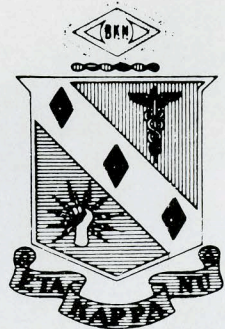


BRIDGE

Eta Kappa Nu



An Educational Journal



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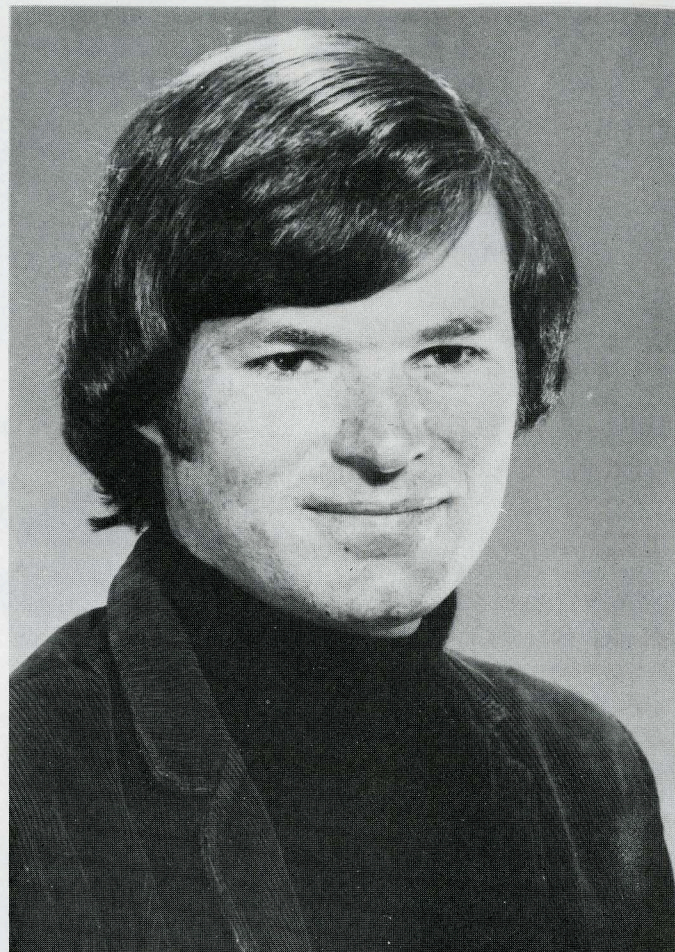
August 1987
Volume 83 No. 4

FRONT COVER: The Campanile at the entrance to Mooseheart introduces our special new series of articles. pg. 10

The BRIDGE is published by the Eta Kappa Nu Association, an electrical engineering honor society. Eta Kappa Nu was founded at the University of Illinois, Urbana, October 28, 1904, that those in the profession of electrical engineering, who, by their attainments in college or in practice, have manifested a deep interest and marked ability in their chosen life work, may be brought into closer union so as to foster a spirit of liberal culture in the engineering colleges and to mark in an outstanding manner those who, as students in electrical engineering, have conferred honor on their Alma Maters by distinguished scholarship activities, leadership and exemplary character and to help these students progress by association with alumni who have attained prominence.

The BRIDGE is published four times annually — November, February, May, August — and is published by Eta Kappa Nu, Haywood Printing Company, 5th & Ferry Sts., Lafayette, Indiana. Second class postage paid at Champaign, Illinois and additional mailing office. Eta Kappa Nu Association. Subscription price: three years, \$7.50; Life Subscription, \$30.

Address editorial and subscription correspondence and changes of address to: BRIDGE of Eta Kappa Nu, P.O. Box 2203, Station A, Champaign, Illinois 61820.



Arthur Newton Winner

the Outstanding Young E.E. Professor Award

by William Johnson

The 1986 winner of the prestigious C. Holmes MacDonald Outstanding Teaching Award for Young Electrical Engineering Professors may also be the most widely recognized researcher in a rapidly advancing field of electrical engineering to be so honored for many years. Dr. A. Richard Newton of the University of California at Berkeley, in the words of his department chairman, "is the major reason we can boast of the finest teaching program in CAD in the world." Although his insight, coupled with a deep theoretical understanding and broad practical experience, has influenced the developmental philosophy of many corporations, he "is first and foremost a teacher" fully worthy of this award.

Dr. Newton's technical presentations are invariably outstanding, whether to an undergraduate class, a graduate seminar, or an industrial symposium. A dynamic and compelling speaker, he diligently prepares for each lecture, providing handouts of each slide and comprehensive printed notes, freeing students for full concentration on the subject matter. He instinctively knows when to slow down, when to re-emphasize, and when to use a new approach. Although his courses are always challenging, they are uniformly popular, such that three recent undergraduate presidents of Mu chapter (at UCB) rate him as "the best teacher I ever had." These three also praise the advice and support Dr. Newton gave HKN during their tenures in office.

Originally from "down under", Dr. Newton had two degrees from the University of Melbourne where he won the Dixon Scholarship as the top engineering student, before coming to UCB where he earned his PhD in 1978. Joining the faculty there in 1979, he advanced to full professor in May, 1985, an outstanding tribute to his teaching ability and value to the university and a record in the department.

Dr. Newton has been especially vigorous in introducing new mate-

rial into his courses in fast-changing fields, so that some are probably the most advanced in the world in their content. Thus, many of his students on graduation are prepared to move immediately to the forefront of leading-edge research. Similarly, his better undergraduates are so imbued with research interests that they qualify for front-line projects for graduate study. In a graduate-oriented department, this genuine effort to draw juniors and seniors into the research mainstream is indeed noteworthy. Currently Dr. Newton supervises fifteen graduate investigations.

A world-class authority on computer-aided-design of large scale integrated circuits (CAD-LSI), Dr. Newton has influenced the direction of developments by many industrial laboratories. Intel, Digital, and the like constantly seek his advice, respecting not only his scientific knowledge, but his technical vision and grasp of the significance of technological advancements, skills usually associated with an IBM or Bell Labs executive. Dr. Newton has authored or co-authored over fifty technical papers, mostly in the fields of mixed mode simulation, synthesis, and data base management systems for VLSI design. In 1983 he received the "Best Paper Award" for his presentation to the Ninth European Solid States Conference in Lausanne, Switzerland, on "Design Work Stations". More recent publications have described hardware accelerators and parallel machines. He is presently a "Distinguished Lecturer" for the IEEE Circuits and Systems Society and has spoken in Australia, Italy, Japan, and Switzerland, as well as the principal cities in the U.S. He has also contributed chapters in three text books.

In his six years at UCB, Dr. Newton has been instrumental in attracting over eight million dollars worth of industrial grants of apparatus and project funds to his department. He has consulted for Intel, Digital, GE, SDA, Tektronics, Hewlett-Packard, Xerox, Micro-linear, Silicon Systems, and others and serves as a director of two

Honorable Mention awarded to Lex A. Akers

corporations. In IEEE he is associate editor of the Transactions on CAD and serves on the ADCOM of the Circuits and Systems Society, frequently organizing workshops for the CAD Committee.

As is the duty of every responsible engineer, Dr. Newton contributes to his community, whether it be in talks to his local high school seniors, assistance to the Society of Women Engineers, or in establishing a laboratory in the third world (India). He has spent time with the natives of rural New Zealand and India doing anthropological research. In fact, a 1985 book on "Justice in an Indian Village" published by UC press was dedicated to him by author E. Moore. His striking slide presentations on these topics, together with his mountain climbing narratives, have made him a popular lecturer to less technical campus groups.

