

DEPARTMENT OF ELECTRICAL ENGINEERING
University of Washington

EARLY HISTORY
of the
DEPARTMENT OF ELECTRICAL ENGINEERING
University of Washington

by

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Converter's Note

This history was originally written as a typescript around 1969. In December 2005 the typescript was scanned and converted to text by Kathy Burch and student assistants. The conversion has been reviewed for faithfulness to the original typescript, first by the students and finally by me. The font has been changed to Times New Roman for readability. The paragraph format is otherwise faithful to the original typescript, which uses a blank line between paragraphs as well as indentation.

In reviewing the conversion I have sought to identify and correct conversion errors while retaining the original typescript, errors and all. Only this page of notes on the conversion has been added. Remaining conversion errors are my responsibility.

Rich Christie

Seattle, December 2005

PREFACE

It is with great humility that the author has volunteered to attempt to write a brief history of the Electrical Engineering Department of the University. Doubtless he is a better engineer than historian, but considering the fact that he is now the member of the faculty having the earliest recollections of the department, having attended the Alaska Yukon Pacific Exposition in 1909 and started his college work in 1910, also having worked very closely with both Dr. Magnusson and Professor Kirsten for many years, as well as being a close friend of Professor Loew to the time of his death, it appeared his intimate knowledge of incidents during that period might be of value. At least this feeble effort might prove valuable to some more able person to produce a more complete and valuable account at some later date.

While mention of the many assistants and teaching fellows who had served on the faculty staff were omitted, the author sincerely hopes he has not omitted any person having been assigned the title of Instructor of Electrical Engineering or above. It is also regrettable that the account for the last ten years or more is so abbreviated. This was largely due to the fact the author was somewhat out of touch with detailed occurrences during these years. Perhaps someone intimately acquainted with this period might wish to re-review this period and might add enough history to cover the first centennial of the department when that time occurs.

Another interesting addition might be to briefly review the records of the many alumni who have been highly successful in post graduate years, such as John Nelson, Superintendent of City Light, John Fluke, President of Fluke Manufacturing Co., Henry Loew, District Manager, General Electric Company of San Francisco, Kenneth Howe, Northwest District Manager for Westinghouse Electric and Manufacturing Co., now retired, to name a few, in all of whom we on the faculty take great pride.

The author also wishes to express his thanks to the several faculty members who gave their assistance, and to Professors Eastman and Dow who enthusiastically approved the idea.

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HISTORY OF THE ELECTRICAL ENGINEERING DEPARTMENT

University of Washington

THE FIRST DECADE

The dissemination of information pertaining to the field of engineering offered by centers of education such as colleges, lagged such fields as religion, philosophy, art and even physical sciences by many generations. While activities which are now classified under the fields of engineering were in use in very early times, such arts were passed on to other persons largely by working in groups or by accepting apprentices to gain such training while employed at the occupation,

In very early times engineering methods became a necessity in military operations for establishing fortifications, building bridges and so on. Similarly, the erection of pyramids, large buildings, amphitheatres and such required engineering principles now involved in civil engineering and architecture. Only in comparatively recent history has such information been offered by means of special curricula in the universities already well established in the more classical fields of education. The study of civil engineering was the first to be offered as such specialized education because of its early development in the military fields. Later as mechanical inventions such as the locomotive, and steamship, followed by those discoveries and inventions in the electrical field, activity in mining and later in the chemical fields, demands rapidly increased for special training in these fields. Such demands were accelerated when workers like Edison, Westinghouse, Morse, Bell and others, successfully adapted such new knowledge to very practical use.

The establishment of institutions for higher education on the West Coast lagged by many generations those in Europe, and even by many decades those in the eastern portion of our country. It was not until 1861 that the University of Washington was established as one of the first institutions for advanced education in the Northwest. At that time the population of this region was largely made up of struggling pioneers resulting in a slow and agonizing effort to promote an effective and growing university. Charles M. Gates ably recorded this struggle in his "The First Century at the University of Washington."

As the development of the Northwest increased with the coming of the railroads, activity in the lumbering industry, and especially accelerated by the Klondike gold rush in 1896, the University found its services in ever increasing demand. Because of the mining activity in these early days even before the gold rush, the establishment of a School of Mines was announced in 1894 with a mining engineering professor to be appointed and courses to be announced in the catalogue of 1895-'96.

The new University campus tract in the Interlocken district between Lake Union and Lake Washington had been acquired as a campus, and a stately light colored sandstone and pressed brick building was started in 1894. In September 1895 the faculty and students began their first term on the new campus while the workmen were still busy with the finishing touches. It was for many years called the Administration building. Later the large assembly hall was dedicated as Denny Hall, which name finally designated the whole building. Compared to the building on the old "down town" campus site, the University housing seemed almost palatial.

Late in 1895 the announcement was made of a new Department of Civil Engineering under Professor Joseph M. Taylor, and Assistant Professor Hayden. Seven courses were offered including such subjects as drafting and surveying. Courses in mechanical and electrical engineering were to be arranged after the arrival of Professor Wm. F. Edwards. Professor Edwards appointed as the next President of the University was to assume duties in 1897.

An article, December 1896, in the Pacific Wave, the first student publication at the University, stated that “the estimated funds needed for the next four years ending in 1899, is \$122,810 for maintenance and \$35,103 for equipment. The estimate contemplates the organization of departments of civil, mechanical and electrical engineering. President Harrington said all these lines were greatly needed in the Northwest since Washington is fundamentally an engineering state. The new teacher in civil engineering is to teach mechanical drawing, and an added teacher in electrical engineering will have temporary charge of the technical mechanical work.”

The catalogue of 1896-97 announced three engineering courses, one for each of the three terms, autumn, winter and spring. Courses included drawing, shop practice, design and sketching of machine parts and design of electrical machinery and appliances. Since most of the preparatory courses usually required for all branches of engineering, such as mathematics, physics, English and so on, were already well established, students were being enrolled toward engineering degrees. The first faculty member to teach specialized engineering subjects such as drafting, was John H. Wolly; Lieutenant U.S.A. 1895-'98, Professor in Military Tactics, University of Washington, 1895; Instructor in Mathematics and Civil Engineering 1896.

The catalogue of 1897-'98 contained the first special section devoted to the College of Engineering. Five year courses in civil, mechanical and electrical engineering were outlined to lead to a B.S. degree in each. The requirements for the first three years were the same in all three branches. These required either French or German during the first two years. The specified courses for these first three years were largely those already offered in other departments. Unless a student was good in such subjects as drawing, physics and mathematics he would not be allowed to enter the fifth year for a degree.

In 1897, Theodore E. Doubt, M.A., University of Nebraska, was appointed instructor in Physics. In 1898 he was advanced to Professor in Physics and Electrical Engineering. Thus he became the first head of Electrical Engineering, which appeared to include Mechanical Engineering as well. Also in 1897, Almon H. Fuller, Lafayette College 1897, was appointed Professor in Civil Engineering and Mines, and in 1898 was appointed the first Dean of Engineering, a position he occupied until 1917.

In the catalogue of 1898-'99, M.S. degrees were offered for the first time in civil and electrical engineering. Also in 1899, a Graduate School organization was formed consisting of the president, the deans of the several colleges and one faculty representative for each college, Horace G. (Mercury) Dyers, Professor in Chemistry was chosen to represent the College of Engineering. There was no graduate dean at this time. The reason for the organization appeared to be to coordinate graduate work in the various colleges. Three years later it was abandoned, leaving the several schools and colleges to control their own graduate degrees. During 1899, David Kelley, B.S., University of Washington, was appointed Instructor in Physics and Electrical Engineering, then Assistant Professor in 1901 and served to 1903.

On April 4, 1900, the Pacific Wave announced a meeting for March 26 to found a permanent organization of the Electrical Engineers' Club. On that date the officers chosen were Harold Baker, President, E. Duffy, Secretary, Thomas Gunn, Vice President, and Ralph Johnson, Treasurer. On May 11 the Electrical Engineers' Club held an exhibition showing such developments as wireless telegraphy, X-Rays, electric heating and welding, lighting, electrostatic and induction effects. The exhibition was under the charge of Professor Doubt.

During 1900, Jacob Dittenhoffer, a man with practical experience, was appointed as instructor in electrical engineering. He served through 1901. Also in 1900, Charles C. More, M.S., Lafayette 1900, was appointed Acting Professor in Civil Engineering, became Assistant Professor in 1904 and finally Professor several years later. The enrollment in the Engineering Department in 1900 was forty students.

The Pacific Wave announced a second exhibition by the Electrical Engineers' Club to be held on May 17, 1901, with Mr. Baker, Mr. Duffy and Mr. Ames in charge. The exhibits would be similar to those shown the year before with an added lecture on color photography. The society has added the help of Mr. Dittenhoffer "a very practical man."

Rudolf E. Heine, B.S., University of Wisconsin, was appointed as Assistant Professor in Mechanical and Electrical Engineering in 1901, and as Assistant Professor in Electrical Engineering in 1903, then served to 1904. Also in 1901, Prof. Milnor Roberts was appointed Dean of Mines, separating the School of Mines from the College of Engineering.

In 1901, the University acquired \$70,000 for a new science building, and \$50,000 for a power house. Science Hall, which in 1932 became Parrington Hall, was first occupied in January 1902.

In 1902, Professor Doubt left the University and Frederick A. (Tubby) Osborn, PhD of Michigan, was appointed Professor of Physics and Electrical Engineering. In 1902 Steren Rowell became the first student to graduate with a B.S. in Electrical Engineering. In 1903 Electrical Engineering had no graduates, but in 1904 there were four B.S. in E.E. graduates, Glendower Dunbar, Laroy Frisbee, Clinton Lantz and Karl Van Kuran.

In September 1903, the Pacific Wave announced that the various colleges of the University changed from the three quarter term system to a two semester term system, and Saturday becomes a holiday. In October 1903, the Pacific Wave announced, "The old carpenter shop in the Administration building (later Denny Hall) was made into a dynamo laboratory. The finely finished 120 connection switchboard, designed by Professor Heine, is most noticeable. In the mechanics department is a complete Marconi outfit with a message distance of sixty miles, and a ten inch induction coil for an X-Ray machine. Professor Osborn has a Helmholtz resonator in the lecture room capable of detecting heat from a candle forty feet away."

With the Administration building and Science Hall as the only buildings available, the engineering department was largely centered in the basement of the Administration building where the physics department was located. However many of the classes were held in Science Hall.

In 1904, Dr. Carl Edward Magnusson, PhD, Wisconsin 1900, who had previously taught physics and mathematics in the University of New Mexico, and later was Professor of Physics and Electrical Engineering in the New Mexico School of Mines, was appointed as Assistant Professor in Electrical Engineering. In 1906 Magnusson was appointed Professor in Electrical

Engineering and official head of the department. Professor Osborn was now Professor of Physics and Director of the Physical Laboratory.

In June 1905, the Pacific Wave announced a new system introduced in the Electrical Engineering department of appointing engineers in actual practice as Lecturers for the department. The men selected that year were Mr. J. D. Ross, Chief Engineer of the City Municipal Power and Light (later Seattle City Light) for central station practice, Mr. Allen, Chief Engineer for Seattle Electric Company (later Puget Sound Power and Light) for electric traction, and Mr. Harrisburger, of Seattle and Tacoma Power Company, for electric power transmission.

