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COME FLY WITH ME?

The crest of Corstophine Hill, just a few miles west of his home in Charlotte Square in Edinburgh was a favorite place for the boy. There he spent many happy hours breathing in the scent and scenery of heather and the Scottish Hills. Above him the birds made their mysterious way, and like man eternal, this stirred his imagination.

Like so may other talented and curious budding geniouses, he was not content just to look and listen. He actively collected samples and each, at his father's instruction, was appropriately labelled with the proper Latin names. Later he was to remark in recollection, " This spoiled the whole thing for me". Throughout his very productive life he could work with great enthusiasm and energy on specific problems, often to significant conclusions, but seemed compelled to move on to the next target with sometimes disturbing alacrity. He was not a "details man".

Not so with the fascination held by flight, although the embryo of this idea did not spring to life for him until many years later.

The next step in this evolutionary process toward flight was an avid interest in kites - mostly just for the fun in the beginning- but more and more he experimented with very serious kite building. These progressed from tradional box kites to huge multicelled kites and finally into large complex flyers constructed of numerous cells of tetrahedral shape using aluminum

tubing. " Why I do this I do not know," he was to write in the National Geographic, " excepting perhaps because of the intimate connection of the subject with the flying machine problem"

Indeed, his ultimate kite, named the Frost King, was made up of some ~~thirteen hundred~~ 3000 tetrahedral cells and supported a not altogether willing passenger some thirty feet in the air.

With that, as he reported to the Washington Academy of Sciences, he had satisfied himself that he could build " structures composed exclusively of tetrahedral winged cells that will support a man and an engine in a breeze of moderate velocity".

Another impetus along the path to flight was his friendship with Samuel Pierpont Langley, a distinguished scientist and later director of the Smithsonian Institution who was an early pioneer in aviation, although his scientific fame came from a study of solar phenomonema. As early as 1896, Langley had designed and built a steam driven airplane which flew a distance of 4200 feet over the Potomac River. This, of course, was not manned flight but an important step between gliders and the airplane which could be guided to take off, fly from point A to point B and successfully land. " Successful, was defined as the pilot surviving.

A group of kindred souls began to take shape. One was a young championship sailor and engineer, Casey Baldwin. Another was an early assistant in the kite flying days. Third was twenty five

year old Lt. Thomas Selfridge, a graduate of West Ploint who had set his sights on aviation instead of artillery.

An engine man was missing so the call, " Come fly with me?" went out to a man who, coincidentally, had once owned a bicycle shop, who was now in the motor business and had built engines for dirigible balloons. Glenn L. Curtiss was his name.

Thus, on October 1, 1907, the Aerial Experiment Association began its existence. The purpose was to develop a practical flying machine without restriction as to type of design. After working first cooperatively on a man carrying tetrahedral kite, each associate in turn, with the help of the others, should build a flying machine of his own design.

And it worked, as we shall see.

But the boy who had watched the birds, the man-child who flew the kites, and the inventor immersed in aviation did not go down in history for saying, " Come fly with me."

Nor was the location North Carolina or Ohio. Instead, it was in the bracing sea air and bright Autumn sunlight of Baddeck in the Province of Nova Scotia on Cape Breton Island.

And what this inventor was noted for saying - an utterance celebrated in book and film and TV commercial- was " Mr. Watson- Come here-I want to see you."

With that curve ball, or perhaps knuckle ball secure in the catcher's glove, I apologize to those who thought that they were going to hear about airplanes and flying as the main topic tonight, although that certainly is close to my heart.

Rather, in the Kit Kat cryptic title tradition, I have chosen a rather unique and relatively unkown aspect of a man to introduce him. Like most inventor/scientists, he was constantly saying " come fly with me", into the realm of the new, the innovative, the exiciting, the world of " what if".

Alexander Graham Bell AND his family present such a wealth of diversity and fascination to a biographer/essayist that it is hard to pick just one perspective for view. Obviously, much has been written about Bell and the telephone and there are aspects of that effort that fill books and papers that make up whole collections at places as diverse as the Smithsonian, the American Telegraph and Telephone Company, the American Academy of Arts and Sciences and the National Geographic Society.

Keeping in mind that the head can absorb what the seat can endure, I have chosen to look this evening at the Bell family and at Bell the man in an effort to understand HIM rather than his invention and also perhaps to find some central theme that seems to hum throughout most inventor/scientists.