Dr. Newton's nomination by Mu Chapter was submitted by its president, Suzanne Chu. Very strong endorsements were furnished by two former Mu Chapter presidents, department chairman Dr. Eugene Wong, three teaching colleagues at UCB, two professors from other universities, and three engineers from industry who had been his former students. After preliminary screening by the Philadelphia Alumni Chapter, which initiated and administers this award, final selection was made by a National Jury of prominent educators and engineers. Their choice of Dr. Newton continues HKN's tradition of recognizing a truly talented and dedicated young teacher. Dr. Richard Newton thus joins the elite list of professors who have honored our profession.

Lex A. Akers

Honorable Mention



Each year our National Jury is impressed by the general excellence of all the finalist candidates whose dossiers were submitted for their consideration. There can be only one winner, but the Jury is permitted to cite one or more superior nominees whose credentials appear so outstanding that they might have won in less severe competition. Dr. Lex A. Akers of Arizona State University in Tempe was such a candidate in 1986.

Dr. Akers received his three degrees from Texas Tech University in Lubbock and taught from 1976 to 1980 at the University of Nebraska at Lincoln. Since August, 1980, he has been at ASU, becoming a full professor in May, 1985. He has been advisor to both HKN and IEEE student chapters, and is a senior member of IEEE, having chaired the local Waves and Device Group.

Always quick to recognize the need for a new course, Dr. Akers

starts from scratch in preparing scopes and text material and in acquiring laboratory apparatus. Noteworthy are the microprocessor course at UNL and the VSLI course at ASU, both of which were innovations that immediately became very popular. He was a pioneer in establishing and teaching in a Phoenix PBS continuing education network which has grown to four campus studios which are now broadcasting all day. Internationally, he has participated in three advanced NATO Study Institutes in Europe and has lectured in China, Japan, and Ireland.

At ASU Dr. Akers has always received top evaluations from his students. He teaches a full range of courses in the solid state area. For the VLSI design course he obtained rights to a code still under development and then negotiated the donation of computer facilities to run it. Thus his students do design comparable with a future

generation of industrial products. His office door is always open for impromptu student counselling, an important adjunct to his superior lecturing techniques and his dedication and commitment to student success.

Most of Dr. Akers' over forty published papers are in the field of small geometry MOSFETs, where he has contributed significantly to the understanding of their behavior. He currently supervises ten graduate students, all of whom benefit from his many industrial contacts, such as Motorola, Rockwell, JPL, Hewlett-Packard and SRI.

Dr. Akers' nomination was submitted by an ASU colleague, Dr. Irving Kaufman, and endorsed by his department chairmen at ASU, UNL, and Texas Tech and four engineers from industry who had been his students. Eta Kappa Nu is happy that the National Jury saw fit to single out this most deserving young EE professor for special distinction.



HOLMES MacDONALD OUTSTANDING TEACHING AWARD

The C. Holmes MacDonald Outstanding Teaching Award for 1986 was presented to Dr. Arthur Richard Newton of the University of California, Berkeley at the Mu Chapter Fall Initiation Banquet on Friday, October 24, 1986 at Le Bouc Restaurant in Alameda.

The award is presented annually and is administered by Philadelphia Alumni Chapter. It consists of an engraved pewter plate, an engrossed certificate, and an honorarium. The presentation was made by George Balderston, Past International Director, representing International Headquarters and the Philadelphia Alumni Chapter. Left to right, Mrs. Balderston, George Balderston, Professor Newton.

TWELVE THINGS TO REMEMBER

1. The value of time.
2. The success of perseverance.
3. The pleasure of working.
4. The dignity of simplicity.
5. The worth of character.
6. The power of kindness.
7. The influence of example.
8. The obligation of duty.
9. The wisdom of economy.
10. The virtue of patience.
11. The improvement of talent.
12. The joy of originating.

The eminent Irish composer, Victor Herbert, was fond of telling the story about the two little girls he met while visiting Galway. There they were, as alike as a pair of ears, standing in front of a small house, hand in hand. He was immediately taken with the children, and he asked their names.

"I'm Patricia, she's Rosemary," said one.

"You're twins, aren't you?" he asked.

"No sir," they replied.
"But aren't you sisters?"

"Yes."

"Well, how old are you?"

"We're both six."

"In that case," he laughed, "if you're both six and you're sisters, you *must* be twins."

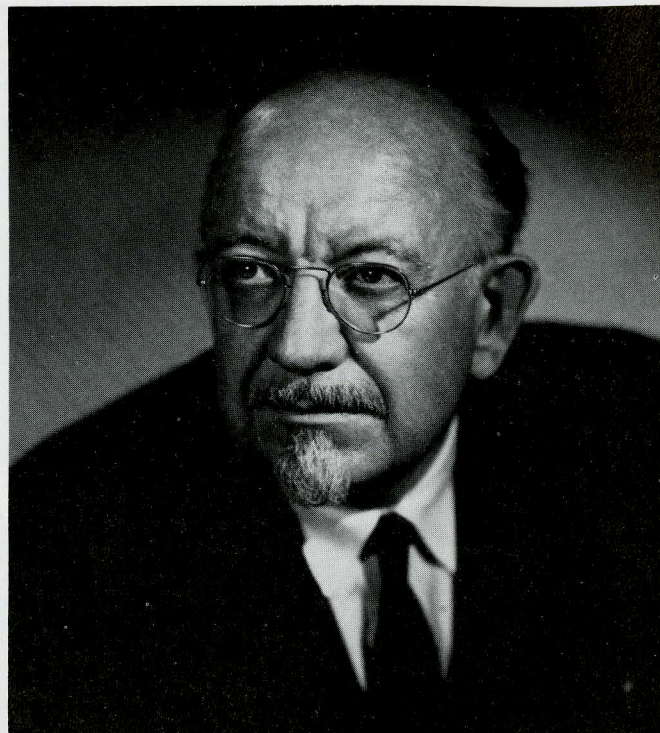
"No sir," explained one of them politely, "we're triplets. Maggie is in the house!"

When sending an address change be sure to send the old Zip Code.

and part of which I was

George H. Brown

Assistant BRIDGE Editor Dr. George H. Brown was formerly Executive Vice President for Research and Engineering of the entire RCA Corporation. He has received many honors including Eminent Membership in Eta Kappa Nu.



A LITTLE MORE ABOUT MARCONI

So much has been written of Guglielmo Marconi that it is difficult to produce a new and original script. I have been reading stories and books about the life and feats of Marconi for at least sixty years and I have observed that many of the authors have repeated the tales with little or no variation until repetition has placed the seal of authenticity on the printed word. A case in point relates to Marconi's first effort to obtain patent protection.

Guglielmo Marconi and his mama arrived in London in February, 1896, to promote his system of wireless telegraphy. Many historians, following each other's writings, have told how Marconi worked diligently for the next three months and was thus able to file the first application "Improvements in transmitting electrical impulses and signals and in apparatus therefor" on June 2, 1896, as Application No. 12039. Actually this was a provisional specification of his invention filed with the

British Patent Office in accordance with prevailing practice which allowed an inventor to file complete specifications within nine months of the initial filing. So he followed with a filing of complete specifications on March 2, 1897, and British Patent No. 12039 issued in July, 1897.