In an announcement later that year, the Pacific Wave stated that "President Kane will recommend Mr. Frank E. Johnson, E.E. of Minnesota, as Assistant in Electrical Engineering. The Electric Engineering department has ordered five dynamo machines and about \$1,500 worth of measuring instruments and other electrical equipment. The Westinghouse and General Electric companies will each take another Washington man in their apprentice course. Two other men from the class of '04 are already with these companies." Throughout his teaching career, Dr. Magnusson was a firm advocate for encouraging his students to gain an acquaintance with the actual equipment and systems to which their theoretical studies applied. One means he used to accomplish this was field trips to actual installations within traveling distance.

The first field trip of the electrical engineering department was held in May 1905 when Dr. Magnusson accompanied by six students journeyed to Electron, Washington, a distance of forty miles. The two day trip, using a railway hand car, since the railroad track passed not far from the plant, was to inspect the new outstanding hydroelectric installation of Puget Sound Power and Light Co. on the Puyallup River. The students in the party were Henry H. Thedinga, '05; Uichi Kuniyusa, '05; Henry G. Cordes, '06; John R. King, '06; Edward M. Brooks, '06.

In contrast to this first field trip, after Grand Coulee was available for inspection, a large group of students, accompanied by several of the faculty, chartered a special bus and traveled nine hundred fifty miles in three days inspecting hydroelectric developments at Ariel, Bonneville, Rock Island and Grand Coulee.

In September 1905, the Pacific Wave reported, "The five new machines ordered, including single, two and three phase A.C. motors, both synchronous and induction, plus a variety of measuring instruments, have arrived. Professor Frank E. Johnson will be in charge of the new laboratory. The Physics Department also obtained new equipment."

In 1905 Frank E. Johnson was advanced to Assistant Professor in Electrical Engineering and served thus until 1915. During this same year Everett O. Eastwood, M.A., University of Virginia 1899, B.S., Massachusetts Institute of Technology, 1902, was appointed Professor of Mechanical Engineering and to serve as head of the department, thus promoting Mechanical Engineering to be a separate department.

What was called a commercial laboratory was established in the old power house to be used by both mechanical and electrical engineering. The electrical equipment consisted of a 75 KW 500 volt D.C. Westinghouse generator, a 60 KW 1100 volt, single phase, 60 cycle A.C. generator and a 22-1/2 KW 110 volt D.C. National generator. These machines were used to supply power for the University. The old power house was later used for a Mines Engineering building for several years following the Alaska Yukon Pacific Exposition at which time the new power house

used for the exposition became available. In 1923, fire gutted the old building and the remaining chimney and brick walls were removed from the general vicinity of the present Suzzallo Library.

In 1906, George S. Wilson, B.S., University of Nebraska, was appointed instructor in Mech. Engineering, and became professor in 1924. Also Mr. Samuel T. Beattie, who had gained a great deal of experience in commercial pattern making and wood working shops became instructor in charge of wood shop training. Later, when shop training courses were deleted from the curriculum, he remained as wood worker for the University until he retired.

In November 1906, an announcement in the Pacific Wave stated, "Professor T. C. Frye and C. E. Magnusson, inventors of imitation citron made from the seaweed kelp, started a small factory in Ballard under the charge of E. M. Magnusson, a brother of Prof. Magnusson. A large factory near Cape Flattery is planned if future demand is sufficient."

In December 1907, the Pacific Wave announced that "Permanent type buildings for engineering, chemistry and a huge auditorium are to be erected and to be finished by 1908. They will be used for the A.Y.P. Exposition. Machinery Hall, to be the engineering building, will be 110 by 222 feet."

The catalogue of 1907-08 states that "the Electrical Engineering laboratory consists of a D.C. section 20 by 40 feet, containing nine D.C. generators and motors with capacities from 2 to 20 K.W. The A.C. portion, 30 by 50 feet, contains eight A.C. generators with a total capacity of 70 K.W. There is also a 25 cell storage battery of 15 ampere capacity."

In 1907, Sandy M. Kane was appointed instructor in metal shop. In later years he was also given charge of the University power house, the one used for the Fair in 1909.

In 1908 a new power house was under construction. It was to be used for supplying power for the A.Y.P. Exposition, and would remain as the power house to supply power and heat for the University buildings. During later years it has been greatly enlarged, used largely for heating purposes. Electric power is now almost entirely supplied by a local power company.

The catalog of 1908-09 stated that the Machinery Hall for the A.Y.P. Exposition would be remodeled to be the new engineering hall. It also stated that degrees of Master of Science would be offered to graduates with a B.S. degree in engineering after having been engaged for three years in responsible and acceptable work in the field.

On March 18, 1909, the Pacific Wave reported that "the students of electrical engineering will meet to organize the Steinmetz Club, for giving students an opportunity to meet and discuss their work, and hear prominent engineers whenever possible. Only juniors and seniors are eligible."

Up to 1910 the activities of the whole University were largely centered in the few permanent buildings, which consisted of the Administration Hall, Science Hall, the old power house and the two dormitory buildings, Lewis and Clark Halls. There was also a fairly large wood-type gymnasium adjacent to the old athletic field near 45th Street, as well as a few other wooden structures, the major one of which was just back of the Administration building almost secluded in the woods. This building (Chem. Shack) was used as a chemistry laboratory until after the Exposition, then used for the student-controlled University Book Store until one was established on 14th Avenue Northeast, which avenue was later named University Way. All of the buildings were well crowded with students by this time, and everyone was looking forward to the close of

the Exposition when the several new permanent buildings, plus as many of the temporary ones as desired, would be available.

The year of 1909 was a gala time for Seattle and especially for the University district. Many years later one of the residents who was of teen age during the fair, related how he and his pals would climb down into a sewer tunnel, then under construction, walk down and crawl out into the Exposition grounds, thus avoiding the entrance charge. Doubtless they were most interested in the "pay streak" entertainment portion situated near where the hydraulics lab now stands. Probably no one who attended the fair will ever forget the crier in front of the South Sea Island booth crying "haba ha haba ha" all day long. It was reported he very nearly went insane before the fair closed. Nor would he forget the balloon which would carry a basketful of sightseers a hundred or so feet into the air to view the surroundings, with its crier shouting "get off of the earth, get up in the air." Doubtless the faculty and students were more interested in the excitement and in preparations for the future than in the college work at hand. It might be said, this was the close of one era, and the opening of another.

YEARS OF GROWING PAINS

For several years after the A.Y.P. Exposition the Electrical Engineering Department, as well as most other departments, experienced growths and declines which were largely due to the effects of two World Wars. At the close of the Exposition in 1909, the University was faced with an immense amount of work. Alterations were necessary in most of the buildings to be used in adapting them to laboratories, offices and classrooms. In October the Pacific Wave reported that the Board of Regents decided to retain twenty-eight of the exposition buildings, the permanent ones of which had been partially financed by the State of Washington. "The Machinery Hall to become Engineering Hall will require much work and may not be ready before the middle of 1910. The shop building was badly damaged by fire on September 18 but will be repaired."

The permanent building, to be used by the Chemistry Department, required a great deal of plumbing work in preparation for chemical laboratories. This building was later dedicated as Bagley Hall and retained that name until the present Bagley Hall was constructed when it became Architecture Hall.

The Expositions Good Roads building was allotted to Highway Engineering, the stately Forestry building would serve as a museum, the Washington State building would house the library while several other of the temporary buildings were to be used for the German Department, the R.O.T.C. and so on. These served for many years with the Washington State building later housing the museum after the first unit of Suzzallo Library was available. The Forestry building, constructed almost entirely of wood with huge log columns in front, was attacked by termites and wood decay, condemned for further use, and a little later razed to allow construction of the Student Union Building. Still later the Washington State building was also condemned and razed.

The remainder of the temporary fair buildings and small structures were removed allowing the gardeners to make the vacated plots presentable.

Dr. Magnusson, now head of the Electrical Engineering Department, was very ambitious and thrilled with dreams and plans to develop an excellent Electrical Engineering institution. He was assisted in the alterations for an electrical engineering laboratory by Frank E. Johnson, a man with much more ability in practical work than Magnusson. F. K. Kirsten, a graduate student in electrical engineering in 1909, and greatly admired by Magnusson, was the key worker in wiring, arranging and even in helping design new equipment needed.

Some new equipment was purchased at this time, but the major part of the equipment consisted of that moved from Denny Hall plus the electrical equipment from the old power house, since the new power house used for the Exposition now supplied power as well as heat for the campus buildings.

The Catalog of 1909-10 described the new electrical laboratory as occupying the south half of the first floor of the Engineering Building, the machinery portion of which is 80 by 110 feet. The equipment consists of 26 D.C. generators and motors, from one to 75 K.W., 110 and 500 volt, with 14 A.C. machines, single, two and three phase, from 2 to 60 K.W. It contains ten separate testing panels, each with connections to the voltage supply, as well as to suitable machines such that connections can be made for the desired tests.

"The laboratory supply of D.C. power is provided by a 35 K.W., 110 volt generator and the 75 K.W., 500 volt generator from the old power house. A suitable 2200 volt induction motor is

connected to each of these generators, the motors being supplied through control panels with power directly from the power house. A transformer reducing the 2200 volts A.C. from the power house down to several steps of A.C. voltage from 90 to 240 volts, supplies the laboratory A.C. power. A glass jar lead plate type storage battery of 130 cells, 15 ampere capacity, stationed in the part basement below the power equipment is also available as a power supply.

“A control board of 12 panels serves to control the motors, generators, battery, and distribute 110 and 500 volts D.C. as well as three phase A.C. power to the various testing panels. A transfer panel placed in one of the groups of testing panels, is arranged with terminals and connections to each testing panel as well as to other laboratory rooms such that inter-laboratory connections are possible.

“At the south end of the building on the first floor are five other separate rooms to serve as; a) an instrument making and repair department under the charge of Frank E. Johnson; b) a shop with a nine inch lathe, grinder, work bench and other shop equipment; c) an instrument and store room; d) a telephone laboratory; e) an electrolysis and special problems room. A photometry room is also stationed in the basement near the battery room.”

It is interesting that the type of jacks designed to be used on the testing panels were made of cast brass with one or two tapered holes in the front of the panel. Flexible cables to connect the desired jacks were provided with tapered plug terminals, which when forced into the jacks with a slight twist, resulted in such a perfect fit and contact they can scarcely be pulled out except by a slight twist and pull. They proved so simple to make and effective in use that the same type, improved by more effective insulation of exposed parts, were used in the new building nearly forty years later and are still in use. Other laboratories, some in the commercial field have copied this design.

The north half of the first floor of Engineering Hall was equipped for a mechanical engineering laboratory with some of their equipment in the partial basement below.

On the second floor the outside balcony portion during the Exposition was formed into rooms for offices and classrooms to serve the three branches of engineering. The inside portion of the second floor, under sky lights, was open to the first floor with the outside portion forming a balcony for viewing the main floor as well as exhibits on this balcony. This portion under the sky lights was provided with a floor and walls to form four large rooms used for drafting rooms for the Civil Engineering until the Civil engineers were moved to other quarters later. At that time these rooms were used as laboratories, one for an impulse generator with its Dufour type cathode ray oscillograph, and the others for electronics and vacuum tube work.