It is the story of how a young man came to make a great invention

and in turn what that made of him.

It is also the story of how , troubled all his life by the timeless and universal human need to communicate, he met that need for himself and meanwhile threw the weight of his ability and eminence against the barriers of deafness and impaired speech that held millions apart from their fellow men.

The first Alexander Bell was born at St. Andrews, Scotland in 1790. He started life as a cobbler but at about age thirty, took to the stage where he performed comedy roles. Evidently success on that side of the footlights was not forthcoming because he wound up as a professional prompter.

From this he developed a fine speaking facility and an interest in enunciation. Theater earnings fell off and Bell began to give speech lessons to the children of St. Andrews better sort. He became the boarding English master at St. Andrews Grammar School and so now found himself conducting elocution lessons by day and tutoring in Dundee homes in the evenings. The correction of stammering particularly stirred his interest. He published books and articles that described his treatment for stammering which included , among other things, teaching how the vocal organs produced various sounds. (Do we see a glimmer of things to come two generations forward here ?)

Alexander Melville Bell, born in 1819 was one of three offspring of what one newspaper of the time called " the celebrated

professor of elocution, Alexander Bell." As a young man, Melville's health was fragile so the family sent him off to the new world, St. Johns , Newfoundland, where like a chip off the old block he participated in theatricals and treated faults of speech by the Bell method perfected by his father. His basic earning came from working as a shipping clerk.

The twenty three year old Melville rejoined his father back in Scotland in 1842 where he began a quarter century of original investigation into the workings of the vocal organs. His success in the treatment of speech problems grew, enabling him to marry and move into a well-to-do neighborhood where on March 3, 1847, Alexander, the second son of Melville and Eliza bell was born. The middle name "Graham" was adopted in his teens and is not a family name. To friends and family he was known as Aleck.

Melville's reputation and activities as an elocutionist grew and he became immersed in phonetics as well. In an 1849 book he suggested that it should be possible " to reconstruct our alphabet and furnish it with invariable marks for every appreciable variety of vocal and articulate sound with a natural analogy and consistency which would explain to the eye their organic relations." A number of years later he devised a solution to this problem by the invention of what was to become known as "Visible Speech". It consists of what look like hieroglyphics that tell the reader by symbols with anologies to the shape of the mouth, tongue movements and breath control, how to use his

vocal organs in order to produce the sound exactly , even if he had never heard it. "Visible Speech" was incorporated into Melville's teaching and his career and reputation continued to grow.

An interesting aside here is that Melville Bell and George Bernard Shaw were contemporaries and common townsmen both with serious interest in speech. I quote here from Shaw's preface to Pygmalion.

"The English have no respect for their language, and will not teach their children to speak it. They spell it so abominably that no man can teach himself what is sounds like. It is impossible for an Englishman to open his mouth wihout making some other Englishman hate or despise him. German and Spanish is accessible to foreigners: English is not accessible even to Englishmen. The reformer England needs today is an energetic phonetic enthusiast: that is why I have made such a one the hero of a popular play. There have been many heroes of that kind crying in the wilderness for many years past. When I became interested in the subject towards the end of the eighteen-seventies, the illustrious Alexander Melville Bell, the inventor of Visible Speech ---was one of them"

Melville's interests in speech and sound continued to expand and soon he and son Aleck were working together as teachers and researchers. They called on Sir Charles Wheatstone whose fame resided in his work with electicity but the Bell interest had to

Demos Examples Aleck and brothers

do with Wheatstone's studies of the science of sound. They had come specifically to look at Wheatstone's improved model of Baron De Kemplelen's eighteenth century device for mechanical imitation of the human voice. (Keep in mind here that this excursion was headed up by Melville Bell and the issue at hand is elocution , not the transmission of the human voice over distance. Never-the -less, we can certainly see the chain of events in motion.)

Upon his return to Scotland from this visit to Wheatstone Melville had given his son Aleck, and Aleck's brother the challenge to build a speaking machine of their own. The details of the resulting device include a gutta percha replica of the jaws,teeth and pharynx and nasal cavities. Aleck himself assembled an intricate mechanical soft palate. The best that all this produced was a breathy "mama" but we can sense the stirrings and the intense interest in speech reproduction that was being kindled.