However, I have a copy of a document dated March 19, 1896, from Carpmael & Co., a London legal firm, advising Marconi that his provisional specification No. 5028, dated March 5, 1896, "Improvements in telegraphy and in apparatus therefor" had been accepted by the Comptroller of Patents. The question then arises as to the absence of a corresponding final patent. The answer lies in the following quotation from a book authored by A. A. Campbell Swinton*:-

During the last forty years I have been concerned in commercial development of many patented inventions. I believe I

was one of the first scientific men to be seen by Senatore Marconi when he first came to this country, and introduced him to Sir William (then Mr.) Preece, and to the General Post Office, of which Mr. Preece was then Chief Engineer. Senatore Marconi explained to me that if I would go to his rooms he would send signals, without wires, from the basement to the top of the house, or vice versa. I replied that I had previously seen Sir Oliver Lodge do the same thing from room to room, through several walls, at the Royal Institution, the only difference being that the transmission was horizontal instead of vertical. I asked Senatore Marconi whether he had patented his invention. He replied 'Yes'; but when the patent was published, its date was seen to be later than that of my interview with him. The explanation was that Senatore Marconi had afterwards consulted Graham, a well-known

The year 1986 has been good to Dr. George H. Brown, Assistant Editor of the BRIDGE. He was given the 1986 Engineering Achievement Award by the National Association of Broadcasters at the annual meeting in Dallas, Texas, on April 17. Two-thousand people were in attendance at the lunch where the presentation was made. Dr. Brown was cited for his leadership of the RCA team which developed our color-television system and for laying the technical foundations of modern broadcasting through his many inventions and his numerous publications which included his classic paper DIRECTIONS ANTENNAS published fifty years ago.

On November 21, Dr. Brown received the Armstrong Medal of the Radio Club of America at the annual dinner held at the New York Athletic Club in New York City. The Armstrong Medal was created in memory of Major Edwin Howard Armstrong, America's foremost inventor in the field of radio technology. The Radio Club of America, founded in 1909, is the world's oldest radio communication society. The award was given in recognition of Dr. Brown's distinguished career which included leadership in developing color-television broadcasting.

Editor's Note

patent expert of the day, who advised him that his patent was badly drawn, and that he, Senatore Marconi, had better begin all over again, which he did.

Over the years, skilled engineers have been bewildered by the incredible luck which followed Marconi in achieving success at the receiving station near St. Johns, Newfoundland, on December 12, 1901. At the time of the Marconi Centenary observances in England in 1974, an eminent engineer read an intriguing paper in which he revealed that, using present-day knowledge and computer techniques together with new measurements on old equipment, he deduced the signal strength received in Marconi's first transatlantic experiment and concluded that the famous "S" signal could not have been heard in Newfoundland by a margin of 20 decibels.

At approximately the same time, engineers at the Marconi Research Laboratory tested the Italian Navy coherer used at the time of the 1901 reception. They discovered that the oxide film on the drop of mercury in the coherer caused the device to act as a thin-film solid-state rectifier and that its performance was only seven decibels below that of a modern point-contact rectifier. So the discussion never ends.

On July 24, 1937, four days after the death of Senatore Marconi, I was occupied in the task of installing a directional antenna system for Radio Stations WSMB in New Orleans. I was sitting beside a road many miles from the transmitter with a pair of headphones and a radio receiver equipped for measuring the strength of the radio

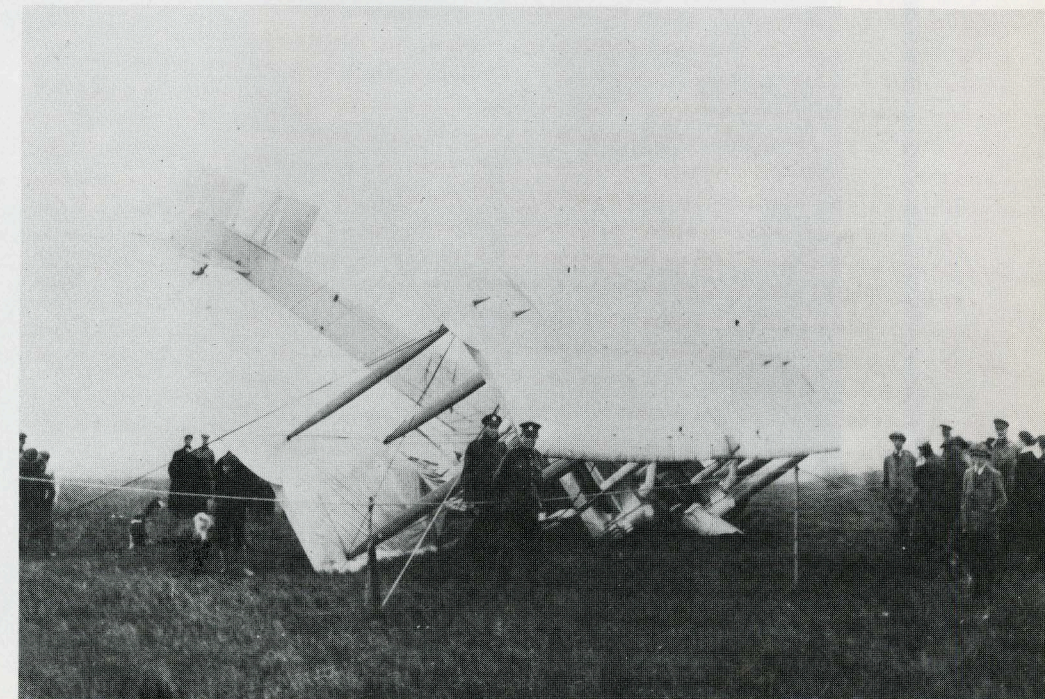
signal. Suddenly I heard an announcement of a program to be broadcast—The Human Side of Marconi—followed by voices of a number of my friends and professional associates. One of the speakers was H. E. Hallborg, at that time an engineer with RCA Communications. He related that in 1912 he was one of a group of American Marconi engineers sent to Ireland to study the huge Marconi transmitter near Clifden on the Connemara peninsula. Day after day while they were in the

Clifden station, they would see Mr. Marconi come to the station with mysterious packages under his arm. Sometimes these would prove to be a new form of spark gap or a jigger for receiving, and the next step would be to try his device in practice.

One cold rainy night, Mr. Marconi came in quite unexpectedly, having walked several miles from the railway station, but carrying the usual package—this time unusually large. Everyone eagerly watched the unwrapping. It was not a condenser this time or a new magnetic detector, but instead a dozen phonograph records.

"I thought you young men from the States might be rather lonely out here," said Mr. Marconi rather shyly, "so I brought you some graphophone records." → →

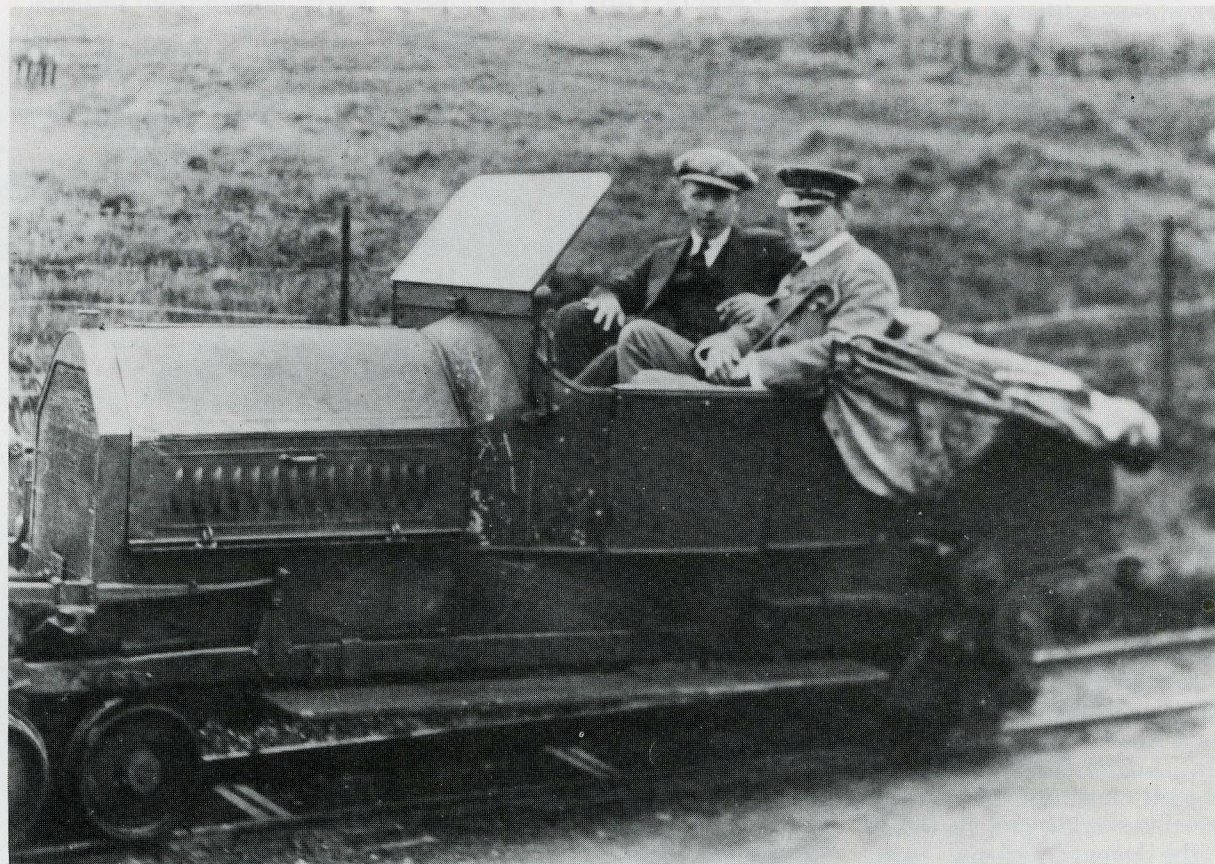
The Vickers Vimy biplane (now in the Science Museum, London) in which Alcock and Brown crash-landed near the Marconi wireless station at Clifden, Ireland.