In 1909, Edgar Allen Loew was added as Instructor in Electrical Engineering. He had received a B.S. in Electrical Engineering in 1906, and later E.E. degree in 1922 both from Wisconsin. He taught as Instructor in Electrical Engineering in Wisconsin from 1906 to 1909 and in the summers did work for D.C. and Wm. B. Jackson. Later D.C. Jackson was the co-founder of Jackson-Moreland Consulting Engineers. Loew became Professor in 1923, and Dean of Engineering 1935-48. After mandatory retirement, due to age, he returned to the Electrical Engineering Department to teach until 1952, when he became Dean Emeritus. Death came in 1967 at the age of 85.

Professor Loew was a dedicated educator and capable engineer. He enjoyed the application of mathematical analysis to problem solving. A student's recollection in comparing the teaching

characteristics of Magnusson and Loew appears interesting to say the least. Both were excellent teachers and demanded that the student use his full capacity, yet quite patient. Magnusson appeared to enter class with the program of teaching the subject matter mapped out in detail, seldom allowing any diversion from the program he had planned. If by chance such diversion occurred, he often appeared annoyed and would devise some means of avoiding further confusion.

Loew on the other hand carried on in a more casual manner and if some diversion occurred he would attempt to start with fundamentals to prove the point. Occasionally he would fail to arrive at the desired conclusion before the class but would refer it to the next meeting when he would give the desired demonstration.

During 1909 a change was made in offering advanced degrees. The M.S. degree was offered in each of the engineering departments after one year of satisfactory work in the outside engineering field after attaining a B.S. degree. A professional degree, Electrical Engineering usually abbreviated as EE, was offered after three years of acceptable work in the engineering field plus a thesis, after graduating with a B.S. degree, or two years after attaining a M.S. degree. Magnus T. Crawford received the first E.E. degree in 1910, and Eric Therkelson received the first M.S. in E.E. degree in 1913.

On April 7, 1910, the University of Washington Daily, which replaced the previous University publication, Pacific Wave, (hereafter this publication will be referred to as the Daily) reported that two four-year courses were now offered in Chemical, Civil, Electrical and Mechanical Engineering. One was essentially the same as had been previously offered, leading to a B.S. degree. The other, devised to meet the need for a broader foundation and general training, would lead to a B.S. degree after four years followed by an M.S. degree after a fifth year of graduate work. The first two years of the second course required either French or German, and about two-thirds of a year more of general studies with some reduction of required technical subjects. The second course was abandoned some years later.

After the initial confusion, inherent in making abrupt changes, the tempo of work of the three engineering departments evolved to a steady normal rate. Their activity for the engineering portion of their programs was almost entirely centered in the one building, including the Dean's office, and it was several years before they began to feel cramped for room.

Even at this early date Dr. Magnusson was a staunch advocate for research and he encouraged his faculty as well as graduates, or even exceptional undergraduates, to become involved in such activity as may appeal to them. This encouragement did result in the publication of several Experiment Station Bulletins by undergraduates in later years.

Somewhat in contrast to this encouragement in the Electrical Engineering Department, Professor Eastwood, as head of the Mechanical Engineering, argued that the feeble efforts in research possible by those in the educational field were so ineffective as compared to the results possible in industrial organizations, that such efforts were largely a waste of time and energy. However the University Administration was moving more and more toward evaluating its faculty members for advancement, at least partially, on their meaningful research activities and the acceptance of their reports in authentic publications.

In 1911, Charles E. Mallery, B.S. in E.E., University of Washington, 1909, was added to the teaching staff as Instructor in Electrical Engineering and served through 1912.

In 1911, Frank E. Johnson, Instructor in Electrical Engineering, and in charge of the campus lighting since 1905, designed and constructed seventy ornamental concrete lamp posts for lighting purposes on the campus. A second set of ninety poles of the same design were constructed in 1914. A few of these original lighting posts are still in use on the campus. Engineering Experiment Station Bulletin No. 6, 1919, "Ornamental Concrete Lamp Posts" describes these posts in detail illustrated by several photographs.

During the year 1911 and 1912, Dr. Magnusson took a year leave of absence to gain some experience with the General Electric Co. at Schenectady, New York. During the first part of his time there he worked in the testing department with the other test men, who were largely recent graduates performing tests on newly manufactured machines before they were sent to the customer.

Some of his former students then on test, later related that it was amusing to see him, after sanding carbon brushes on some huge D.C. machine, crawl out from under it, a somewhat corpulent figure, far blacker than the average negro.

The latter portion of the year he spent working with Steinmetz and his helpers, the chief one of which was F.W. Peek, Jr., usually termed as "Steinmetz's right-hand man." In later years Magnusson told of an incident which indicated how very human Steinmetz really was. On receiving one of Steinmetz's recent publications, his group of helpers discovered what they all agreed must be an error in some equation he had included. They all agreed it should be called to his attention but no one was willing to do it. They finally convinced Peek he must do it since he was the one who appeared closest to Steinmetz. Faced with his duty, Peek, "shivering in his boots" fearing Steinmetz still might not be in error and might erupt in a rage, approached Steinmetz and explained their finding. Steinmetz only reply in his somewhat broken English was: "Well, I must have made an error."

In 1912, Leslie F. Curtis, B.S. Tufts College 1910, experience with General Electric Co. in their testing and other departments in 1911, was appointed Instructor in Electrical Engineering. In 1916 he was advanced to Assistant Professor In 1922 he took a year leave of absence to work with the Bosch Magneto Co. where he remained in commercial practice.

He was a rather precise individual, a good but exacting teacher, spoke with a slight lisp, or was it a tendency toward a New England dialect. During his period of teaching he did some research resulting in Eng. Exp. Station Bulletin No. 8 in 1920; "Voltage Wave Analysis Using Indicating Instruments".

During 1912 a student branch of the American Institute of Electrical Engineers was installed, with the student, George Tripple, as its first chairman.

In 1913 Magnus T, Crawford, a former student, now Superintendent of Power Transmission for Puget Sound Power and Light Co., was appointed as Lecturer on electric power transmission.

Also during the autumn of this year the various engineering departments held their first annual open house, displaying and explaining their work as well as calling attention to the latest engineering developments. The public was invited though its major function was to stir up interest in the high school students. With some changes this institution has been maintained even to the present time. Its value is two-fold; that of informing the public what their institution is doing, and perhaps equally important, giving the students an opportunity to direct and carry out something on their own initiative. At one period in later years one or more of the faculty

attempted to enhance the glamor of this display by devising and constructing special equipment. The result was a decided diminishing of the student's interest when putting on this show.

In 1915, Frederick Kurt Kirsten, mentioned before in the arranging and wiring of the new electrical laboratory, was appointed Assistant Professor in Electrical Engineering. He became Professor in 1923, and in 1929 was appointed Professor in Aeronautical Engineering. Perhaps he has been the most colorful character who has occupied a professorship in the engineering faculty of the University. For that reason a brief review of his life previous to his faculty period should be interesting.

He was born in Germany in 1885, the son of a teacher. He graduated from the Royal Gymnasium at Grossenhain in 1902. Having made some rash boasts about sailing the seas, that same year he signed up and began service before the mast on the merchant ship *Elfrieda*.

In the South Pacific they were besieged by a calm at sea and scarcely moved for weeks. With provisions and water almost exhausted the crew almost perished of hunger and thirst. "For five weeks there was no fire on board and we existed nearly on whiskey alone." Sailing up the Pacific Coast, salt water got into the drinking water resulting in another siege of thirst. Off Cape Flattery the crew mutinied.

When they arrived at Tacoma, Washington, Kirsten deserted the crew, as he said, "To save my life I thought." However he was shanghaied back aboard to sail on to the Orient. Once more he escaped by jumping the ship as they were leaving, and he swam back to shore with one dollar and a half to begin life in the United States.

Knowing hardly a word of English, he walked south out of Tacoma, following the railroad tracks until he came to the small town of Roy. An old German farmer found him warming his feet in a saloon in Roy and offered him a job on the farm at ten dollars a month, which Kirsten accepted.

One day a boy came to the farm selling magazines to work his way through college. He proposed that Kirsten come to the University with him the next autumn. Kirsten declined believing he could not speak English well enough. That autumn however, he did come to Seattle and on the first day walked between Denny and Science (Parrington) Halls, afraid to enter either. He finally plucked up nerve and entered Denny, and who should he meet but the magazine salesman who befriended him and helped him get registered.

He started his University work in 1905 and the next year enrolled in electrical engineering. He graduated in 1909 with a B.S. in E.E. and magna cum laude honors. He was also awarded the Jacob Furth Electrical Engineering Prize of one hundred dollars for the students with the highest grades in the 1909 electrical engineering class. He said he didn't think he deserved it so spent a good portion of it treating the rest of his classmates.

That autumn he worked with Magnusson and Johnson on the new laboratory and later did some teaching in engineering drafting. He then left the University until 1915, holding responsible positions with three electrical organizations. During that time he designed the new electrical engineering laboratory at the Massachusetts Institute of Technology, probably relying much on his experience at University of Washington. He also did the major portion of electrical as well as mechanical design on the 220 kilovolt, 220 mile, Big Creek electrical transmission line into Los Angeles. This was the largest as well as the highest voltage commercial line in the United States, and perhaps in the world at that time.

He retired as Professor Emeritus in 1951. He spent the remainder of his time on his farm near Roy which he had bought some years before. He died in 1952 at the age of 67. His wife Agatha (Aggie), the old German farmer's daughter, joined him in death in less than a week.

He was rather small and sturdy in stature, with muscular arms and shoulders, which when unclothed, appeared swollen out of shape. He had characteristic German features, was very keen, quite mathematical, and very much inclined toward research and inventing. However he was not greatly inclined toward reporting his work and inventions, and can be credited with comparatively few publications under his name, as compared to the many inventions and developments he pursued. He was doubtless one of the most publicized of the faculty in the local papers and was very often sought for lectures.

In 1916 Dr. Magnusson's "Alternating Currents" textbook was published by McGraw-Hill. He had written and used the text in his classes for a year in blue print form in an effort to eliminate errors before publication. The text was very popular and used at the University as well as several other colleges for many years.

On October 16, 1916, the Daily reported, "An endowment granted by W.E. Boeing will provide for an aeronautics laboratory. The new building will be situated in the engineering building's group and will contain instruments capable of measuring pressure differences of one thousandth of a pound. It will consist principally of a steel lined tunnel about six feet square and twenty feet long. The laboratory is to be the best obtainable. Only two other such laboratories exist in the United States, one at Massachusetts Institute of Technology, the other at the government Navy Yard at Washington, D.C. Mr. Boeing is greatly interested in developing aviation as a sport as well as an instrument of defense."

Though Professor Kirsten remained on the electrical engineering faculty until 1929, he was at this early date taking a keen interest in aeronautics and was active in planning as well as later supervising the operation of this laboratory. As Boeing was developing his aeroplane manufacturing establishment, Kirsten was almost continually acting as a consultant.

On April 17, 1917, the Daily reported a course in aviation to be offered by Professor J.W. Miller, and on May 1 another report that fifteen students attended the first class and perhaps fifty more may enroll.

Due largely to Dr. Magnusson's year of working with Steinmetz, the General Electric Co. made the University a gift of one of their electric oscillographs. With the use of this instrument for laboratory work Dr. Magnusson offered an undergraduate course in the study of electric transients using Dr. Steinmetz's text on that subject. This was probably the first time such an undergraduate course was ever offered in an American college. Later most other colleges offered a similar course.