Of further evidence is the fact that, with no earthly idea of its portents for the future, Melville had written in an 1863 publication about the " philosophical investigation of the faculty of speech , accoustic and articulation principles which might lead to mechanical inventions no less wonderful than those currently underway in optics."

In the meantime, Aleck enrolled at the University of Endinburgh and although some of his early notes survive, it is not known if

he even finished the term, ~~let alone complete a formal college education~~. We know he never graduates from college.

Concurrently, Bell became even more active as a teacher with his father Melville although he was becoming ~~more and more~~ increasingly interested in scientific advancements and continued to experiment in speech production. Perhaps a major breakthrough we can see in hindsight, was his effort to determine the precise pitch of certain vowels by sounding tuning forks before his open mouth while moving his tongue through the positions of the vowel scale. One of the positions would make the fork sound loudly because the resonance and the pitch the vowel made in that position was precisely that of the fork. This may have been the first step toward the invention of the telephone which has its foundation in resonance.

An important philosophical aspect which must be emphasized here and throughout our examination of this man is that what we are seeing is not an entrepreneuer/technologist looking for fame and fortune but an inquisitive, scientificly oriented person seeking knowledge and better understanding with the primary end to improve the lot of others rather than himself.

Back to resonance.As is often the case , other scientists were tilling the same fields. A German, Helmholz, had advanced synthesizing vowel sound by keeping tuning forks in continous vibration by means of electromagnets. Aleck knew of this and studied the work vigorously, soon discovering that he must master the basic principles of electricity if he was to progess.

At about age twenty, Aleck Bell, became a teacher at Somerset College in Bath, which was really a preparatory school for gentlemen's sons for the Army. While he was teaching Euclid and French, he laid in supplies to his study of glass bottles, acid, zinc, and copper to make electrical batteries and continue to educate himself in electromagnetics and circuits.

However, a new and what was to become an overwhelming deminsion grew in father Melville's thoughts -- the idea of teaching speech to deaf mutes using the vehicle of visible speech, and Aleck became keenly interested. Thus, in in May 1868 Alexander Graham Bell first tried his hand at teaching the deaf at a private school for deaf children in Edinburgh, an activity that remained at the core of his life from then on.

Later that year, Melville was invited to make a lecture tour in the United States. The fame of Visible Speech had preceeded him particularly among scholars, and President Thomas Hill of Harvard had learned the system from Bell's book. At a party given for him by Hill, Melville expounded on the system not only to James Russell Lowell and others of the intelligentsia, but also to a public spirited Cambridge lawyer named Gardiner Greene Hubbard.

Out of this social occasion came two significant events of great impact. One was the invitation to Melville to become a Lowell lecturer during the next season in the United States, and the

other was the intense interest evidenced by Gardiner Hubbard in Aleck's work with the deaf. Hubbard had a profound personal motivation in this not only because he was the philanthropic head of an establishment for the deaf and dumb at Northhampton but because one of his daughters, Mabel by name, had become sticken deaf by scarlet fever at age five.

Aleck, himself, was often in real or imagined poor health which manifested itself by headaches, sleeplessness and fatigue. Since his younger brother had recently died of tuberculosis, the parents decided to emigrate to the healthy and stimulating climes of America. The family set sail on July 21,1870 for Montreal and by August had purchased a comfortable house on ten acres just outside the small town of Brantford, Ontario.

Soon, Melville was off lecturing in Canada and the United States on another series of Lowell lectures. One of the patrons of these lectures, a Bostonian, Sarah Fuller, at the request of the board of education had organized a public day school for deaf children, The Boston School for Deaf Mutes, later renamed the Horace Mann School. Miss Fuller had learned about Visible Speech from earlier contacts with Melville Bell and proposed that he teach it at the school. Not wishing to be tied down, he suggested young Aleck and in April 1871, the young man accepted an appointment to initiate Visible Speech at the Boston School,as well as similar assignments at other New England schools for the deaf.

Before the sun had time to set on his arrival in Boston, Bell was

tapping the area's reservoirs of knowledge including the Massachusetts Institute of Technology which he found owned a complete set of Helmholz's apparatus. He soon made friends with some of the science faculty where discussions often turned to the reproduction of speech.