So saying, he placed the first one on the machine and the homesick Americans thrilled to the strains of "Everybody's Doing It Now."

Seven years after Guglielmo Marconi trudged the dreary miles from Clifden railway station to the transmitter, Mr. John Alcock and Lieutenant Athur Whitten-Brown were the first men to fly non-stop across the Atlantic in a heavier-than-air machine. On their way to London, their Vickers Vimy bi-plane crashed in a bog in front of the Clifden station in County Galway. On that fateful day, June 15, 1919, the Marconi operators rescued Alcock and Brown from the wreck, served them tea, and sent the news to the outside world by Clifden's direct landline to Marconi's London office. The two heroes were then placed in a flange-wheel railcar for a trip

Alcock (left) and Whitten-Brown rather grimly contemplating the prospect of a trip in a railcar on the Marconi light railway which ran from a point on the main road across the peat bogs to the wireless station.



from the wireless station across the peat bogs toward Clifden. Apparently Senatore Marconi became weary of toting phonograph records across the bogs and had made railroad track available.

A few years ago, my wife and I, accompanied by two grandsons, set out to see what remained of the historic Clifden transmitting station. After much questioning in Clifden, we finally encountered one elderly citizen who was able to direct us south on the narrow coast road. About four miles from Clifden, we found the bog, unencumbered by signs except one which stated "ROAD NOT SUITABLE FOR MOTOR VEHICLES." Somewhat of an understatement for the two ruts plunged into a lake several feet in depth. In the distance, we spied one concrete tower base and a pile of rust which appeared to be the remains of an alternator. Closer to us was a vertical steel rail about three feet tall, the last remaining relic of the Marconi light railway.

On a nearby hillside stands a white stone in the general shape of an aircraft tail fin, erected by Aer

Lingus. This memorial points to a white cairn a mile away in the bog where the Alcock-Brown aircraft landed. In the town, another memory of the aviators stands as the Alcock and Brown Hotel. But not a sign to tell one of the fifteen years when the giant Marconi transmitter linked the British Isles with North America. Two photographs in my old copy of "The Principles of Electric Wave Telegraphy and Telephony" by J. A. Fleming show the huge engine and boiler house, the large condenser house, the giant antennas, and even a commodious residence for the operators. It is a shock to realize that only a concrete block, a steel rail, and a pile of rust remain.

My interest in Marconi's life and career persisted until finally my wife and I visited Bologna. As a first step, I walked past the Marescalchi Palace on Via IV Novembre where Marconi was born. Then we proceeded to the Villa Grifone which was his boyhood home and where he conducted his first experiments. While we were viewing the mausoleum at the foot of the hill near the road, a caretaker informed our taxi driver

Last remaining relic of the Marconi light railway.



that the house was undergoing repairs and visitors were not permitted to enter. The taxi driver did not know what to do with this information for he was no more able to speak English than was the caretaker. When I addressed the caretaker in her own language, she beamed at us and suggested that we drive to the top of the hill to visit the house and take coffee with her. This we did and we found the house being completely refurbished, with a large meeting room being prepared for technical conferences and a laboratory being re-established on the top floor. It is a magnificent building with high ceilings, marble floors, and huge fireplaces. The fields around, on a high plateau, fade off in the distance to a series of rolling hills, affording an excellent location for radio-propagation experiments.

A marble commemorative tablet on the front wall of the house, facing the village of Pontecchio, is inscribed:-

Onore al merito di Guglielmo Marconi il quale in questa casa facendo le prime prove ancora giovanetto col suo ingegno e collo studio evento il telegrafo senz filo nell'anno 1895 ammirato dall'Italia e dall'Europa.

That is to say, "Honor to the achievement of the young man who, making the first tests, in this house and inventing wireless tele-

graphy in 1895, is admired by Italy and Europe."

Apparently my unpublicized visits to Clifden and to Villa Grifone established me as a pseudo-authority on Marconi for I was invited to speak at the Marconi Centenary session at the annual meeting of the American Association for the Advancement of Science held in San Francisco during February, 1974. It was a fitting climax to my long time pursuit of lore concerning the Senatore. The speakers were introduced by Signore Egidio Ortona, the Italian Ambassador to the United States, and one of Marconi's daughters, Gioia Marconi Braga, was one of the speakers. When I learned of her participation from an advance program, I anticipated that this figure from the past was likely to appear in a wheelchair. To my surprise, she was a handsome and gracious lady, ten years my junior. The day was made memorable for me when we were invited to have dinner that evening at the home of Marconi's grandson, Dr. Francesco Paresce. During the course of the evening, Gioia made the wry comment that she found the aircraft beacon on a radio tower near her home to be very annoying as the red light flashed through her windows. I felt that she had little cause for complaint since her father had made radio towers possible.

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Interesting Places - Part 1

MOOSEHEART

by PAUL K. HUDSON
Editor — Bridge

It has been said many times in many places and it will remain true through all the years of forever, that we never stand so tall as when we stoop to help a child. Situated on approximately two square miles of rich farmland in the Fox River Valley of Illinois, 38 miles west of Chicago, is a magnificent institution built by

God with the help of the loving hearts and hands of the members of the Loyal Order of Moose. It is the Child City called Mooseheart. No people could ever have built anything so wonderful without Divine Inspiration.



LEFT—A Mooseheart Campus showplace depicts the "Old Country Store," well stocked with penny candy and patronized by kids of all ages.

BELOW—The winters at Mooseheart provide ample snow to make snowmobiling a most popular sport for both boys and girls. Supervised instructions are mandatory, safety is stressed and fun is had by all.

NEXT TWO PAGES—An aerial view of Mooseheart. Shown is the campus and lake adjoining the farm lands. Facilities serving the Child City consist of 38 residence halls, 10 educational facilities, 9 farm units, 19 employee residences and 17 support buildings—a total of 93 structures all located along more than 8 miles of paved roads.





The entrance requirement for Mooseheart is extremely severe. Most youngsters at the Child City lost one or both of his parents before he was eligible for admittance. However, Mooseheart should never be thought of as an orphanage for its facilities and program are far above the general understanding of that designation. It does not merely offer the minimum essentials of shelter care and then farm the children out for their education, health care and other needs. Mooseheart is a complete city within itself having its own schools, residence halls, stores, health center, church, fieldhouse, bank, dairy farm, recreational facilities, etc. It even generates and distributes its own electricity and has its own water system. The children at Mooseheart receive better care, education and upbringing than most of the children in the U.S. who live at home. There are 93 buildings in the Child City.