On February 5, 1917, the Daily reported that the engineering open house would be held only every other year after this year. Also the annual engineering field trip will be replaced by as many individual trips for each department as may be desired.

On March 28, 1917, the Daily reported; "The engineers will hold their fourth open house displaying mining in Mining Hall, forestry in Forestry Hall, mechanical, civil and electrical engineering in Engineering Hall. There will be a power generating plant with power sufficient to light a house, operated from the rear wheels of a Ford, and an oscillograph capable of showing

the effects of a person's voice traveling through the air as sound waves, as well as many other interesting exhibits."

In 1917 Dr. Magnusson was appointed Acting Dean of Engineering, since Dean Fuller left that year. In 1920 Magnusson was appointed as Dean of Engineering.

Even somewhat before this time the war in Europe against Germany and the Kaiser was raging ever more and more intense. Germany was even perpetrating acts that threatened to involve the United States. On February 6, 1917 the Daily reported that the war scare is arousing the interest of the cadets which might lead to a volunteer army. Another report states that Dr. Meisnest head of the German department opposes the entrance of the United States into the war. On February 8 a report said Dr. Gowen believes we will not enter the war though he approves the stand of President Wilson in breaking relations with Germany.

On March 20, 1917 the Daily states; "President Suzzallo appointed a committee to determine how the various departments, especially scientific, engineering and military groups, could be most useful in the event of war. Among the twenty two selected were H.G. Byers, Chairman, F.A. Osborn, George Wilson, Edgar Loew, Charles More and Capt. Wm. T. Patton."

When Germany finally risked sinking the Lusitania and greatly stepped up her submarine activity, war was declared April 6, 1917. The tempo of military training preparations on the campus accelerated rapidly. On June 7, 1917 the Daily reports; "The University faculty adopts a report of the war emergency committee to alter courses in all branches of training for 1917-18 curriculum. This affects many departments especially those in military training, physical training, engineering and others."

Even with all the war activity a few other events took place in 1917. A four quarter system was planned to start on October 1. This was done in an effort to encourage more students to engage in training, especially in technical and engineering lines which would be so greatly in demand in the war emergency situation rapidly developing.

In December 1917 the Engineering Experiment Station was organized to direct, to some extent, engineering research, but of more importance to consider for publication the results of such research work in a series of Engineering Experiment Station Bulletins. Later a few of the publications more general in subject matter were called Reports.

Bulletin No. 1 in 1917 was entitled "Creosoted Wood Stave Pipe and Its Effect Upon Water for Domestic and Irrigation Uses," by the Bureau of Industrial Research, H.K. Benson Director. Most of the later bulletins were under the research author's name.

In 1918 Dr. Magnusson was appointed Acting Director of the Engineering Experiment Station and the next year he became Director, a title he held until his death in 1941.

On October 2, 1918 the Daily reported; "With 20 barracks, which are to be finished today (situated roughly where General Engineering Building now stands) to accommodate 500 men and 20 more to be constructed soon, the University is beginning a military year." The barracks were used for the Students' Army Training Corps.

The campus thus became a hive of activity but the normal procedure of college work, especially in engineering was greatly disrupted, and since so many of the students were enlisting for military service the enrollment declined sharply.

During the war years and for some time after (1917-1920) Professor Loew took leave from teaching and spent a considerable amount of time as Electrical Engineer, and later as Superintendent of the American Nitrogen Products Company, in LaGrande, Washington, since nitrogen was so much in demand at this time for the manufacturing of explosives,

On November 25, 1918 the Daily reported; “On Saturday, November 23, a gale caved in the sky lights over the middle portion of Engineering Hall causing four thousand dollars worth of damage. A class scheduled to meet in the large mechanical drawing room at ten o’clock found the door locked, then adjourned to another room and thus fortunately escaped harm. Details of men from the companies of the army rushed to the scene to clear up the debris.”

In 1918, Gordon R. Shuck, E.E. of Minnesota was appointed Instructor in Electrical Engineering. In due course of time he was advanced to Professor in 1937. He retired as Professor Emeritus in 1952 and passed away in 1957.

Professor Shuck had a rather quiet, “easy going” personality, was an excellent teacher and capable research worker. Previous to his assignment at the University he had worked as an engineer in Alaska, and did some consulting work during his teaching career.

Since World War I ended during November 1918, changes on the campus were being made. On January 8, 1919 the Daily reported that the work of removing the barracks is now under way. However a few of them were retained for some time and used mostly for drafting classes. A student of that period related later that because of their poor construction one could readily see daylight outside through many of the cracks. One morning during an unusually cold winter spell the steam heating pipes from the power house had frozen leaving the barracks so cold their drafting ink had frozen. The instructor suggested they keep busy at other items until the ink could be thawed.

On March 5, 1919 the Daily reported; “The Engineering students plan an Engineering Council with power to arrange and finance all joint engineering functions including social events, sports, special field trips and so on and provide a clearing house for all engineering problems.” The Council was a very active one and functioned for many years.

On April 9, 1919 a group of eleven members of the University faculty, at the suggestion of Professor T.C. Frye, met to form an organization “for the declared purpose of fostering productive scholarship.” The result was the Research Society with qualifications for membership requiring a national reputation for productive scholarship through ten years of creative work and publication, or the equivalent for such professions as art and music. The President was asked to name a committee to select suitable faculty members. The committee chosen was Dean John T. Condon and Dean David Thomson who selected eleven out of the faculty of over two hundred as charter members. Dr, Magnusson was one of the charter members. In 1941 four out of the seven more or less permanent electrical engineering faculty, plus Professor Kirsten now in Aeronautics, were members of the society. The society usually met once each week during the academic year to listen to a report of one of the members on his activities since he last reported.

In 1919 Wm. Spraragen, B.S. in E.E, Union College 1916, was appointed Instructor in Electrical Engineering. He only remained a couple of years.

In 1919 the University registration figures showed 4600 students. That autumn Dean Magnusson reported nearly 400 freshmen students registered in engineering. The enrollment which had dropped during the war years was increasing again.

In 1920 the engineering students held their first two-day open house for the public. This custom was maintained until about 1960 when it was again reduced to one day on Saturday.

At this period of hydroelectric development Tacoma was developing some very economical power sites and offering power at exceptionally reasonable rates encouraging electric space heating in homes. Professor Loew made a series of studies on costs and experience in residential heating in Tacoma. This study resulted in several publications including two Experiment Station Bulletins on "Electric Heating in Residences," No. 15 in 1921 and No. 20 in 1923.

The new influx of students after the return of the enlisted boys in World War I resulted in the need for more faculty, especially in electrical engineering. During the years 1920 and 1921 four new persons were appointed.

In 1920 George Lisle Hoard, B.S. in E.E, 1917, M.S. 1926, University of Washington, was appointed Instructor in Electrical Engineering. He passed through the various promotions to Professor in 1941, retired as Professor Emeritus 1964. Professor Hoard's early training was in the power field but he later took up electronics also as a part of his teaching work. In 1938 he served as a consultant to the Seattle Transit System and later assisted the College of Fisheries in a program to guide fish electrically around dams and other river obstructions.

His work with the Seattle Transit System resulted in publications, one of which was Exp. Station Bulletin No. 100, 1940, "Modernization of a Transit System. Factors that Determine the Choice of Vehicle."

Professor Hoard proved to be one of the so called permanent faculty, was an excellent teacher, sometimes reported as a little "tough" on students.

In 1921 Jack Roderick Tolmie, B.S. in E.E., University of Washington, was appointed Instructor in Electrical Engineering. In 1923 Tolmie took a position with the Pacific Bell Telephone Co. and remained with them until retirement.

In 1921 Albert Kalin, B.S, in E.E., University of Washington 1919, was appointed Instructor in Electrical Engineering. In 1923 he left to take a position with a private firm in the East.

In 1921 George S. Smith, B.S. in E.E. 1916, E.E. 1924, University of Washington, was appointed Instructor in Electrical Engineering After advancing through the several steps of promotion he became Professor in 1941, retired as Professor Emeritus in 1960.

He spent three years in General Electric Test Department largely as Assist. Head as well as Head of Test, and two years as Electrical Engineer for International Coal Products Corp, of Newark, New Jersey. During his teaching career he served as consultant for Carlisle Lumber Co. on production of activated charcoal from sawdust, also later as consultant on electrostatic problems for Waterside Milling Co., Tacoma, E.I. Dupont de Nemours Co., as well as for Boeing Co.

He was also one of the early "permanent" members of the faculty, with a possible lesser teaching ability than most of the others but did make a fair record in research and publications.

With Tacoma developing new power plants in the Lake Cushman area, and Seattle starting the various phases of the Skagit River development, the conditions in this part of the State were ideal for research in such fields and at the same time presented excellent incentives for student's interest. Many field trips were made. The initial Skagit development was followed from trips through the tunnel to the Gorge power house during its construction to the completion of the

Gorge power station and later to large dams further up the river as well as power houses there. At this time Magnusson was working on a variety of studies on hydro-electric developments, while Kirsten and Loew were busy acting as consultants, as well as studying the mechanical and electrical features of transmission line design.

In 1922, Sandy Kane, Instructor in metal shop work as well as Supervisor of the power plant, was replaced by Gilbert S. Shaller, B.S. Illinois 1916. He was promoted to Assistant Professor in Shop Engineering in 1923. He was assisted by C. L. Sullivan.

Kane, who had no college degree, had been for several years at odds with Professor Eastwood, Head of Mechanical Engineering, which finally resulted in the change.

Dr. Magnusson, who for the past several years had been teaching his course in electric transients, published his first text on "Electric Transients" with Kalin and Tolmie as co-authors, since they had prepared the oscillograms used as figures. While the text was far less mathematical than texts used later, it served very well for this early undergraduate work and was used by Magnusson during the remainder of his teaching years. It was also used in several other colleges until later texts were published.

In 1926 Magnusson published a revised edition under his name alone since he had hired Professor Smith to prepare a whole new set of much improved oscillograms.

During this period Dr. Magnusson had been discussing with various members of the engineering faculty the proposal of some type of courses, for freshmen enrolling in engineering, to condition them for the type of training they must follow later. Ofttimes students are inclined to register in some department because to them it appears to be glamorous, and later find themselves not adapted to this line of study. By introducing them at this early stage to what lies ahead they would be able to make a desired change with a minimum loss of time and credits in seeking some other preferred degree.

Up to this time the engineering courses first year engineering students were required to take were largely those devised for civil engineering plus metal shop work. Some of these courses were not considered essential in other engineering departments.

The result of these discussions was the formation of an entirely new department to be called General Engineering, which would process all first-year engineering students, thus relieving other departments of any duties to these freshmen. The prescribed course was almost identical for all branches of engineering, with prescribed electives to allow for any desired differences. During the first year the students would be required to take one or more of these conditioning courses each quarter, which courses were labeled General Engineering. This would give them a good foundation for later work in all branches of engineering.

Professor Elgin Roscoe Wilcox of the Civil Engineering Department was selected to head this new department, and to supervise the subject matter of these new conditioning courses. The result appeared very satisfactory to all departments. The new department grew because of the rapid growth of engineering enrollment and later a new building was assigned to its use. Recent rumors indicate some dissatisfaction with this type of department has developed but thus far no definite changes have been proposed.

