plenty of water spray to soak us. However, at age 15 one is tough and wet clothing in a gale at 25 F did little to quell our enthusiasm.

I studied every page of the classic book, "Mountain Craft" by Geoffrey Winthrop Young, with greater assiduity than any other book I'd ever read. Gradually, we became competent rock climbers doing occasional Severe climbs.

We visited other venues in the Peak District. Brassington Rocks, a Dolomite Limestone outcrop was a

Brassington Rocks



favorite because the rock had a porous structure rather like Swiss cheese. It had many tiny, finger-sized holds and it thus afforded quite different climbing from Millstone Grit.

At the end of 1949, Brian and I went to Fort William, Scotland, by train and walked up Ben Nevis. We had planned to camp in the snow on the summit plateau of the highest mountain in Britain for three nights in order to celebrate the New Year. We had with us a bottle of Demerara Rum for the event. All went well until we discovered that with no ventilation in the tent, the moisture from our breath formed hoar frost on the tent's roof. Without a flysheet, every gust of wind then caused a light sprinkling of frost to fall inside the tent. Slowly but surely, our sleeping bags became soaking wet during the night. Even more seriously, they froze almost solid in the day! After two nights, we decided that we'd had enough and we broke camp and retired to the Fort William YHA.

In the summer of 1950, Brian and I hitchhiked to the Isle of Skye, Scotland. One of the most uncomfortable journeys I've ever had was sitting on the back of a truck loaded with small aluminum girders! Even the glories of Glencoe could not distract me from the pain of sitting on all those sharp edges.

The Cuillins from the Road to Glen Brittle, Loch Lagan

At that time, MacBrayne charged you ten shillings and sixpence to get to Glen Brittle no matter whether you started at Malliag, Glenelg or the Kyle of Lochalsh. We took the Glenelg/Armadale ferry and then the bus. It had wooden slat seats that were almost as uncomfortable as the girders had been!

As I looked down the Glen Brittle valley, I could see that there were no telephone wires and I realized that I had finally cast off the yoke of my father. Whenever, I went off on a "walking" holiday in the mountains, he gave me a number of florins, two shilling pieces, with instructions to 'phone home frequently. In Glen Brittle, I was "free at last!"

Eventually we got to Glen Brittle, hardly believing the utter alpine savagery of the Black Cuillins. We set off up the hill to Coire Lagan intending to camp at as high an elevation as we could. The sun set but we continued climbing in the gloaming. Quite suddenly, we became aware of the sound of moving air in front of us. I tossed a rock about 10 feet in front of me and could not hear it land! We had gone up a gully all the way to the ridgeline some where near the Inaccessible Pinnacle!

We beat a somewhat shaken retreat and pitched our tent on a nice soft patch of moss about 1,500 feet lower. We awoke the next morning to find that we had camped in a bog! Our sleeping bags and clothing were, of course, all soaking wet.

We retired back down to the valley and asked the farmer if he would allow us to sleep in his barn. "Yes! But there's to be no cooking, no candles and no smoking". We installed ourselves in the loft above his flatulent kyne and started "drying out". Every thing was fine except for the size and numbers of midges—washing oneself in the cattle trough outside was indeed a sore trial!

The rock in the Cuillins is predominantly Gabbro, a coarse grained granite with quite exceptional roughness and friction. The joke was that if you wore a woolen sweater you couldn't possibly fall off! It also abraded your fingers tips so badly that they became too sore for climbing, necessitating a day off every fourth day.

We stayed for ten days and did all the usual climbs: Sgurr Alisdair, Sgurr Dearg, the Cioch and the Inaccessible Pinnacle. And, of course, we swam very briefly in the 40 F waters of Loch Lagan!

In the fall of 1950, I went off to Oxford and that ended excursions with Brian. I joined the Oxford University Mountaineering Club immediately. At Oxford, the only possibilities for climbing were on the buildings at night and the local railway bridges.

The OUMC hired a bus once each term to take us to the nearest real climbing venue, High Rocks at Tunbridge Wells in Kent. There we spent the day climbing a very small outcrop of Sandstone. The climbs were short and were mostly almost obscured with trees. In fact, if a climb became too difficult it was often possible to abandon it by jumping into a tree! This, of course, temped one to try a lot of Severe routes that would have been out of the question elsewhere. It was, indeed, a far cry from the Cuillins.

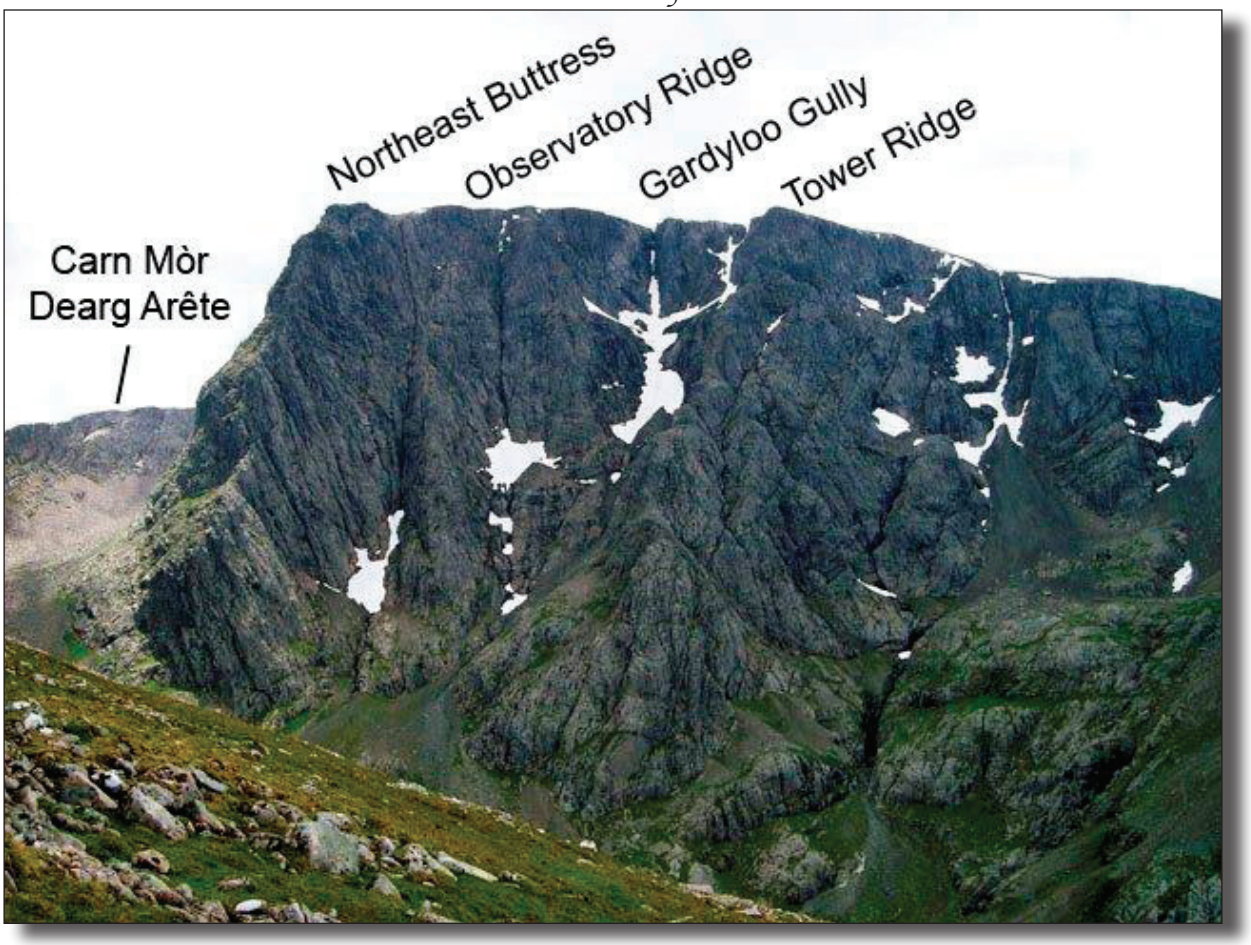
The OUMC visited Glen Brittle in the summer of 1951 with about 12 of us staying at the YHA. Because I had been there before, I became the leader of the novices. One day, I led a party of six that first took a boat to

Loch Coruisk and then climbed the Dubh ridge and returned to Glen Brittle via Coire Lagan. It was referred to as, "Doing the Dubhs!"

Another party I led climbed the Cioch and then bathed briefly in Loch Lagan. There were two women in that party but that did not stop us all stripping off and enduring 30 seconds of the ice-cold water! Prudery has no place in those bitterly cold conditions!

At Easter in 1952, the OUMC went to Ben Nevis, staying in the Scottish Mountaineering Club hut at about 2,000 feet up the Alt'Mhuilinn valley. The hut was completely without heating and everyone who went there had to bring one pint of kerosene for the Primus stove used for cooking. It was still full-arctic conditions with snow down to the 1,000-foot level. We took off our outer layer of clothing and very carefully stacked them outside near the door. The idea was to keep that outer layer frozen and thus windproof!

Ben Nevis Massif Annotated



This was extremely serious full-alpine snow and ice climbing of the highest technical standard with the *crème de la creme* of young British

mountaineers. In fact, individuals were allowed to be there only by invitation of the president of the OUMC.

I was in a party of four led by Michael Westmacott that climbed Tower Ridge; it was totally encased in snow and ice. It took us 14 hours, starting and finishing in the dark! On the summit plateau, I foolishly put down my ice axe to open a bar of chocolate and slipped on the hard snow crust. I will never forget the utter horror of slowly sliding head first down towards the overhanging cornice. With no axe, I was totally unable to arrest my slide. Then, suddenly I was jerked to a standstill and I realized that the party was, thank God, still roped together! I thought afterwards, "You stupid, bloody, bastard Mallinson—you made a mistake in a game that does not permit mistakes!" I felt so ashamed!

Tower Ridge, Tower Gap

Mike Westmacott was on the successful 1953 Everest team and he succeeded in getting as high as the South Col.

The following day, I led a party of three up the South-East Buttress, a long ordeal of cutting steps up a steep, very exposed snowfield. We

descended to the hut by jumping off the cornice on the Carn Mor Dearg Arête and glissading about 1200 feet down the snow covered couloir!

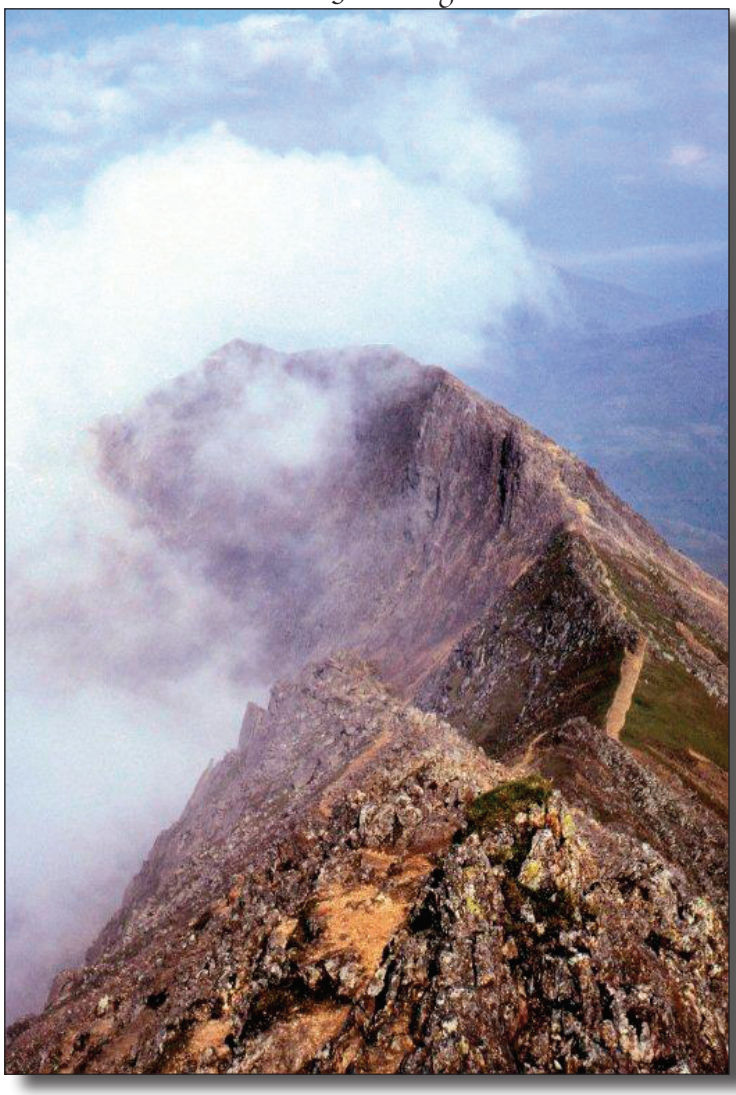
Carn Mor Dearg Arête

The following day tragedy struck! Hamish Nicol and Anthony Rawlinson were attempting a first ascent of Zero Gully on the North East Buttress of Ben Nevis. As the online account in the Alpine Journal tells, Hamish came off and he dragged Anthony off his belay. Apparently their ice pitons "just popped out, one by one, like the buttons on a dress shirt"! They fell onto a steep snowfield and rolled and slid down some 800 feet, becoming wrapped together in their rope. Fortunately someone saw the fall and mounted a rescue operation immediately. Nowadays, ice screws are used, never straight pitons.

In those days, before the futile "War on Drugs" descended upon the civilized world, emergency mountain rescue boxes had morphine and both men were given subcutaneous shots. Hamish had broken his jaw, while Anthony escaped serious injury. We carried them down to Fort William. After they had been taken off to hospital, the kind supervisor at the "Dew of Ben Nevis" scotch distillery allowed us to spend the night sitting near his huge copper stills—the warmth was glorious!

Hamish had been short-listed for the 1953 Everest team but his name was now withdrawn. He told me later that, having suffered two serious accidents, he knew that he would be disqualified. He later became president of the Climbers Club. In 1997, he was killed climbing a cliff in Cornwall.

Crib Goch Ridge



Anthony later became president of the Alpine club. Sadly, he too was killed climbing. In 1986, he fell off Crib Goch on Snowdon in North Wales.

In late1952, Michael Whitehouse, my University College night climbing partner and I went to North Wales on his motorcycle. We stayed in Llanberis and climbed Crib Goch on Snowdon in full-alpine conditions. It was totally in the cloud and we saw nothing but snow and ice plastered rock

My last OUMC trip was to Wasdale Head in the English Lake District in early 1953. This was rock climbing pure and simple, mostly on very hard metamorphic rocks, with rather poor friction. I had now graduated to the position the leader of the meet. I concentrated most of our time climbing on Great Gable. Of course, we climbed the almost obligatory Needle. I led a Very Severe climb for the only time my life, the infamous Innominate Crack. It is a single, near vertical, 100-foot pitch which one ascends on tiny little square edged holds about 0.3 inches wide.

Thereafter, I joined the RAF and went mountaineering no more. In later life, I ascended Mts. Lassen and Whitney and several of the Yosemite peaks such as Half Dome and Cloud's Rest, but that was just walking not climbing.

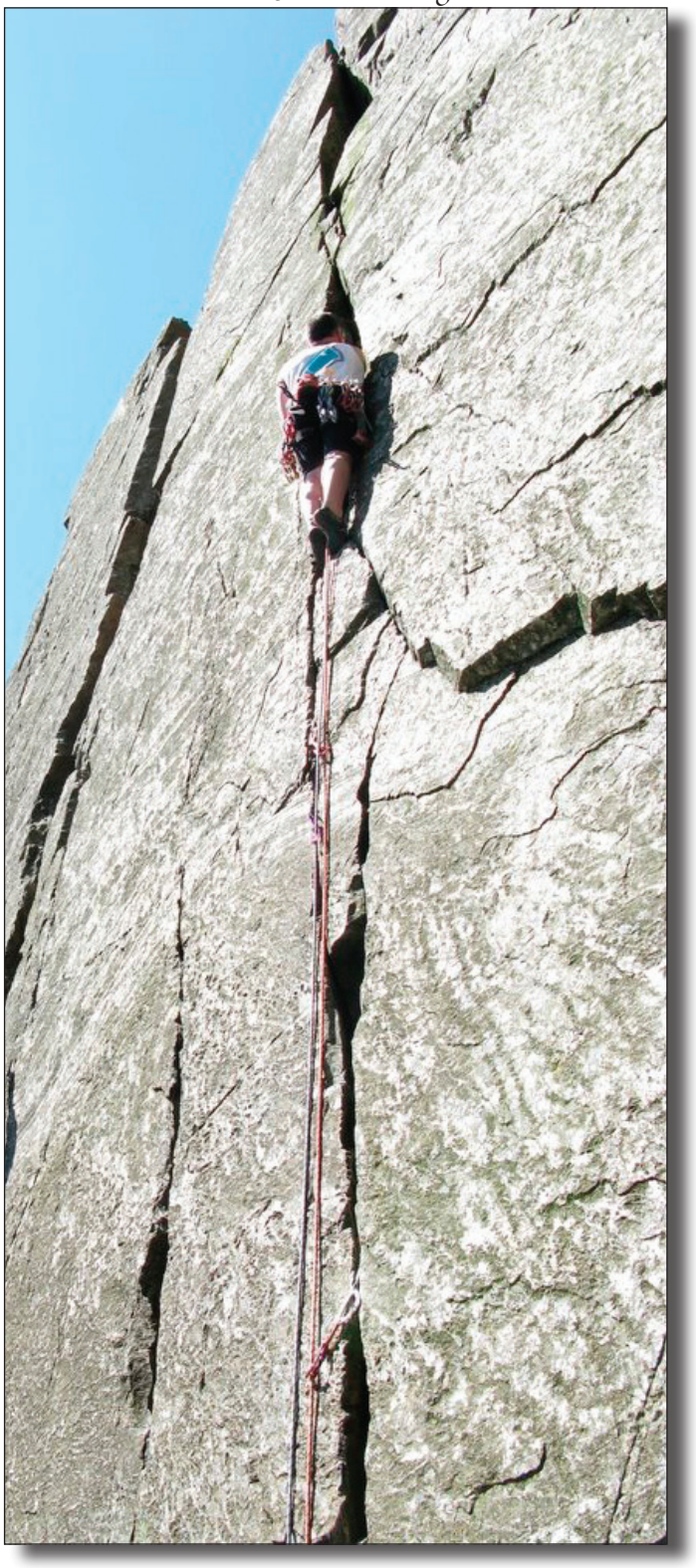
What did I learn from my mountaineering career? First and most important, I developed a mental toughness that I do not think could possibly be gained any other way. I discovered that, given the will and resolve, physical discomfort becomes of almost no concern! What ultimately matters is, "Does the body function?" rather than "How does it feel?"

I reveled in the challenges of doing things that are absolutely real and have to be seen through to completion. In those days before helicopters and cell 'phones, there was no possibility of external assistance. This is, indeed, a far cry from playing a contrived sport, following some arbitrary set of rules, where a referee's whistle brings everything to a halt!

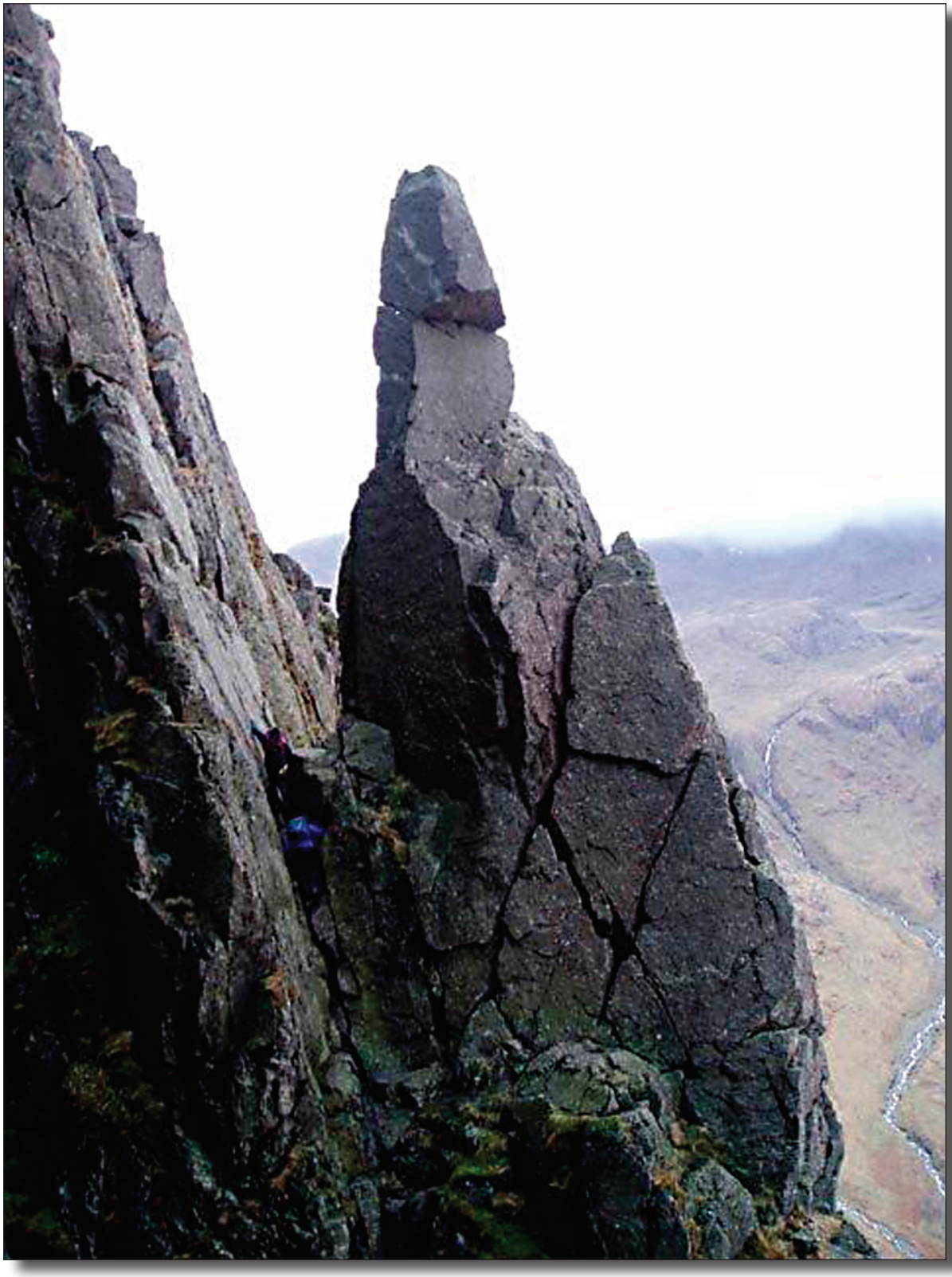
Finally, I came to experience the most profound sense of team spirit and bonding that is possible, where one's very life depends upon it. This should not be confused with the herd mentality that members and supporters of sports teams commonly call team spirit!

It may be hyperbole to say that mountaineering turned John Mallinson the boy into a man, but there can be no question that it prepared me perfectly for the next phase of my life, flying jet aircraft.

Innominate Crack:: Very Severe
Not John Climbing



Napes Needle



HOW I BECAME A PHYSICIST

In the autumn of 1949, I was summonsed to the office of the headmaster, Mr. Baker, MA (Oxon), of Urmston Grammar School. Urmston is a suburb 6 miles to the SW of Manchester, England. This was a far from welcome invitation because each of my previous visits to Mr. Baker's office had resulted in a caning for some petty offence of the kind that can be conjured up only by those of very limited intellect.

Old Urmston Grammar School,

When I entered the office I saw, to my absolute horror, that Mr. Baker had my father with him. Oh my God, I thought, what ever might be the imagined offence, this time I am about to be expelled!

Mr. Baker looked up and said, "Ah, there you are John. I have just been talking to your father about your academic record."

In those days, although I managed always to be near the top in class in Mathematics and Physics, I was invariably at the very bottom in French and Latin. This must be, I feared, the inevitable day of reckoning for my utter scorn of foreign languages, be they dead or alive.