Much of this was put aside, however, as Aleck's teaching became more demanding. The governing board is reported to be astonished at the rapid progress made by his students and consultations and additional teaching followed at Northampton and Hartford with similar success and tremendous personal satisfaction. From then until the day of his own death , he thought of himself above all else as a teacher of the deaf.

After a leave of absence of about six months to recover from fatigue, Bell returned to the Boston school in the Spring and again came in close contact with its President, Gardiner Greene Hubbard.

A word here about Gardiner Hubbard is appropriate for future reference because although the sole content of the relationship at this point in time was work with the deaf, what neither knew was that a momentous event had just occurred. The fledgling scientist/inventor had just met his venture capitalist and the world would never again be the same.

Hubbard's American ancestry reached back to 1635 when his

maternal grandfather came to the United States from Ireland bringing with him a comfortable fortune which grew to be one of the greatest in Boston. Hubbard was a Dartmouth graduate and a well know Boston lawyer who, like Bell, had a concern for the welfare of others and acted on it with uncommon enthusiasm. Like Bell, he also had a talent for communicating this enthusiasm. In short, he was a promoter who among other things organized the first street railway system outside New York and was an organizer of the Cambridge Gas Light Company. He did considerable work in patent cases and had a special interest in things mechanical and electrical, particularly telegraphy.As mentioned previously, his young daughter Mabel, had become permanently deaf as a result of scarlet fever at age five and Hubbard never ceased searching for better ways of teaching the deaf. Of course, a serious problem that usually accompanied deafness occuring this early in life was severe speech impairment.It was this common interest in the deaf and the emergence of Aleck Bell as the preeminent teacher of the deaf that formed the chain of events that brought together this tall, thin, bearded Yankee and the black haired young Scotsman.

Aleck's reputation flourished and he came to have a formidable impact on the education of deaf, extending well into the midwest.

We turn now to the telephone-- but not to a recitation of the trials and errors, the pitfalls and progress, nor the mechanism itself but to an understanding of the environment that was so necessary for such a breakthrough to take place.

Since the mid-forties when it passed Philadelphia, Boston had been the nation's leading scientific center, capped in 1865 by the opening of MIT. It led also in the making of scientific electric appartus. New England was the heart of American industry and thus Boston had plenty of skilled artisans, inventors, electricians, machinists, engineers -- the technological elite of the nation. Private machine and electrical shops sprang up to do contract work for inventors and experimenters. It was here that a young countrified telegrapher came to become a free lance inventor working on the multiple telegraph. Tom Edison was his name and he and Bell often found themselves working in more or less friendly competition although it does not appear that they were even close acquaintances.

Throughout Bell's contacts with Hubbard and others in the power structure, all coming out of his work with the deaf, he had access and introduction to scientists and laboratories and he took advantage of these opportunies.

As we have heard, it was also good times for venture capitalists and thus money was available. This was particularly the case with Bell and Hubbard with Bell now tutoring Mabel Hubbard.

On a more personal level, Bell had the legitimacy of a professorship at the School of Oratory at Boston College and was lecturing steadily to such august groups as MIT's Society of Arts and Sciences,even though he himself was not a college graduate.

He was a bachelor and thus was free to turn his study into a laboratory and to work on experiments at whatever time suited him, often all night long. All his life Bell was essentially a night person who did his best work when others were asleep and these working until the wee hours made him a notoriously oversleeper, claiming that early morning sunlight hurt his eyes to the point of severe headaches.

Back to Gardiner Hubbard. Hubbard had been intensely interested in commercial telegraphy, particularly hoping to find a way to break the lock that Western Union held on the business. He hoped to do this by finding a device to reduce costs through increased volume of messages through a common line. Bell had, ~~of course,~~ worked on and off in telegraphy and Hubbard picked up on this interest quickly and strongly encouraged him to concentrate his work on telegraph technology. In fact he offered to help him financially in return for a share in the patent rights..Later, George Sanders, Hubbard's attorney provided additional financing.

On February 27,1875, Bell, Hubbard and Sanders put into writing their oral agreement to share equally in Bell's telegraphic inventions including," any further improvements he may make in perfecting said inventions" -- a very key and shrewd phrase well known to venture capitalists today. Should the inventions prove valuable, a company was to be organized to control the patents, each of the partners to get one third of the stock. What God had wrought here, in this simple agreement, begat what eventually became the largest single business enterprise in the history

mankind, which man has so recently put assunder.