Of the 1200 acres of land, 290 are used for the

campus and park, and 23 for a lake. The rest is used for the dairy farm, pasture and tillable fields. Mooseheart also owns 100 acres of woodland near Mount Morris, Illinois, that is used for summer camping and recreation for the Mooseheart children.

Mooseheart is different from other Children's Homes in several ways:

1. If the father is dead and the mother is still living, she is invited to come with the children to Mooseheart and live there so that the family circle will not be completely torn to pieces with unnecessary trauma for the child and mother alike.

2. Because Mooseheart is not a public school, religious education is given to all the children. Also, because it is not operated by a church organization, there is no subtle direction of the children into one particular faith. The students attend services every Sunday and are trained in the faith which prevailed

BELOW—Children do not wear uniforms at Mooseheart and every student is urged to exercise his or her individual tastes when shopping at Mooseheart stores. Here, two high school girls look over a sweater at the girls clothing store.

TOP RIGHT—The Children's Cathedral at Mooseheart. It is believed to be the only major church in the world constructed primarily for children. Its Tower of Tolerance, rising high

above the treetops, is one of the landmarks in the surrounding Fox River Valley. The Protestant Chapel is located on the left and the Catholic Chapel on the right of the main Nave of the church.

BOTTOM RIGHT—Pennsylvania Hall was built with contributions from the Moose of Pennsylvania. This replica of Independence Hall in Philadelphia is one of the homes for high school boys. The various residences house from 12 to 28 students with a housemother in each residence.



in their original home. One class period is set aside each week for religious instruction. These classes are taught either by Catholic or Protestant Chaplains or by a qualified teacher designated by the Chaplains. Students of the Jewish faith, being few in number, continue their religious instructions at a Synagogue in the neighboring city of Aurora.

3. The educational goal of Mooseheart is to provide each student with at least a high school education and a trade in which they can support themselves after graduation. A student in the 7th, 8th and 9th grades spends three months in various exploratory vocational courses in order to determine which one holds the most interest for him or her. From the 10th grade on, students devote about one-half of each day to vocational training. They are certified in the trade upon graduation. Students who have the ability and desire to go to college are given special college preparatory courses and sent to college on scholarship.

4. Mooseheart established a Naval R.O.T.C. Program as an addition to its regular secondary education program. It is compulsory for every able-bodied high school student. Upon graduation every qualified student is eligible to receive a full scholarship at participating R.O.T.C. colleges and universities in addition to an appointment at the United States Naval Academy. Students not seeking a higher education may enter the Armed Forces and automatically qualify for the third degree rating level.

5. Every Mooseheart student is given the opportunity of learning to play a musical instrument, and to develop his singing voice. Private lessons start at the fifth grade. By the 9th grade they many join the Band or the String Chamber Orchestra. There are Protestant and Catholic Choirs and a Senior Chorus.

6. Mooseheart has a complete physical fitness program. In addition to a formal fitness training program from the 7th to the 12th grade, there are Varsity teams for interscholastic competition in football, basketball, track, volleyball and bowling. Approximately 95 percent of the junior and senior high students participate in these programs.

7. In 1960 a Drama Guild was established at Mooseheart. It is open to students of all ages. Each year several productions are performed, both comic and serious. Awards are made to the students who have made the greatest contribution.

8. A very intensive health program is provided by a Health Center staffed by resident doctors and dentists. Mooseheart has more than 300 children at the present time and has had over 10,000 during the years since it was built.

The huge sums of money needed to operate Mooseheart come from the 2,100 Moose Lodges and affiliate clubs. There are more than one million members. A part of each member's lodge dues is allocated to Mooseheart. In addition there is an endowment trust fund that rises by a substantial amount each year. If more fathers of young children realized what a marvelous insurance policy equivalent for his wife and children Mooseheart represents, there likely would be fifty million Moose members by now.

There is one minor but very charming aspect of the Mooseheart story. At nine o'clock in the evening, Central time, all activities in many Moose lodges cease for a brief moment. It is the hour when the little children at Mooseheart are kneeling by their beds and saying their prayers. The members and guests in the lodges stand, face in the direction of Mooseheart, fold their arms, bow their heads and recite in unison the following prayer: "Suffer the little children and let them come unto me. Forbid them not for of such is the Kingdom of Heaven. God bless Mooseheart. Amen."

TOP RIGHT—The Mooseheart library with its 40,000 volumes is one of the largest high school libraries in America. Supplying quality books was taken on as a continuing project by the Women of the Moose.

BOTTOM RIGHT—Color Guard Review, taking place in the Mooseheart football stadium. Naval R.O.T.C. is compulsory for every able-bodied high school student.



How Does the Optic Nerve Transmit a Picture?

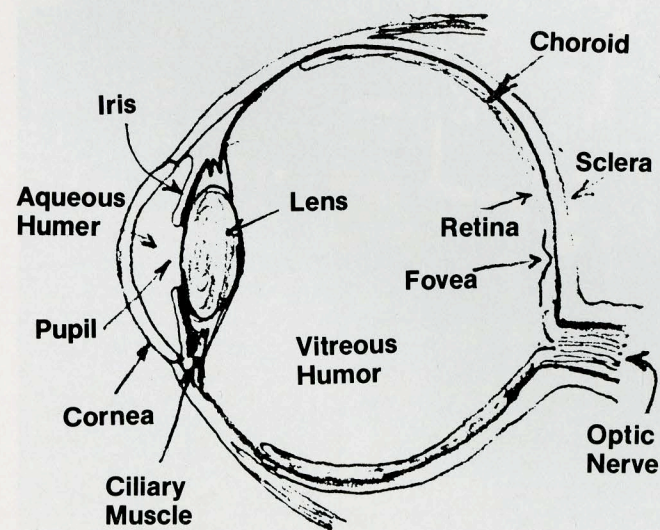
A Close Look at the Eye

by George J. Taylor

Preface I have devoted the better part of my life to eyes. People have eyes, and that's why I'm so fond of them—people. Eyes play a very important role in the lives of working men and women and in the education of students. Eyes are controlled by light in homes, factories and commercial establishments and are responsible for the overall economy and success of our great nation. (You better believe it!)

I've never lost my respect and enthusiasm for this vital organ in the human body. After ten years of retirement as a consultant, I'm still active in the science of seeing by participating in the greatest society (IESNA) in the country on a local, regional, national and international level. Recently I have given more thought and consideration to all this because of a delicate eye surgery I had in May 1984. So I have decided to condense a volume of information, for the benefit of my immediate family, on the importance of their eyes.