Mr. Baker continued, "I have been telling your father that I think you should try for Oxford and Cambridge. What do you have to say to that?"

"But what would I study?"

"An excellent question indeed, John", said the headmaster approvingly. Thereupon, he picked up the pile of my class report sheets lying on his desk, studied them for perhaps all of 30 seconds and said, "Well, it would have to be Physics wouldn't it? What do think about that Mr. Mallinson?"

My father, a mechanical engineer, was probably not too sure at that very moment whether Physics was an archaic branch of Medicine or not, said, "Well, err— well, err—if you say so—I—I suppose that's the best choice!"

"Well then, that's settled," said Mr. Baker without bothering to ask me for my opinion on the matter.

And there it was—as they say today, "a done deal"—my lifelong career had been decided upon in about 30 seconds flat!

Was it the right choice, you might ask? All I can say is that, at 79 years of age, over 60 years later, Physics still fascinates me and I read Science and Scientific American regularly and avidly!

In retrospect, I have often thought the whole proceeding had many of the characteristics of an arranged marriage, with all the essentials being determined without seeking my opinion, with almost no discussion and with quite exceptional brevity. It is surely manifest that sometimes others really do know what's best for one!

The Physics teacher, Mr. Nicholson, was delighted to hear of his prize pupil's plans. "I'm sure you will do well and I will, of course, follow your career with interest."

Mr. Atkinson, the Mathematics teacher, notwithstanding that I usually managed to place in the top two or three in his classes said, "I hear that you're trying for Ox/Cam in Physics. That's a wise choice because you'd never have made a Mathematician. However, at least you know where to find things!" Long ago, in that simpler world, people did not suffer fools lightly nor did they mince words!

In late 1949 and early 1950, I sat for both the Oxford and Cambridge entrance examinations. I succeeded, going on to study Natural Philosophy (Physics) at University College, Oxford.

At age 18, I started at Oxford and studied Physics and absolutely nothing but Physics. There was no time wasted on the Remedial Writing or Constitutional History kind of trivia that squanders the first couple of years of most college curricula today.

The tutor assigned to me for my very first term at Oxford was no less than the redoubtable Dr. G. F. Rushbrooke of the "Introduction to Statistical Mechanics" book fame! I was forced immediately to find out about Stirling's Theorem and all that statistical stuff just to be able to understand what he was "on about" each week! Mr. Atkinson was right: I knew where to find things!

It may be of interest to note, in this materialistic age where it seems money controls almost every aspect of life, that, in the 1950's, if one passed the entrance exams, the British Minister of Education covered all tuition fees and living expenses. To this day, I have no idea what Oxford cost. Neither did my father—he simply gave me 6 pounds a week as beer money!

Clearly, not all change is for the better. Who would not like to be able to dispatch their son off to what is arguably the best University in the World for mere pocket change?

THE HIERARCHY OF SCIENCES AT OXFORD IN THE 1950s

Shortly after I went up to Oxford in 1950, it was made clear to me that there was general agreement amongst the undergraduate cognoscenti concerning the relative merits of the various scientific disciplines.

It may be of interest to read about our thoughts on this hierarchy in the 1950s, not least because they are so very different from the beliefs prevailing today.

FIRST and foremost stood the MATHEMATICIANS. When mathematicians speak of the Pythagorean or Binomial theorems, they understand that these are Laws of logic that have always been, and will always be, flawless and valid at every place in the Universe. It was agreed that mathematicians sat in glory on the very right hand of God!

SECOND came the PHYSICISTS. They too are the guardians of a set of Laws that describe almost all natural phenomena. In the main, these Laws remain fixed and beyond question, but it is occasionally necessary to expand them in the light of new knowledge. For example, Newton's Laws of Mechanics and the Conservation Laws had to be augmented in order to incorporate Relativity and thus expand their validity to higher energies and to astronomically distant regions of space. Since the Laws of Physics do not have quite the same permanence or universal applicability as those of Mathematics, physicists were considered inferior to mathematicians.

THIRD came the CHEMISTS. Apart from some Laws of Physics, such as the Gas and Conservation Laws, that chemists constantly attempt to usurp as their own, the chemists have to rely on sets of Rules only. Many of these Rules are so weak and variable that it is pointless to pretend that they are Laws. For example, in the Rules of Solubility of compounds in water, Rule 4 says that all sulfates are soluble except those of Ba, Sr, Ca, Pb, Hg and Ag! With only weak Rules, chemists had to rank below physicists.

FOURTH lay the BIOLOGISTS. The animal kingdom in all its glory is so manifold and complex that even pretending that Rules exist was simply unworkable. Accordingly, biologists had no choice other than having to learn, by rote, huge numbers of Facts. If, for example, an arthropod has eight legs it's an arachnid, if it has only six it's an insect. Despite the classification of Linneaus, introduced in the early1700s, even problems of mere identification sometimes remained insuperable. With nothing but a multitude of Facts to guide them, biologists fell necessarily below chemists.

FIFTH came the MEDICAL DOCTORS. It was assumed that most had adopted this lowly discipline because they have been deemed unfit for any of the above sciences. They were commonly regarded to be unable to comprehend

the intellectual rigor of Laws, to be unable to discipline themselves to follow Rules and to find it impossible to remember more than a small number of Facts. Moreover, there was considerable debate whether Medicine was even really a science!

It is interesting, to say the least, to see how things have changed in the last 60 years! There have been totally revolutionary developments that have, in my opinion, all but inverted the hierarchy.

MATHEMATICS can no longer be considered to be a discipline of almost crystalline purity. There has arisen a general understanding of the terrible burden of Godel's Incompleteness Theorems. These show that, even in arithmetic, sets of axioms without self-contradictions cannot exist! More seriously, the advent of high-speed computers has made it possible to solve the most complicated problems by numerical methods. This has trivialized much of mathematics. Today almost any fool can take an expression that has defied analytical integration over the centuries and evaluate it numerically in seconds on their laptop computer!

BIOLOGY and CHEMISTRY have been conflated to become hardly recognizable as separate disciplines. The discovery of the helical structure of DNA, the decoding of its base code for synthesizing proteins and the sequencing of entire genomes have revolutionized all the life sciences. Biochemists, who used to grope around trying to identify specimens by their physical appearance, now sequence them and, in so doing, even discovered a new, third domain of life, the archaea! Molecular biologists, led by Venter, have even managed to construct, ab initio, the entire genome of a bacterium that is capable of life and self-replication!

MEDICINE has been transformed. Physics and high-speed computers have made possible imaging equipment such as CAT and MRI scanners. Now, instead of poking the patient, the doctor can order up imagery of better than 1 mm resolution of their patient's internal organs. The biochemists have delivered to the doctors automated blood analysis equipment able to measure virtually all components of the blood. Ever more capable gene mapping equipment is rapidly becoming affordable. En passant, one might pause to wonder if doctors are capable of comprehending this potentially overwhelming torrent of data!

PHYSICS seems to have shrunk into relative obscurity. In the 1950s, it was in the forefront with both the peaceful and military applications of nuclear energy. Now, it has ended up with enormously expensive, internationally financed machines in pursuit of such sub-nuclear entities as the Higg's boson. It is difficult even to raise much enthusiasm for the consequences such a discovery might engender. Better theories about dark matter, perhaps? The seemingly endless quest to generate power by nuclear fusion is another

endeavor that requires international consortia to fund. Other physicists labor away on String Theory in a seemly futile attempt to reconcile Relativity and Quantum Theory. After some 25 years of effort, invoking spaces with no less than 11 dimensions, many of its of its leading exponents are now concluding that it is naught but an arcane branch of mathematics, related to topology but unconnected to physical reality!

The reader will most surely have noted that my discussion of the current state of science differs somewhat in nature from that eschewed by the Oxford undergraduates of 60 years ago. I can only say that, as 18 year old students, we believed in the supreme importance of philosophical considerations. At the ripe old age of 79, I now find myself paying some heed to the practical aspects of scientific studies! Alas, the inevitable toll of time cannot be denied!

So what do I think the hierarchy is, in 2011?

BIOLOGISTS

MATHEMATICIANS

MEDICAL DOCTORS

PHYSICISTS

MY FLYING CAREER

In the 1950s, National Service was compulsory for all young men in the UK. One could get deferment to go to college, but then 2 years of military service, most probably in the Army, awaited you after graduation. This was not a pleasing prospect!

As soon as I got to Oxford, however, I discovered a much more appealing alternative existed. If I joined the Oxford University Air Squadron and learnt to fly whilst I was an Oxford student, I could then volunteer for a 3 year Short Service commission in the Royal Air Force. Moreover, the RAF promised that the 3 years would be spent flying, flying and doing nothing else but flying!

So in early 1951 I joined the OUAS and started to learn to fly. The free bus, which came up the High street every hour, took me out to Kidlington airfield where there were 12 deHavilland Chipmunks lined up ready to go. It took me only 8 hours to go solo—rather less than normal. I can, of course, recall flying round the pattern for the first time alone and turning my head round to see the instructor's seat empty behind me.

I must confess that the availability of those Chipmunks had a decidedly adverse effect upon my studies. Whenever it looked like good flying weather, it was almost impossible to resist the urge to leave the books and get on that bus! The OUAS provided a free lunch out at Kidlington and, moreover, paid you one shilling and sixpence for each hour flown. Coincidentally, that was the price of a pint of wallop in a pub. Even today, the idea of getting a pint of beer for an hour's flying sounds like a very good deal indeed!

FLYING CHIPMUNKS

In those days the RAF was, as later writers have put it, "obsessed with aerobatics". I thrived on the experience for a wide variety of reasons. It is hard to convey the ethereal joy of doing aerobatics in a sky half filled with puffy cumulus clouds. Looping around the clouds, diving through the canyons between the clouds and possessing an absolute mastery of the space are uniquely fulfilling experiences. One enjoys a different world up there—a pure and

deHaviland Chipmunk Mk22

beautiful world with none of the petty distractions that normally occupy and waste so much of our lives.

Another reason of great importance to me was the understanding of aerodynamics that performing aerobatics well fosters. Bear with me as I give a short lecture.

The angle between the chord of the wing and the airflow is called the angle of attack, AOA. As the AOA of a wing is increased, first the lift coefficient generated increases linearly. Then above about 10 degrees AOA, the increase in the lift coefficient becomes more gradual and it eventually peaks at around 15 degrees. The lift generated by the wing is proportional to the lift coefficient multiplied by the airspeed squared. If one slows down, it is necessary to increase the AOA in order to maintain level flight because the lift must equal the weight of the 'plane. The stalling speed, slower than which level flight cannot be maintained, occurs when the lift coefficient is at its peak.

This behavior is very similar to the sideways force that an automobile tire generates as its slip angle is increased by steering a smaller radius circle. The slip angle is the angle between the direction the tire is pointing and its trajectory over the road. At a slip angle of about 10 degrees, the sideways force peaks and any attempt to tighten the circle further results in skidding, which is analogous to stalling.

One of the beauties of flying is that one can explore the AOA characteristics without the danger of hitting anything. In a car, it's only rarely, for example when driving on airfields or in large car parks, that one can safely explore skidding phenomena.

In some aerobatic maneuvers, like loops, one must start with sufficient airspeed that one gets over the top of the loop without stalling—otherwise one "falls out of the top". In spinning, one deliberately stalls one wing but not the other—the result is a delightful "autorotation", where the 'plane is both rolling and yawing simultaneously!

Aircraft have a "rudder authority" speed above which "top rudder" can maintain level flight even when the 'plane is in the 90 degree bank or knife-edge attitude. The AOA of the fuselage provides the necessary lift. This makes it possible to perform very Slow or, indeed, Hesitation Slow Rolls.

On the matter of "rudder authority", it is obvious that most modern pilots are not familiar with the concept. At air shows, even such experts as the US Air Force's Thunderbirds or the US Navy's Blue Angels pilots seem to be incapable of performing proper slow rolls. What they do are actually Aileron Rolls, which result in the roll being barreled, that is tracing a perceptibly helical path through the air. I have been told that many of today's single

engine jet pilots think that the rudder pedals are only there for steering whilst taxiing!

I found the business of exploring the limits of an aircraft to be absolutely fascinating! After a little experience, one soon gets into believing that it is the outside world that is tumbling around. One's body experiences relatively large forces. A normal loop starts of with a 4 to 5 g pull-up, but one soon becomes accustomed to it and learns that, by tensing the abdominal muscles," blacking out" can be avoided.

FLYING TIGER MOTHS

My job during college vacations now became flying deHavilland Tiger Moths at the local Volunteer Reserve airfield, RAF Barton. These 1932 era, open cockpit biplanes were a delight. The 'plane had no brakes, no radio and no electrical system other than the engine's magnetos. To go night flying, you had to take a lead acid battery out to the 'plane for the instrument and navigation lights!

deHavilland Tiger Moth
1933 G-ACDC at Redhill 1979

One was able to sense the airspeed by the sound of the air in the rigging wires. In an aerobatic maneuver called a Stall Turn in the UK, and a Hammerhead in the US, the airspeed drops to zero at the pivot point. In a Tiger Moth, it all started to go quiet as that point approached and you sensed that it was then time for full rudder!

Some standard aerobatics were very difficult in the Tiger Moth. In a Roll off the Top, called an Immelman in America, even though one started off at the maximum permitted airspeed, 115 kts, it was almost impossible to arrive at the top of the half loop at more than the "rudder authority" speed of 70 kts. That meant that the half roll that completes the maneuver was a pretty sloppy, wallowing mess of a thing! One had to fake it by starting the half roll before reaching the top of the loop—that way the inevitable dropping of the nose in the half roll was less obvious!

It will be of interest to modern day pilots that not only were we taught spinning in that distant era almost 60 years ago, but also that we were taught spin recovery "under the hood", that is on instruments. In the Tiger Moth, the only gyro instrument was the Turn indicator. The drill for spin recovery was 1) break the stall by applying full forward stick, 2) stop the yaw by applying full rudder to center the slip needle, 3) level the wings by applying full aileron

to center the turn needle and 4) pull out of the ensuing dive as evidenced by the fact that the airspeed indicator needle stopped increasing! One was taught, in fact, to deal with each of the three axes one at a time!

In 1980, in its wisdom, the FAA decided that spin training was too dangerous to be kept in the private pilot's curriculum. Today, even commercial pilots need only experience the onset of spins before recovering! It is not surprising that, having never been in a spin themselves, most young pilots refuse to believe that it is possible to recover from spins on "partial panel" instruments alone!

TigerMoth NZ-862

After about 300 hours of Chipmunk and Tiger Moth flying, I graduated to the OUAS's Harvards.

FLYING HARVARDS

These relatively large and powerful, radial engine machines were quite different. All the looping maneuvers took a lot more altitude and time. Pulling 4 to 5 g for 10 seconds is very different from experiencing it for only 5 seconds. One had to accept that, despite muscle tensing, occasional "blacking out" was inevitable. Aerobatics had become a serious challenge to one's physiology.

In late 1953, with some 400 hours of flying, I left the OUAS and joined the RAF proper. I was posted directly to a jet conversion unit at RAF Middleton St. George to learn to fly Meteors.

I joined a class that was composed entirely of pilots from several University Air Squadrons. One of them, John Holt, a fellow University College, Oxford student was a Rhodes scholar from South Africa. He had to visit the Air Ministry in London to demand that, after flying in the OUAS, he should be drafted for two year's National Service in the RAF. Can you imagine the surprise of the Air Ministry bureaucrats to meet a man who was actually volunteering for National Service? It is absolutely wonderful that there are some people in this world who are really made of the right stuff! Wearing a beret, he is standing behind me in the Jet Conv Class photo.

Jet Conv Class--Gloster Meteor.

FLYING METEORS

Flying the Meteor was another step up in the seriousness of flying. It was the first jet aircraft in the RAF, a twin jet fighter with Rolls Royce Derwent engines. They were of the original Whittle type with a centrifugal compressor, producing 3,500 lbs thrust at 14,400 rpm. At its best climbing speed of 280 kts, the initial rate of climb was almost 8,000 feet per minute!

This rate of climb was almost intoxicating; one punched up through layer after layer of cloud feeling rather like the cork exploding from a champagne bottle The application of full aileron produced a roll rate of 240 degrees a second with no perceptible effect upon the climb rate!

In many ways, it was an aircraft built to fight the Battle of Britain all over again. Having got to 30 to 40,000 feet altitude, you were almost immediately faced with a critically low fuel situation since the endurance was only 55 minutes! If you were not commencing the letdown procedure 40 minutes after take-off, then it was time to declare an emergency on 121.5 Mhz! With an external ventral tank, endurance was increased to 75 minutes!

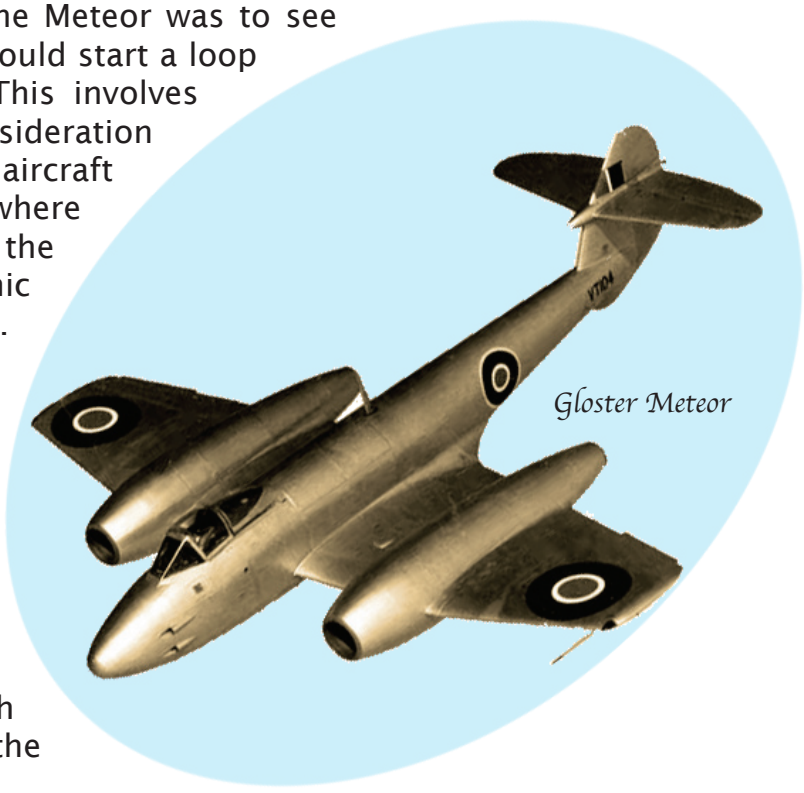
Performing a loop now involved suffering 5 to 6 g for almost half a minute We wore anti-g suits, that used compressed air in plastic tubes to constrict the lower abdomen and legs, in order to resist ‘blacking out”. They were very uncomfortable but effective.

In a maximum performance turn, performed at 100% power and at 270 kts, you were subjected to a constant 6g. Even the g-suit could barely keep you conscious! It is a strange fact that no one but fighter pilots seem to understand that turns in the minimum time and with the minimum possible radius are achieved at the highest possible speed. Most pilots think, incorrectly, that they can turn tighter if they slow down!

Despite these physiological assaults on the body, flying the Meteor was exhilarating, as well as demanding! We had to perform the hated "Pattern B" exercise on instruments. At 300 kts, you had to climb exactly 4,000 feet while turning 450 degrees—one full turn plus 90 degrees—then fly straight and level for 2 minutes and then descend 4,000 feet whilst turning 450 degrees and so on. When flying "under the hood", it was almost too much to keep up with all the mental arithmetic needed let alone fly the aircraft!

Low-level cross-countries at 150 feet and 450 kts were, to say the least, stimulating. One quickly learns that if the Mach meter shows 0.7, then you are doing 7 miles a minute! I shall never forget the sight of the Northeastern face of Ben Nevis flashing by in less than a minute as I hurtled up Alt' Mhuillinn. It was a far cry indeed from taking 14 hours to climb Tower Ridge in 1952! However, unless the air is very still, low-level cross-countries can be a very rough ride and that alone makes them quite exhausting.

A favorite game in the Meteor was to see at how high an altitude one could start a loop and still get over the top. This involves another aerodynamic consideration called compressibility. Every aircraft has a critical Mach number where the airflow over the top of the wing first becomes supersonic and a shock wave forms. The Meteor's critical Mach number was 0.82 and above that speed the 'plane could not be controlled properly because the shock wave interfered with the action of the ailerons; usually the right wing dropped. As altitude is increased, the indicated airspeed of the critical Mach number decreases because the air becomes less dense.



Gloster Meteor

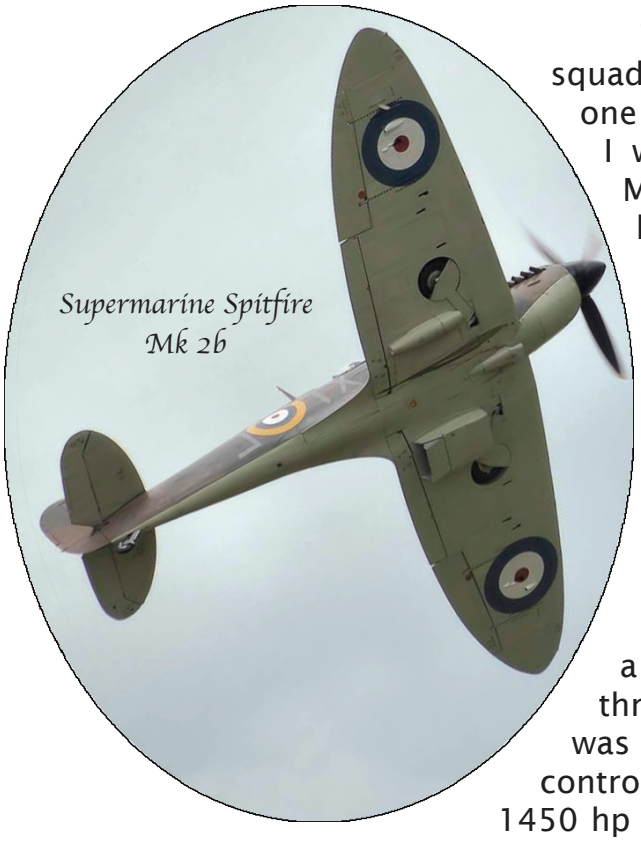
The game was to dive to the critical Mach number, at say 28,000 feet, and try to perform a loop. If it worked OK, then you tried it again starting at 29,000 feet. It's like trying to start the loop at progressively lower indicated airspeeds until eventually you "fall out" of the top! As I said, the RAF in the mid-1950s was aerobatic crazy!

The way to show your instructor that you were good was to do a slow roll at 500 feet after take-off. On all descents, one checked the airspace below for aircraft by rolling every 5,000 feet.

After Middleton St. George, I joined a low-level interceptor squadron. Most of the flying was following radar vectors at less than 1,000 feet over the North Sea. Our Meteors were being vectored to intercept Spitfires, that were pretending to be incoming Russian bombers.

An interesting exercise was air to air firing. One of the Meteors towed a target drogue and the rest of us took turns firing at it. Only about 20% of the bullets fired registered hits! The exercise was not so amusing, however, when it was your turn to fly the drogue 'plane. You cowered down below the armor plate behind the seat wondering just where all those missed bullets were going!

FLYING SPITFIRES



Supermarine Spitfire Mk 2b

The Spitfires were in one of the last squadrons in operation. I enquired what did one have to do to fly one of their Spitfires. I was told that first you read the Pilot's Manual and took a test to check that you had learnt the important numbers, like the minimum oil pressure, the best climbing speed and so on. Then you sat in the cockpit until you felt that you could pass the "blindfold cockpit test". For this, you were literally blindfolded and asked to point to the oil pressure gauge, the airspeed indicator and so on, reciting the appropriate important numbers as you did so.