The telegraph work did not go particularly well,however, and Bell grew frustrated pretty much losing his zeal for the chase. As we have said, he was not a great one for sticking to one idea (excepting for his work with the deaf) for very long periods of time.

Actually, his mind was still full of thoughts about the electrical transmission of speech. These experiments he continued and on a hot night in June 1875 he and his assistant Tom Watson put together an experiment that successfully transmitted recognizable sound by exciting reeds in a receiving gadget that had been generated by a sound induced feeble electrical current exciting electromagnets. This is really the birth of the telephone from a technological standpoint although there was much work to be done to get to an instrument that would transmit speech in any commercialll y usuable fashion.

As stated at the beginning of this paper, the purpose here is not to discuss the invention, but suffice it to say that some setbacks occured when his venture capitalist Hubbard insisted he stick to his telegraph experiments.

Ultimately, however, a patent application on Bell's multiple telegraph was filed on February 25,1875, two days after a patent on a similar device developed by a young Chicagoan, Elisha Gray,

who in 1872 had a small company that was to become Western Electric.The Bell patent was held to be an interference and was disallowed.

Gardiner Hubbard had known for some time that Gray had been preparing and filing a number of claims surrounding telephony in general and on February 14, without Bell's knowledge, Hubbard had gone ahead and filed Bell's patent on the undulatory current telephone. Later, THE SAME DAY, Gray's attorney entered an application on a speaking telephone based on the liquid variable resistance principle.

Here we have one of those unique but not altogether uncommon occasions in the history of science where two or more men have arrived at the same fundamental concept at the same time while working independently.

Citizenship 1874

In this case, Alexander Graham Bell won out and on March 7, 1876 United States Patent No.174,465 was officially issued. It was titled," Improvement in Telegraphy" and dealt mainly with a harmonic multiple telegraph but went on to describe a " magneto-electric telephone".

Experiments had continued apace and that famous line to Tom Watson was uttered three days later on March 10,1876.

In the ensuing two years , Bell lectured and demonstrated throughout the United States, Canada and Europe as well as

working with Tom Watson on improvements. The lectures and demonstrations met with thunderous enthusiasms and accolades in the press.

On July 9,1877 the Bell Telephone Company was formed by Hubbard, Sanders, Watson and Bell as a voluntary association without capitalization.

A month later, Aleck married Mabel Gardiner whom he had been romancing almost from the time he began as her tutor.

On Auguest 1, the first shareholders meeting of the Bell Telephone Company was held and Hubbard enthusiastically reported that there were over 600 telephones in service without a failure or complaint. Hubbard and a brother, with Sanders and Watson elected themselves to the board of managers and chose Sanders as Treasurer. Watson became superintendent of manufacturing and Bell was appointed " electrician", what would pass today as director of research and development.Interestingly, the concept of leasing the equipment came very early, rather than just selling the equipment.Licensing was also used.

Bell was not a businessman and had no interest in becoming one. "Business," Bell wrote Gardiner Hubbard in the fall of 1877, " is hateful to me at times and it would fetter my life as an inventor." Hubbard became his financial advisor and also the sole trustee to his telephone rights in Europe. Bell also transferred

virtually all of his stock to Mabel after making some gifts to his own family members.

In fact the business was not an overnight success and late in January 1879 the Bell Telephone Company was nearly bankrupt. It escaped that fate only through merger with a financially stronger New England Telephone Company with the new name of the National Bell Telephone Company.

Aleck Bell and Gardiner Hubbard pretty much passed from direct activity in the company now, not even being corporate directors any longer. As a result of dilution during the merger, the Bells wound up with about one seventh of the ownership shares instead of their former one third. However, the market value of their holdings had increased from $ 50,000 to over $ 70,000. From June to November the stock rose from $110 a share to over $1000, during which time they sold blocks here and there. In 1880 the National Telephone Company was reorganized into the American Bell Telephone Company. Although he continued to dispose of his stock from time to time, the value of the remaining shares continued to rise. By prudent and conservative investments of his gains, Bell was now a millionaire and with this, his fortune seems to have reached a plateau.