The Eye The structure of the eye is similar to and contains all the elements of a modern photographic camera—and more. However, the eye is spherical in shape and held together by the SCLERA, a tough outer coat that surrounds the entire eye, including



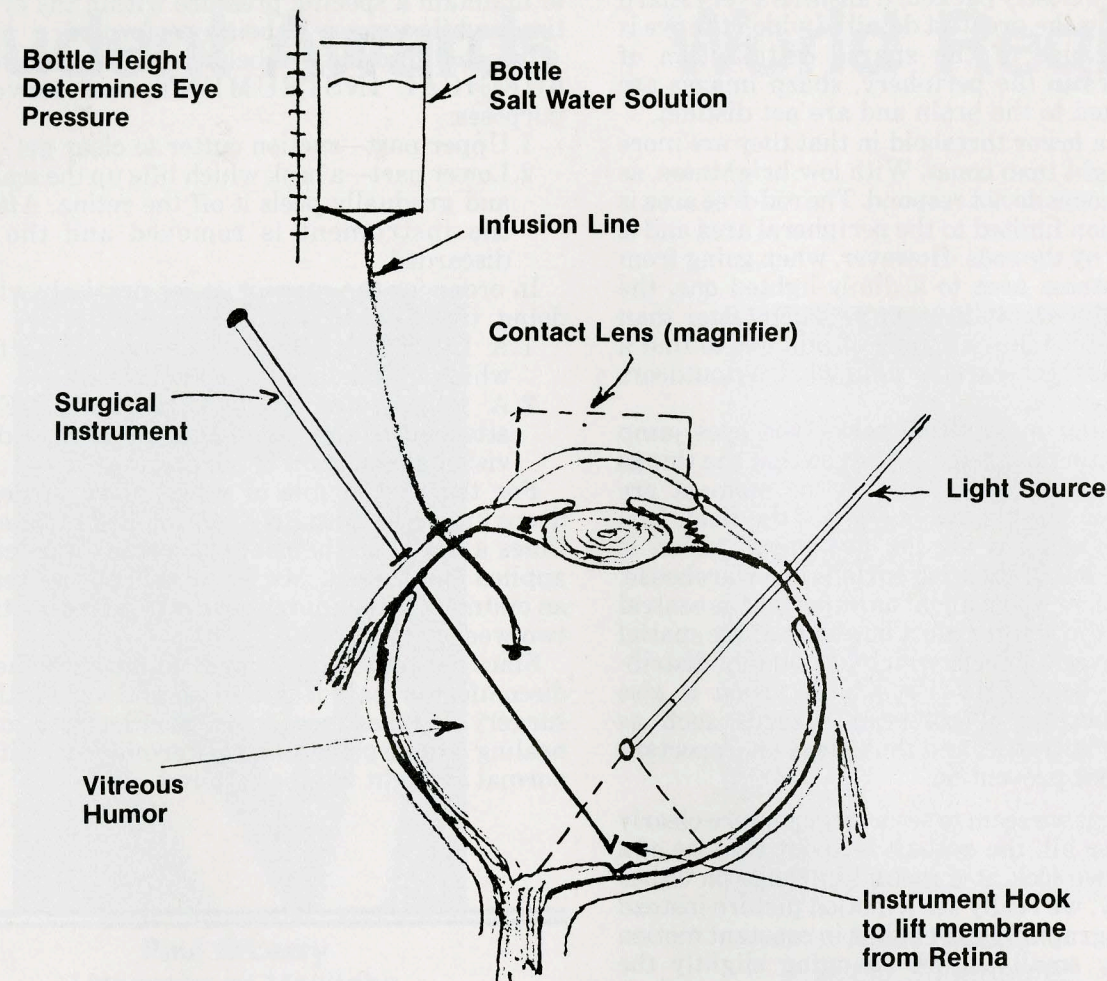
the CORNEA, which is the clear front covering of the eye. The interior of the eye is divided into two chambers, the small sections in front of the LENS which is filled with AQUEOUS HUMOR, a watery blend, and the large section behind the lens filled with VITREOUS HUMOR, a jelly-like fluid.

The IRIS is an opaque fibrous membrane lying over the front surface of the crystalline lens and carrying a centrally-placed circular aperture called the PUPIL. The iris has two opposed groups of muscle fibers which can produce changes in the size (diameter) of the pupil. The pupil is similar in its function to the aperture stops of the camera. The eyelids act like the shutter in a camera.

The CILIARY MUSCLE delicately controls the curvature of the lens so that the eye can focus accurately at one distance and then change its focus to another object at a different distance. The process of being able to change the focus of the eye is called "accommodation," and the pupil size (diameter) changes accordingly—smaller in size when reading a book requiring more concentration than when viewing a mountain in the distance.

The RETINA lines the inside "rear" of the eyeball and is composed of several layers of nerve tissue. When light reaches the retina, it passes through the entire thickness of tissue before reaching the light sensitive layer which lies near the sclera. The layer lying nearest the sclera is made up of "photoreceptors." This layer may be likened to a fine mosaic of minute photoreceptors which are connected to the brain through a complex system of OPTIC NERVES.

There are two types of photoreceptors—RODS and CONES. The concentration and arrangement of rods and cones varies over the retinal area. A small region at the rear center of the retina, known as the FOVEA, contains only cones. It appears as a small pit (head of a pin) in the retina. It is here that the concentration of cones of the minutest diameter exist—some 60,000,000 of them. Outside this rod-free area, rods and cones are mixed with the proportion of cones decreasing steadily toward the peripheral edge of the retina. There's something well over 100,000,000 rods alone in each eye. And, remember, the eye rods and cones connect with that complex system of the optic



nerves. Yet there are only 1,000,000 nerve fibers to deliver to the brain the information gathered by the optic nerve. What a stroke of luck for the brain!

How We See Before explaining this process, let's take a look at the development of vision since birth. Our first visual impressions took place while we were infants, before we organized our thinking or developed much analytical thinking. Simultaneously with these first impressions, we touch objects with our hands and gradually we learn that they are where our sense of touch or hearing tells us they are. Then the greatest achievement of seeing is accomplished. The sequence of these accomplishments is interesting.

1. At birth—no power of fusion
2. At 5 weeks—fixation of objects in the line of sight
3. At 6 months—binocular fixation and power of orientation acquired
4. At 6 years—age we begin a lifetime devoted to near vision
5. From there on—prevalence of eye defectiveness increases quite rapidly
 - a. at age 20-30—39% have defective vision
 - b. at age 40-50—71% have defective vision
 - c. over 60—95% have defective vision

The range of illumination over which the eye can see with reasonable comfort is enormous. The

average intensity of illumination at noon on a sunny day is nearly one million times greater than that given by the full moon. Still, one can see fairly well in either case. So the human eye can adapt itself to enormous differences in the intensity of illumination.

Isn't the eye really remarkable? And isn't it true that eyesight is our most priceless possession?—controlling 87% of our human bodily motions! Shouldn't we preserve the function of eyesight with good lighting at all times whether the task be in the kitchen or at a lathe in a machine shop?

As mentioned previously, the process of focusing the eye on an object is called accommodation. The lens is an elastic structure, its form and position being determined by the tension of the suspensory ligaments. During accommodation, the ciliary muscle contracts and relaxes the suspensory ligaments which allows the lens to assume a more spherical shape, thereby increasing its power in order to focus on near objects—such as threading a needle. When viewing distant objects, the ciliary muscle relaxes, resulting in less tension on the lens and causing it to become more flattened and with less power.

Central vision differs from peripheral vision in several respects. The fovea, where millions of tiny-

sized cones are closely packed, transmits a very sharp image showing the greatest detail of which the eye is capable. Because of the sparse distribution of photoreceptors in the periphery, sharp images are not transmitted to the brain and are not distinct.

Rods have a lower threshold in that they are more sensitive to light than cones. With low brightness, as at night, the cones do not respond. The rod-free area is blind and vision limited to the peripheral area and is done entirely by the rods. However, when going from a high brightness area to a dimly-lighted one, the cones respond to visibility ever so much faster than rods. Even so, it takes a couple of minutes to find a seat in a movie theater when coming in from outdoors on a bright day.

In performing most visual tasks, the eyes jump from one fixation point to another so that the things requiring most critical seeing at the moment are brought within the central portion of the field. In a task like threading a needle, peripheral vision is unimportant, but in stacking cartons in a warehouse, peripheral vision is just about as important as central vision. Here, the worker must be aware of the spatial relations between objects which are widely distributed in the visual field. Peripheral vision is also useful in detection of potential hazards such as driving a car in traffic, and thus plays an important role in accident prevention.