You were then approved to fly a Spitfire! I taxied out and opened the throttle for take off very circumspectly. I was concerned about losing directional control and "ground looping" the aircraft. With 1450 hp of Rolls Royce Merlin up front and a tail

wheel at the other end, I was so cautious that I believe that I was airborne before I'd even got to half throttle!

I climbed away at 120 kts and performed all the standard aerobatic maneuvers at around 10,000 feet. What a magnificently harmonized, sweet flying machine the Spitfire was. About 40 minutes later I returned and managed to pull-off a decent landing!

FLYING CANBERRAS

After only 6 months as a fighter pilot, I was assigned to learn to fly Canberras at RAF Bassingbourn. This ratcheted up the seriousness of flying two more notches. The aircraft was the highest-flying bomber in the world and we had to wear a "pressure breathing waistcoat", PBW, in order to operate safely above 48,000 feet. The Canberra was, of course, pressurized so the PBW was only required in case of a loss of pressurization above that altitude.

We had to undergo Explosive Decompression training. Breathing 100% oxygen, one sat in a steel tank at about one half an atmosphere pressure corresponding to 18,000 feet cabin altitude. Then, without warning, a gate valve about 4 feet in diameter opened and the pressure dropped to about one sixth of an atmosphere corresponding to about 50,000 feet. Instantly, the tank was filled with mist, just like a cloud chamber.

The effect on you depended on whether you were at that moment breathing in or out. If you were exhaling it was OK. If you were inhaling, however, it was like being hit by a truck because the sudden drop in pressure forced you to exhale immediately. The PBW was also very uncomfortable in operation. You breathed from an oxygen mask that supplied oxygen at more than the ambient pressure and in order to breathe out you had to blow into

English Electric Canberra

the mask. This tripped a flip-flop valve that redirected the oxygen flow into the waistcoat, which then proceeded to crush your thorax. Then you had to suck into the mask to start the cycle again. You were alternately being pumped up and squeezed out!

In the event of decompression above 48,000 feet the drill was to close the throttles, extend the airbrakes, open the bomb bay doors and descend at Mach 0.81 to 40,000 feet.

The other way in which the Canberra notched up the seriousness of flying was the fact that they had ejection seats. They were Martin-Baker units with a 3 cartridge, telescopic gun that shot you 80 feet vertically. If you were doing more than 100 kts, you could eject "safely" whilst rolling down the runway!

Every four months, we had to take a ride on an Ejection Seat training ramp. You sat in a real ejection seat and told the operator what you weighed. He added the appropriate number of lead weights and then you pulled the face blind down. Blacking out instantly, you felt absolutely nothing as you were accelerated upward at 10 g. The first thing you become aware of was the sound of a ratchet mechanism slowing down and stopping. Upon raising the blind, you saw that you were now well above the hangar roofs, about 80 feet up a very thin looking girder. To say it was highly vertiginous is being polite! Next, the operator lowered a hook on a cable that disengaged the ratchet device and lowered you down. I hated that part, thinking, "My God, suppose the hook slips and I go crashing back down!"

The damned thing always gave me such a blinding headache a few hours later that I realized the best thing to do was go straight to bed with a bottle of pain killers!

Those trifling physiological onslaughts aside, however, flying the Canberra was a wonderful experience. Its Rolls Royce Avon engines produced 6,500 lbs thrust each. That meant that when doing pattern work with low fuel loads, the 14,000 lbs 'plane accelerated down the runway at about 0.8g and it was necessary to throttle back at 250 feet in order to get the undercarriage up below 175 kts and stay below 1,000 feet altitude. Cruising at any altitude below 20,000 feet was more efficiently conducted on one engine.

A normal mission with full fuel started off climbing at 330 kts and then at Mach 0.72 up to 44,000 feet and then cruise climbing, as the fuel load was burned off, at about 1,500 feet per hour. After 4 hours you were above 50,000 feet, comfortable in the knowledge that, apart from the Lockheed U-2, you were almost two miles higher than any other aircraft in the world. It was very different indeed from a Tiger Moth!

We would frequently fly across the Atlantic to Newfoundland and back in order to tweak our North American allies. We flew north from the UK and up the Norwegian coast to Cap-Nord to provoke the Russians in Murmansk! Every three months you were encouraged to take a 'plane and fly it wherever you wished for 72 hours. My two indolent navigators always wanted to make the relatively short hop down to Gibraltar and whoop it up there on duty-free booze. On one such "Round Robin", I made them work on a three-leg flight out to Colombo, Ceylon, now named Sri Lanka.

One memorable NATO exercise was held in the Western Mediterranean with my squadron being deployed to Malta. Our mission was to locate and attack the US Navy's aircraft carrier, the USS Ticonderoga.

We soon found it—after all, at 50,000 feet the horizon and thus radar search range is over 250 miles away. Knowing that it could not possibly have moved more than a few hundred miles overnight, at dawn the next morning we mounted our attack. Our 12 aircraft were stacked at 500-foot intervals between 45,000 and 51,000 feet and routed to arrive overhead the Ticonderoga almost simultaneously, coming from all points of the compass.

The Ticonderoga's defending force was flying the US Navy's front-line fighter, a rather pathetic little thing called a Cougar. It was barely able to climb above 40,000 feet. As we approached the "sitting duck", they looked rather like minnows milling about impotently ten thousand feet below!

As you approached the bomb release point, you announced your identification and counted down the last 5 seconds of the bomb run followed by, "Bombs away"! We operated on the honor system, whereby, if you were intercepted within the next 30 seconds, you would call out, "Bombs cancelled". There were, of course, no cancellations!

It is difficult to imagine the sense of utter frustration and, indeed, humiliation that the poor American admiral must have felt upon hearing all twelve of us calling, "Bombs away". He must have known that, had it been war, no less than seventy-two 1,000 lbs bombs would now be raining down on his defenseless flagship!

My leaving the RAF was delayed a couple of months by the 1956 Israel-Arab war. The squadron was deployed to Cyprus, from which we bombed the runway at the Alexandria airfield in Egypt. The objective was to ground the Russian MIGs that were assisting the Egyptians. You can imagine our disbelief that, in order to limit collateral damage, we were ordered to perform this task from 1,500 feet only! Though flying the highest-flying warplane in the world, we had to fly at pattern altitude! As you were unloading your six 1,000 lb bombs onto the concrete below, you could see, with the naked eye, bloody Arabs on their camels shooting at you with rifles! So much for the interference of damned politicians in military matters! It turned out to be a

waste of our time anyway, because the Russians, having no taste for a fight, had flown off to Syria before we arrived!

In 1956, I was very temped to sign on for another 3 years in the RAF. I was promised that if I did so, my next posting would be to the Empire Test Pilot's School at Boscombe Down. The ETPS was of course the ultimate dream of every red-blooded pilot!

However, I had been in the RAF long enough to see many pilots grounded for such minor medical problems as needing spectacles. They were usually transferred to Air Traffic Control duties, where their unenviable fate was to serve out their commissions stuck in a control tower watching others do what they themselves longed to do! I left the RAF with about 1,200 twin jet hours.

FLYING MY CESSNA 172 and BEECHCRAFT BONANZA

In 1976, I resumed flying as a Private Pilot in California. Eventually I bought a Cessna 172 and flew it for almost 2,000 hours, getting as far afield as Calgary, Canada. In 1987, I sold the Cessna and bought a Beechcraft V-35B Bonanza in which I also did 2,000 hours, flying east as far as Atlanta and north as far as Seattle.

The Cockpit Of My Bonanza

I finally stopped flying in 2007, having flown almost 6,000 hours without any incidents of consequence. I quit because the insurance premiums were being increased by about 40 % every year after I reached 70; by age 75, they had become quite ridiculously high! Additionally, the insurance company wanted me to have an aviation medical and a flight test annually, even though the FAA required them only biennially!

FLYING SUPER DECATHLONS

For a few of years in the early 1980s I took up aerobatics again. I rented a Super Decathlon; a specialized aerobatic machine equipped with inverted flight fuel and engine oil systems. The wings have a symmetrical profile and are mounted at zero degrees incidence and, consequently, the plane flies equally well “right way up” or inverted.

In the Decathlon, I extended my repertoire of aerobatics to include all the inverted maneuvers. Doing an English Bunt for the first time takes a fair degree of “mental fortitude”. One slows down to just above the stalling speed and then pushes the nose down and under to perform one half of an inverted loop! One arrives at the bottom pushing about minus 3 or 4 g. Negative g is, of course, uncomfortable but it is in some ways more acceptable than positive g because it doesn’t cause “blacking out”!

I also perfected the art of performing Snap, or Flick, Rolls. These are essentially spins along a horizontal axis. You slow down to about 1.5 times the stalling speed and initiate the snap by simultaneously applying full rudder and elevator. The result is a rapid rotation, because only one wing is stalled. I enjoyed these particularly because they were not permitted in the RAF and we all know about the attractions of forbidden fruit!

I will conclude this essay with some comments upon private flying generally. I continue to be amazed by the incessant drumbeat in the monthly aviation magazines about the necessity to remain physically fit in order to fly private aircraft safely! In fact, I cannot see any valid reason why a private pilot needs to have any medical certification!

School bus drivers, who are at a much greater risk of accident with almost immeasurably more grievous consequences, do not have to undergo medical examinations. If one becomes unconsciousness, even for only a few seconds, when driving a car or a bus, a serious, possibly fatal crash is very likely. Yet all honest pilots will admit that they have fallen asleep without mishap on long cross-countries!

As for the difficulty of private flying and the constant recital of its dangers, I do not understand why the monthly magazines seem to be so determined to minimize just how safe it really is. Flying light aircraft is arguably a safer activity than driving a car—all you need to avoid is overloading the ’plane, running out of fuel or hitting the mountains! In a car, there is the ever-present danger from oncoming traffic with a relative speed of 100 mph only just a few feet away. In a ‘plane, there’s almost nothing up there to hit! As I said, that’s why aerobatics are so much fun!

Cessna 172
Skyhawk

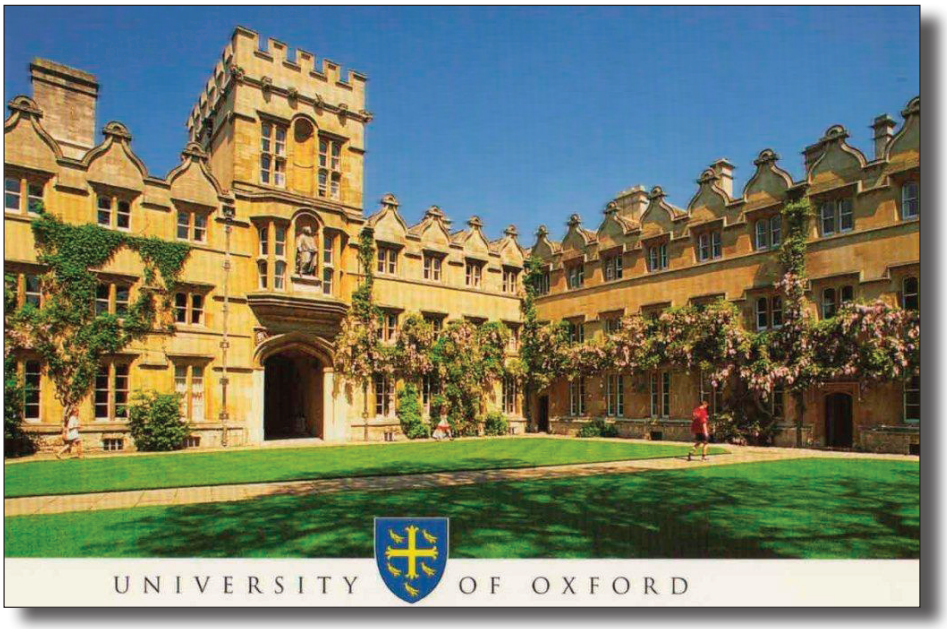
My Beechcraft Bonanza V35B

Super Decathlon
Aerobatic Plane

NOCTURNAL GOINGS ON AT UNIVERSITY COLLEGE 58 YEARS AGO

Apart from flying light aircraft in the University Air Squadron, my principal sport at Oxford was night climbing—an activity usually conducted in a strictly covert manner. However, I was caught "at it" one night with amusing consequences that led to my learning some important lessons in life!

Radcliffe Quadrangle



In Hilary term of 1953, my Univ climbing partner, Michael S. Whitehouse, ('50) and I decided to climb on the Oxford City Town Hall building. At about 11 pm, I started up a drainpipe, whilst my roped up partner waited below in Blue Boar Street.

To my dismay, I saw a constable approaching. To Michael, festooned with rope, he asked rhetorically, "What's going on here then, young Sir?" He then shone his torch up at me, trying to look inconspicuous some 35 feet up the pipe, and said, "Now then, young Sir, I can see you. And what's more, you know I can see you. So do be a good fellow and come on down right away" I had no choice but to comply.

Mike and I were swept away in a gleaming, black Wolseley police car to the Oxford City Police station, all of a quarter mile away down St. Aldates. Mike was then released—it being no crime merely to stand in the street. However, I was booked, relieved of my belt and shoe laces—lest I might, in my shame, attempt suicide-—and put into an immaculately clean, white tiled cell.

Nevertheless, this did not cause me any serious concern. It was the custom of Arthur Goodhart, Professor of Jurisprudence and Master of Univ, to inform all Univ freshmen that the civil police operated at Oxford only at the pleasure of the Chancellor of the University. The University had preceded the Peelers by at least eight centuries and even had its own police force—the Proctors and their henchmen, the Bulldogs.

The police had no choice but to telephone Univ and ask what should be done with its miscreant. The Dean of Students, Giles Allington, presumably told them, "Set him free immediately" So, after less than 15 minutes in the slammer, I was indeed set free and driven to Univ.

At Univ, the arresting constable and I were admitted to the "locked up tight for the night" college and led to the Dean's rooms in the Radcliffe quad, by the long-grumbling night porter, Douglas.

Giles, looking simply magnificent in a long, red velvet dressing gown, greeted us, "Do come in. Now, constable, please take your time, I want to hear every last detail of the night's excitement"

The constable started, just as one might expect " At 11.30 pm, as I was proceeding eastbound on Blue Boar Street, my attention was…"

He had stopped because Giles had just disappeared into his private rooms. Giles' distant voice could then be heard "Do go on my dear man, I am attending to your every syllable"

This splendid charade was repeated several times, sometimes augmented by the sound of flushing drains, until the humiliated constable finally concluded his tedious, unheard report. Giles promptly emerged in full glory from his ablutions saying "Thank you, officer, for a most lucid account. The porter will see you out directly"

Giles then asked me "Pray tell me, what moves you to night climbing"? I replied gauchely, "Because it's nice" That caused Giles to wince visibly, "My dear Mallinson, surely you do realize that nice is an uncommonly weak word?" I was then dismissed with an admonition to cause no further trouble that night.

The only long term sequelae of this adventure were that my climbing rope had been impounded and that I had to face the very serious matter of an interview with the Junior Proctor in the Bodleian. Unlike the civil police, the Proctors had real power—even rustication was a possibility!

However, he had but one question for me: "Why ever were you caught?" I allowed that it was indeed an unpardonable gaffe. The Proctor replied, "Then I see that we understand each other," and returned my rope.

I wonder if today's undergraduates would be afforded such a thoroughly civilized and grown-up educational experience?

FROM OXFORD TO CALIFORNIA
OR
HOW A YORKSHIRE LAD BECAME A CALIFORNIAN

In the early1950s, when I was at Oxford, National Service was universal for all in Britain. One got deferment to go to college but after graduation, two year's military service, most likely in the Army, was compulsory. That prospect was not the least bit pleasing to me!

I soon found out, however, that if I joined the Oxford University Air Squadron and learnt to fly first, then I could volunteer to be in the Royal Air Force on a Short Service Commission for three years. Not only would I be able to fly whilst at Oxford, but also I could then spend three years in the RAF flying. No disagreeable square bashing or standing in trenches —just flying, flying and nothing but flying!

At Oxford, I learnt to fly in Chipmunks and graduated to Harvards. I must confess to the fact that knowing that the Air Squadron bus came up the High Street every hour on its way out to the airfield, had a very adverse effect on my studies! The prospect of rolling and looping about "up there", in and out of puffy cumulus clouds, was much more appealing than spending another dull morning in the college library!

My vacation job then became flying Tiger Moths at the local RAF Volunteer Reserve airfield. For that, I was paid one shilling and sixpence per hour. At that time, one pint of bitter beer at the local pub cost, coincidentally, exactly that amount! Even today, that seems like a very appealing deal—fly for an hour and earn a pint of wallop for your effort!

In the RAF proper, I flew Meteors and Canberras, both twin jet aircraft. The exhilaration of climbing at almost 10,000 feet per minute in the Meteor and popping through cloud layers like a champagne cork is unforgettable! The Canberra was, at that time, the highest-flying bomber in the world and we operated regularly above 50,000 feet.

I was greatly tempted to stay in the RAF, particularly since I was assured that my next posting would be to the Empire Test Pilot's School at Boscombe Down. Of course, getting to the ETPS was every red-blooded pilot's ultimate goal.

In those days, however, having to wear glasses was a disqualifying condition in military aviation and I had seen many pilots grounded. The RAF usually then assigned these unfortunates to air traffic control duties, where they were doomed to sit out their Air Force days watching others do what they, themselves, longed to do! I decided against such a precarious career.

So, towards the end of the three years in the Royal Air Force, Flight Lieutenant (GD Pilot) John C. Mallinson 2608385 started corresponding with the Oxford University Appointments Service.

I went on job interviews at companies like Alcoa and British Steel and succeeded in getting lackluster offers at about one half my RAF salary. However, amongst the mail that Oxford sent me was a letter announcing that one Dr. Franklin Wells of AMP, Inc., Harrisburg, Pennsylvania would be at the Westbury hotel in London. He was prepared to see anyone who was interested in "talking about North America".

Mainly because Suzanne, my first wife, had spent 9 months in Canada and the USA in 1952, had greatly enjoyed the experience and wanted to return there, I went off to see Dr. Wells. We spent a very pleasant hour together. I asked about the prices of staples, housing, the climate and what Americans thought about the British. I even asked politely what was AMP's business!

I recall that we had a particularly interesting conversation about the philosophical difference in the meaning of the word "one", when it denotes a single object, from it's use where it is part of a continuous sequence of numbers!

Then, to my utter surprise, Dr.Wells said that he was prepared to offer me a job at AMP at $5,000 per year salary. I was flabbergasted, since I thought our meeting was merely "talking about North America". I said, "But why are you offering me a job?" He replied, "Because you are the only young man I've seen on this trip to London who has not asked me about my company's life insurance and pension plans!" Thank God, I knew enough to keep my mouth shut! I accepted on the spot, telling him that I expected to be out of the RAF in late October.

I drove back to Suzanne and told her that not only that we were going to America but also that my salary would be just three times what the RAF paid me!

At the time, it was called the "Brain Drain". You may be pardoned for thinking it was more like going fishing with the almighty dollar!

The onset of war between Israel and Egypt delayed my leaving the RAF until mid-December.

I had to go to the American Embassy in London to get a visa. At that time, since Britain always had an unfilled quota, it was a mere formality. Nevertheless, they asked some extraordinarily ludicrous questions! "Do you intend to attempt to overthrow the Government by force?" "Do you intend to live on the immoral earnings of others?" "Are you a member of any foreign, proscribed organizations?" Finally, I was asked, "Are you a Caucasian?" to which I replied, "Good God, No! Don't you know that the Caucasus Mountains

are on the Eastern boundary of Turkey? I'm an Anglo-Saxon not a bloody Wog!" I had never been asked about my race before and it was my first encounter with the profoundly ingrained, racial nature of American society.

Caroline, Suzanne and I arrived in New York City on the Queen Mary on 3 January 1957. The stormy crossing had taken 7 days—a far cry from the 5 hours my Canberra would have taken! We had with us two trunks. One trunk was impounded because it was emitting "nuclear radiation!" Under the stern gaze of armed guards, it was duly opened to find the source: the luminous dial of a magnetic compass!

At Harrisburg, I was given a Hertz 1957 Chevrolet for a month. I was appalled at its combination of low geared steering and extraordinarily poor handling! After my sports cars in England, it was a pig!

My first boss at AMP was Joseph Sweeney, a former Cal Tech mathematician and researcher. He took me to California to visit Stanford Research Institute and later he put me in charge of a joint Amp / SRI program to develop a logic system using magnetic ferrite cores. In 1997, Phebe and I took a trip on the later Queen Mary 2 to celebrate my 40th anniversary in America and we happened, by chance, to meet the Sweeneys. Sadly, Joseph seemed barely able to remember me even though his wife remembered me and that I had a "little white sports car"!

I started a routine of visiting SRI in the Bay Area for one week out of every six. It did not take me long to realize the attractions of California and the Bay area. One could drive to the Sierra Nevada in three hours, visit Yosemite or drive the 10,000-foot high Tioga Pass, visit the Napa Valley only an hour away or simply enjoy to the local beaches! Apart from two delightful weeks in late Fall, there was always better weather in California than Pennsylvania!

I asked my friends at SRI if they had any ideas where I might find a job in the Bay Area and one of them, Dave Bennion, replied, "You ought to try Ampex. You'd probably like it. It's a company run by engineers for the sake of engineering!" He was absolutely right. Ampex, the company that invented video recording, was an extremely innovative company. Over the years it won technical award after technical award, for example for "stop motion" video, but it never made much money!

Dave was one of the founders of the BCRZ Winery that later became the world renowned Ridge Vineyards. He was, shall we say, a "fallen Mormon". When he was a child in Salt Lake City, he recalled that his mother used to sniff Xmas cakes and throw them out if she detected sherry, rum or brandy! When his father died, Dave put his inheritance into BCRZ but did not dare to tell his mother. Five years later, when she died, Dave came out of the closet and, within a week, he had resigned from SRI, moved to live on the vineyard on the Monte Bello ridge above San Jose and become a full-time vintner!

So, following Dave's advice, I 'phoned Ampex, got an interview with the Research Director, Arthur Hausman and was offered a job. I started at Ampex in 1962 and that is how this Yorkshire lad became a Californian!

A BORD DU CONCORDE

OR A PHYSICIST GOES SUPER-SONIC

In 1980, I flew from New York to Paris on an Air France Concorde. I managed to afford this adventure by "triple-dipping" for the $1,500 one-way fare. I had to go to Paris to attend a conference held by the French Department d'Archive on behalf of a committee that I served on at the US National Archive and Records Administration. Accordingly, I was able to charge the Ampex Corporation one third, the US Archives one third and I had to find the last third myself!

The BAC-Aerospatiale Concorde first entered service in 1970 and it continued until 2003. With its enormous fuel consumption, it is questionable whether it ever made a profit. It returned only about 15 passenger miles per gallon; about one sixth that of a Boeing 747. As a consequence, there was already talk of it's being withdrawn from service in the late 70s. I was, therefore, anxious to experience the super-sonic machine as soon as I could wangle it!

The other factor that severely affected the Concorde enterprise was the decision by many nations, including the USA, to prohibit supersonic flight over land. Concorde was thus restricted to trans-oceanic routes only. All of the twenty or so airlines that had made pre-production orders then withdrew, leaving only British Airways and Air France as heavily Government subsidized customers. With only 20 aircraft being manufactured, the Anglo-French consortium never recouped the development costs.

Apart from the short-lived Russian Tupolev 144, that debatably never entered regular airline service, the Concorde was the only supersonic airliner in the world. Its performance could fill an encyclopedia with superlatives. It cruised at 55,000 feet at 1,175 KTS or 1,350 MPH; over twice the speed of sound! That speed is, of course, the reason why it burnt so much fuel.

I arrived at the Concorde lounge in New York's JFK airport about three hours before flight time. I was immediately offered Champagne but I declined the offer saying, "My name is Mallinson and I'm here early in order to have plenty of time to inspect the aircraft!" After a brief delay, a very polite young man in an Air France uniform took me out onto the tarmac; he told me he was a technical liaison officer.

When standing underneath Concorde, one gets a magnificent view of the four Rolls Royce / Snecma Olympus turbojets. Each produces 33,000 pounds static thrust that increases to 38,000 pounds when the afterburner is in operation.