On February 14, 1924 the Daily reported, "B.A. Travis, graduate of University of Washington in 1922, now with Westinghouse Electric and Manufacturing Co., stated that he doubted any university can show a better record than Washington for men (with an electrical

engineering degree) who have been out of school for an equal length of time.” This same general opinion had been offered by others who were acquainted with the records of University of Washington men in the General Electric Co. as well as other companies in the industrial portion of the United States at that time.

In 1924 Dr. Magnusson served as a member of the American Committee at the World Power Conference. He served again on the same committee in 1927 and 1933. Also during 1924, two more new members were added to the electrical engineering faculty, and fortunately two who proved to be “early permanent members” and members who served very prominently during their terms of service.

Roy Eric Lindblom, B.S. in E.E. 1922, M.S. 1929, University of Washington, appointed Instructor in Electrical Engineering in 1924, advanced through the various promotions to Professor in 1945, deceased in 1960.

Professor Lindblom was a person who could scarcely be content unless what he attempted was accomplished to the best of his ability. He had very little bent toward research though what he did was well done. He was probably the best teacher the department ever had since he was thorough, always well prepared in what he taught and although demanding of students was in general very popular with them. He was unusually capable of planning, designing and carrying to completion his many ideas of improvements, especially improvements of the laboratory equipment.

When the electrical engineering laboratory was first completed in 1910, Professor Johnson was given charge of it. Later after Johnson had died, Professor Shuck was asked to supervise the laboratory maintenances. In about 1923 the task was delegated to Professor Smith who served until 1927 at which time he took a year’s leave of absence. Professor Lindblom was then chosen to continue, which he did until the time of his death in 1960.

It was at this task he displayed his unusual ability to design and construct very suitable, dependable and rugged equipment for laboratory use, the type of equipment not commercially available. The actual construction work was largely accomplished with student help, which experience was valuable to the students involved.

Later when the new electrical engineering building was being designed many of his ideas and suggestions were accepted, especially in planning the new laboratories. After the building itself was completed he again, largely with student help, installed all of the laboratory wiring, placing of distribution boards, design and building of testing panels and installation of test machinery.

It might be of interest to relate one of the crises with which he was confronted and the method adopted to meet it. The house wiring of the building proper was of course completed by the contractor with the usual union electricians. After the building was completed and accepted by the University the laboratory work was started. When the work was well toward completion the Electricians’ Union discovered that students and non-union help was being used. They demanded that union workmen be used for its completion or they would make trouble for the University. This was near the end of the week so Lindblom asked the rest of the faculty to help together with as many students as he could obtain, and by working Saturday, Sunday and some evening work, the job was completed when the union arrived the next week.

Also in 1924, Austin V. Eastman, B.S. in E.E. 1922, M.S. 1929, University of Washington, was appointed as Instructor in Electrical Engineering. He passed through the various promotions to Professor in 1942, became Head or Executive Officer of the department in 1941, retired Professor Emeritus in 1969.

After graduation he spent two years with the General Electric Co. with most of this time spent on electronics and vacuum tube work which was now becoming a thriving industry. During his years on the faculty he did only a comparatively small amount of work in the field of research in the usual sense of the term though he did make a rather extensive study of the Seattle Transit System and during World War II served on the Seattle Transportation Commission, greatly aiding with his engineering experience. He served two years as Director of the Institute of Radio Engineers.

He gave most of his time and energy to teaching and study of teaching methods. After assuming head of the department he worked unendingly and hard at altering the curriculum for the changes demanded by the industries, obtaining exceptionally high grade men as additions to the faculty, and upgrading the department especially as a post graduate institution.

He was an excellent teacher, hampered to some extent during the first few years by a slight stuttering. This he overcame completely and was later able to deliver an excellent speech.

To relate details about the numerous alumni of the Electrical Engineering Department who have made notable successes in later years would lengthen this document beyond its original intention. However there is a case now and then of such interest that a brief mention might be pardoned. One such case is that of Loyal V. Bewley, B.S. in E.E. (1923) University of Washington, M.S. in E.E. (1928) Union University.

When Lisle Hoard and Mr. Bewley met and became friends in France while in service during World War I, Hoard urged Bewley to enter the University after discharge from the service. This advice Bewley accepted. After graduation in 1923 Bewley entered General Electric Test Department, and after test spent many years serving in various departments of the General Electric Engineering division up to 1940. At that time he was asked to serve as Head of the Electrical Engineering Department at Lehigh University. In 1954 he was appointed as Dean of Engineering where he served up to their required retirement age which occurred in 1962. Since then he has returned to the General Electric Co. to serve as Educational Consultant.

An experience he related to the author of this document a few years ago appeared to be of such interest, the incident will be given here in his own words.

After graduating in E.E. from the University of Washington in 1923 I went "on test" with General Electric in Schenectady. It was the custom of the Company to hold a banquet for the new recruits and I found myself seated next to Robert E. Doherty, then Assistant to Charles Proteus Steinmetz and some years later President of Carnegie Institute of Technology. Steinmetz was acknowledged to be the greatest electrical engineer in the world. I had heard a great deal about him from Dean C. E. Magnusson who was an ardent admirer of the great engineer and often told his classes about him. So I grabbed the chance to ask Mr. Doherty if he would introduce me to Steinmetz. Doherty demurred, saying that it would serve no purpose and that "the Doctor" (as Steinmetz was called) did not relish the demands made on his time by people seeking introductions. So I forgot the matter.

A few weeks later Mr. Doherty sent word to me to stop by his office. Upon reporting to him he handed me a copy of an A.I.E.E. paper by Steinmetz entitled "Third Class Conductors" along with a copy of a very critical discussion of the papers by Dr. Joseph Slepian of the Westinghouse Company. Doherty said to me, "You wanted to meet Steinmetz. Here is a way to do it. Read this paper and this discussion and prepare a suitable reply." Next morning I handed Mr. Doherty my work. He glanced through it (a few pages of analysis and some curves), then looked at me in a quizzical sort of way and asked, "When did you do this?" "Last night", I replied. "How long did it take you?" "All night." "When did you sleep?" "I didn't." He then dismissed me.

A few days later I was called to the phone down on test. It was Doherty and he asked me to report to him immediately. I told him that I had been sanding brushes and was very dirty, and that I'd be up as soon as I could wash up and change clothes. He said, "Bewley, can you obey an order?" "Yes sir!" "Well I don't want you to clean up, come up here just as you are, in your overalls." I disobeyed him to the extent of washing the brush carbon off my face and hands and then reported to him. He announced, "We are going in to see The Doctor and I want you to tell him what you found." I strenuously objected, that wasn't at all the way I wanted to look to meet Steinmetz. But Doherty was adamant, so we repaired to Steinmetz's office. Doherty left me in the outer office while he went into the inner sanctorum where Steinmetz worked. I heard Doherty explaining the situation and arguing, but Steinmetz didn't want to discuss the matter at all. Crestfallen and deflated I walked out into the hall. After a while Doherty came out and said that The Doctor would now see us. So we went in.

There was the world renowned engineer, a little hunchback in a grey sweater, half sitting on a tall stool by a long table, an enormous head crowned by a crew-cut, straggly beard, long black cigar, sizing me up by peering over his glasses at me with alert beady eyes. In a high-pitched German accent he stated, "Doherty tells me that you read my paper and the discussion on it and have made some calculations and prepared some curves. Tell me what you found." I told him. He cogitated for a moment, grunted, then his face came alive and in rapid fire fashion began to draw conclusions and extend his ideas. I shall never forget the profound impression of his magnetic personality, and the feeling that I was in the presence of a mighty intellect at work – the impact was almost physical. Then, after a while, he thanked me and invited me to come and see him again. I never did. Soon after Steinmetz took a trip west, caught a cold, and died.

Many times, in the course of my own modest career, when I have been stuck with some problem, I found the necessary inspiration to solve it by remembering the contact with Steinmetz, now nearly a half century ago.

After the first increase in student enrollment after World War I, the electrical department settled down to a more steady tempo. At this time the number of graduates was somewhat greater than the demand for them in industry, and this had a tendency to discourage entrance into engineering.

On the other hand the activity of the faculty was increasing because of the increasing activity in hydro-electric development and electric transmission lines under study or construction. Dr. Magnusson published Exp. Sta. Bulletin No. 26, 1924; "Hydro-Electric Power in Washington - Part I, A Reconnaissance Survey". Professors Kirsten and Smith were busy on mechanical design of lines resulting in Exp. Sta. Bulletin No. 17, 1923; "Transmission Line Design - Part I, Mechanical Features - Section A, Design of Spans with Supports at Equal

Elevations” by Kirsten; Bulletin No. 29, 1924; “Transmission Line Design - Part I, Mechanical Features -Section B, Design of Spans with Supports at Unequal Elevation”, by Professor Smith.

Somewhat later Professors Kirsten and Loew published a series on electrical characteristics of line design. Bulletin No. 32, 1925, “Transmission Line Design – Part II, Electrical Features – The Line of Maximum Economy.” In 1927, Professor Kirsten and C. M. Briggs published Exp. Sta. Bulletin No. 44, “Transmission Line Design – Part III, A 500 Mile Transmission Line.” Following later Professor Loew published Exp. Sta. Bulletin No. 50 in 1929, “Transmission Line Design – Part IV, Choice of Line Voltage and Conductor Size.” A number of articles in technical publications also appeared during this period.

In 1926, Theodore Bergstrom, B.S. in E.E. (1924), University of Washington, was appointed Instructor in Electrical Engineering and served through 1927.

In 1928, John Weir, B.S. in E.E. (1925), University of Washington, was appointed as an Instructor in Electrical Engineering and served through 1929.

In 1927, Professor Smith took a year of absence to work in the Lighting Arrester Department of General Electric Co. at Pittsfield, Massachusetts under K. B. McEachron, one of the world’s foremost authorities on lighting and its effects.

In 1928, Professor Loew, who was then teaching transmission line design classes, published his text “Electrical Power Transmission” by McGraw-Hill. Later Professor L. V. Bewley, then Dean of Engineering at Lehigh University pronounced it the best available text on that subject.

During the decade of 1920 to 1930, a considerable amount of animosity was building up among many of the engineering faculty of the various departments, toward Dr. Magnusson as Dean of Engineering. Probably the dean of engineering should not at the same time act as head of a department as well, since there is always a tendency to believe he would more readily favor advancements in rank or salary in his department above those in other departments. This possible error occurred again with the man who replaced Magnusson who also served as head of Civil Engineering.

This displeasure became so apparent that Dr. Magnusson resigned the deanship in 1929 but remained Head of Electrical Engineering. Richard G. Tyler, B.S. in C.E. Texas (1908), C.E. Massachusetts Institute of Technology (1910) was brought into the faculty to become Dean of Engineering.

During 1929 the Department of Aeronautical Engineering was formally established though classes had been conducted in the subject for several previous years. Professor Kirsten was now appointed as Professor in Aeronautical Engineering though he had been teaching some Aeronautical subjects for several years before.

During 1929 and 1930, Dr. Magnusson and Professor Kirsten approached the Guggenheim Foundation seeking a grant to construct a new building to house classes and laboratories for the rapidly expanding aeronautical department. The grant was made and the present Guggenheim Hall was added to the campus.