The Bells usually spent all their income and sometimes more. The spending was lavish for the times but not wasteful. Over a period of forty years Bell spent nearly a million dollars on non-paying research and experiments. His contributions to the welfare of

deaf persons totalled nearly $ 500,000. They had an elegant home in Washington and summered in Brattleboro. Heat made him headachy and miserable so they were always seeking out cool spots to spend summers. This lead to Cape Breton in 1886 where he accumulated all the acreage on a significant headland near Baddeck where he built a substantial lodge which is still in the family today. There were numerous outbuildings which held laboratories, kite building sheds and the necessary facilities for various kinds of domentic animals. He named his estate Beinn Bhreagh (ben vree) which means "beautiful mountain" in Gaelic. The times at Beinn Bhreagh were not only dleightful in themsleves but a very necessary respite from the many distasteful defenses he was forced to make on the telephone patents. Over the decade or so following the granting of the basic patents there were some 600 challenges, many of them accusing perjury, fraud, collusion and bribery but they were all decided in Bell's favor. One can imagine how anxious he was to get away to the "beautiful mountain".

Relationship with mother

The next few years were full of fame, fortune, fights to protect the patents and a very happy and congenial marriage. Wherever he went he continued to be active in working with the deaf and continued to experiment and invent. Helen Keller / Annie Sullivan

Although Alexander Graham Bell continued to be inexaustably curious, the early telephone ws about the only major success. He did some additional work on the telegraph and phonograph plus

some improvements on the telephone.

At Baddeck he was constantly at work on the previously mentioned kites and airplane, tetrahedral building shapes (predating Buckminster Fuller by many years), hydrofoils, some genetic work on multiple births in sheep, and the study of heredity as a factor in deafness.

He was extremely active at the Smithsonian and National Geographic Society and Bell's daughter Daisy married young Gilbert Grosvener who was to become one of the most successful managing editors in the twentieth century.

He was above all a family man and in the marvelously done Alexander Graham Bell Museum operated by the Canadian Government at Baddeck we see many photographs of Bell romping with grandchildren-- a Santa Claus looking fellow, portly with white beard,belted coat, shirt, tie and tweed plus fours.

So what was this man? An inventor? Certainly -- but not on a par with peers such as Edison. An entrepreneuer? Not really by choice. Hard driver? No, his major failing was an inability to stick to projects. Of service to mankind? Most assuredly, perhaps more because of his work with the deaf then just the telephone, but we have seen that one was the outcome of the other. Intellectually curious? My,yes! The list goes from communications, to genetics in sheep to hydrofoils, selenium, air conditioning, conservation of waste heat from stoves, storing

solar heat in fluids for circulation, condensing drinking water from sea water, kites, aeronautics, a vacuum jacket that was a precursor to the iron lung, an invention he worked on growing out of the death of one of his children due to lung disease that restricted his breathing -- the list is almost endless.

Kept volumnious NOTES AND RECORDS

He never consented to an autobiography saying that he " preferred a post mortem to a vivasection without anesthetic". He received numerous honorary degrees plus the Thomas Alva Edison medal from the American Institute of Electrical and Electronic Engineers. He was an early leader in the women's and universal suffrage movements and the first Montessori class in Canada was held at Beinn Breagh. He travelled extensively with Mabel throughout Europe, South America and the Far East late in his years. He was awarded the Volta Prize from the Government of France and used the $10,000 to establish the Volta Laboratory which developed a commercially successful improved cylinder for Edison's dictating machine which Bell called the graphaphone. Ultimately , he sold his shares in the Volta Graphaphone company for $100,000 and put it into a foundation for research relating to the deaf. This fund eventually financed the establishment of the Volta Bureau which is the center of information regarding the deaf in the United States as well as housing the offices and library of the American Association for the Promotion of Teaching Speech to the Deaf.

He experimented with x-rays and in 1897 used x-rays to locate metal in a human body.

Bell was called in by the physicians treating President Garfield to explore the possibility of locating the asassin's bullet in Garfield's body, as outgrowth of previous work he had done with a device to cancel out the interference of induction on a telephone line.Unfortunately, the slug was buried too deep and on Deptember 19 the President died from infection probably from the unwashed fingers of the surgeons who had been probing manually for the bullet. The idea did not die however, and Bell's "telephone needle probe" began to be used where x-rays were not available. As an outgrowth of this, the University of Heidelberg awarded him an honorary degree in medicine for his contribution to surgery.