The engine air intake ducts were large enough for a man to stand in. I inspected them closely in order to understand the three airflow control doors. Because a stable flame front can propagate only at less than the speed of sound, it is very difficult to sustain stable combustion in airflows much faster than Mach 0.5. When the 'plane is flying at Mach 2, the three doors are positioned in order to ensure that shock waves slow the air going into the engine down to about Mach 0.5. This results in the air pressure in the ducts being almost trebled before it even reaches the engine's compressor.

At 55,000 feet the atmospheric pressure is only about one-eighth that at sea level. Without the shock wave pressure recovery system, the engines would, of course, only be able to produce one-eighth the sea level thrust. With the pressure recovery at Mach 2, one-third sea level thrust is realized.

Also the exhaust nozzle of the engine was of great interest to me. Because the best propulsive efficiency of a jet engine is obtained when the exhaust velocity is equal to the true airspeed. When this is so, the air behind is left essentially undisturbed and thus no energy is wasted. The diameter of the jet pipe has to be reduced at the higher speeds in order to increase the exhaust velocity.

We then climbed up some stairs and entered the cabin. Concorde had 96 passenger seats arranged in pairs each side of the aisle. The cabin was very long and narrow. I believe it was narrower than the cabin of a Douglas DC-3!

You may imagine my fascination when I was then led into the cockpit! All of the instruments were familiar to me since I had flown twin jet aircraft in the Royal Air Force; see my essay, "MY FLYING CAREER". In the fatuous terminology of today, it was a "Steam Gauge" cockpit, meaning all the instruments were round and mechanical.

I was even allowed to sit in the captain's seat until I'd taken my fill of the wonders! This was, of course, twenty years before the 9/11 World Trade Center attack and all the limitations and indignities subsequently imposed by Homeland Security.

I then returned to the lounge and studied the copious technical literature the liaison officer had provided for me. I had decided that this unique experience in my life was not to be blurred by alcohol and, consequently I again refused the Champagne that was, by now, flowing in abundance! However, I did allow myself a very considerable quantity of caviar and oysters.

There were about seventy passengers, including a group of perhaps thirty rather loud German engineers who worked for Siemens. Indeed, they must have had a very successful trip to the USA to justify their fares.

The ‘plane taxied out exactly on time. Each engine burnt about 8 gallons of fuel per minute when taxiing; a total of about one ton every 10 minutes!

Without delay, it was lined up on the runway and the take-off roll began. The initial acceleration, with the four engines producing 33,000 pounds thrust without afterburning and an all-up weight of about 400,000 pounds was about the same as doing 0 to 60 MPH in a car in 8 seconds! At about 100 MPH, the afterburners were lit and they resulted in a noticeable kick! The ‘plane lifted off at about 220 KTS (250 MPH), which did seem to be noticeably faster than that of a Boeing 747. After the gear had been retracted, the afterburners were turned off.

On a panel at the front of the cabin, the Mach number is displayed. This made it easy to follow the progress of the climb.

The aircraft starts its climb at 350 KTS (400 MPH) going into Mach 0.90 as it climbs up to 35,000 feet. It then starts the “transonic run”.

As you may imagine this was a great thrill for me—supersonic flight at last! As the afterburners came on again, I raced down the aisle to the rear of the ‘plane so that I could look out over the delta wing and the full span elevons. I was hoping to see some evidence of the inevitable shock wave passing over the wing. Alas, there was nothing to be seen!

To one accustomed to all manner of adverse phenomena at the critical Mach number when the airflow over the wing goes supersonic, this was indeed surprising. I realized that fully powered, irreversible controls do not permit control surface “snatching” and are thus very different from the manual controls of the aircraft I had flown!

As the airflow becomes supersonic, the center of lift on Concorde moves rearward some six feet. By pumping fuel into a tank in the tail stinger, the center of gravity is moved rearward to compensate. So exactly was this transfer performed, that I was not able to detect any movement at all of the elevons.

After the transonic run, with the ‘plane doing Mach 1.7, the afterburners were extinguished. The aircraft then started a slow cruise climb with the Mach number gradually increasing. At 55,000 feet, the Mach number achieved its final value of 2.1. It impressed me enormously that the transition to super-sonic flight had occurred with absolute smoothness. I could see that the Champagne in the glasses of the German engineers remained quite still except when applied to their increasingly garrulous lips!

As the ‘plane settled into its Mach 2.1 cruise, I went forward into the cockpit. My friend, the technical liaison officer had arranged matters so that my visit to the cockpit was expected.

Le Capitaine LeFevre was seated sideways with his right leg over the armrest! From the Gauloise seemingly welded to his lower lip to the glass of white wine in his hand, Hollywood central casting could not have produced a more archetypical Frenchman! Of course, the aircraft was on autopilot with the co-pilot minding affairs. Nothing could be seen of the outside world since both the droop nose and the heat shield were now raised. Moreover, at 56,000 feet there would be no other aircraft to be seen anyway.

This flight was shortly after the eruption of Mount Saint Helens in the Cascade Mountains in Washington State. The Concordes kept appearing with a very noticeable brown line on the fuselage that was due to unseen encounters with volcanic dust.

I spent about 30 minutes discussing with him all the usual aerodynamic minutiae. For example, the airspeed indicator showed only 420 KTS (480 MPH). The true airspeed is equal to the indicated airspeed multiplied by the reciprocal of the square root of the quantity, air pressure divided by sea level pressure. At 56,000 feet, the air pressure is only about one eighth that at sea level and thus 480 indicated airspeed equals 1,350 true airspeed!

I noted that the second officer made position reports, in English, as the 'plane crossed each line of ten degrees of longitude. As my high school geography teacher had said, "English is the international language of navigation and commerce!" I suppose that if that vainglorious, egomaniac Napoleon Bonaparte had prevailed at Waterloo, it would have been French.

As I was leaving the cockpit, Le Capitaine LeFevre said, "Monsieur Mallinson, you seem to be so knowledgeable and interested in matters aeronautical. Perhaps you would like to return later and witness my landing at de Gaulle?" A more splendid idea could not have possibly crossed my mind! And who but an egotistic Frenchman would refer to it as "my" landing?

I returned to the cabin and worked my way methodically through one of those utterly wonderful, seemingly endless, epicurean French meals. There were, if I recall correctly, no less than 8 courses! Escargot, sole, beef that almost dissolved in the mouth and so on through the éclairs, the cheese board and the chocolates! With the prospect of witnessing the landing later, I was indeed a happy fellow.

I studied the outside view, coming to the conclusion that, contrary to popular opinion, it was barely possible to detect the curvature of the Earth. The sky was, however, a considerably darker blue than that seen at sea level. The sky is blue because of the preferential scattering of the blue part of sunlight by the atmosphere. The darkness at 55,000 feet is thus not surprising since only one eighth of the atmosphere remains above.

It was very noticeable that the rather small windows were becoming warm despite the outside static air temperature of minus 56 C. This is due the energy of the Mach 2 airflow as it slows in the aircraft's boundary layer. In the RAF, I had learnt that the stagnation temperature rise is equal to one fifth the Mach number squared times the absolute temperature. The nose of Concorde accordingly reaches 130 C—hence the heat shield.

The reason the aircraft was designed to fly at Mach 2.1 and no faster was because of the heat limitations of the aluminum alloy used its construction.

Air France Concorde

Any faster would have meant parts having to be made of titanium, a much more expensive and difficult to work metal.

As soon as I felt the power being reduced for the initial descent, I went forward into the cockpit again. This time I was told to strap myself into the instructor's seat immediately behind the captain's seat. It had both shoulder and lap straps. I put on a set of earphones so I could hear all! For an aviation buff, it is hard to imagine being in a more splendid situation!

The 'plane remained supersonic down to about 35,000 feet and then descended further at Mach 0.9, going into 350 KTS.

Every 10,000 feet the co-pilot made announcements like, "Je vous remarque trente mille pied." This caused both Le Capitaine and L'Ingénieur to respond, "Oui, trente mille pied." It is the custom of nearly all commercial 'plane cockpit crews to "call out" the tens of thousands because they are

indicated by the smallest of the three needles on an altimeter and are thus the most likely to be misread.

Just before crossing the Brittany coast some 200 miles east of Paris, we contacted French ATC and all conversations from then on were conducted in impassioned French. Apparently, once safely over La Belle France, the presumably detested English language was no longer required!

Concorde Landing at Heathrow

At about 20 miles from De Gaulle, we broke out of the cloud at 4,000 feet in the dark and in a heavy snowstorm. And there it was; the "rabbit" for de Gaulle and, of course, it was straight ahead! The rabbit is a row of sequentially pulsed lights that "point" to the threshold of a runway. In all my flying days, the sight of the rabbit never failed to thrill me! To emerge from the clouds and be aligned exactly with the rabbit seems to me to be a simply wonderful triumph of technology!

The airspeed was now about 250 KTS and we "crossed the fence" at about 185 KTS in an extremely nose high attitude. The height of the landing gear above the runway could be read on the radar altimeter. The actual touch down was almost imperceptible!

The time elapsed from take off in New York to landing in Paris was 3 hours and 20 minutes! The lumbering Boeing 747 takes well over 8 hours. The world most probably will not see such performance ever again!

JOHN MALLINSON : RECIPIENT OF MAGNETICS SOCIETY ACHIEVEMENT AWARD 2007

John C. Mallinson was born in Bradford, UK in 1932. He received all his degrees from the University of Oxford.

After serving as a pilot in the Royal Air Force, he emigrated to the USA. From 1957- 62 he worked in the Research Department of Amp Incorporated, Harrisburg, Pa., on the design of multi-aperture ferrite logic systems. In 1962 he joined the Ampex Corporation, Redwood City, Ca., initially in the Magnetic Tape Division, where he studied the properties of iron particles suitable for high density magnetic recording tape.

In 1966, he moved to the Ampex Research Department and began a lifelong interest of the origins of noise in magnetic recording systems. From 1976-78, he led an advanced Ampex engineering team in the development of a prototype 1,000 Megabit/ second digital tape recorder.

In 1978, he returned to the Ampex Research Division as Manager of the Recording Technology Department, directing several activities in high bandwidth and data rate recording on both tape and hard disc.

In 1984, he was invited to be the first permanent Director of the Center for Magnetic Recording Research at the University of California, San Diego, where he was responsible for the selection and appointment of the professorial staff.

After building up a solid portfolio of 18 industrial sponsors, he left academia in order to pursue his interests in research and teaching. Over the period 1990-2005, he visited research labs and universities worldwide presenting over 100 classes on the foundations of magnetic recording and magneto-resistive heads.

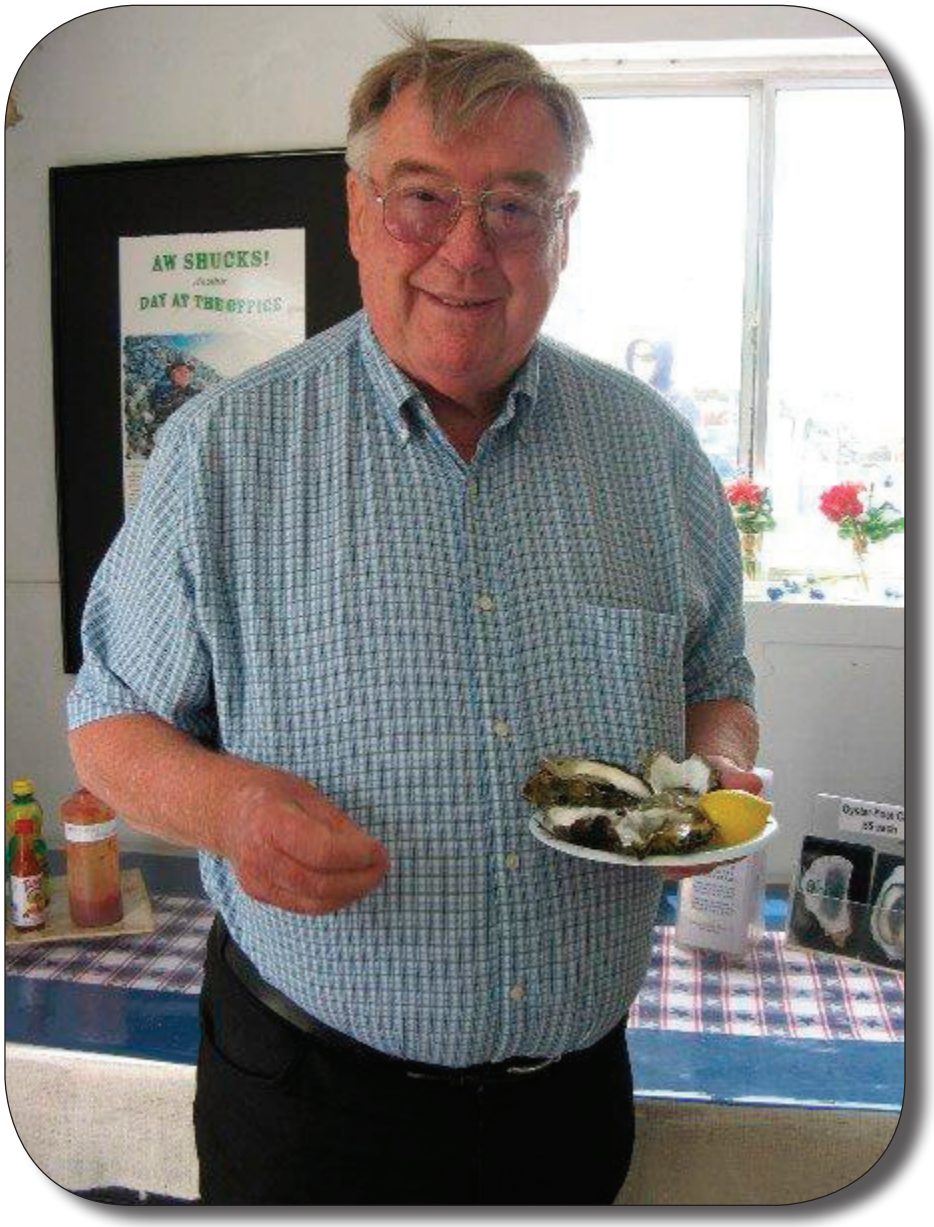
He is the author of 4 textbooks, “The Foundations of Magnetic Recording (1987 and 1994), “Magneto-Resistive Heads, Fundamentals and Applications (1996) and “Spin Valves and Magneto-Resistive Heads”(2002). They were printed in English by Academic Press and in Japanese by Maruzen Publishing. He has published over 90 peer reviewed papers, 4 review articles and 6 contributed book chapters.

Dr Mallinson is a Fellow (1984) and Life Fellow (2004) of the IEEE. He was awarded the Alex M. Poniatoff Golden Achievement Award in 1984. He is presently a Visiting Professor at Plymouth University, UK. Dr. Mallinson’s many contributions to the Magnetics Society include having been a Distinguished Lecturer, Program Chair, Publications Chair, Editor of the IEEE Japanese Translation Journal on Magnetics and chair of the San Diego Chapter. He

is presently a member of the editorial board of the IEEE Transactions on Magnetics.

JOHN C. MALLINSON received the IEEE Magnetics Society 2007 Achievement Award for "contributions to the theory, practice and teaching of magnetic recording".

Dr. Mallinson Contemplating his Achievements
Point Reyes, 2010



PUBLISH OR PERISH

In my professional career, I published over 90 peer reviewed scientific papers. In 1987, I published the first of my four textbooks with the others appearing in 1994, 1996 and 2002. All four books were published by Academic Press, Inc. Each book sold between 5 and 6 thousand copies. The following is the preface from the first book.

THE FOUNDATIONS OF MAGNETIC RECORDING

PREFACE

For more than a decade, the field of magnetic recording has needed a comprehensive textbook that is suitable for use at the senior undergraduate or graduate level of study. With the recent establishment of academic centers in the United States such as those at the University of California, San Diego, Carnegie-Mellon University and the University of Santa Clara, where formal classroom instruction in magnetic recording science and technology is now being undertaken, the need has become more urgent. This book, which is based upon the lecture notes of a class I have taught since 1972, is intended to satisfy this need.

No formal prerequisites are necessary for students; however, the ideal student should have a firm grasp of undergraduate level physics (in particular electromagnetic theory), mathematics, chemistry, and electrical engineering and their interrelationships, because magnetic recording embraces all these disciplines. Above all, the reader of this book, whatever may be his or her formal education, should be primarily interested in comprehending the physical nature of the subject. The principal emphasis in this book is to cover the most important topics in magnetic recording in a manner that is scientifically correct and readily understandable to the nonspecialist.

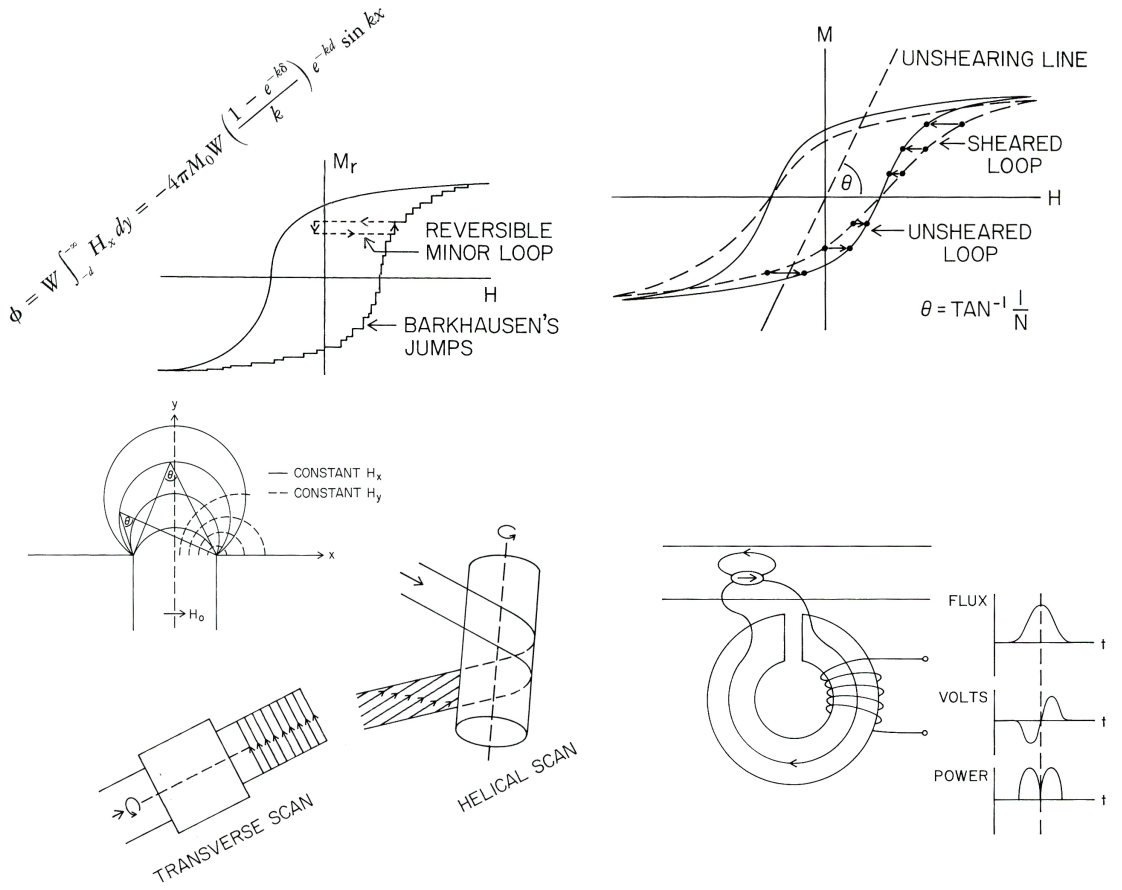
The book follows a logical sequence. In Chapters 1 and 2, the fundamental physics of and measurements in magnetism and magnetic materials are treated. In Chapters 3 and 4, the two major, unique components of a recorder, the media and the heads, are discussed. Chapter 5 deals with the writing process, which is, even today, poorly understood. Chapter 6 covers the read or reproduce process. The foundations of the theory of noise and signal-to-noise ratio are given in Chapter 7. Chapters 8, 9 and 10 cover audio, instrumentation, video and digital recording systems, respectively. The student is led from basic physics to philosophical considerations of system design.

Considerable liberties have been taken with the mathematical notation. For, example, no distinction is made between actual positions of the reproducing head and the recording medium since it is the difference between their positions

that is most important. These simplifications are made because they simplify the appearance of the mathematics. It is my opinion that full mathematical notation frequently impedes rather than aids the student's understanding of the physical essence of a problem. Students will notice that vectors in the text are indicated by boldfaced type.

In general, this book does not give complete proofs of the many equations it contains; rather, the reader is merely guided through the several stages of an analysis. The final result is then given and it is followed by an extended discussion, which emphasizes the physical nature and practical consequences of the findings.

The book is intended to be self-contained and, accordingly, references are not cited in the body of the work. A list of further reading material is, however, included for each chapter. These lists will direct the student to the original papers and to more detailed accounts of particular topics. On the other hand, a book of this size can make no pretense of covering all the current fields of research, investigation, or development. Readers will, however, be treated to a solid, basic understanding of the field of magnetic recording.



THE HALLS OF ACADEME

In 1984, after spending 22 years at Ampex, I was invited to be the Director of the Center for Magnetic Recording Research, CMRR, at the University of California at San Diego, UCSD.

CMRR had been started in late 1983, to address the fact that although almost every University in the country had a Solid State Devices laboratory, there were none with a Magnetic Recording Center. This was despite the fact that nearly all computing has always depended upon magnetic recording on hard disc for mass memory.

I accepted the position thinking that a change would be good for me and that, in any case, the Halls of Academe would make a pleasant halfway house to retirement.

For it's first six months, CMRR had had a Temporary Director, Al Hoagland. When I got there, the plans for the dedicated building had already been approved and construction was about to commence. Four endowed chairs had each been funded with $250,000; the endowments were the interest earned on these sums, about $20,000 per annum. Jack Wolf, from the Univ. of Massachusetts, had already been appointed to one of the chairs.

The contributions from the original eight industrial sponsors provided the endowment funds, the building costs, my salary and the operational expenses. The Univ. of California paid the salaries of the four endowed chairs and maintained the building.

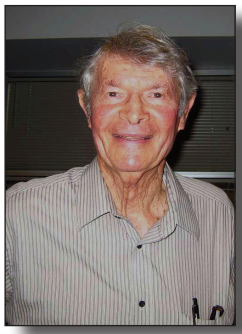
My first job was finding appropriate individuals for the remaining three endowed chairs. Since Jack Wolf was an information theorist, I decided that experts in magnetic materials, magnetic recording physics and magnetic recording mechanics were required. In that way, I reasoned we could form a team that would be well able to serve the needs of our sponsors.

I appointed Ami Berkowitz of General Electric Research, Neal Bertram of Ampex Research and Frank Talke of IBM Research to the three chairs. All came from industrial labs because, at that time, there was no academic activity in magnetic recording.

I commenced a very pleasant stage in my life flying all over the United States in my Bonanza visiting essentially all the companies involved in magnetic recording. At each, I would give an account of the activities at CMRR and try to persuade them to join as sponsors. The prospect of having access to the CMRR library and UCSD's Japanese translation service was a very great attraction, particularly for the smaller companies.