In previous years Boeing had provided funds for a moderate sized wind tunnel for testing small aeroplane models. This tunnel, housed in a wooden structure, was supervised by Professor Kirsten. Shortly after the construction of Guggenheim Hall, the State of Washington together with a grant by Boeing, provided funds to erect a much larger wind tunnel near Guggenheim

Hall to be housed in a permanent brick type structure. The design of this building as well as the equipment placed in it was supervised largely by Professor Kirsten, assisted by Professor Fred Eastman, Professor Austin Eastman's brother. Later the new wind tunnel was dedicated as the Kirsten Wind Tunnel.

The question now arose as to who would be appointed as head of the new aeronautical department. Because of Professor Kirsten's great activity in the field for many years, and having been appointed the first full professor in the department, there appeared every expectation that he would be chosen. However, possibly because he and Dr. Magnusson had worked together so diligently to obtain the building, the recent animosity against Magnusson together with Professor Eastwood's feeling he was being bypassed though he considered the department somewhat a branch of mechanical engineering, led to a final decision to appoint Prof. Eastwood Head of both Mechanical and Aeronautical Engineering in 1930.

Even as early as 1922, Professor Kirsten had proposed a radically new theory of propulsion in water or air, which he called the cycloidal propeller. By 1925 he had perfected his propeller for use in water to the degree that W.E. Boeing financed a boat equipped with the cycloidal propeller for demonstrations in Lake Union. Since the tests appeared very favorable Kirsten contacted the U.S. Navy hoping they would accept it for use on Navy vessels. The personnel higher up in Washington, D.C. finally decided against acceptance. In 1932 he was approached by the German Company, Voith, who purchased his patents and it was used on several commercial vessels in Germany and other European countries.

Early in his work he had also proposed the propeller for use in air, and in 1925 the Government proposed Kirsten submit plans for its use on the dirigible Shennandoah. Again it was finally not accepted. Kirsten's Exp. Sta. Bulletin No.79, 1935, "Cycloidal Propulsion in Air" describes the theory and development.

In 1929 Dr. Magnusson published his text entitled "Direct Currents" by McGraw-Hill. This proved to be an excellent text on the fundamentals as well as on direct current generators and motors. Since he used a graphical method of explaining the saturation curve effect upon the operating characteristics of motors and generators which was first used by Langsdorf, there was some question as to how Langsdorf might react. Either Langsdorf overlooked this use of his suggestion, or Magnusson had altered the scheme, with Professor Lindblom's help, to such an extent that Langsdorf did not consider it advisable to object.

The publication of the text also stirred up some ill feelings between Magnusson and Loew. At the time Professor Magnusson was publishing his text on "Alternating Currents," Magnusson and Loew had an understanding that Loew would publish the direct current text, or Loew at least considered it was their understanding. Prof. Loew thus had been working on such a text and had it partly complete when he found Magnusson had his manuscript well completed. Professor Loew then altered his plans and wrote a somewhat more abbreviated text covering both direct currents and alternating currents designed for non-electrical students in engineering. Thus his "Direct and Alternating Currents" was published by McGraw-Hill in 1933. It proved to be a most excellent text and was even used in many colleges for majors in electrical engineering.

The wiring in the electrical laboratory, while considered excellent at the time it was installed, was getting somewhat dilapidated from use, and far below the standard wiring requirements at this date. The engineering building was constructed with fine brick outside walls but the inside was all timber and highly inflammable especially with oil on floors from

machinery. Magnusson was always fearful of fire and induced the University administration to grant enough funds to rewire the laboratory using rigid steel conduit throughout. Professors Lindblom, Smith and Hoard did this work during their summer relief period from teaching, and everyone breathed a sigh of relief when the task was completed.

At about this period, Professor Smith was to realize a fortunate return on his year spent with the General Electric Co. Smith's brother-in-law, Edward Shelton a previous University E.E. graduate, now employed in Pittsfield, Massachusetts by General Electric Co., found some thirty five or forty high voltage condensers which General Electric had used on transmission line tests but now of little value to them, which he induced the Company to donate to the University for constructing a surge or so called "lightning generator." The General Electric Co. went still further and donated a Dufour type of cathode ray oscillograph with all the necessary equipment for operation. With this equipment together with the experience gained during the year in Pittsfield, Smith set up a moderately high voltage surge generator, as well as the oscillograph in one of the large inside rooms under skylights previously used for drafting rooms. This was used by the students as well as for research, for several years. Later Dr. Magnusson obtained funds to purchase much larger and higher voltage condenser units enabling Smith to re-design and construct a new 600 kilovolt unit which was reinstalled in the new building later.

The depression which hit in all its fury in 1929 began to have its disastrous effects on all departments in the University by 1931 and 1932. The Legislature had cut appropriations drastically and all salaries were cut again and again. Fortunately the electrical engineering department did not lose any of its faculty as was the case in some other departments. However by 1933 more liberal appropriations were obtained and part of the salary cuts were restored.

The effect of the depression upon the number of students registering was somewhat the reverse. With many workers losing their jobs and employment for new workers almost non-existent many of those at college age either started college work or continued it as graduates to prepare for employment in the future. This was especially true for engineering. In a November 1931 Daily report Dean R. G. Tyler stated that electrical engineering is the most popular course in engineering. Out of 893 students in the Engineering College, 149 are in electrical engineering.

Back in the mid-twenties or before, J. F. Peters of Westinghouse produced photographic figures caused by voltage surges which he called Klydonograms, and suggested them as a means of studying voltage surges and their effects upon electric equipment. Workers at the General Electric Co. called them Lichtenberg figures. These intrigued Dr. Magnusson to study such effects by placing the photographic plates in the presence of a magnetic field such that the field's effect upon the movement of the electrons producing such figures could be determined. With no magnetic field present the movement appeared straight outward from the central contact point, but with the field the movement took a spiral path as Magnusson suspected it would. By this means he determined whether the electrons moved outward or toward the positive electrode, and of course the reverse for the negative electrode.

These results he reported by means of papers prepared for the scientific societies as well as in Exp. Sta. Bulletin No. 59, 1932 "Electric Discharges No. 1. Effects of the Magnetic Field on Electric Figures in Air". A February 1932 issue of the Daily announced "Magnusson wins international fame with studies in Lichtenberg figures. He disproves theories of European scientists Pederson, Toepler and Pizitram that the positive ions are projected from the positive

electrode in such figures. Magnusson proved by using the effects in a magnetic field that the reverse is true.”

It was interesting that Magnusson was greatly disturbed by a letter from a famed scientist who severely criticized the statements in his papers and reports. Later he received a second letter from the same scientist asking to be pardoned for the previous letter. He stated that he had duplicated the tests described by Dr. Magnusson and convinced himself that the conclusions Magnusson had stated must be correct.

During about this same period Professor Shuck had been busy with studies on electrical measuring equipment, as well as on the use of the theory of calculating as well as measuring the effects in unbalanced three phase circuits by means of “Three Phase Symmetrical Components,” first proposed by Fortesque in 1918. He reported the results of his studies in the three Exp. Sta. Bulletins, No. 52 (1930) “Kilovolt-Ampere-Hour Meters”; Bulletin No. 70 (1933) “Metering Symmetrical Components”; Bulletin No. 84 (1935) “Equations for Calculating Three Phase Symmetrical Components”, as well as papers to technical publications. He obtained and sold a patent on one of his measuring devices. His Bulletin No. 84 is a classic in presenting simplified methods of dealing with very complex types of problems and has been the one most often requested.

In 1934 Lyall B. Cochran, B.S. in E.E. 1923, E.E. 1936, University of Washington, was appointed Instructor in Electrical Engineering, becoming Professor in 1952 and Professor Emeritus 1969. Professor Cochran had served as Instructor in Electrical Engineering during the year 1923-24 and was replaced by Eastman who had returned that year. Professor Cochran wished to gain some experience with the General Electric Co. where he served two years. He then spent two years with the telephone company in Everett, Washington largely on telephone service measurements, and finally two years with the State Department of Washington before returning to the University.

Professor Cochran, a very excellent teacher, proved himself well qualified in planning and supervising the electronics portion of the laboratory introduced after his arrival. He planned the installation in Engineering Hall as well as the one later in the new Electrical Engineering Hall. He always gave a great deal of his time to what might be called extra-curricular activity with the students and with the public. He was quite popular as a lecturer on some of the new advances in the electronics and high frequency fields, and was continually quoted in news articles.

The depression in the early thirties brought about the development of the Grand Coulee project as a means of creating jobs and at the same time carrying out a project considered too big to be undertaken by any organization other than the Federal Government. Again Dr. Magnusson gave freely of his energy in studies of problems involved. Again many field trips were planned visiting the power site from the time the only evidence of activity was a survey camp near the river where the old ferry barge was busy carrying automobiles and passengers across, until the plant was finally in operation. He strongly advocated the dam to be carried to its present height, and even argued for a higher dam if concessions with Canada could be obtained to back the lake into their territory. He also suggested and made studies of a grid system of transmission lines and interconnected systems, similar to actual grid in operation at this time. Evidence of his activity at that time can be found in Eng. Exp. Sta. Bulletins No. 90 (1936), No. 93 (1937), No. 95 (1937), No, 96 (1937), No. 99 (1938).

While Dean Tyler was installed as Dean in 1929, he was now experiencing some of the dissatisfaction Dr. Magnusson had been confronted with in 1929, and finally resigned in 1935 to continue work teaching in civil engineering. Professor Edgar A. Loew was chosen to take his place and served to his retirement age for deanship in 1948.

In April 1935 the Daily reported a rather significant development by two undergraduate students, George K. Barger and Siegfried Hanson. For some years the U.S. Fisheries Department had been inserting small marked metal tags beneath the skin of young fish from the hatcheries, hoping to recover at least some of them later when they were caught for processing. These students designed an electronic sensing device to detect the tags as the fish were transferred over a belt to the processing equipment. The signal thus sensed caused a relay to kick the fish from the conveyer.

While this single citation might lead to the belief that such undergraduate activity was unusual, the facts are that there had been many others though this appears to be one of the more commercially valuable ones.

In 1936 Dr. Magnusson was granted the title of Dean Emeritus of Engineering, somewhat delayed as compared to the usual practice.

From the time Professor Eastman joined the faculty in 1924 he began teaching some courses in electronics and vacuum tubes. The number of courses were slowly increased and when Professor Cochran started his work in 1934 he set up the laboratory for this work. In 1937 Eastman published his text "Fundamentals of Vacuum Tubes." The amount of this work in electronics slowly increased until the students were finally given the option of specializing either in the power field or in the electronics field.

In the early thirties Professor Smith while working with his transients laboratory students was confronted with a desire to record magnetic transients by means of the oscillograph. Finding no direct means of doing this enticed him into a search for means of making magnetic measurements. Recalling the use of a bismuth coil, the resistance of which is altered when in a magnetic field, during his physics laboratory work, suggested using two such coils in the arms of a Wheatstone bridge as a possible solution. After overcoming many problems such as obtaining bismuth wire, as well as forming it into coils, and many months of tedious work, a successful meter was finally accomplished, which would measure both stationary as well as varying fields. This resulted in several papers in technical magazines, even one in the London Electrician. A patent was obtained, but he was never able to get it on the market though Weston and others seriously considered the possibility of manufacturing such an instrument.

