UNIVERSITY OF TORONTO
FACULTY OF APPLIED SCIENCE & ENGINEERING

Memorial Tribute to

EARL BURKE

Professor Emeritus
The Edward S. Rogers Sr. Department of Electrical & Computer Engineering

April 27, 2022

Be it resolved –

> THAT the Council of the Faculty of Applied Science & Engineering record with deep regret the death on March 28, 2022 of Earl Burke.

Professor Emeritus Earl Burke, a respected member of ECE's Power Group, passed away on March 28, 2022 at the age of 96. Earl earned a degree in electrical engineering from Nova Scotia Technical College in Halifax, after which he joined General Electric in Toronto. In 1951, he joined what was then the Department of Electrical Engineering at the University of Toronto as a Lecturer. After completing his MASc degree, he was appointed to Assistant Professor, eventually achieving the rank of Full Professor. He retired in 1986 and was appointed Professor Emeritus.

Professor Burke served as Chair of the Faculty of Applied Science & Engineering's First Year Studies for a number of years and was a well-liked lecturer. His expertise in research and teaching was in the area of electromagnetics as applied to electrical power systems. In 1979, while on a one-year sabbatical leave, supported by a National Research Council Senior Industrial Fellowship grant, he Joined Trench, a company for which he had been providing consulting services for about five years. There, he led the development of a new product line of power conditioning coils for the electrical power utilities. He continued to provide consulting services to Trench for 25 years.

Earl loved to build things, which he did much of during his retirement, but his main hobby was gardening. He convinced a group of neighbours with adjacent properties to let him plant their backyards, giving him access to a long stretch of land. With the help of a friend, he proceeded to create a masterpiece, which he maintained for many years. He also travelled widely and served as a volunteer in the Palliative Care Unit at St. Michael's Hospital for 25 years.

He is predeceased by his parents and first wife, Anne Adele Stortz. Earl is survived by his wife, Geraldine O'Meara, as well as his sons Patrick, David and Stephen and their families.

Be it further resolved –

> THAT this tribute to Earl Burke be inscribed in the minutes of this Council meeting, and that copies be sent to his family as an expression of the respect and gratitude of the members of this Council.

Prepared by Professor Safwat Zaky in consultation with Professor Reza Iravani.

Tribute to Professor Earl Burke

Professor Earl Burke was a faculty member of the Electrical Engineering department for over 30 years. He was a contemporary of Jim Ham and Gord Slemon in the Power Group. All started shortly after World War II. Along the way, he served for many years as Chair of First Year Studies for the School of Applied Science and Engineering.

Professional Life – Research Contributions at U of T

Professor Burke's research area was in electro-magnetism, specifically field problems in power engineering, particular as it relates to utilities and induction heating systems.

A review of his research papers saw the research methodology changing significantly over the years.

The late 1960's focussed on current distribution for induction systems, using empirical methods and involving sensor development.

The 1970's saw the beginning of computational analysis, both analytical and numerical, starting with simple axisymmetric geometries, with a focus on reducing eddy current losses.

In the 1980's computational analysis techniques as applied to induction systems were further developed (e.g. direct boundary element method and the method of fundamental solutions). Geometries became more complex. Eddy current losses were now being more commonly differentiated between skin effect and proximity effect losses.

The late 1980's and early 1990's included more complex geometries specific to industry, such as air-cored reactors, and the design of shielding for those reactors.

Professor Burke also practiced as a consultant for many years, and took a sabbatical in the late 1980's at Trench Electric in Toronto. He retired from the University in 1992, after 35 years of service.

Patents

Professor Burke had a number of patents. The one that proved most successful was for "Dynamic Braking Resistors for High Voltage Power Distribution Systems."

Braking resistors are used in power distribution systems that includes a first system connected to a second system by a tie line. Under fault conditions between the two systems, the braking resistors kick in, absorbing extremely large energies in a very short time, and ensure the stability of the system.

Briefly, the braking resistor design has a first and second cylindrical resistance windings helically wound closely adjacent to one another about a common axis. They are wound in opposite directions about that axis, each winding having the same number of turns.

The design resulted in a very small total inductance and virtually no voltage differential between the coil layers. The braking resistor design was smaller, less costly, and profitable.

Professional Life – Research Contributions at Trench Electric

Upon retirement from the University of Toronto, Professor Burke began consulting, and then working for Trench Electric, Toronto, which designs and manufactures high voltage electric products that are sold worldwide.

At Trench Electric, he was involved in many projects, and a number of patents, again with a focus on reducing losses in induction systems, but not limited to that.

One of his favorite patents there was an induction reactor design for heating billets which reduced losses using smaller wire strands for the induction coils.

In the state of the art at the time almost all induction heating coils were made of hollow copper conductors, which were wound into a single layer solenoidal coil. This gives rise to very large I2R losses in the reactor, and therefore the efficiency with which energy is transferred from the coil to the billet being heated was typically in the range of 30 to 70 percent.

A principal object of the patent was to provide an increase in the efficiency of induction heating systems by providing an inductor arrangement that reduces electrical losses. This was accomplished by a coil (either single or multiple layered), using a stranded conductor coil in which the current distribution is controlled. The result was much lower eddy losses.

A major manufacturing challenge in building this type of induction reactor was the development of a filament winding machine for the stranded conductor coils. After a major cable manufacturing company said it could not be done, it was developed from scratch in-house at Trench Electric.

Professor Burke retired a second time, this time from Trench Electric after 25 years of service.

Favorite Stories from Life at U of T

Early in his career there was a meeting of the engineering faculty and the math department over first year mid-term math marks that were not good. At that meeting, Earl remarked that engineering students were not math students, and that there was merit in considering this difference. After the meeting, the Dean commended both Earl Burke and Lawrie Kennedy for speaking well on the matter. Their reward was to be seconded to teach first year calculus along-side the math faculty. Although a little apprehensive, Earl found the math faculty to be a wonderful and supportive group to teach with.

Another story was teaching year one common courses which involved a number of faculty. Each would contribute one question to the test or final. Each faculty member would then compose their master-piece question, that question that would, in a phrase used at that time, ‘separate the men from the boys.’ In the end it was successful in separating the students from a pass.

After that, two professors would sit the exam beforehand to determine whether the time allotted was sufficient.

On another occasion, he was on the selection committee for the next warden of Hart House. Various requirements were suggested and added on to, and then added on to some more. At that point he pointed out that the job description that was being formulated would require someone with the business savvy of JP Morgan, the creative insight of Isaac Newton, and the altruism of Jesus Christ. The committee moderated their job description.

The collaborative nature of the faculty was a source of a lot of satisfaction, whether it was at the Faculty Club, across the street at the greasy spoon, on committees, or on at least one occasion, the 'must have' resume item that all faculty vie for, as fund raiser for the United Appeal for the Engineering School. He found the various offices he visited in various states of outward and inward orderliness. Gord Slemon had a pristine, empty desktop. Allan Yen had a room full of boxes filled with scientific papers. When asked about a possible paper on a particular topic, Allen would stop, reflect, go to a particular box, and then directly to the middle of the box, and fish out the intended article.

Conclusion: There is little correlation between effectiveness and the state of one's desktop.

Prepared by Patrick Burke
April 28, 2022