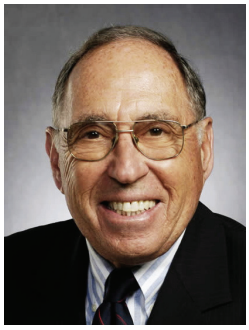
It was wonderful being able to go to seminars almost daily and to see world-renowned scientists. Meeting and talking to graduate students was

John the Doctor of Science, University College, 1998

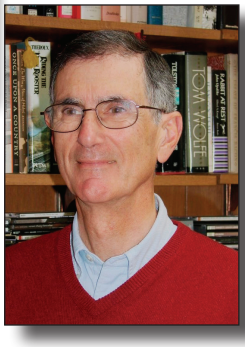


Hoagland

Atkinson



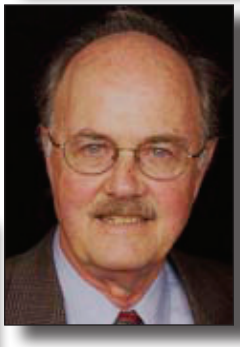
Wolf



Attiyeh

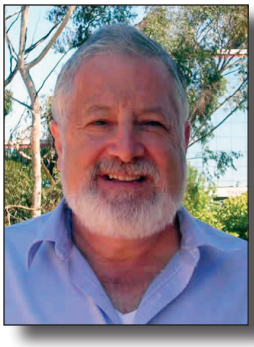
The Cast

Berkowitz



Rudee

Bertram



Talke

immensely stimulating. Their thirst for knowledge and unbounded curiosity were quite simply a joy.

I enjoyed teaching my "Fundamentals of Magnetic Recording" class each year. It was very highly rated by the students.

UCSD Student's Review of my Fundamentals of Magnetic Recording Class

ECE 143, Winter 1988
Fundamentals of Magnetic Recording
Instructor Mallinson, J.C.

Fourth week enrollment:	33
Questionnaires returned:	19
Student comments received:	14
Average hrs/week study time:	5.00
Recommended class:	94%
Recommended instructor:	100%

Student comments: An amiable (4), enthusiastic professor (3) with sincere concern for his students (4), Dr. Mallinson was regarded as an exceptional instructor (4) and conveyed his thorough understanding (6) of the interesting topic (7) via lucid (4) and well-prepared lecture (5). The only criticism respondents aired concerned tests which were difficult (4) due to harsh grading (3), required copious amounts of memorization (3), and were highly detailed (5). The textbook was excellent (2) and supplemented lectures well (4). *DWD*

Course description: This course covered the fundamentals of magnetic recording technology. Students completed homework, a midterm, and a final. Grades were awarded as follows: A > 85%; B 75-85%; C 65-75%; D 55-65%; F < 55%. The prerequisites are complex algebra, electro-magnetic theory, and vector manipulations.

I enjoyed the long vacations. I took six weeks off in the summer of 1986 in order to write the eponymous textbook based upon the class. I rented a house in Inverness, California and wrote two chapters a week. It is amazing how much can be accomplished if one works completely uninterrupted from 8 am to noon every day. I wrote it all out in longhand and in the afternoon,

whilst I slept off the well-deserved bottle of wine that went with lunch, my wife typed it up.

After a few years there, however, I began to realize that, just beneath the surface, there were many things that were very seriously wrong with the University of California.

First and foremost, I came to understand the professors would not engage in cooperative work with other professors. This was because the Academic Senate rates a professor for promotion in the professorial ranks almost exclusively upon the number of papers published where he is the principal author. My original idea of building a team was unworkable in the UC system.

Second, the professors are engaged in direct competition with each other for external grants, for example those from the National Science Foundation. Accordingly, they are loath to give original talks in seminars for fear that others might scoop their ideas. All I could do was get them to repeat an old piece of work, such as last year's conference paper, or send a graduate student to give the talk. My naive idea of holding delightfully collegial, afternoon seminars "with tea and chocolate biscuits" was simply not possible. There is no sense of team spirit in the UC system.

Third, many of the professors are astoundingly lazy. At UC, a professor is expected to have but three "contact hours" of teaching per week. When starting a class, I understand that each hour of teaching may well take many hours of preparation. However, after having taught the same class a few times, almost no further preparation is required. With a little planning, it was possible to meet the teaching obligation before lunch on Monday. Moreover, since the only "disciplinary" action that can be brought against a tenured professor is to withhold promotion, many professors chose simply to ignore the rule and do no teaching at all.

A professor is also expected to hold a certain number of "office hours" each week when he is to be available to his students. Yet one heard constantly the tales of woe of graduate students who had not seen their professor for several months. Very frequently, the professor simply orders one of his post-docs to hold the "office hours" for him.

To my surprise, my former Ampex colleague, Neal Bertram adopted a daily routine of appearing about 10 am and leaving after lunch! Later on, he simply did not show up some days. At Ampex, he would have been fired for absenteeism.

A particular aggravation for me was that I could not get the four endowed professors at CMRR to travel and visit our industrial sponsors at their own facilities. One might have thought that accepting some $20,000

a year from the sponsor's endowment might have engendered some slight feeling of obligation. Sadly that was not the case. Their opinion was: "Let the sponsors come to CMRR if they want to know what we are doing". To no avail did I point out that, if they gave a talk at the sponsor's own facility, many of their scientists and engineers would be able to benefit. It was particularly surprising to me that it took so little time for the three CMRR "industrial" professors to adopt this cavalier attitude.

Fourth, I became aware how greedy were the professors. The only circumstance where one of them visited a sponsor was when they thought there was a chance of getting more money out of them. Despite their endowments, they had no compunction about going to a sponsor, usually a large company like IBM, and asking for a grant to do some particular investigation. Frank Talke, the only one of the CMRR professors who did actually work hard, was constantly going to IBM to scrounge for equipment and beg for more money.

Fifth, not only are there many incompetents but there is no stomach in the UC system to punish those who make even enormous mistakes. About 18 months after I joined CMRR, I visited the Senior Vice-President at IBM, San Jose, Dr. Ray Abuzayyad, to enquire if they had perchance forgotten to make the last payment on their pledge to CMRR. To my profound embarrassment, I was told that it had been paid over one year previously!

It turned out that the Dean of Engineering, Lee Rudee, and the UCSD accountants had miscounted the sum of precisely one million dollars. Every budget I had ever received at CMRR was in error by that amount. Far from being relatively prosperous, CMRR was in fact deeply in debt because the "missing million" had already been spent on the building. It is truly astounding that neither Dean Rudee nor the accountants were reprimanded in any way. In fact, I was the one that had to scrimp and save and, ultimately, be made the scapegoat.

Dr. Abuzzayyad was involved in an interesting story. After his wife had died suddenly, he asked his relatives in Lebanon to find him a replacement. Such was his truly admirable dedication to the business of the IBM corporation that he left San Jose one Thursday, flew to Lebanon, interviewed the candidates and managed to get back "on site" by the following Tuesday morning. The chosen one was duly prepared, packaged and shipped out to San Jose some weeks later.

Dean Rudee had signed off on the CMRR building plans before I got to UCSD. As the structure was being finished, I realized that it had a serious design flaw. Equipment larger than about a six-foot cube, a transmission electron microscope for instance, could not be moved onto the two upper floors because the elevator was too small, Moreover, the architects had made no provision for a "soft wall" in the building. Soft walls, which can be opened

up easily are invariably included on the upper stories of industrial labs. Again the University sought no redress and Dean Rudee continued in his position as Dean of Engineering.

The Dean of Graduate Studies, Dick Attiyeh, was another ineffectual individual. Amongst his duties, was the oversight of CMRR and thus he too was culpable in the million-dollar debacle. To my knowledge, apart from attending the opening ceremony, he never visited CMRR. In fact, for the first three years he had no contact with us. Then, as the long-term consequences of million-dollar error slowly churned its way through the labyrinthine UCSD accounting system, he started wanting annual financial statements from me.

A joke that is relevant follows: "What is a Dean?" "He is a perfectly ordinary mouse of a professor who is learning to be a rat."

In general, I became disgusted about how damned mercenary was life at UCSD. It is, I believe, a direct consequence of the life-tenure system that appoints people to permanent positions, paying their salaries but providing them with no operating funds.

As I told the Chancellor of UCSD, Richard Atkinson, at the sight of the professors in their academic regalia at Convocation, "They remind me of generals in the Spanish air force. They have very impressive uniforms but no money for fuel or ammunition for their aircraft". I do not think he was too amused.

At that time, however, the Chancellor was probably not inclined to be amused about anything because he was involved in a very public and presumably humiliating, court case. A biology professor with whom he had had an affair was suing him, claiming that she had been rendered sterile as the result of an abortion that he had forced her to undergo! The San Diego Union newspaper kept us apprised of all the salacious details. Amazingly, this incident did not impede Chancellor Atkinson's illustrious career—subsequently, in fact, he become the President of the UC system.

A few months before I wrote this essay, the President of Hewlett-Packard, Mark Hurd, admitted to a relationship with a corporate consultant and was forced to resign. An absolutely more stark contrast between "Town and Gown" can hardly be imagined.

It is indeed a strange reflection on the American academic system that money looms to be such an important issue. In industrial labs, the researchers usually have almost no part in determining the research department's annual budget. As a result the question of money rarely arises. One might be forgiven for not realizing that the Halls of Academe are very different.

The professors and their little groups of students are rather like medieval Italy, divided into petty, squabbling principalities. At Ampex

Research, had I gone down the corridors and asked people, “What are you doing here?” I am sure all would have answered with something along the lines, “To increase the density or bit rate of magnetic storage”. At UCSD, I believe I would have received as many different answers as people I asked.

I soldiered on seeking new sponsors and eventually ending up with eighteen, rather more than twice the number of founding sponsors. All my efforts, however, could not get CMRR out of the red. One million dollars is a very big hole. My task was not made easier by Dean Attiyeh’s sympathetic demand that CMRR pay interest on its debt.

I continued without success to urge the indolent CMRR professors to visit our sponsors. The traveling that had started out as a pleasure had now become a monster, with eighteen sponsors to visit a couple of times a year.

By 1990, my relationship with the professors had deteriorated to outright animosity and they urged Dean Attiyeh to “do something”. He responded by asking me to resign, citing my inability to balance the budget. The situation had grown so distasteful that I agreed to resign on condition that UCSD continued to pay me my full salary and benefits for three more years.

The staggeringly inept Dean Attiyeh agreed to this. In one irresponsible stroke, he not only managed to aggravate further CMRR’s financial problems but also to “kill the goose that laid the golden eggs”. It is hard to imagine a worse action for CMRR!

The fundamental reason for this unfortunate saga is, in my opinion, the life-tenure system. It provides no incentives whatsoever for excellence. By allowing major faults to go unpunished, individuals end up carrying no responsibility. The system is without “checks and balances”.

It is curious indeed that these very same flaws, the absence of incentives and lack of responsibility, are frequently discussed concerning the ultimate downfall of Marxist, totalitarian societies!

The main losers are our nation’s finest and brightest, the graduate students. It was so disheartening to see, over and over, their slow decline from initial enthusiasm into a final apathetic state of counting the weeks and longing to leave. And, of course, that describes precisely my experience at UCSD.

It is a system that is rotten to the core.

MAXWELL'S EQUATIONS WITHOUT ALL THAT MATHEMATICS

It is difficult not to be aware of Maxwell's Equations. They have appeared on the cover of Time magazine. In many places, they are used almost as a decorative device that implies profound wisdom. For example, they are chiseled into the granite walls of the Tunnelbana, Stockholm; they are the "logo" for the King's Technical University (KTH) station.

The equations are considered to be the high water mark of classical physics. No less an authority than Albert Einstein, the famous German physicist said, "I consider Maxwell's Equations to be the greatest flower of the human intellect!" He believed that, when the history of science in the 19th and 20th centuries is finally settled, they will be judged to be of greater importance than Relativity. He kept a photograph of Maxwell on his desk throughout his life.

Maxwell's famous equations led to mankind's first understanding about how light and energy can be propagated through empty space. Since essentially all of the energy that grows our food and thus supports life on Earth comes to us through empty space from the Sun, an understanding of how it happens is, for some of us, a matter of great importance.

For many years, it has been my belief that most people have an innate understanding of physics. Everyone knows that heat flows from the red-hot end of an iron poker to the cool end we are able to hold—that's the physics. But many cannot follow the differential equation that describes just how much heat flows—that's the mathematics.

It is an extremely unfortunate fact that so much of physics is taught as though it were a branch of applied mathematics. Whole generations of physicists, particularly in the late Victorian era, actually believed that when it is understood properly, all physics conforms to elegant mathematical formulations. Nowadays, such a belief is regarded as an absurd naivety.

At Oxford in the 1950s, I can still recall attending a whole lecture sequence on thermodynamics that was taught purely as an exercise in mathematics. At the end of one lecture, the worthy lecturer turned to us and said, "Gentlemen, if you care to associate P with pressure, V with volume and T with temperature, you now have before you the Second Law of Thermodynamics. Please remember, however, that I have merely been exploring the properties of certain linear differential equations" Elegant?—yes. Useful?—no!

I remember wondering if it ever crossed the fevered, yet brilliant, Hungarian brain of Dr. Norman Kurti that, since every single person, excepting

the mentally impaired, in the whole wide world knows that heat always flows from the hot end of the poker to the cold and never the other way, a complete understanding of the Second Law of Thermodynamics is, in fact, well-nigh universal.

In Stockholm, I often wondered how many of the students, or indeed the faculty, at KTH understood where Maxwell's Equations came from, what they meant and of what use they were. After quizzing several students, I soon came to the conclusion that most simply ignored them. Many were completely baffled by them. A few said they understood the mathematics but had no idea of their physical significance.

This led me to give, for the first time in 1995, my lecture "Maxwell's Equations without all that Mathematics". It drew an overflow and enthusiastic audience.

Thereafter, I gave the same talk at several university and industrial laboratories. At IBM Research, San Jose, the main auditorium was packed solid and I was asked to repeat the talk the following day. The unexpectedly huge crowd was a result of so many of the staff bringing their teenage children. The inescapable conclusion is that, whereas most people like physics, most dislike mathematics.

It would be totally incorrect of my reader to think that I dislike mathematics. On the contrary, I have used mathematics "as the hand maiden of physics" extensively throughout my long career in science. Nevertheless, perhaps because the discipline of mathematics is so unforgiving of any early misunderstandings, I have always tried to bear in mind that it is generally disliked.

To get started as gently as possible, each of the four celebrated Equations is given in plain English and then in its full formidable mathematical glory.

The divergence of the electric field E equals the electric charge density q divided by the permittivity ε.

$$\text{div E} = \frac{q}{\varepsilon} \qquad (1)$$

The divergence of the magnetic field H equals zero.

$$\text{div H} = 0 \qquad (2)$$

The curl of the electric field E is equal to the permeability μ multiplied by the time rate of change of the magnetic field H.

$$\text{curl E} = \mu \frac{dH}{dt} \qquad (3)$$

The curl of the magnetic field H is equal to the permittivity ε times the rate of change of the electric field E plus the electric current density *j*.

$$\text{curl H} = \varepsilon \frac{dE}{dt} + j \qquad (4)$$

It may be imagined that Maxwell's Equations did not simply "spring forth, full-born in their full glory" in the mind of Maxwell. On the contrary, he built upon previous work. His genius was that of making one final, crucial contribution. My first objective here is to describe how we might perform some simple experiments that both illuminate their origins of the equations and reveal their physical meaning.

DIFFERENTIAL OPERATORS

THE SLOPE, OR RATE OF CHANGE $\frac{dy}{dx}$

First of all, however, I have to explain just a little about differential mathematics. If we draw a curve on a graph showing how one variable, *y*, changes with another variable, *x*, the slope of that curve is called the first differential of *y* with respect to *x* and it is written as *dy/dx*. Here the *d*'s connote very small, actually infinitesimally small changes, a notation introduced by the English mathematician Newton in the mid-1600s. It is important to understand that the slope, *dy/dx*, is a concept that applies at a point; the curve has a slope at every point on it.

THE TIME RATES OF CHANGE $\frac{dH}{dt}$ and $\frac{dE}{dt}$

In Maxwell's third and fourth equations, the terms *dH/dt* and *dE/dt* appear. They are the time rates of change of the magnetic field H and the electric field E, respectively. If we were to graph H or E with respect to time t, *dH/dt* and *dE/dt* would be the slopes.

THE DIVERGENCE DIV

In Maxwell's first and second equations, the differential operator divergence, written div, appears. Consider swishing the water around in the

bathroom basin. If the drain plug is closed, the div of the water flow is, at every point, zero. When the drain plug is opened, the div of the water flow adjacent to the drain becomes a negative number. The divergence is simply a differential operator that indicates inflow or outflow from a point in space.

THE ROTATION CURL

In Maxwell's third and fourth equations, another differential operator appears. Think about the airflow over the back of a moving car that has a bicycle tied onto its trunk. If the bicycle wheel is turning, it is because the airflow measured parallel to the wheel's rim does not average out to zero around the whole wheel. The summation of the tangential flow around an infinitesimal point is called the rotation; it is sometimes written as rot but more usually as curl.

THE EQUATIONS

THE FIRST EQUATION $\text{div E} = \frac{q}{\varepsilon}$

Now let's tackle Maxwell's first equation. Suppose we create a positive electric charge q perhaps generated by rubbing a piece of plastic with a silk cloth. We then measure the electric field E around that charge with an electrometer. When this was first done in the 1700s, an electrometer was a delicate thing with two strips of silver foil that repelled each other when they were electrically charged. Nowadays we would use an instrument of the type widely used in the semi-conductor industry to monitor for static electricity in chip manufacturing plants.

If we measured the field all around our piece of charged plastic and summed up the field crossing the surface of a sphere that encloses the plastic, we would discover some rather surprising facts. The sum is always the same no matter what is the size of the enclosing sphere! Moreover, the sum we measure is equal to the magnitude of the enclosed charge q divided by a constant ε. Since the sum over the surface of the enclosing sphere is the outflow of the field, what we have shown in fact, is that the divergence of the electric field is equal to the charge divided by a constant, that is $\text{div E} = q/\varepsilon$. Physicists call this Gauss' Law. Gauss was the German mathematician in the mid-1700s, perhaps most well known for his contributions to statistics.

The constant ε is called the permittivity and it measures the reaction of a medium to the electric field. For example, the permittivity of a typical plastic is around 3 to 5.

Of course, the electric field in this experiment is static and is not actually flowing outward. Nevertheless the same nomenclature is used. Had we created a negative charge, perhaps by using cat's fur to rub the plastic, the divergence would have been a negative quantity.

THE SECOND EQUATION div H = *0*

Now let us visualize another simple experiment. Let us measure the magnetic field H crossing the surface of a sphere surrounding a small permanent magnet. In the distant past, this was done by timing the swinging of a small magnetic compass needle; the faster the swing the higher the field. Nowadays, we would use an electronic instrument. We would find that the sum of the measured H crossing the complete surface of the sphere is zero. In some regions there is an outflow of H, in others there is an inflow and, upon summing, the two cancel out exactly. In other words, div H = *0*.

The reason that div H = *0* is that the magnet has an equal number of North and South poles. The field surrounding the magnet has two parts—that coming from its North poles and that due to its South poles. By Gauss' Law, the field from the North poles has a certain positive divergence and that from the South poles an equal but negative divergence.

One of the most fundamental differences is that although electric charges can exist as monopoles of either polarity, magnetic poles or charges can only exist as dipoles. Every North pole has its South pole companion. If you saw a magnet in half in an attempt to separate the North from the South poles, more poles appear on the cut ends and you end up with two smaller magnets each with a N/S dipole.

THE THIRD EQUATION curl E = $\mu \frac{dH}{dt}$

Again, let us visualize an experiment. Let us take an incomplete loop of electrically conductive, copper wire and connect its ends to a voltmeter. Then we move a magnet through the loop and notice that whenever the magnet is moving, the voltmeter registers a voltage. An English scientist, Faraday, first conducted this experiment in the early 1800s.

Next, we measure the time rate of change of the field *dH/dt* and calculate the sum threading the loop. If we have been careful, we would find that the voltage measured is equal to the sum of *dH/dt* threading the loop multiplied by a constant. The measured voltage is, of course, equal to the electrical field E summed up tangentially around the copper loop.

Reducing our experimental finding to a very small point leads directly to Maxwell's third equation.

The constant μ is called the permeability. In a typical piece of iron, the permeability may be several thousand.

To be correct, the constant in the third equation must actually be minus the permeability; however, in the interests of simplicity, that nicety is ignored here.

Maxwell's third equation is usually called Faraday's Law. Over 99% of all commercial electric power generation works by exploiting Faraday's Law; giant alternators have coils moving through non-uniform magnetic fields.

$$\text{THE FOURTH EQUATION curl H} = \varepsilon \frac{dE}{dt} + j$$

Before Maxwell, the equation curl H = j , the electric current density, was well known as Ampere's law. It expresses the fact that electric currents always generate magnetic fields. Ampere was a French physicist in the early 1800s

Now we come to Maxwell's "piece de resistance"; the brilliant, masterstroke of genius that "pulled it all together"! James Clerk Maxwell, a Scottish physicist, realized in the 1870s that there must be a companion to Faraday's Law. Just as curl E is proportional to *dH/dt*, there must be an analogous relationship linking curl H to *dE/dt*.

Let us consider an experiment that is the magnetic analog of the electric experiment that I have just described concerning the third equation. We take an incomplete loop of a magnetic conductor, that is a material with a high permeability μ. An iron wire will suffice. In the gap at the ends, we place an instrument that measures magnetic field H. When a piece of electrically charged material, such as the plastic we used in the first experiment, is moved through the loop, a magnetic field will be detected.

By carefully measuring the rate of change of the electric field, everywhere, we would find that the magnetic field measured (times the length of the gap) is equal to the permittivity multiplied by the sum of the *dE/dt* crossing the area of the loop. The measured field (times the gap) is just the sum of the magnetic field generated around the loop.

Reducing our finding to an infinitesimal point leads to Maxwell's curl H = ε *dE/dt*

In the 1800s, people talked about the displacement, D = εE and the quantity ε *dE/dt* can, therefore, be written as *d*D/*dt.* Since the time rate of change of electric charge dq/dt is the electric current, *d*D/*dt* was referred to as Maxwell's displacement current. The total current is the sum of the displacement current and the electric current.

That completes the main purpose of this essay—that of explaining in an almost non-mathematical manner where Maxwell's Equations came from, how they might be proven experimentally and showing what is their physical significance.

Finally, I intend to entertain you with a couple of the Crown Jewels of classical physics that arose directly from Maxwell's Equations. I can only hope that you will be able to derive as much joy from them as I have over the last 60 odd years that I've known about them!

"FIAT LUX", SAID THE LORD AND MAXWELL SHOWED HOW IT GETS HERE!

Armed with the famous four equations it is possible to understand how light travels. Unfortunately, I do not know of any way to show how Maxwell's equations can be manipulated into the Transverse Electro-Magnetic (TEM) wave equations that does not involve some mathematics. I have included a brief mathematical appendix at the end of this essay for the reader who wishes to get a feel for the connection between Maxwell's equations and the TEM wave equations.

However, here you may take my take my word for it that from the Cartesian coordinate form of the vector differential operators div and curl , only two simple mathematical steps lead to the wave equations:

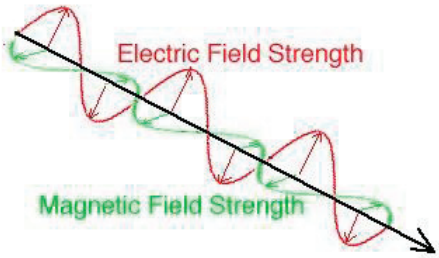
$$\frac{d^2 H_x}{dz^2} = \varepsilon_0 \mu_0 \frac{d^2 H_x}{dt^2} \qquad (5)$$

$$\frac{d^2 E_y}{dz^2} = \varepsilon_0 \mu_0 \frac{d^2 E_Y}{dt^2} \qquad (6)$$

Equation (5) describes the progress of a wave of the *x* component of the magnetic field H traveling at the velocity $1/\sqrt{\varepsilon_0 \mu_0}$ in the *z* direction.

Equation (6) describes the progress of a wave of the *y* component of the electric field E traveling also at the same velocity and in the same direction.

Transverse Electric & Magnetic Waves



Light travels as a pair of waves vibrating transversely, that is orthogonally, to the propagation direction. The two waves have the same frequency and are in phase.

The velocity of propagation is the speed of light *c*. The permittivity and permeability of free space ε_0 and μ_0 are both experimentally measurable constants. The velocity in free space ($1/\sqrt{\varepsilon_0 \mu_0}$) is calculated to be 186,000 miles per second, within a few percent of the value that is measured.