The meter is fully described in Eng. Expt. Sta. Bulletin No. 103 (1940) "Bismuth Bridge Magnetic Flux Meter."

In 1937, Charles M. Wolfe, B.S. in E.E. (1925) West Virginia, M.S. (1929) PhD (1932) California Institute of Technology, was appointed as Instructor in Electrical Engineering. He remained until 1941. Professor Wolfe was the second professor added to the Electrical Engineering faculty having a PhD degree. He was rather quiet, what might be termed a "lone worker." He entered into some research work studying vacuum tubes.

For some reason he seemed to feel Dean Loew would never be inclined to advance him either in rank or salary so left in 1941 to work with a manufacturing company in California. Apparently he did quite well there and is now partially retired but still serves as a consultant.

In 1938 Professor Lindblom, with the aid of some of his student helpers, prepared and conducted an excellent exhibit for the Electrical Engineering Department during the Western Washington Fair at Puyallup in September. This was probably the first and only time such an exhibit has been displayed at the Puyallup Fair and it entertained a very enthusiastic audience.

In February 1938 the Daily reported that Dean Loew announced an enrollment of 1277 students in the seven departments of engineering. A similar announcement in 1939 gave the enrollment as 1338.

This was again one of the periods of expansion in the engineering department. In November 1939 the Daily announced that Dean Loew stated, "You cannot find a man without a job six months after commencement. We have been looking for men to fill the requests by industry and cannot find them."

During this period the conflict in Europe was becoming more and more intense, and again Germany under Hitler seemed inclined to intensify his actions against any country which opposed him in any way, including the United States who were aiding his opponents. Again the effects upon the students were quite varied, with more tendency toward anti-war demonstrations than took place before World War I. The commotion generated by such groups resembled a somewhat feeble preview of those in 1968 and '69. However President Sieg demanded no demonstrations should take place on the campus, and while some were held just off the campus in Eagleson Hall and other places, they resulted in little damage or effects.

During 1940 Dr. Magnusson became seriously ill. He was later confined continuously in bed until he passed away July 10, 1941. His death was not only a great loss to the University and Electrical Engineering Department, but to the community and in fact the whole state for his efforts in hydro-electric, power grid, electric power uses, sales and rates, as well as his many other studies which were of considerable importance.

During Magnusson's siege of illness Dean Loew took over the duties of Head of the Electrical Engineering in addition to his duties as Dean.

This might well be considered the end of an era in the story of the Electrical Engineering Department and its period of growth pains. The activity was carried on largely by a group of seven or eight faculty members, largely with a boyhood experience gained on the farm, only one of which could boast of a Ph.D. degree, but all active and faithful to the end. They, as will probably be true of those who follow, found it necessary to prepare themselves to teach much of the material required, which was not available during their period of training, because of the rapid developments as well as advanced requirements in the curriculum.

With requested appropriations almost always painfully slashed by the State Legislature, with no federal grants for research which became so popular in later years, and very little from other sources, each member of the faculty desiring to conduct research work must use whatever equipment was available or devise and construct his own equipment. The sources of funds for purchasing equipment were almost nil, there were no technicians at his command, there was not even a good machine shop available in the department for his use. However even under these limitations their achievements were reasonably good.

All of them were members of either the American Institute of Electrical Engineers, or of the Institute of Radio Engineers. Most of them had been granted the grade of Fellowship in one or

the other of these societies and one had been granted a Fellowship in each of the two before the two were combined as Institute of Electrical and Electronic Engineers.

Very few references have been made of the many reports and technical publications produced by the several professors since during this period a major portion of their work was ably reported in the Engineering Experiment Station Bulletins.

Perhaps this record would not be complete should the arduous and devoted services of the head secretaries for the department not be mentioned. During a large portion of Dr. Magnusson's time as head, Miss Anderson, usually without assistants cared for the many details which so greatly reduces the load on the shoulders of the department head. After Miss Anderson's many years of service, Miss Northern (Bernez Kuhn) continued the task again for many years with very little assistance. Miss Northern continued this duty until she retired to her husband and her retreat on Camano Island in 1960. In the later years she was caring for most of the details of pre-registering the electrical engineering students. Doubtless Professor Eastman, who took over the duties of Head of the department following Dr. Magnusson would have experienced far more headaches, without the assistance of a secretary who perhaps knew more about his duties, and the details he had assumed than did he at the start.

THE YEARS TO MATURITY

A successful department, similar to a great university, will not reach maturity until its growth and influence cease to increase, and at that time it is likely to become aged or, worse yet, may be on the road to decline or death. Fortunately the Electrical Engineering Department at the University of Washington appears to be entering a period of healthy growth and development.

After the grievous death of Dr. Magnusson, and even before his death when the fact became evident that he could not possibly survive for long, the problem of choosing a new head for the department was unavoidably entering the minds of all concerned. This problem quickly ripened into a necessity after his death.

The question usually arises, should it be one of the present faculty or someone from the outside? With industry seeking every available trained person and with other colleges in general offering better salaries than could be promised here, choosing one of the present faculty appeared to be the only answer.

From items of gossip which usually filter out into the open after such events, at least four persons appeared eligible for the selection. Since Professors Hoard and Smith were now about equal as senior members, they would probably be considered. Professors Eastman and Lindblom, also equal in seniority and both very active in their lines of endeavor, would about end the list since Professor Kirsten had left the department and was deeply involved in his new pursuits. Neither Smith or Lindblom appeared to have much desire to be chosen, the choice of Hoard or Eastman appeared to be the likely answer. It was sometime after Dr. Magnusson's death when Smith was told that Magnusson had favored Hoard or himself.

Both Hoard and Eastman appeared to be hopeful of being chosen, and since it was Dean Loew's duty to advise President Sieg, Professor Eastman was assigned the promotion in 1941. Doubtless this has proven to have been a wise choice.

Several years previous to this time the question had been pondered whether the Electrical Engineering Department had accepted too many of its own graduates as faculty members and was thus becoming "ingrown." Of the seven or eight members having served long enough to be thought of as "permanent members" only Dr. Magnusson, Professors Loew and Shuck had been acquired from outside institutions. However, nearly all of the others, while Washington graduates, had gained a considerable amount of experience in the commercial field before having accepted teaching as a career. Whether or not the acceptance of Washington graduates was wise, the department has made a reasonably good record. Nor did the acceptance later of several of our own graduates appear to be in error when compared to the many later faculty members from various other institutions, some considered of the highest standing among colleges.

The next faculty member to be chosen in 1941 was one of our own graduates, although with some advanced training elsewhere, and in later years he has proven to be one of our most valuable faculty members. Thus W. Ryland Hill; B.S. in E.E. (1934), University of Washington, M.S. (1939) and EE (1940) University of California, was appointed as Assistant Professor in Electrical Engineering. He became Professor in 1953, and Associate Dean of Engineering in 1959. Not only has he proven himself to be an excellent teacher, well liked by his students, he has served the department as well as the University in many other ways. He served as a member of the University of Washington School Executive Committee, the Freshman Year Committee, the Commission on University Senate, and many other assignments.

In 1957-58 he took a year leave of absence to serve as Acting Head of Electronics at the Madras Institute of Technology, Madras, India. Again in 1966-68 on a second leave of absence he served on the United Nations Educational and Cultural Organization (Founded in 1946) at Paris, France.

In 1949 his text "Electronics in Engineering" was published by McGraw-Hill Co. which proved to be an excellent text. Since it appears undesirable to attempt to mention publications of the various faculty in technical journals unless they are of special importance in this history, his various papers will also be omitted.

Back in the 1930's or before, the requirements in English courses in the curriculum for engineering students had not been entirely satisfactory as taught to English majors. In an effort to improve courses for engineers, since there were now usually enough to fill one or more classes of such courses, the English Department assigned Prof. Amy Violet Hall to care for the special needs of the engineering department. She did excellent work in studying the engineering requirements, one of which was training in report writing, and devised and taught such courses to the engineering students. She also expanded the field of such courses to enhance the students' knowledge in cultural aspects. Later she was joined by Professor Stewart Chapman and the result was a complete break from the English Department, and the creation of an engineering department called the Department of Humanistic-Social Studies. The courses were designed to provide a general non-technical education as an integral part of the engineer's professional training. Professor Chapman served as Chairman of the department until 1968 when he was succeeded by Prof. White.

The war in Europe was now taking on a serious aspect since Germany under Hitler, now with a fairly well developed air force as well as navy, was bombing England from the air and sinking ocean shipping whenever she seemed to feel it would enhance her prestige. The fact became quite evident that the United States would be forced to declare war. We were already supplying large quantities of the tools of war, and were at the same time preparing for the possible event of joining the Allies.

The destruction by air bombardment in England induced a speed up in the research for means of detecting the approaching aeroplanes at a distance. The result was the radar detecting devices using ultra high frequencies.

Radio was already well established in the electrical engineering curriculum, and now the ultra high frequency field must be given more attention. In 1941 Professor Cochran was delegated to attend, as a representative of the University of Washington, a three week conference on Ultra High Frequency Techniques, and methods of teaching this material. This was held at the Massachusetts Institute of Technology at the request of the U.S. Armed Services. In 1942 he again attended a second two week conference on the same subject. Using this training he set up courses for the department for the teaching of this advanced work.

When Germany began sinking our merchant ships, and even attacking our convoys protecting them later, the United States was forced to declare war. Again a large group of barracks were constructed, now between Engineering Hall and Freshman Basin, to be used for special training purposes.

In 1942 Professor Eastman announced a speed up program for junior and senior students stressing the technical courses. An urgent demand was also building up to offer accelerated

training for technicians and repair crews. Since such technicians in radio and electronics were most in demand, the Electrical Engineering Department set up special accelerated courses for this purpose. Many of such special courses were scheduled as evening courses, and most of the faculty were teaching one, two or three evenings a week and some on weekends in addition to their regular work.

While we were serving an unusually large number of students during this period our work as well as enrollment in the normal engineering activity was dropping to a new low since so many regular students as well as potential students were being taken by the armed forces. However, one new faculty member was added in 1943.

Vinson LeRoy Palmer; B.S. in E.E. (1940), M.S. in E.E. (1948) University of Washington, was appointed as Instructor in E.E. in 1943 and as Assistant Professor in 1948. He promised to be an excellent addition to the faculty but the lure of outside offers induced him to leave the faculty in 1951.

When the war finally ended in 1945, everyone breathed a sigh of relief and were anxious to get the department back to normal. The Federal Government had provided funds, which could be obtained by application, for those who had served in the armed forces to enter or to continue their education in any acceptable institution they may choose. Now that the boys were being released from service and with this Federal assistance, the enrollment, especially in engineering again climbed rather rapidly, and again class room space was greatly in demand.

The temporary barracks were largely being dismantled though a few were being moved to other parts of the campus and were used for many years thereafter.

Although Professor Kirsten was no longer in the Electrical Engineering Department, he was always remembered as one of our faculty and thus our interest in his activities never waned appreciably. Thus a brief record of his later work should not be out of place.

In 1935 he invented a fire extinguishing dust which seemed successful in quenching fires with little or no damage as compared to the use of water and other liquids. In 1938 he invented an improved pipe for tobacco smokers which he claimed would give a very much cooler smoke and filter out more of the deposits as compared to most types of smoking equipment. This was the one invention that proved to be a financial success for him. He and his son set up a factory near Lake Union and the business proved very successful. Fortunately they sold out before other similar types flooded the market.