How is it that we seem to see a large picture clearly defined? After all, the eyeball is about the size of a marble. Yet we look at a mountain range on either side. Actually, we really see a motion picture instead of a set photograph. The eyeball is in constant motion through very small angles, changing slightly the direction of the line of vision about ten times a second. The result is on the same principal as the motion picture, but reversed; instead of seeing objects moving, we see them in different positions blended into a single picture. In other words, the comparatively large picture we see plainly is produced by seeing it in very small parts in such rapid succession that we are unconscious of the process. Each instantaneous picture image is shot to the brain by way of the optic nerve system. Thus, seeing is an act of the mind; it is the consciousness of our environment produced through the agency of light. So it might be said that it is the brain that "sees," not the eye.

Several years ago, I developed a growth in my right eye, on the RETINA over the FOVEA, known as a "Macular Pucker." It impaired my vision to the extent where I was unable to read a book when I closed my left eye. Nor could I distinguish who a person was standing directly in front of me. When driving a car, if I closed my left eye, I could see the roadway and lines on it but was unable to read signs such as STOP and SLOW.

The important part of this operation is to maintain a uniform pressure within the eye in the area where the VITREOUS HUMOR exists. This is done by means of a BOTTLE filled with a salt water solution and suspended above and near the eye. This solution is fed into the inner part of the eye through an INFUSION LINE and the bottle is raised or lowered

to maintain a specific pressure within the eye at all times while surgery is being performed.

Inserted into the eye below the Infusion Line is a SURGICAL INSTRUMENT that serves two purposes:

1. Upper part—suction cutter to clear gel
2. Lower part—a hook which lifts up the scar tissue and gradually peels it off the retina. After that the instrument is removed and the tissue discarded.

In order for the surgeon to see precisely what he's doing, two other things are required:

1. A LIGHT SOURCE is inserted into the eye which illuminates the operative area.
2. A magnifying glass CONTACT LENS is attached to the top of the eye to provide good vision at the point of surgery.

For the first couple of weeks after surgery, eye drops known as "Maxitrol" are applied to the eye four times a day. For the next six weeks, "Vasocidin" is applied four times a day. To complicate matters a bit, an ointment is put into the eye just before bedtime for two weeks.

Since surgery is performed under anaesthesia, no discomfort or pain is witnessed and very little after surgery. It takes three to six months for a complete healing to take place and to determine to what extent normal eyesight will be restored.

Terry O'Laughlin was not a natural athlete. But he worked hard at Notre Dame. He began as a student manager of the football team and worked his way up to fifth-string quarterback by his senior year.

Others got the headlines but none worked harder than Terry. He had still not played a down by the last game of his last year. With 40 seconds to play and Notre Dame trailing Southern Cal by six points, Terry was sent into the game.

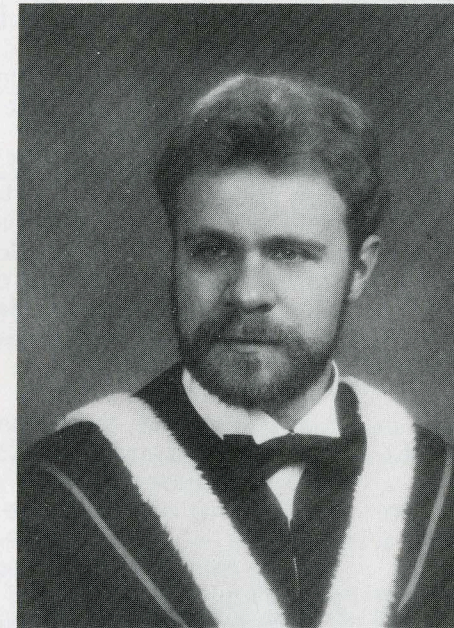
He immediately threw the ball out of bounds on fourth down to stop the clock.

Bobby John Lester's mother wanted him to be a great concert pianist. But Bobby John loved baseball. He would make his kid brother, Sidney, practice the scales on the piano while he sneaked out to play the game he loved so much.

Bobby John learned to switch hit and go to his left and hit behind the runner. He would run on and off the field. He would run while others walked.

He was cut last week by the Vasalia Mets and given bus fare home. His brother Sidney has moved to Monte Carlo to avoid paying tax on \$7 million in royalties he earned last year playing piano in a rock band called Life Sux.

Student Awards World Region

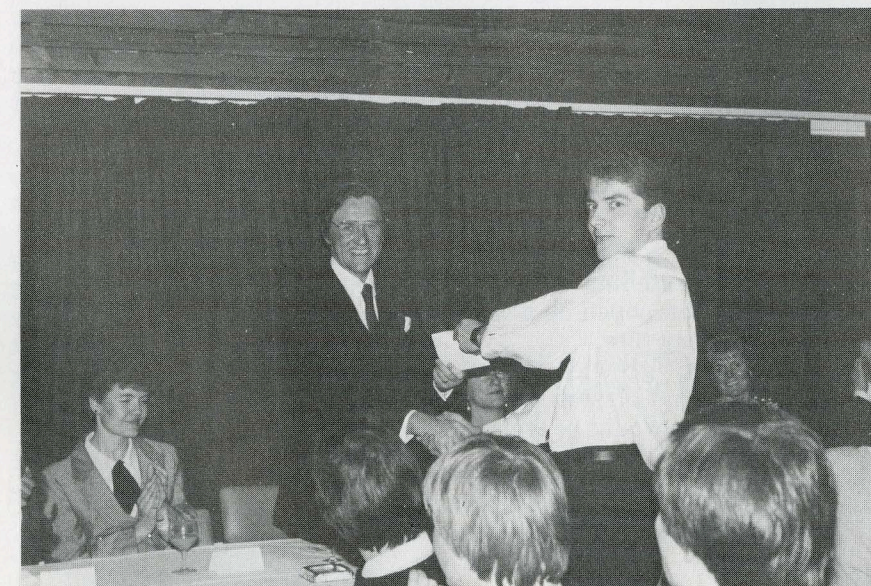


Paul O'Leary
University of Manitoba



Alain Nicolle
Ecole Superieure
d'Electricite

Steven Sorrell of the City University London receiving his award from Dr. Roger Chapman, head of Electrical Engineering at the University.

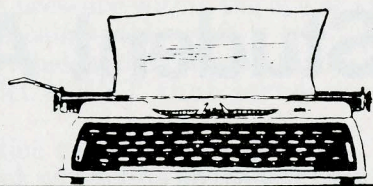


Eta Kappa Nu again presented awards to outstanding electrical engineering students at the University of Manitoba, The City University, London and the Ecole Superieure d'Electricite, Paris.

The awards consisted of attractive Award Certificates, Memberships in Eta Kappa Nu and substantial monetary gifts.

Each award winner was a straight-A student and was recommended by the E.E. Faculty of the university.

High Five



The posters on an office wall were designed to inspire employees to greater efforts. One of them read, "You can—if you will!" Beneath it, someone had scrawled, "And you're canned if you won't!"

The head accountant for a large corporation worked for thirty years for the company. Every morning when he came to work, he unlocked his desk, peered into the center drawer for a long moment, then locked it up again.

One day the man died and, after a decent interval, everybody rushed to pry open that center drawer. It contained a little slip of paper. Printed in capital letters on the paper were the words: "The side towards the window is the debit side."

Don't knock the weather—without it, nine out of ten people couldn't start a conversation.

Never invest your money in anything that eats or needs repainting.
BILLY ROSE

Experience is not what happens to you; it is what you do with what happens to you.

ALDOUS HUXLEY

I've never been poor, only broke. Being poor is a frame of mind.

MIKE TODD

I learned more about economics from one South Dakota dust storm than I did in all my years in college.

HUBERT H. HUMPHREY

Marrying a man is like buying something you've been admiring for a long time in a shop window. You may love it when you get it home, but it doesn't always go with everything else in the house.

JEAN KERR

The parents of an eight-year-old boy who was away at camp for the first time hadn't heard from him, so they called him and were a bit disappointed to discover that he hadn't missed them at all.

"Have any of the other kids gotten homesick?" his mother asked.

"Only the ones who have dogs," replied the boy.