The color of the light is governed by the frequency of the vibrations. By convention, the plane of polarization of the TEM light waves is taken to be the plane of the E wave, here the *y-z* plane.

As I mentioned above, it is considered to be the high water mark of classical physics that, backed by experimental evidence and Maxwell's physical and mathematical genius, the propagation of light, radio and radar and, in fact, all radiant energy through empty space is completely understood! As I said above, essentially all life on Earth depends upon it!

ON THE INERTIA OF ENERGY

An almost immediate result of Maxwell's work was Einstein's *gedanken*, or thought experiment that led to his formulating what has become probably the most well known equation in the world:

Energy = mass times the velocity of light squared

$$E = mc^2. \qquad (7)$$

Consider a box of mass *M* in free space. Within the box is a light source and a light absorber spaced a distance *L* apart. Suppose that a brief flash of light with total energy *E* is emitted by the light source in the direction of the absorber. Note that here, *E* denotes energy, not electric field. Maxwell's equations lead to the conclusion that that this emission exerts an impulse, which is a change of momentum, upon the box equal to *E/c.* Accordingly, the whole box must start recoiling with a velocity of *E/Mc*.

The time it takes the light to reach the receiver is *L/c*. When the light hits the receiver, there is an equal and opposite impulse and this causes the box to stop moving. This point may perhaps be more easily understood if we were to think about a box with a peashooter in it. As the pea is fired, the box recoils. When the pea hits the target, the recoil stops dead.

Now, because the box is in empty space and, therefore, no external forces acted upon it, the first of Newton's laws of mechanics demands that its center of mass cannot have moved!

Einstein realized that the inescapable conclusion was that the burst of light must have mass *m*! In fact, the mass M of the box times the distance that the box moved, *M* times *E/Mc* times *L/c,* must be the exactly equal and opposite to the distance the burst of light moved times its mass, *L* times *m*.

$$Lm = M(E/Mc)(L/c) \qquad (8)$$

Or, $E = mc^2$. (9)

This famous equation was originally called the Einstein's Theorem on the Inertia of Energy. And it all came from thinking about Maxwell's TEM light flowing across an empty box in space!

Indeed, it may well come as a surprise to you to see that this equation, explaining as it does the awesome power of atomic bombs and nuclear reactors, is entirely a result of *classical physics* and has nothing to do with the *Theory of Relativity.*

APPENDIX

DERIVATION OF THE TEM WAVE EQUATIONS IN FREE SPACE.

First we have to express curl E in its three coordinate (*x,y,z*) form:

$$\text{curl E} = \left(\frac{dE_z}{dy} - \frac{dE_y}{dz}\right)\bar{i} + \left(\frac{dE_x}{dz} - \frac{dE_z}{dx}\right)\bar{j} + \left(\frac{dE_y}{dx} - \frac{dE_x}{dy}\right)\bar{k}$$

Suppose that E_x and E_z are everywhere zero. Suppose also that E_y varies only in the *z* direction. Now, ignoring the minus sign, curl $E = dE_y / dz$ only.

Suppose that H_y and H_z are everywhere zero. Suppose also that H_x varies only in the *z* direction.

Under these conditions, Maxwell's third equation becomes:

$$\frac{dE_y}{dz} = \mu_0 \frac{dH_x}{dt} \qquad (10)$$

Upon realizing that in empty space the current density, j, is zero, Maxwell's fourth equation becomes:

$$\frac{dH_x}{dz} = \varepsilon_0 \frac{dE_y}{dt} \qquad (11)$$

Now let us differentiate (10) with respect to z and (11) with respect to t:

$$\frac{d^2E_Y}{dz^2} = \mu_0 \frac{d^2H_x}{dtdz} \qquad (12)$$

$$\frac{d^2H_x}{dzdt} = \varepsilon_0 \frac{d^2E_y}{dt^2} \qquad (13)$$

Eliminating the common term from (12) and (13) yields the TEM wave equation for E_y:

$$\frac{d^2 E_Y}{dz^2} = \varepsilon_0 \mu_0 \frac{d^2 E_y}{dt^2} \tag{14}$$

By differentiating (10) with respect to t and (11) with respect to z, we are led in an analogous manner to the TEM wave equation for H_x:

$$\frac{d^2 H_x}{dz^2} = \varepsilon_0 \mu_0 \frac{d^2 H_x}{dt^2} \tag{15}$$

Next we show that the wave equations (14) and (15) are satisfied by:

$$E_y = \sin k(z - ct) \tag{16}$$

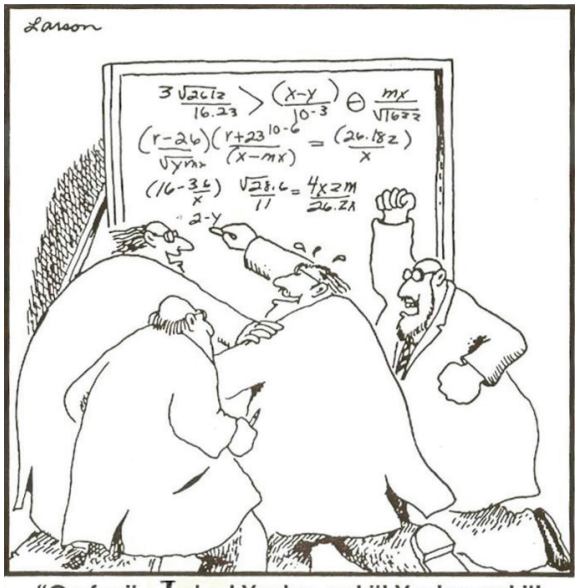
$$H_x = \sin k(z - ct) \tag{17}$$

These equations define waves of wave number k = 2π/wavelength, traveling in the z direction at velocity c.

$$k^2 \sin k(z - ct) = (\varepsilon_0 \mu_0)\,(kc)^2 \sin k(z - ct) \tag{18}$$

$$\text{or} \qquad c = 1/\sqrt{\varepsilon_0 \mu_0} \tag{19}$$

Had we worked with wave equation (15), the same result would have appeared. Thus we have proved is that each of the two orthogonal fields are propagated at the same velocity, the speed of light $c = 1/\sqrt{\varepsilon_0 \mu_0}$



"Go for it, John! You've got it! You've got it! Good hands! Don't choke!"

MY PROFESSIONAL SWAN SONG

On the occasion of my receiving the IEEE Magnetics Society Lifetime Achievement Award, I gave this talk in Minneapolis at The Magnetic Recording Conference in May, 2007.

First of all, I want to thank the IEEE Magnetics Society for this splendid Award—I am profoundly honored.

It has been suggested that I start this talk with the statement, "I invented Magnetic Recording"—but that would be a lie! As has been known since George Washington chopped down his father's cherry tree, telling lies is not acceptable behavior.

What I do propose doing is telling you a little about the state of recording when I joined the field in 1962. And after that, I'll try to convey to you what it was like being a physicist in magnetic recording research in the 60s and 70s.

I will conclude with a few remarks on mentoring.

ON MAGNETIC RECORDING IN THE 60s AND 70s

Apart from the digital tape and hard disc recorders used to this day in computers, all other recording was analog before 1970. There were analog audio, instrumentation and video recorders. It is difficult to realize, bombarded as we are today by the shrieks of the Madison Avenue flacks insisting that everything digital is infinitely superior to analog, that that, too, is a lie!

Some analog audio recordings, for example, those made on an Ampex 300 ac biased audio recorder, even today are considered by audio professionals to be the finest recordings ever made!

Indeed, it is hard to recall the "transparent" or "crystalline" perfection of the images produced by an Ampex 2000 frequency modulated video recorder, when a highly trained engineer had adjusted the recorder correctly. Apart from the added noise, the recorder duplicated perfectly everything that the TV camera produced.

In neither of these recorders were any supposedly imperceptible "tricks", such as the omission of high frequency content partially masked by large amplitude low frequencies, employed—and the exceptional results just mentioned were the result. In contrast, digital recordings today not only employ such "tricks" but also are compromised further by compression algorithms, such as MP3 and MPEG 3 in audio and video respectively.

Eventually, of course, digital recording was adopted for a number of excellent reasons. The ability to self-correct and, therefore, produce error free multiple generation copies is the most important of these reasons.

However, there is no doubt that the adoption of digital recording for analog material represents—A Triumph of Brute Force over Elegance!

ON MAGNETIC RECORDING RESEARCH IN THE 60s AND 70s

What was it like being a researcher in the 60s and 70s? The answer is simple—it was a paradise because this was surely the golden era of research in magnetic recording!

Of course, the fundamentals had been thoroughly investigated by Westmijze's landmark "Studies in Magnetic Recording" in 1953. Nevertheless, there remained a seemingly endless number of problems to investigate.

Signals can be corrupted only by interference, distortion and noise but very little was understood about these critically important phenomena. The side reading of adjacent tracks is an example of an interference that had to be understood. The distortion in fm video recorders, arising from the incorrect positioning of the zero-crossings in the output waveform, had to be analyzed.

And then there was the question of the signal to noise ratio. I am proud to be able to stand here and remind you that I am the man who brought you the seminal idea that the SNR is equal to the number of independent magnetic particles in a bit cell! This is surely the principal idea that has guided the phenomenal advances in hard disc recording for more the last 35 years!

It is important for you to realize that all these investigations were, of necessity, performed by closed form mathematical analysis. In the 60s and 70s, computers were used principally for accounting and business purposes with scientific computation being so difficult to accomplish that it usually had to be orchestrated by a dedicated mathematician or computer specialist.

In classical mathematical analyses, perforce one is able to study only a small part of the recording channel at a time. However, that portion was studied in exhaustive detail and a complete, in depth understanding could usually be achieved.

This contrasts vividly with R&D work today where, in many cases, the entire recording system, from current into the write head to voltage out of the read head, is computer simulated. Moreover, in many cases, the investigator uses a commercially available "black box" software package and he or she has no idea, and presumably little interest, in how the program actually works!

That person is, of course, completely unable to tell you why something happened! Personally, I find this kind of work to be completely unsatisfying because it provides almost no insight or understanding into the nature of things.

It seems to me that it's analogous to baking a cake. One knows the ingredients, follows the recipe, bakes the mixture for a certain time/temp and out comes the cake. Of course, the cook cannot answer any probing questions about why the cake has a particular moisture, density or texture!

I do understand that from the standpoint of engineering, massive computer simulation is a very powerful tool—indeed, if it is correct, it can act as the proof of a design.

Doubtless, history will record that the change from classical, mathematical analysis to massive computer simulation is again—A Triumph of Brute Force over Elegance!

ON THE IMPORTANCE AND SATISFACTION OF MENTORING

I want to conclude my talk by mentioning the importance and satisfaction of mentoring and mention a few names. At Ampex, I had the enormous good fortune to work with two video engineers of outstanding talent and ability and, absent this experience, I most probably would not be here giving this little speech!

Michael Felix worked at the world's first regularly scheduled TV station, the BBC at Alexandria Place, London in 1937. I learnt more from him about the obligatory sequence of signal processing steps that are necessary in order to realize high recording densities than from any other individual.

Charles Coleman was at America's first regularly scheduled TV station, WBKB in Chicago in1947. He taught me that not only could a magnetic recoding channel be regarded as a communication channel but also that every part of that channel could be measured with less than 1% error—in fact it was a highly precise communication channel.

I have mentored many in my 45 years in magnetic recording. I would like to mention two individuals in particular, because I'm sure that all of you here are very familiar with them.

I hired Neal Bertram, a physicist and author of the little red book, "Theory of Magnetic Recording", at Ampex around 1970 and proceeded to tell him everything that I knew about recording. In 1985, I arranged for his chaired professorship at CMRR. There can be little question that Neal's many contributions have had more influence on the work reported at this conference than that of any other person.

I hired Roger Wood, an electrical engineer, at Ampex around 1980 and I proceeded to tell him all I knew. Today, Roger is the de facto leader of the worldwide effort to achieve one terabit per square inch recording!

There have been no more deeply rewarding experiences in my career than seeing those whom I mentored develop and subsequently achieve such outstanding success in their careers!

Once again, let me thank the Magnetics Society for this wonderful award.

I cannot resist explaining the origin of “Swan Song”. Medieval monks in England, struck by the beauty and elegance of the Mute Swan, could not accept that it remained forever mute. So they decided that it must burst into glorious song on its way to heaven—its Swan Song!

A BRUSH WITH THE LAW

I have had very few encounters with the law in my life. One occurred at Oxford in 1953 as I have described in “Nocturnal Goings On at University College 58 years Ago”.

There have, of course, been many traffic tickets for speeding—they are not worthy of further comment!

In 2000, however, an incident occurred at Princeton-by-the-Sea, near Half Moon Bay, California that led to my writing to the local Sheriff.

In the belief that my letter will be found to be amusing, I am including it in this collection of essays. The response from the local District Attorney may prove to be of interest also!

Dr. John C. Mallinson
2474 Hallmark Drive
Belmont, CA 94002
August 17, 2000

Don Horsley, Sheriff
400 County Center
Redwood City, CA 94063

RE: Report of an Incident in Princeton

Dear Sheriff Horsley,

I am a retired 68-year-old former University of California professor Very frequently, I drive or fly over to Princeton to have lunch, enjoy the harbor view, bird watch and escape the mid-Peninsula heat. I have paid taxes on my house in San Mateo County since 1982 and during that 18-year period I have had no contact whatsoever with the San Mateo County Sheriff's Office nor its officers.

Since I pay County of San Mateo taxes in excess of $4,000 per year on my house, and over $1,250 per year on my aircraft, I calculate that over the last 18 years I have paid almost $100,000 in county taxes. You are no doubt aware that a portion of that money supports the County Sheriff's Office and officers.

On Tuesday, August 15, I drove to Princeton and parked in the Johnson Pier Upper Parking Lot. This large car park was deserted with the exception of two of your officers' SUVs. These vehicles were positioned as far as possible from the road at the southern-most extreme of the car park.

You may be aware that as one approaches old age, "frequency" becomes an increasing irritation. After somewhat more than an hour, I relieved myself discretely behind my car door. Apart from your officers about 150 yards away, I made sure that no one else was within 250 yards.

I had no sooner got back into my car when your gallant officers, presumably feeling considerable guilt for having done nothing for the welfare of the San Mateo County taxpayers for over an hour, sprang into action.

It was indeed a stirring sight to witness the two 6,000 pound giant vehicles, with lights, strobes, and sirens a-blowing, roaring across the completely empty parking lot to intercept one stationary, retired professor with a weak bladder!

Lt. John F. Quinlan asked me to get out of my car and show him my Driver's License. Then with the sagacity that can surely only come from many years of dedicated public service he stated that I "had exposed myself in order to urinate."

After some discussion about the obviousness of his remark, the good Lieutenant asked his partner in idleness, Sgt. Janet Colombet, to radio for reinforcements!

Some ten minutes later a back-up officer, Deputy Sheriff Paul M. Drack appeared, who took my license and uttered another series of platitudes about my being a "public nuisance." However, just like Lt. Quinlan, Deputy Sheriff Drack seemed uncertain how to proceed and he had poor Sgt. Colombet radio for yet more assistance!

Another ten minutes later Deputy Sheriff Michelle D. Day and another officer, whom I did not bother to identify, turned up. There were now two Ford SUVs and three Ford sedans surrounding the ex-professor who "took a leak." Shortly thereafter, a uniformed individual from the Harbor Master's office appeared riding some sort of golf cart or trolley.

I looked at the assembled vehicles and realized that all of my $100,000 paid in County Taxes would not be enough to buy them! I looked at the five sheriffs of assorted rank and wondered what could possibly justify such an excessive display of force!

On the good side, however, I must tell you that all your assembled officers seemed to be in remarkably good spirits; indeed, a very jovial atmosphere prevailed. No doubt I was considered to be the main entertainment in an otherwise dull Tuesday afternoon coastside.

Eventually Deputy Sheriff Day brought herself to write me a citation for "Public Nuisance - Offensive to Senses." She was the only one of your officers who actually did anything!

Then all five of San Mateo's finest drove off in close line astern formation - a splendid sight marred only by the fact that every one of them ignored totally the parking lot exit Stop sign!

About five minutes later, Deputy Sheriff Day and the unidentified officer reappeared because she had realized that she had given me the wrong court appearance date and, moreover, she had decided belatedly that I should provide a right thumbprint. In her boundless enthusiasm, she managed to spill the fingerprint ink on her patrol car's hood!

All told, I timed this protracted farce to have taken just over 50 minutes to enact. About twenty minutes later, two of your Ford sedan patrol cars again circled the empty parking lot, no doubt looking for any sign of further infractions!

I have tried deliberately to give a light hearted and, I hope, amusing account of this saga, but it does raise several very serious questions that I feel sure you will wish to have answered.

1) Is it right, or indeed proper, for two of your officers of the opposite sex to sit tête-à-tête for over one hour when parked in the most isolated part of an empty parking lot? Surely a meeting for any legitimate reason should more appropriately be held in public view?

2) Why was Lt. Quinlan unable to act expeditiously and write out the citation immediately?

3) Same question for Deputy Sheriff Drack?

4) Is it reasonable or appropriate to commit some $100,000 of vehicular assets and to involve the expenditure of a total of approximately 2½ hours of your officer's time to deal with my minor infraction?

5) In times when children are kidnapped and women are being raped and killed, it seems almost daily, should not your officers be seen to be patrolling the streets and highways rather than congregating *en masse* in empty car parking lots?

You, Sheriff Horsley, are the elected official charged by the San Mateo County Board of Supervisors with oversight authority over the Sheriff's Office. It seems obvious to me that last Tuesday's activities are the result of totally inadequate training and oversight! I believe that the taxpayers of San Mateo County deserve much better service. I trust that you, Sheriff Horsley, will feel sufficient civic responsibility to get answers to my questions. I look forward to hearing from you shortly. Do not hesitate to call me at 650/595-5910 any time. Alternatively, I would be delighted to visit you personally in Redwood City or Moss Beach.

I must also advise you, Sheriff Horsley, that I am sending a copy of this letter to the San Mateo County Board of Supervisors. I feel sure that they, too, will require explanations from you.

Upon the advice of my wife, I have decided not to send a copy of this letter to the local papers. I think that she fears a rash of jokes along the lines, "How many San Mateo Deputies does it take to cite one weak-bladdered retiree?"

The next time I drive to enjoy Princeton, I will take my "Pilot's Pal" with me!

SAN MATEO COUNTY
OFFICE OF THE DISTRICT ATTORNEY

AUGUST 28, 2000

JOHN CHARLES MALLINSON
2474 HALLMARK DR
BELMONT, CA 94002

RE: SAN MATEO CO. SHERIFF OFFICE Crime Case # SO0022816

DA Case Number: 0221331

You are hereby notified that the District Attorney has determined that no criminal charges will be filed at this time arising out of the above referenced police report.

You are NOT required to appear in court on the date you agreed to appear. However, if you posted bail, you may contact the Clerk's Office to inquire about return of bail money 15 days after your original appearance date. Any questions regarding bail should be directed to Municipal Court Clerk's Office at (650) 877-5773.

Should further investigation into this matter result in the filing of criminal charges, you will be notified by mail of your new appearance date in court.

Very truly yours,

James P. Fox, District Attorney

By _____
Deputy

WILL POSTERITY REMEMBER ME?

I have always been led to believe that, if one wishes to be remembered after one "quits this mortal coil", one should try to accomplish one or more of the following four actions.

First, one should have children. Second, one should write books. Third, one should invent something. Fourth, one should discover an eternal truth.

I have two wonderful daughters, Caroline and Elizabeth. They have provided me with five healthy grandchildren, Morgan, Johanna, James, Kyle and Cameron. Moreover, two of these have already provided me with great-grandchildren—James has Sierra and Kyle has Alistair.

As to the question of whether these great-grandchildren will actually remember much about me, I have serious doubts. I suppose that the chances are about the same as mine with my own great-grandparents—that is to say, almost zero! Just as I do not know, off-hand, my great-grandparent's names or their occupations, I do not think my great-grandchildren are likely to know much about me!

I have been fairly diligent about writing books. "The Foundations of Magnetic Recording" and "Magneto-resistive Heads" were both printed in two editions.

Sadly, however, the whole field of magnetic recording is rapidly slipping into obsolescence. Today, there are no more audio or video tape recorders. Magnetic recording will likely persist for only a few more years in computer hard disc drives. My books are, therefore, read now by very few. In the next ten years, they will slip into technological irrelevance and, from then on, no one but a few obscure historians will ever look at them or remember me.

My inventions were likewise all in magnetic recording and, like all those audio and video recorders, they have already been consigned to the trash heap of history.

However, there is hope for me. All is not lost! In my lifetime, I did manage to discover an eternal truth. I discovered, in 1972, that there existed a way of magnetizing flat sheets made with a permanent magnet material so the all of the magnetic field or flux comes out on just one side only. Those who are interested in reading my original 1973 paper, "One-Sided Fluxes—A Magnetic Curiosity", can find it on-line by entering "One-Sided Fluxes" in their web-browser.

This class of magnetization patterns was previously completely unsuspected and its discovery was indeed a great surprise—hence the title

of my paper. Probably because I called it “A Magnetic Curiosity”, the Ampex patent department made the great mistake of not bothering to seek a patent on the work. Figure 1 from that paper appears below.

The important practical advantage of One-Sided Flux patterns is that the magnetic field strength on the side with flux can be much higher. Ideally, in tapes or flat sheets, it can be twice as high.

Eight years later my idea was adopted by a German named Halbach, who very surprisingly never acknowledged my earlier work. Since I had published my findings in the world’s principal journal on magnetic materials and devices, it is hard to believe that he was not aware of my discovery! He used my idea to construct “wiggler” or “undulator” magnets that are a key technology in “free electron lasers”. These devices are universally called Halbach Arrays and they enable the generation of intense beams of X-rays from particle accelerators.

“Refrigerator magnets” originally appeared in the early 1960s. The original magnets were magnetized conventionally and they stuck to the refrigerator only weakly. By 1980, much improved versions were being manufactured that were magnetized in a one-sided flux manner. With twice the flux, they stick to steel refrigerators panels with four times the force of the previous designs. I urge you to experiment with a refrigerator magnet and note that it will only stick on one side—the one-sided flux side, of course.

Had Ampex held a patent, it would have earned a fortune even if the royalty had been but 1 cent per refrigerator magnet! One can hardly imagine the billions that are manufactured and sold each year.