We do need to get back to flying now in order to maintain some semblance to my title, and perhaps a good way to do this is just to cite some of the milestones in Bell's activities in aeronautics to understand that this was not just idle curiosity nor the work of a dilettante.

December 1891-- Bell began experiments on propellers driven from their tips by rockets or jets of steam.

January 1892- He wrote an article called "Flying Machines of the Future" describing passenger carrying flying machines capable of flying long distances.

July 1893- Bell started experiments with rocket powered gliders.

August 1893 - Bell began experiments on propellor design looking specifically on thrust and efficiency.

November 1894 - He began work on lifting properties of different airfoils and wing design.

May 1899 - He constructed experiments with laminated wood propellers of different blade angles and thicknesses.

August 1899 - Work on center of gravity and its affect on balance and stability in flight.

March 1902 - Bell developed the tetrahedral cell to solve the structural weakness in the rectangular elements of a box kite.

December 1905 - The 1300 celled tetrahedral kite "Frost King" was flown and supported one of his assistants on a rope.

October 1907 - The Aerial Experiment Association was formed.

December 1907 - The Cygnet, a kite made of 3393 tetrahedral cells was flown to a height of 51 meters with Thomas Selfridge inside.

March 1907 - The Red Wing, basically a bi-wing glider with a rudder, elevator and push-pull propeller flew for 97 meters with Casey Baldwin as aviator.This was the first powered flight by a Canadian.

May 1908 - The White Wing with such innovations as a lighter propeller, ailerons and a steerable tricycle landing gear was flown. (Bell filed and received a patent on the hinged aileron although the French were actually slightly ahead in practice, a fact apparently unknown to Bell.)

May 1908- Thomas Selfridge made two flights in the White Wing, becoming the first member of the U. S. Army to fly an airplane.

July 1908 - The June Bug, a newly constructed craft flew 1553 meters under the pilotage of Glen Curtiss winning the Scientific American Cup for the first manned flight over one mile.

September 1908- Thomas Selfrdige died from head injuries received in the crash of a Wright Brothers airplane at Fort Meyer, Virginia becoming perhaps the first aircraft passenger fatality. Orville Wright, the pilot, received two broken ribs and a broken leg.

March 1909 - The A.E.A. held its last meeting in the hall of

Beinn Bhreagh. The last action, directed to Mabel Bell, was a vote of " high appreciation of her loving and sympathetic devotion without which the work of the association would have have come to nought." It was been a $20,000 gift from her that financed this effort

A fitting closing quote typifying the man Bell, comes from a commencement address he made to the Friends School in Washington in 1914.

" We are all toomuch inclined, I think, to walk through life with our eyes shut. There are things all around us, and right at our

very feet, that we have never seen: because we have never really looked. Don't keep forever on the public road, going only where others have gone and following one after the other like a flock of sheep. Leave the beaten track occasionally and dive into the woods. Every time you do so you will be certain to find something you have never seen before. Of course it will be a little thing, but do not ignore it; one discovery will lead to another, and before you know it you will have something worth thinking about to occupy your mind. All really big discoveries are the results of ---(this)"

On August 2,1922, suffering from diabetes and complications he passed away peacefully at his beloved Beinn Breagh, his hand holding Mabel's, still weakly pressing out the hand messages of the deaf.Both he and Mabel rest in peace here on the "beautiful mountain."

I would like to particularly acknowledge the information and help given me in the preparation of this paper by Mr. J. W. Stevens, Superintendent of the Alexander Graham Bell National Historic Park in Baddeck, Nova Scotia; the permitted use of details from a paper written by Dr. D. F. Arseneau of the Alexander Grahan Bell Institute at the College of Cape Breton that was given at the 1982 annual meeting of the American Association for the Advancement of Science, and particularly a fascinating book written by Dr. Robert V. Bruce of Boston University entitled,"BELL,Alexander Graham Bell and the Conquest of

Solitude", Little, Brown and Company 1973.

I would also like to mention that the idea for this paper came about during a trip flying my own airplane to Cape Breton in September 1984 and the excitement I found, as a pilot, in discovering this unusual and little known aspect of Alexander Graham Bell.

John N. Holscher
The KIT-KAT Club
Columbus, Ohio
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