Wilde's Wild Quotes

"Duty is what one expects from others."

"I sometimes think that God, in creating Man, somewhat overestimated His ability."

"Good taste is the excuse I've always given for leading such a bad life."

"The Niagara Falls would be more impressive if it flowed the other way."

"Don't give a woman advice. One should never give a woman anything she can't wear in the evening."

"Nothing succeeds like excess."

"Always forgive your enemies: nothing annoys them as much."

"I never travel without my diary; one should always have something sensational to read on the train."

"The public is wonderfully tolerant; it forgives everything but genius."

There are still a few Pat and Mike jokes around. This one dates back seventy years or more, and illustrates the economic fallacy that unemployment results from technology.

Two laborers on a big construction site were watching a huge steam shovel as it scooped up a ton of earth with every bite.

"I tell you, Pat," growled Mike, "if it weren't for that blasted scoop, five hundred of us would be working with shovels."

"Sure," replied Pat, "and if it weren't for our shovels, a million of us would be working with teaspoons."

Lyle "Animal" Atkins, his career behind him and his bubble gum card out of print, pointed dramatically to the centerfield bleachers in the seventh game of the World Series. Everyone laughed.

He pointed again. And again. The umpire told him to stop horsing around and play ball. The police report later revealed that while Animal was striking out, 459 people in the centerfield bleachers were mugged by a gang disguised as hot dog vendors.

And, of course, there was Patsy, a horse with a funny walk that was about to become rubber cement before being rescued by the granddaughter of the washed-up old trainer, Sunny Jim Robinson, who drank a bit.

"Oh gramps, oh, gramps," begged little Shirley, "let me have him. All he needs is love and I know he can become a champion."

Sure enough, after lots of patience, understanding and tender care, Patsy could go seven furlongs in 1:22. Sunny Jim went into hock to enter Patsy in the big race. The entire Robinson family borrowed against its insurance to bet on him at 40-1.

Patsy broke from the gate last, quit completely at the eighth pole and Shirley shot him with her grandfather's pistol the next morning.

The steel tycoon, Charles M. Schwab, maintained a certain comradeship with some of his long-time employees in the mill. Coming into the open hearth section one morning, he recognized a brawny old worker, naked from the waist up, his rippling muscles glistening with sweat and shining in the lurid glow of the furnace.

"Mick Dugan," exclaimed Schwab admiringly, "you look like an old Rembrandt!"

"Heck, Charlie," barked Dugan, "you don't look so hot yourself!"

Student

AWARD DINNER

by Marcus Dodson
Chairman

For the second time in the 21 year history of the Alton B. Zerby Outstanding Electrical Engineering Student Award co-winners were chosen. The award was presented to Charles Anthony Bier and Dick Philip Welch at a banquet to honor them on September 13th at the Marriott Lincolnshire, which is just north of Chicago. This was the date and site of the annual meeting of the International Board of Directors earlier in the day. The banquet was attended by all of the board members and their families along with the recipients and their families and friends. Also, at the function, Marc Dodson was given Eminent Membership. The celebration continued following the awards banquet at the Marriott Lincolnshire Theater-in-the-Round.

Both award recipients graduated summa cum laude, Mr. Bier from Rice University and Mr. Welch from the University of Illinois-Urbana. In their parallel honors both will continue their academic training sponsored by a National Science Fellowship, Mr. Bier at Cambridge University and Mr. Welch at Stanford University. Both young men majored Computer Science.

Mr. Bier, in addition to receiving his BSEE degree also completed the requirements for a degree in mathematics. His professors predict that with his expertise in math theory and his knowledge and understanding of the electrical engineering aspect of computers, that he can look forward to success in research. This is a safe prediction since he demonstrated his research capability at Rice University.

Mr. Welch had academically perfect grades in all courses and demonstrated organizational and practical skills as well as competence in oral and written communication. He made electro-mechanical things work, he got things done. His professors predict that he will be a success in applied engineering. This is certainly a reasonable prediction based on practical application and leadership skills demonstrated while at the University of Illinois.

Also honored as Honorable Mention, but not present, were Jeffrey William Purnell from the University of the Pacific and David Alfred Willming from the University of Missouri-Rolla. Both of these young men with near perfect GPA's, graduated summa cum laude.

Mr. Glenn Todd Colon-Bonet received recognition as a finalist and was given a certificate by President Alan Lefkow. Other finalists, but not present, were Christopher Howard Jolly of North Carolina State University, Angela Pajak of the University of Dayton, Kathleen C. Uyehara of the University of Hawaii at Manoa and Glenn Scott Weinreb of M.I.T.

The Alton B. Zerby award uses no HKN funds but has its own financial base through trust funds. The winner's transportation and other award expenses are paid from the income from the A. B. Zerby Trust Fund. It was established through gifts by his friends in Eta Kappa Nu in his memory. The cash stipend comes from the income of the Carl T. Koerner Trust founded in his memory by his wife, Edie Koerner, and gifts from his friends.

The preparation for the award starts each year when a committee of the Los Angeles Alumni Chapter sends an application to each Student Chapter of HKN in January with a letter requesting a nomination. The committee screens the nominations to select the finalists. These dossiers are then sent to prominent leaders in industry, IEEE, HKN, etc. for independent ranking. Thus the winner or winners (as in 1979 and 1986 emerge—the best—selected from the EE Senior Classes of more than 175 Colleges and Universities.

In a special ceremony conducted by President Alan Lefkow, Vice President Harold K. Knudsen and Secretary Paul K. Hudson, Marcus D. Dodson was installed as Eminent Member, the highest recognition that is given by Eta Kappa Nu. In Mr. Dodson's response he thanked everyone in HKN for placing the respect and confidence in him with this honor. The function ended with everyone congratulating him, with his wife Ada at his side.

The entire group reconvened at the theater to see "Baby", a musical comedy.

The 1987 Student Award Dinner will be in the Marriott Lincolnshire Resort on September 19th.

Ludwik Finkelstein

At the Tenth Annual Meeting of the Fellowship of Engineering, Professor Ludwik Finkelstein, Dean of the School of Electrical Engineering and Applied Physics at the City University, London, was elected Fellow. Dean Finkelstein is a faculty sponsor of the Eta Kappa Nu award program at the University.

The citation for the Fellowship reads:

"Distinguished for contributions to the theory of Instrument Science. He has combined information theory, systems theory and mathematical modelling to give new engineering insights into the measurement process, and has won international recognition for the application of this work to engineering research and education."

The Fellowship of Engineering honors Britain's most distinguished engineers and it aims to take advantage of the enormous wealth of engineering knowledge and experience which they possess. It has a unique role in the United Kingdom's National Academy of Engineering.



Ludwik Finkelstein

The guests were all seated, patiently waiting for the dessert that would top off the excellent dinner—when from the front of the house the little boy's friends called him to come out and play.

"Sorry, fellas," he yelled back. "I can't come out now. It's my turn to help mother count the spoons after the company is gone."

Harrison "Stilts" Hoover was 15 years old, 7-foot-4-inch, 275 pounds, clumsy and lonely. Girls refused to go out with him and everybody asked him how the weather was up there. Then his father put a basket up on the garage for him and Stilts learned to slam dunk with two hands.

His world changed. Fat men in shiny shoes with big cigars wanted him to go to their schools. One man offered him the combined inventory of all the Cadillac dealerships in North Carolina. Another handed him a check with six zeroes after the number of his choice.

Stilts, instead, went to UCLA on an academic scholarship, found new friends in the student union, began eating sunflower seed, lost 100 pounds, developed a chronic cold and is now the tallest librarian in southern California.

"Darling," said the affectionate husband, "I've insured myself for \$50,000 so if anything happens to me you will be provided for."

"Good," said the affectionate wife, "now you won't have to call the doctor every time you feel sick."

"You always cook more than we can eat."

"How could I economize with leftovers if I didn't?"