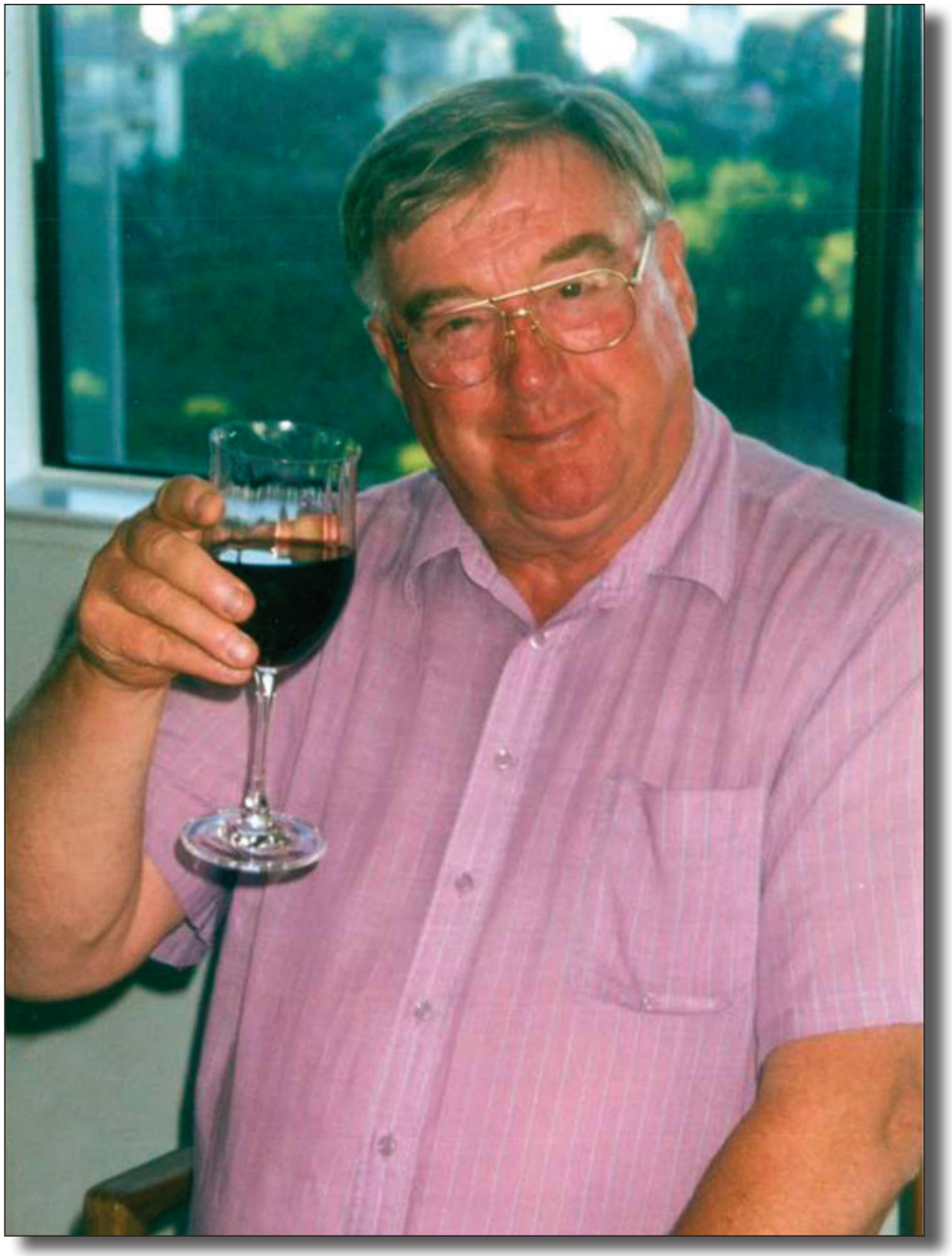
Subsequently, in collaboration with the mathematicians at Plymouth University of Plymouth, England, all the one-sided flux magnetization patterns that are possible in cylindrical and spherical geometries were described and categorized.

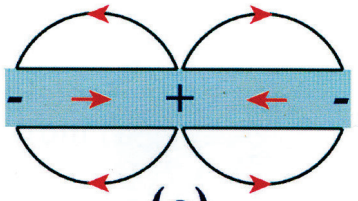
One of the cylindrical patterns permits the construction of “self-shielded” electric motors. One of the spherical patterns explains why the Moon, Venus and Mars have no “relic” or “fossil” magnetic fields. One of the remarkable things about science is the enormous range of application of some principles!

Since in the last 39 years no one has claimed to have anticipated my 1972 discovery, it seems certain that my name will be remembered forever as the discoverer of one-sided flux magnetization patterns. The principle I discovered can even be condensed into a single sentence: “One-sided fluxes occur in flat sheets whenever orthogonal components of magnetization are Hilbert transforms of each other”. It is the mathematical statement of an eternal law of physics that will endure as long as Maxwell’s Equations!

I might even be remembered as the man who showed how a refrigerator magnet should be magnetized in the best possible manner. Indeed, one might hope to be remembered for something less mundane than a refrigerator magnet---but I suppose it's better than the usual fate of becoming more or less completely forgotten in two generations!

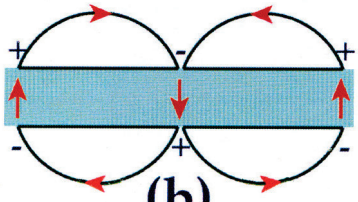
John Contemplating Posterity, Belmont 2009





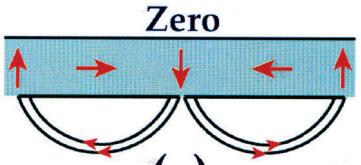
$m_x = \sin kx$

(a)



$m_y = \cos kx$

(b)



$m = m_x + m_y$

(c)

Figure 1 — (a) Flux from longitudinally magnetized tape. (b) Flux from perpendicularly magnetized tape. (c) Flux from rotating vector magnetized tape.

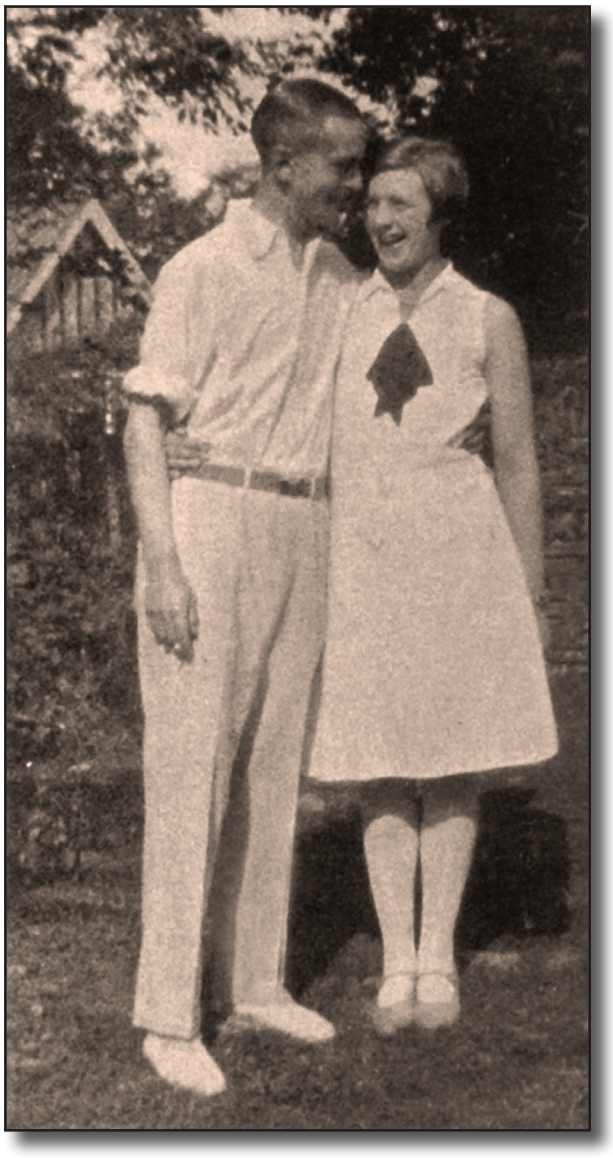
MY FATHER, WHO ART IN HEAVEN

FAMILY HISTORY: My father, Charles Hildred Mallinson, was born in Halifax, Yorkshire in 1903. He had but one sibling, Jack Hildred, born in 1906.

My father's father eventually became the Chief Engineer at the Campbell Gas Engine Co. in Halifax, Yorkshire. Neither Charles nor Jack went to college; instead they each served five-year engineering apprenticeships at Campbell.

In 1927, the two brothers started an automobile garage in Bradford, Yorkshire. It went out of business during the great depression of 1930; my mother attributed it to my father's obsession with perfection.

Father & Mother



Subsequently, both joined Hepworth and Grandage, Ltd., a company that manufactured pistons, piston rings and cylinder liners for motorcycle, car, aircraft and ship engines and, after the mid-30s, gas turbine blades. My father eventually became in charge of development; Jack became head of the sales department. Both remained at H & G until their retirements at age 65.

My father married Elaine Steager, the daughter of a textile merchant trader originally from Memel in East Prussia (now Klaipeda, Lithuania) in 1930. Jack married Lucy Brown, the daughter of a Bradford pawnbroker in 1932. Both were Bradford girls.

A twin herself, my mother gave birth to the celebrated twins John and Mary in 1932. Lucy had no children.

My father died in 1984 from a massive stroke. Jack died in 1990, of what cause I know not.

MY FATHER was probably one of the most retiring and least assuming of men I have ever known. My mother often recalled that her "Chas", as she called him, could not look her in the face in the light of day and say, "I love you", until they had been married for three years and had already had the twins! I have no doubt that he adored her to his dying day. One must assume that matters were rather different in the dark—but perhaps not!

He was, as they say, a "cold fish", very rarely showing any emotion. Despite his retiring nature, nevertheless he had very strong views upon many things. Inevitably, some of those opinions had a profound effect upon shaping my personality.

Pops, as I called him, absolutely abhorred physical exercise. I never saw him walking or taking exercise in any manner whatsoever. He kept saying to me," You are one of the most fortunate generations of mankind because, thanks to the invention of the internal combustion engine, you will never need to perspire in your life!" In those days, you must understand, horses sweated, men perspired and ladies had hot flushes. If he were still alive today, he would be appalled at the widespread belief that exercise is good for you. Every day, I take a short walk and hope that he is not looking down upon me, despairingly, at my being so weak willed as to believe all the current cant about the virtues of exercise!

Not surprisingly, he eschewed all sports. In fact, he used to say "I think that organized sports must surely rank as a more colossal waste of human energy and resources than even that of waging war." He thought the practice of holding football and cricket matches on mid-week afternoons was socially reprehensible, asking, "Don't those idle slackers have jobs to go to?" That a sports stadium was to be abandoned, demolished and another built was, to him, a symptom of serious societal mismanagement, "Why do they not build useful things, such as hospitals or schools?" He would leap up and turn off the TV whenever a soccer match or golf tournament came on saying, "It's absolutely amazing how much interest people have in following a bouncing ball!"

My father could never understand why people would choose to expose themselves to risk. Consequently, I was told not to have a motorcycle, not to go rock climbing and, most certainly, not to fly. I did all these things, mainly due to the influence of one Eric Langton about whom I will write elsewhere. In WW2, he wouldn't let me out of our air raid shelter to watch the searchlights and anti-aircraft fire, surely a spectacle that any red-blooded boy would want to see!

He was, above all, a perfectionist. He would not let me into the house one day until I had finished cleaning my bicycle and that included, of course, cleaning the wheel rims between all the spokes. When I was about

12, he gave me a Meccano erector set. I promptly built an Eiffel tower and proudly showed it to him. “Wonderful, John, now I want you to go through it and put all the bolt heads on the outside and make sure that every nut on the inside has a washer under it.”This I accomplished, although it took much longer than originally building the tower and I again showed it to him. “Good, now I want you to make every bolt head slot be either exactly vertical or horizontal!” In the end, my tower met his standards and even though I was, by then, pretty fed up with Meccano, I did learn that, “If a job’s worth doing, it’s worth doing right!”

I should add at this point that I did not feel bullied by Pops. It was simply made plain to me that there always was a right way to do things. Moreover, never in my life did he strike me. In fact, I do not think he ever used physical coercion. It will not surprise you to learn that I too have never hit another person.

“Pops” Mallinson in Repose

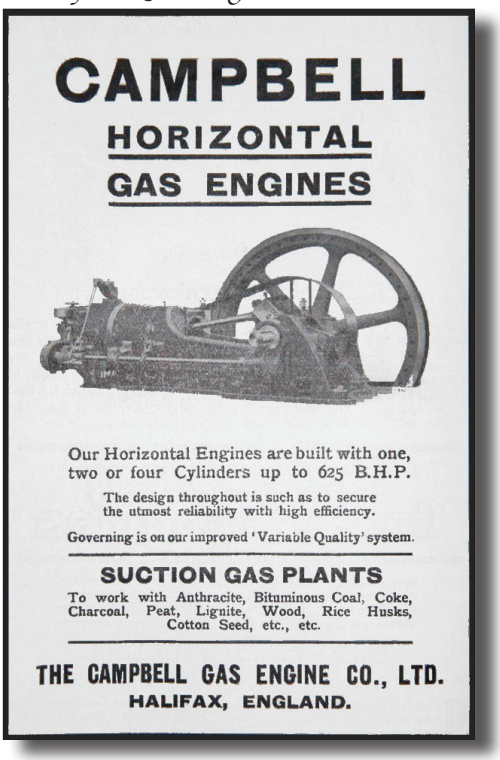
My father’s principal philosophy was, “Man was put here on the Earth to do battle against Nature and that in order to succeed, this battle has to be a cooperative activity.”

He told me over and over, “Don’t waste your time competing against your fellow men, John; wanting to beat people is just an empty vanity!”

He regarded the triumphs of the industrial revolution as proof positive that winning the battle against Nature did indeed better mankind’s lot on Earth. And what better place to witness the industrial revolution than the North of England, where it all began? Where the first steam locomotive ran and the first production machinery in the world for wool weaving and cotton spinning appeared? It is, in fact, the very place on Earth that produced the immortal phrase, “Where there’s Muck, there’s Money!”

His particular forte was, of course, the internal combustion engine. He took me one day to The Bradford Industrial Museum at Eccleshill, Bradford, to show me an engine his father—my grandfather—had made at the Campbell Co. He was extremely proud of this two-cylinder, industrial gas engine for two reasons. "My father had to design every last detail of that engine, right down to the steels and alloys used for the pistons and bearings. You know in those days, John, there were no H & G or SKF catalogs to select parts from!" Secondly, that engine had run 24 hours a day for no less than 49 years at Bradford's Esholt sewage works, running on, shall we politely say, methane, pumping what is, in the business, called sludge! The engine is still in that museum; Phebe, my wife, and I viewed it in 2009.

Campbell Gas Engines Advert, 1918



Pops had a new car every two years, generally of the 2-liter class. In those days, it was necessary to "decarbonize" engines at 30,000 miles and he was happy to leave that chore to the next owner. Also, having a new car kept him abreast of the latest developments in the car industry.

Hepworth and Grandage Advert, 1949

Incidentally, the only sport that interested him at all was motor racing. In particular, he liked "Timed Trials", where the drivers compete one at a time because, as he put it, "It takes a lot of the human element out of it!"

My father never showed much interest in money. One of his favorite aphorisms was, "Remember, John, money functions merely as a lubricant for commerce and it has no intrinsic worth!" Nevertheless, he

certainly taught me how not only to live within my means but also how to save money. At age 12, I started delivering newspapers after school and he insisted that I give half of my earnings to my mother each week to help "with the housekeeping". At the age of seniority, 18 years in the UK, I was told that it all had been placed in an interest bearing savings account and the money was now all mine! When I was 19, he lent me some money to buy my first car, a Morris 8 roadster, with the understanding that I was to repay him so much per month.

When the debt had been repaid in full, he gave the whole amount plus interest back to me saying, "There's a lesson for you John. If you had been putting that money in a saving account, it would have been just as easy!" The result is that I have never failed to save at least 10% of my income! Sadly, I failed utterly to pass on this virtue to my daughters!

My father gave Mary and me each about half our inheritance when he turned 70. I invested it all in real estate in the Bay area, eventually owning no less than 6 rental properties. With those investments, I made a great deal of money. When I was that same age, I did similarly with my daughters but, sad to say, they did not invest it prudently!

My father's views on religion were quite simple: "It's all a lot a poppycock! How can people put their trust in a man who uses a large *hat* as the symbol of his authority?" He had in mind the Archbishop of Canterbury, the Pope and, most probably, even the King of England! When we turned 15, he suggested to Mary and me, "Perhaps you ought to give going to church a try? Why don't you go to the Church of England on Sunday and then try a Methodist and a Baptist chapel the following weekends?"

I complied, even adding a Telepathic Society séance to the list. When I reported that nothing had moved me, he said that it didn't surprise him. I'm sure he would have enjoyed the little parody of the Lord's Prayer that I chose as the title of this essay. However, he must have been very disappointed that my sister Mary went on to become a very devout C of E Christian! Incidentally, it was Mary's opinion that being forced, as young boys, to be church choirboys had put both my father and Jack off church for life!

My father had a great respect for the law. He admired its constant striving for perfection. His favorite story was about a fellow Yorkshireman who, in the mid 1930s, was in court in Halifax for a stop sign violation. The policeman testified, "He didn't stop at the line and was moving when he crossed it" The elderly defendant replied, "Nay, nay young constable, if I'd a' stopped there, I'd still be stuck there! And, lad, tha oughta know that movins t'only way to cross t'line!" The case was dismissed and all STOP signs in the UK were subsequently changed to HALT signs.

Pops was meticulous about obeying the law. If the speed limit was 30 mph, then he drove at 30, no more and no less. The only civil disobedience I can recall was that every year, when he was filling out the car registration renewal form, he struck out the question, "Does this vehicle have a radio installed?" with the comment, "Not relevant to motoring!"

My father detested most politicians, considering them to be knaves and charlatans. Such was his confidence in the social stability of Britain that he only rarely thought it to be necessary to vote. As a result, I lived in the USA for 37 years without feeling any need to vote.

He believed that a civilized society should provide everyone with food, shelter, education and medical care. Of course, these have been the foundations of British society for over 60 years. "After that, you're on your own, John! If you want a nice house, a nice car or holidays abroad, then you'll just have to work for them!"

I remember going to the bank with him one day and asking him if a bank manager earned a good salary. "Bank managers, headmasters and doctors are of about equal worth in society and they are paid about the same!" was his reply.

He detested firearms. When I was 14, I bought a Webley air pistol from a friend. I took it home and hid it under my bed. Two days later, it simply vanished "into thin air" and I knew better than to ask my parents what had happened to it!

My father neither drank nor smoked. He had given up both to render his support to my mother's doing so during her pregnancy. Interestingly, when it was realized that she was bearing twins, her doctor then ordered her to drink two bottles of Irish Milk Stout daily!

When the twins were born, my mother resumed both vices with her usual gusto but my father continued to forebear. His tastes in food were extremely mundane; "I think I like butter more than anything else!" said he as he smoothed it thick on his toast at the breakfast table.

His tastes in music were primitive. The only music he really enjoyed was a brass band in a Park on a Sunday afternoon. The Black Dyke Colliery Band playing Handel's Lago was his ideal. Otherwise, it really was a case of, "I'd rather listen to the valve gear of a diesel engine at 'tick over'"

Pops remained healthy through his life, with but one bout in hospital with pneumonia. He had to start taking diuretics for hypertension at age 55, just as I did. He had a minor stroke at 65, but was driving again a few weeks later. When in the South of England he often complained, "This place is too enervating—the air's got no body to it at all!" Quite simply, he preferred to be in the Muck of Yorkshire, his birthplace!

I tried to visit my parents once a year and always took copies of my latest papers to show them. My mother always said, “Oh look, lovey—there’s your name at the top!” My father would take them away but sooner or later would corner me alone in his workshop or garage and say, “I can’t understand a word of all this stuff! But what I want to know is what do you actually do at Ampex?”

I think that he could never really believe that I just sat in the Research Department and thought about how magnetic tape recording worked. Also, I’m sure that he never believed that I got only 10 days vacation a year at a time when all workers in Europe got at least 6 weeks. My parents hated it that I was only visiting them for 2 or 3 days, even though I told them it was almost one third of my annual leave.

Once a month, my father checked his car’s tire pressures. This turned out to be the perfectionist’s last act! He bent down, his face froze and my mother knew he was dead before he even hit the ground! I’m quite sure that he would have wanted it that way, since having the correct tire pressures was very important to him!

JACK MALLINSON was, in most ways, the very opposite of my father! First and foremost, he was a big, vain, boring bully. Indeed, I was quite sure that he must have got his job as Director of Sales at H & G mainly by his ability to bully salesmen. He is the only man I have ever met who had the absolute gall to take his mistress with him on family holidays, causing, shall we say, certain tensions!

Aunt Lucie & Uncle Jack

According to my mother, Lucy refused to give Jack a divorce and he had told her, "Then you'll just have to put up with Marjorie being around."

However, I liked Marjorie. She was a kind person who doted on her dog Tuffy and her cats. She provided me with many an afternoon tea, usually boiled tomatoes on toast. During the WW2 food rationing, that was considered a feast!

Marjorie had a sister, Vida, who had a whirlwind wartime romance and marriage to a British merchant navy sailor. She never saw him again. No, the U-boats didn't get him; apparently, he jumped ship in New Guinea for a native woman! Vida had a dullard boy, Guy Dommit, who ended up working in the rhubarb fields.

Of course, I presume that you do know about of the "Yorkshire Rhubarb Triangle"? It is very well known in the world of horticulture.

On the other hand, Lucy was an irritating, busybody, "know-it-all" kind of woman. She seemed to be far more interested in correcting my English than actually talking to me, "No, no, John; 'the fast car is quick' not 'the quick car is fast'!" That kind of pedantry may well have been "the grist for her mill", but it didn't amuse me!

Jack, as you may have surmised, was a ladies man. He went up to London for a week every year to "interview" professional models and decide which were to appear in the annual H & G naked lady calendar! As Director of Sales, he considered this to be one of his prerogatives. Perhaps he even claimed Le Droit de Seigneur?

With no children, Jack and Lucy spent their money on “the good life”. He bought a new Jaguar every year, just as soon as the New Year’s model appeared. They went to the south of Europe each summer on holiday for a month, with the Jaguar and the mistress going there with them on the overnight “car train”.

He delighted in the power of the 3.5-liter Jaguars. He enjoyed going slowly in traffic until he had lured some ordinary motorist into trying to pass him. Then, Jack would start accelerating and force the poor unfortunate into having to brake hard and fall in behind him again. This caused Jack endless, sadistical amusement, “Did you see the look on his face” he cackled with glee!

Jack and Lucy spent a great deal of money upon tasteless nonsense like Italian leather furniture that my father thought was both vulgar and hideous. As my father commented, “Why anyone would choose to have Italian cow hide all over one’s living room is simply beyond me!”

But Jack was one of those who believe that the ostentatious display of wealth impresses people. My father thought that it not only was a rather pathetic notion but was also a certain indicator of an inferiority complex. My father felt that most things concerning money should be kept as a strictly private matter.

Triangle in the Rhubarb in the Triangle

Jack took great delight in humiliating headwaiters and the like. After a splendid dinner at the “Top of the Mark” in San Francisco, Jack insisted on telling the head chef, “ You know, your cooking will never make the standards of Le

Cordon Bleu!" and the sommelier, "Don't waste your time recommending California wines, they are grossly overrated!" I actually believe that, in his later years, if Jack didn't do that sort of thing, it would have detracted from his enjoyment of life! He'd grown accustomed to being—and needed to be—a big, boring bully!

After my father's retirement from H & G, there was very little need for him to associate with Jack anymore. I believe there was almost no contact between them in the latter years of my father's life. "He's just too vain and self-centered for me to waste my time upon!" That is why I don't know the nature of Jack's terminal ailment.

"OH LOVEY", SAID MY DEAR MOTHER

FAMILY HISTORY: My mother, Elaine (nee Staeger) Mallinson was born in Bradford, Yorkshire in 1904. Her father, Emil Staeger, was a textile merchant-trader, originally from Memel, East Prussia (now called Klaipedia, Lithuania). She had four siblings: Mabel (1888), Maud (1890), Eraine (1891), and her twin brother, Fred.

She married my father Charles Mallinson in 1930 and they produced the renowned twins in 1932. Father was born in Halifax, Yorkshire in 1903.

She died in 1990 and though the death certificate said of "Old Age", I know it was really more a case of sheer loneliness. Her beloved husband, Chas, as she called him, had died 6 years previously in 1984. The last time I saw her, about 6 months before her death, she was just "skin and bones" and seemed to have lost all will to live. She didn't want to go out, saying she'd seen it all before. She said everyone she knew had died. Fortunately, my sister Mary lived but one hour's drive away and could visit her weekly.

MY MOTHER was without question the best friend I ever had. I knew that I could count on her loving support whatever happened in my life—and having been married four times, you know that, indeed, rather a lot did happen! She would settle down after dinner, with yet another glass of Scotch at hand, a box of "Black Magic" chocolates open, another cigarette lit, and sit knee to knee with me and say," Now then, lovey, tell me everything about it!" I did tell her everything and felt totally loved whatever I said.

Mama was a most wonderfully interesting person to talk to for two other reasons. First was her uninhibited attitude and unbounded curiosity about anything concerning sex! This will become very obvious in what follows below! The other reason was that she ended up being the guru who knew everything worth knowing about everyone in the family.

There is so much to tell about that wonderful lady that it is difficult to know where to begin. Let me start, however, by saying that she was a very different kind of person than my father. As I have written elsewhere, my father was a “cold fish”. My mother, on the contrary, was warm, loving, and generous to a fault. According to my mother, my father was a virgin when they met. You may judge for yourself about my mother when I tell you she used to say, that when she met my father, “I had never seen such a large penis on a man!”

She first saw him sitting in an adjacent box in the Alhambra theatre in Bradford. She claimed it was love at first sight. He, a modest and retiring man, must have been bowled over by his good fortune at meeting her and, I suppose, at the pace of her conquest of him! However, it turned out to be a “marriage made in heaven”.

My father was rather strict about things that he thought to be important. For example, during the WW2 food rationing, he felt that all the food on one’s plate must be eaten. If it were not, then that food would simply have to reappear at the next meal! My mother, who knew that if I’d not eaten something it was because I didn’t like it, managed to make sure that the uneaten food was somehow diminished with each reappearance. In my father’s defense, the WW2 Food Minister Lord Woolton’s slogan during WW2 was, “Waste Not Want Not!” How my mother managed to feed the teen-age twins on a 4 ozs of meat and 4 ozs of butter per head per week ration is beyond me.

When I turned 4, I was sent to a local private preparatory school. One morning, I locked myself in the lavatory there and refused to come out. My dear, softhearted mother came to the school and said, “Oh, lovey, if you’d only just unlock the door, we can go home together right now!”

At age 8, I locked myself in a clothes-changing booth of the Windsor swimming baths in Bradford, where my mother took Mary and me to learn to swim. Into the Men’s Changing Rooms came Mama and said, “If you’ll only come out, lovey, you won’t have to go in the water today!” Needless to say my sister, Mary, learnt to swim long before I did.

In a way, Mary was always the bane of my life. My parents tried hard to treat us equally, but it was not always the fair thing to do so. Mary always took much longer doing her homework than I did and my father didn’t want to let me go out to play until slowpoke Mary had finished. Again mother came to the rescue, “But Chas, you can’t expect them to take the same time. After all, they’re not identical twins!”

As my mother often told me, I was like her, loving every one and nearly all aspects of life. Mary was more like my father, that is to say, much more reserved. My nephew Christopher claims that the first time he recalls

Mary, his mother, saying to him, “I love you”, was when, at age 23, he was setting off to New Zealand and she was saying goodbye to him on a railway station platform!

My mother was very gregarious. In most of the family wedding, christening and company dance group photos my mother is to be seen like the queen of the party on the front row with my father barely visible at the end of the back row!

When I was about 14, Mama came into my bedroom and caught me “self-abusing myself” as it was so quaintly put in those days. “ Oh, lovey, don’t waste yourself like that! In a couple of years, you’ll find a nice girl friend who’ll do everything you want!”

I ask you, is that not just the sort of loving mother every boy needs? No boring old moral cant, no fatuous nonsense about doing harm to myself, just straight, positive talk about the bright future ahead!

It turned out that it took three years, but she was otherwise absolutely right! The girl wrote to me, quoting from the Ruba’iya’t of Omar Khayya’m,

> *A Flask of Wine, a Book of Verse—and Thou,*
> *Beside me Singing in the Wilderness,*
> *And Wilderness is Paradise Enough*

I realized it meant that she loved me! She was still visiting my mother some 20 years later, asking about me. “You must have “looked after” her very well indeed!” said mother approvingly!

She always answered my questions directly. At about age 8, when I wanted to read and understand everything in the newspapers, I burst into her bridge group one afternoon asking, “What is a prostitute?” My dear mother hardly looked up from her cards, “It’s from the Latin verb “statuere“ meaning “to station”. It means a woman who stations herself before you!”

A few days later, I asked her why anyone would want a woman to behave that way and I was told, “Because, lovey, almost all men like to put their penises into women’s vaginas!” At that tender age, this information was indeed a great puzzlement to me!

At age 16 or thereabouts, my mother gave me a copy of “Modern Sexual Practices” saying, “You’d better read this, lovey, and then you’ll know what actually happens!” I recall that this book was mainly a manual about the physical aspects of sexual congress and was not a load of psycho-booby claptrap! It was not quite the “Kama Sutra”, but it came close.

Much later on, when we were talking about deviant sexual practices, Mama came out with what must surely rate as her “piece d’resistance”, “No, no, lovey, you bugger animals but you sod your friends!”

I believe that this distinction is not always observed in this country. In America, a curiously Victorian and intensely prudish society, the subject of deviant sex is generally not even discussed openly. Indeed, as I write today in 2011, even the question of “same sex”, homosexual marriage is, incredibly enough, still a subject of intense political and moral debate.

I have often reflected upon how curious it is that the British are thought to be reserved with the Americans being deemed open minded. In my experience, the exact opposite is closer to the truth!

My mother shared my father’s disdain of sports, although she claimed that she had excelled at field hockey as a schoolgirl. Most English schools have the appalling practice of devoting every Wednesday afternoon to sports. The only way I could avoid spending pointless hours “Chasing the bouncing ball”, as my father put it, was to do cross country running. I soon discovered, however, that if I fell to the back of the pack, I could drop out unnoticed and go home, where my dear mother had a cup of tea and some “chocky bickies” waiting for me! Thus refreshed, I then hid in some bushes down the road and rejoined the rear of the pack as it came pounding past. Because I’d only run about 3 miles of the 7-mile course, I always managed to finish with the leaders and win the praise of the hated, empty-headed sports master, “ Well done, John! A good effort!”

My mother had perfect pitch and would occasionally complain that music on the BBC was off-key! She seemed to be familiar with most of the canon of classical music. She said, however, that having been forced to learn piano as a young girl had put her off music and she rarely went to concerts! It may well have been that my father didn’t like classical music. However, they seemed to compromise on musicals! The family was taken to see Oklahoma, Brigadoon, Annie Get Your Gun and the like almost every month. I hated every one of them, wondering why they had to keep on interrupting the story and all start singing! Funnily enough, I later became an opera aficionado, going to the complete, twelve opera season at the San Francisco Opera for almost 20 years. Possibly it’s because opera is based on real literature or, even better, historical events?

Mama smoked like the proverbial mill chimney, getting through at least two packs every day. She was the only person I’d ever seen who managed to have three cigarettes going at once! After dinner, she’d light one up with coffee at the table, then she’d go to make more coffee and start another in the kitchen and, if the ‘phone then rang, she’d start another in the hallway as she talked. She beat the odds but her twin brother, Fred, an equally heavy

smoker, did not, dying of acute emphysema at age 71. I reckoned that he must have smoked just over 1 million cigarettes by the time he croaked!

She also loved her tipple. In those distant, almost incredibly civilized days, it was the custom to invite the neighbors in for Sherry before lunch on Sundays. My teetotal father circulated amongst the guests with two decanters that looked alike. One contained Sherry for the guests, the other had Scotch for mother!

When armed with her booze, chockies and ciggies, my mother was set to enjoy TV. Her particular favorite program was a harrowing BBC series about surgical procedures. I can recall her telling me about an episode that showed a D and C, "It was wonderful, lovey, you could see them working right inside, dilating the cervix!"

Pops & Mama

She devoured the daily newspapers: the "Manchester Guardian", a national paper in the morning and "The Telegraph and Argus", the Bradford local in the evening. In the late 70s, she read some surprising news in the T & A. As she told me later, "The Pakistani majority in Bradford's government had

voted to allow the swishy Mornington nursing home, where you were born, lovey, to become a brothel!"

On Sunday, "The News of the World", a barely disguised crime tabloid, was delivered to the house. Mother devoured this with relish in bed and I can just imagine her saying to my father, "Oh, Chas, there's a lovely story here about a vicar who buggered a donkey for almost ten years!"

My mother never learned to drive. In those days public transport was universal, frequent and perfectly adequate. The grocer, Mr. Benn, would 'phone her twice each week and enquire if she needed anything special or should he just deliver her usual order. For my mother, there was no unseemly pushing of a shopping cart full of stuff through a crowded car park! Bradford's main department store, with wonderful name of "Brown and Muff", of course delivered your purchases the very next day! I think that were she alive today, Mama would be horrified about how everyone now has to do everything for themselves. She lived in an age when the garbage men came into one's garden shed, carried out the bins and put them back there.

She never wanted me to 'phone her from America, complaining, " I can't remember all that you said, lovey, and that makes you seen even further away" We corresponded at least every month and that was OK because she could go over a letter time and time again. Sadly, I grew to realize, as she grew older, that my going to the USA was most likely one of the greatest disappointments in her life. This became terribly clear to me, one day after my father had died, when she said, "I know you'll think that I'm just a silly old woman, lovey, but when I look at the moon, can you see it at the same time in California?" It damn nearly broke my heart! I lied and told her, "Yes, always" and she said, "Good, now I won't feel that you're so far away!" Dear Mama, she wore her "heart on her sleeve"!

After my father died, Mama became very friendly with Harry Walden, who lived in the apartment below. Harry was a retired furniture upholsterer who lived with his utterly useless wife, Molly. I call her that because, upon Harry's retirement, she had literally retired to bed, where he, the mugwump that he was, took her all her meals! As far as my mother knew, "There's nothing that ails Molly but bloody idleness!" Harry and Mama enjoyed watching TV together and he drove her into Leeds or Bradford on shopping expeditions. No doubt they also exchanged stories about their distant sons; his had gone to live in Borneo as a mining engineer! When Molly died, Harry moved away to Scotland, leaving mother lonelier than ever. After all, his son had come back and retired on the Black Isle, near Inverness in Scotland!

Now, I'll regale you with some of Mama's stories about the family.

MABEL was married to Arthur Roberts, the Principal Viola in the Halle Orchestra. All I remember about Arthur was that he was a very quiet man

who introduced me to Edgar Allen Poe and to classical music. He took me to see him playing in the Richard Strauss tone poem, "Till Eulenspiegel's Merry Pranks".

Arthur & Mabel

Mabel had a sign outside her house that read, "Registered Spirella Corsetiere". I liked being at her house, because I could ogle the endless procession of ladies coming to be fitted. Mabel believed that these excruciatingly uncomfortable garments should be worn to promote a women's health by improving their posture! As usual, Mama's opinion is worth repeating; "Mabel is so puritanical! She'll never realize that her clientele come to her because they know that men want their women to have a full bosom, a narrow waist and ample hips!"

Mabel and Arthur had one child. Their son Leslie was almost surely a homosexual. When I went walking in the Derbyshire Dales with Leslie, his "friend" always tagged along! In retrospect, I realize that perhaps it was just as well that he did!

ERAINE, usually called Daisy, lived with Maud in London. In the 1920s, both were working, according to mother, as "very high class tarts"! One summer, Daisy came back to Bradford to have an abortion. Mother was duly dispatched by Daisy to the local telegraph office to send a message, "Be patient, Cuddles misses you, back soon". Mama must have had many a lurid conversation with Daisy at that time.

Daisy married Cyril Williams, a phenomenally successful railway locomotive engineer that I have written about in the next essay. They had no children. Cyril had been married for three months previously in a marriage that was annulled. Mother explained why: "Cyril's first wife turned out to have an infantile vagina and the marriage couldn't be consummated!"

Daisy, on the other hand, must have "looked after" Cyril very well. The last time I saw her, she was over 80 and in bed in an old people's home. As I kissed her goodbye, she pulled me down saying, "Oh, I do love the weight of a man on me!" She must have loved corpulent Cyril indeed!

MAUD led a life that fascinated my mother. Maud had started smiling and waving from her apartment window to an older man, each morning, as he commuted by on a passing train. One day, he got off at the next stop, walked back and sought out Maud! Mr. Morton turned out to be the very wealthy owner of a cotton-spinning business and, in due course, they were married. But it was doomed from the start, according to my mother: "Maud just could not keep her hands off those young Army officers!" A divorce followed that Mama said was, "Was the biggest and messiest divorce case in the country in 1927!" Maud had one child, my cousin Joan. Joan married a Navy officer, Noel Thorne, but they divorced, leaving Joan alone with Nigel, Deirdre and Hilary.

FRED was a "wild young man" in his early bachelor years. He hurtled around the Yorkshire Dales on his "Flying Squirrel" Scott motorcycle. He had a lady friend who had an absolutely fabulous name: Lulu Featherstone! Miss Featherstone ran a health club and when Fred took me there, I was barely 10 years old. I could hardly take me eyes off the gorgeous Lulu, who looked as though she had been poured into her skintight leotard! It left absolutely nothing to be imagined! It was the first time in my life that I felt the overwhelming weakness that the Bible says Samson felt upon first seeing Delilah!

Fred & Kathleen

In 1942, Fred married Kathleen Stephenson, the mother of my half cousin, Barbara. Mr. Stephenson, Kathleen's first husband, was the developer and owner of Stephenson's Furniture Polish, a Bradford business. Fred and Kathleen's only issue was a daughter, stillborn in1943. Kathleen was a lovely, gentle but timid lady. On seaside holidays, we called her "Katey back-wash" for her fear of our swimming in the sea! Kathleen died in 1966 after a long illness with arteriosclerosis.

Fred did not remarry but became very close to his secretary, Phyllis, at the woolen mill, Thomas Burnley and Co., where he was a director. He dined with her frequently and even went on summer holidays with her. When Mama asked him if he was going to marry her, Fred reportedly replied, "No, she'd expect sexual intercourse then, wouldn't she?"

Fred ended up as the miser in the family. He took his passbooks to his banks every Friday afternoon to have them add the interest. He then sat adding it all up on Saturday morning. It is horrifying, indeed, the changes a mere 30 years can bring. Fred went from roaring around on very powerful motorbike with a gorgeous "dolly bird" clinging onto him to sitting all alone counting his money, "Just in case the bank's made a mistake!"

JACK was my father's brother. I have discussed him, in detail, in my essay "My Father, who art in Heaven". His wife Lucy desperately wanted children but Jack did not. Apparently, my dear mother advised her to put pinholes in Jack's "French Letters", as condoms were then called in polite society! It was to no avail; clearly, the odds are not good for a few thousand little soldiers in comparison with those achieved by nature's army of several hundred millions!

What a rich and complex menagerie they were! My dear mother loved them all even as she reveled in their foibles!

All have now gone to dust.

Let the Ruba'iya't have the last word:

"The Moving Finger writes; and, having writ, moves on:
Nor all your Piety nor Wit shall lure it back to cancel out half a Line,
Nor all thy Tears wash out a Word of it".

CYRIL, THE LOCOMOTIVE ENGINEER

FAMILY HISTORY: My mother had a twin brother, Fred, and three older sisters, Mabel, Maud and Eraine, known as Daisy. Daisy, born in 1891, married William Cyril Williams, in 1924 and they had no children.

CYRIL, born in 1889, was the youngest of the six sons of a Welsh Methodist minister who had emigrated to South Africa at the turn of the century. The minister took his boys to London to spend two days in the Science Museum before embarking. Presumably, he thought that it would be their last opportunity to learn about the origins of science and engineering before setting off to what, at that time, must have been a pretty bleak and uneducated land.

Cyril's first job, in 1906, was at the very bottom—a freight car axle greaser—as a starting apprentice for the Natal Government Railways. His last job was at the very top—Director of Beyer, Peacock and Company, Gorton, Manchester, the largest manufacturer of steam locomotives in the world!

In his "online" obituary, he is listed as W. Cyril Williams, F.R.G.S., A.M.I.C.E., M.I.Mech.E., M.I.Loco.E., M.Inst.T. An imposing set of qualifications that matches an imposing man!

He became a towering force in my family, the only "absolutely larger than life" person I have ever known. He had the same corpulent figure as Winston Churchill and was, too, always replete with an enormous cigar. Whenever he arrived at our house, he had a wealth of stories that were simply unmatchable by ordinary mortals!

For example, in 1948, he arrived after a business trip round the world on which he had obtained an order from the Indian Railways System for no less than 420 B & P locomotives! He had then telegraphed Daisy in London, asking her to join him in New York City to celebrate his triumph!

New York held great sentimental significance for Daisy and Cyril since it was the location of their courtship. Indeed, their " New York courtship bed", as Cyril fondly called it, was shipped back to England!

For our 21st birthday, they took Mary and me to dinner at the Savoy Hotel in Mayfair, followed by Beethoven's opera "Fidelio" at Covent Garden. As usual, when Cyril did something, he did it right—"first class, all the way"!

During WW2, he consulted for the War Office on transportation matters and traveled widely. One day he arrived with a gift; a single avocado pear from, of all exotic places, Casablanca, Morocco. None of the plebian Mallinsons had even heard of, let alone seen, such a treasure before! It was duly handed around, examined and then cut into 4 pieces for us to relish.

He was, above all, an extremely methodical individual. In 1956, when I told him I was going to the US to work in Harrisburg, Pennsylvania, he took me into his library, straightaway picked up his diary for 1924 and said, "Yes, I thought so! I passed through Harrisburg on the Pennsylvania Unlimited on such and such a date—the locomotive, a blank, blank, blank, took up water there at 50/60 mph and it averaged 78 mph on the whole run from Philadelphia to Pittsburgh"

Uncle Cyril & Aunt Daisy

He had little time for anything other than steam engines. When I told him that I was flying jets in the Royal Air Force, he asked me if I knew that jet engines depended upon only a few thousandths of an inch clearance between the turbine blade tips and the shroud ring? "That's not the way the Flying Scotsman's built, John. It will arrive in Glasgow on time, even if there's a quarter of an inch play in its connecting rods

Shortly after he became the Director of B & P, he was elected to be President of "The Institution of Locomotive Engineers". He celebrated the occasion by buying a huge, black Daimler limousine of the kind favored by the British Royal family. On a trip through Cornwall, he decided to take a photograph of the car on a one-lane hump-backed country bridge. When other motorists started tooting their horns, he dispatched Daisy to explain that this was Cyril's presidential car and would they be kind enough to wait!

However, all was not perfect in the Williams world! Cyril was a very serious alcoholic. In fact, he was one of that sad kind who find it necessary to go out every morning, “To buy the newspapers” as they say, so that even their spouses will not know just how much they are imbibing! Before the many speaking engagements and dinners Cyril had to attend later in his life, his aide made sure the headwaiter understood that Mr. William’s water glass was to be kept full, at all times, with straight gin! However, like Churchill, he was a perfect example of the fact that not all alcoholics are dysfunctional!

In 1959, Cyril died in hospital following abdominal surgery. Daisy came to see him every day and to make sure that his hollow walking cane was full of gin. Cyril got up in the middle of the night to “have a nip”, lost his balance, fell to the floor bursting open the stitches and then hemorrhaged to death on the floor!

ERIC, THE MOTORCYCLE RACER

FAMILY HISTORY: Eric Langton was born in Leeds, Yorkshire, in 1907 and died in Perth, Western Australia, in 2001. In 1934, Eric married a cousin of my father, Mary Robert. Mary was born in Leeds in 1910 and died in Perth in 2009.

ERIC had a most profound influence in my life. He was a professional motorcycle racer and he taught me a supremely important lesson in life that was absolutely beyond the capabilities of my father! My retiring and unassuming father could not see why anyone would ever risk life and limb. On the contrary, Eric showed me that it was entirely possible to perform, with safety, acts that are fraught with extreme danger, provided one approached them in an intelligent manner!

Without the wonderful example of Eric, I would not have ridden a motorbike, not gone rock and ice climbing and not have learnt to fly and hurtled around the UK at 550 mph in a twinjet fighter!

Thanks to Eric's example, later in life, when I wanted to "go speeding" in my Porsche in the 60s and 70s, I would go out after I'd personally serviced the car and inspected all the tires for signs of damage. I'd drive east on the San Mateo bridge to make sure the CHP were not lurking and then come back west howling along at 136 mph, red-line limited, in complete safety! That is not quite the same as having a quick blast late at night, when half snockered!

In the 1930s, Eric won or was runner-up for the World Speedway championship several times. As captain of the British speedway team, he toured the world each year, visiting both North and South America and Australia. In his house, a quarter mile from mine, there were more silver trophies, plates and cups than one could easily count—he was very successful at his profession! He developed a reputation for not having accidents, although one crash in his earlier days when road racing in the Isle of Man did result in his having a steel plate in his skull! As he said to me, "Road racing's

so much more dangerous than speedway. It's so much faster and there are so many things nearby you can hit!"

Eric is credited with introducing the "foot forward" style of dirt track racing in the 1930s. His brother Oliver, stayed with the older "trailing foot" style that was much more exciting to watch but not as fast.

It was a particular pleasure for me to visit Uncle Eric and Auntie Mary's house. Imagine the excitement for a 10 year old of watching Eric fine tuning a JAP 500 cc racing engine in his garage! Or the thrill of being trusted with a 12 bore shotgun and a box of shells and being asked to go out into the woods behind his house and shoot as many of the noisy birds in the rookery as possible! Even mowing the lawn for Eric was a thrill since his motor mower had an old JAP 500 engine! More than once "it got away from me" and I had to get Eric to come and manhandle it out of the bushes. I must not forget to mention that Mary, a lovely, kind lady usually gave me glasses of milk and "chocky bickies"!

Eric was the captain of "The Belle-Vue Aces" speedway team in Manchester from 1930 until his retirement in 1947. You can find many photographs of Eric "online". In the 1940s, he frequently drove over "the moors", from Bradford to Manchester, towing a trailer with two 'bikes. He was kind enough to take me along. Just the ride alone, in a 3.6 litre Ford Pilot, was a thrill with Eric clipping the corners within inches of the bridge abutments. Being given a white coat that allowed me to roam around the pits was close to heaven. All the noise and the smells of castor bean lubricating oil and nitro benzene doped fuel were damned near intoxicating!

After retiring in 1947, Eric started designing and building speedway bikes himself. He introduced sprung front forks and rigid frames when the standard speedway bike had rigid forks and a flexible frame.

He also consulted at my father's company Hepworth & Grandage on the development of pistons for racing engines, most notably the 16 cylinder BRM Formula 1 engine. Eric had a very finely developed sense about engines

that amazed my father, who was an “engine man” himself. On one occasion, during the full-power testing of an engine in a test cell, Eric said, “Might as well shut it down, it’s starting to seize!” None of the instrumentation showed anything amiss, so they continued the test and, of course, it seized solid minutes later!

Eric and Mary had developed a great liking for Australia in their prewar speedway tours. In 1950, Eric had become increasingly fed up with the post war socialism and taxation in the UK that made it increasingly difficult for an independent business enterprise like his to prosper. At that time, the Australian government was offering the British free passage with the promise of free return after 2 years for holiday or otherwise! They emigrated to Perth, where they spent the remainder of their days.

Eric earned his livelihood in Perth in an interesting way. Every year, he and Mary would appear in London and, dressed appropriately, they would drive an immaculately restored antique car in the “Brighton Run” from London to Brighton. At Brighton, everyone knew that Eric’s mount was for sale. Having sold the car, Eric and Mary then went off driving throughout the UK to inspect new candidates for restoration. When a suitable car was found, they towed it to Southampton and it went back with them to Perth. Two or three years later, it too would appear in the “Brighton Run”. Eric’s cars were all of the highest quality like Rolls Royce Silver Ghost, Packard, Hispano Suiza, Isotta Franchini and the like. He didn’t see the point of spending his time on mass-produced rubbish! My father was in awe saying, “Do you know that Eric even fabricates radiators from scratch with brass pipe and copper fins?”

Mary complained that she saw almost nothing of Eric. He disappeared into his workshop after breakfast, appeared for lunch briefly at midday, came in for dinner and went to bed at 8 pm. One evening in 2001, he said he felt unusually tired, went to bed early and died in his sleep. Having beaten all the odds, thus passed peacefully Eric, a world champion motorcycle racer.

Auntie Mary grew to like Perth less and less in her later years, thinking that she'd be happier back in the Yorkshire of long ago that she remembered so fondly. Nevertheless, she died in Perth in 2009. She had two sons, Max and Simon. At her memorial service, Simon said that she had lived a fortunate life: she never was sick, she never knew want, she had never lost anyone to war, she predeceased her children, and she died peacefully in her sleep.

My 1961 Porsche 356B on its 21st Anniversary