In 1939 he invented an ultra-violet moth destroyer to be used largely in orchards for controlling damaging moths. In 1940 he invented a centrifugal dust remover for cleaning air streams for purposes where well cleaned air is important. That same year he proposed and invented a heated air pneumatic mattress.

In one of the many lectures requested of him by various audiences, his subject was inventions. During the lecture he was discussing the merits of his pneumatic mattress. "With this mattress the air is preheated to any desired comfortable temperature, can be held at any desired pressure. The mattress is provided with very small pores which will slowly leak a refreshing amount of air to bathe the body throughout the night. Controlling the mechanism supplying air pressure by means of a suitable time control, one need not even be annoyed by an alarm clock in the morning. Simply have the mattress automatically deflate at the desired time."

In 1942, with Germany bombing England, we were considering night patrols to detect any possible enemy planes approaching and were using sirens for alert signals. Kirsten invented an air raid siren with sound reflector to greatly amplify such signals.

During the war the Bonneville Power Administration had been allowed rather liberal appropriations to insure they would be prepared to supply sufficient power for use in the war efforts. A sizeable portion of the appropriations had been allocated to be used for research work. Because of their preoccupation with other duties they had been unable to make use of this portion, and at the end of the war the time limit was near when the unused portion must be returned to the general fund. Because of this they had requested the government that they be allowed to contact the various colleges and obtain research proposals. If such proposals would be of value to Bonneville, allocations from this fund could be granted to carry out such research.

The Electrical Engineering Department made three proposals: 1) a study of electric heating for use in residential space heating; 2) the effect on present electrical distribution systems with various percentages of the houses served changing to electric space heating as well as additional required distribution facilities for greater percentages of houses electrically heated; 3) the economic feasibility of using electric power to heat houses by means of reversed refrigeration or the heat pump. This was the first time the department had been offered government grants for research work.

Professor Shuck accepted the second item and Professor Smith took over the third. The work was to be planned and supervised by the professor with the details of the work carried out by graduate students working toward masters degrees. The findings of these two research projects would be submitted to Bonneville in reports, and would serve as theses for the masters requirements.

By the time Professor Smith had completed the work on his proposal, the use of the heat pump was becoming more or less popular for residential heating. Since using the outside air as a source of heat is by far the simplest method, serious difficulties arise during the short cold spells occurring almost every winter. To obviate this the use of ground grids was proposed and some installations were being tried. Smith was now given further grants to make studies of ground grids as the source of heat. This resulted in several phases of actual experimental work as well as mathematical studies. The results were largely reported in a series of articles published by technical magazines. Later Smith continued other work on straight electrical heating as well as other phases of heat pump studies, some without grants and others with grants from local sources.

With so many of the men discharged from military service returning or starting on further advancement of their education, the demand for both space and more faculty members was rapidly increasing. The first need was being met by the planning for a new building for electrical engineering to be located across the roadway west of Engineering Hall, while the second was relieved by the appointment of three added faculty members.

Walter E. Rogers; B.S. in E.E. (1934) California, M.S. in E.E. (1948) University of Washington, was appointed as Instructor in E.E. in 1946, and became Professor in 1956. Professor Rogers specialized in the teaching and research on electric fields. He published a text, "Introduction to Electric Fields" in 1954. The text was so favorably accepted by other colleges, that Professor Rogers was requested to spend a year teaching at Massachusetts Institute of Technology in 1955. In later years Professor Rogers took over the supervision of the graduate

program, greatly aiding the rapidly increasing stature of the Electrical Engineering Graduate Department.

Laurel J. Lewis; A.B. (1933), E.E. (1935), Ph.D. (1937) Stanford, was appointed Associate Professor in E.E. in 1946 and became Professor in 1954. Professor Lewis became the third faculty member having a doctoral degree and really the second more or less permanent one. His interests are centered around the development of the graduate program, and introduced computer studies in the department. He served as consultant to the Applied Physics Laboratory, as Chairman of the University Faculty Committee and many other University as well as Engineering faculty duties. He supervised a rather extended study of the use of computers to determine the most effective utilization of networks and water storage in the operation of large power systems and distribution grids.

Floyd D. Robbins; B.S. in E.E. (1925), E.E. (1949) University of Washington, was appointed Instructor in E.E. in 1946, and as Associate Professor in 1957. This appointment was taken after retirement as a staff officer in the U.S. Army. His principal interest has been the generation and distribution of electric energy. His efforts in arranging and supervising student field trips to local engineering developments, as well as his interest in the student organizations of A.I.E.E. and I.R.E. have been of great value to the department. In 1961 he received a special award for fifteen years of service as faculty adviser for the student branch of A.I.E.E. and I.R.E. He served as consultant to the State of Washington Department of Fisheries in their studies of the effects of dams on the spawning of fish. In more recent years he served as consultant to the General Electric Co. at Hanford, Washington, in studies leading toward the generation of power from nuclear sources.

For several years after World War II a considerable amount of commotion occurred because of the presence of communist-led activities. As unseemly as might be expected many of the University faculty appeared to be swayed by such isms, and if not directly extolling them, at least opposing methods proposed to limit such activity. Fortunately there was a minimum of such activity expressed by any of the electrical engineering faculty. They all appeared to be too engrossed in their department duties to be involved in such debatable controversy. An item which appeared to them to be of more importance was the planning of the new building. Room was in such demand that many classes and office accommodations must be shifted to other buildings.

With the enrollment still increasing, the need for more faculty members resulted in the addition of several at this time.

F. Robert Bergseth; B.S. in E.E. (1937) University of Washington, S.M. in E.E. (1938) Massachusetts Institute of Technology, was appointed Instructor in Electrical Engineering in 1947, and became Professor in 1957. Previous to joining the faculty he was employed as an engineer by the Allis-Chalmers Mfg. Co. and also served five years as an officer in the U.S. Navy. As a faculty member he has made some excellent research contributions on electronic relaying in power systems, which work was sponsored by the Bonneville Power Administration. He has for many years been a member on the State Board of Engineering Examiners, responsible for the licensing of professional engineers of the state, and more recently has been selected as the Chairman of the Board. He has, during the absence of the department head, served as temporary head of the department. He has served on many committees both for the department or at the college level, as well as for the A.I.E.E. and I.E.E.E. He served as assisting author with E. A.

Loew on the fourth edition of "Direct and Alternating Currents" in 1954 and coauthored with F. J. Alexandro, L. J. Lewis and D. K. Reynolds in the publication of "Linear System Analysis" by McGraw Hill Co., 1969.

H. Myron Swarm; B.S. in E.E. (1940), M.S. in E.E. (1950) University of Washington, Ph.D. (1960) Stanford, was appointed as Instructor in Electrical Engineering in 1947, became Professor in 1959, and Associate Dean of Engineering in 1966. After his graduation in 1940 he served in several engineering grades for the Civil Aeronautics Administration on radio and ultra high frequency equipment. Later he worked at similar tasks for Hewlett-Packard Co. and Radio Propagation Laboratory at Stanford. From 1956-57 he was engaged in microwave and x-ray field emission tube research for Linfield Research Institute in Linfield, Oregon. Since 1957 he has remained as a permanent member of the faculty. Some of his most unusual research work in the Antarctic will be mentioned later. His record of technical publications is quite extensive. He has served on many committees, both of department and college level, and his consulting practice is quite extensive, including Boeing, John Fluke Mfg. Co., Minneapolis-Honeywell and others. He became the third of what might be termed "permanent" faculty members having a Ph.D. degree.

Homer M. Rustebakke; B.S. in E.E. (1941) Polytechnic College of England, M.S. (1945) Pittsburgh, was appointed Instructor in Electrical Engineering in 1947, and Assistant Professor in 1949. He proved to be an excellent addition to the faculty but took leave of absence in 1955 and never returned.

Andrew B. Jacobson; B.S. in E.E. (1941) University of Washington, was appointed as Instructor in E.E. in 1947. Jacobson did a considerable amount of teaching in several of the basic courses, but his most valuable talent to the department was that of technician, especially in radio work. His ability to be considered for advances in the teaching field appeared so doubtful and the salary possible for technician help so low, he was readily enticed to accept much better offers in California where he has proven very successful. He left the department in 1953.

Two more faculty members were added during the next year.

Thomas M. Stout, B.S. in E.E. (1946) Iowa State, M.S.E. (1947) Michigan, was appointed Instructor in Electrical Engineering in 1948. Mr. Stout appeared to be an excellent addition to the faculty but better offers elsewhere caused his departure in 1954.

Arthur E. Harrison, B.S. in E.E. (1936) California, M.S. (1937) Ph.D. (1940) California Institute of Technology, was appointed Associate Professor in Electrical Engineering in 1948 and became Professor in 1952. From 1940 to 1946 he was development engineer for the Sperry Gyroscope Co. working on klystrons. He is a specialist on microwave tubes and has published a text on "Klystron Tubes" by McGraw Hill Co. in 1947. At the University he has continued his work at research and teaching of microwaves and related subjects. As a side interest he has developed a rather extensive field of research as well as an extensive list of publications and lectures, on studies of glacier movements on the various mountain peaks in Western Washington. A major portion of this work occurs during the summer as well as on weekends. Fortunately, he has had several grants of funds to pursue these studies. He has proven to be a most valuable "permanent" member of the faculty.

The new Electrical Engineering Building was completed as a building in the early part of 1948, but much work was still to be done in wiring the laboratory and shop portions, as well as designing and building new testing sections, moving equipment from Engineering Hall and

installing it, together with considerable new equipment, in the new building. Professor Lindblom with a crew of student help was busy all summer on the power laboratory and various shops. Professor Cochran was busy planning and designing equipment for the new electronics laboratory as well as moving equipment from the old building, while Professor Smith carried out a similar program in moving the impulse or lightning generator to the new high voltage laboratory in the new building. A gift of much of the high voltage equipment from the x-ray part of the Swedish Hospital, when new modern equipment was installed there, helped to greatly improve the quality of the new high voltage laboratory. This laboratory was used for instructing students in high voltage techniques, as well as for a considerable amount of high voltage testing for companies in the Seattle district and even as far as Vancouver, Canada. However, due to the rapidly changing curriculum, the space was so greatly needed for other research, the laboratory was dismantled in the early 1960's.

During 1948-49 part of the electrical engineering work was conducted in the new building and part in old Engineering Hall. In changing over, some of the classes first met in the old building and with each student carrying a chair or other item, reconvened in the desired room in the new building.

Because he had reached the retirement age as Dean, Professor Loew retired as Dean Emeritus of Engineering, and Harold E. Wessman; B.S. (1924) M.S. (1925), C.E. (1929), Ph.D. (1936) Illinois, was appointed as Dean of Engineering in 1948. Professor Loew continued teaching in the Electrical Engineering Department until his retiring age for teaching in 1952.

After the Electrical Engineering Department had vacated Engineering Hall, the mechanical engineering laboratory was expanded to use the first floor space previously occupied by the electrical laboratory. A large portion of the second floor was used by the Humanistic-Social Studies Department with a specialized library in the old high voltage laboratory room. The floors and stairs in the building, now nearly fifty years old were very badly worn and many portions had already been patched or replaced.

The enrollment in electrical engineering reached the highest peak it had thus far attained in 1949 while the university as a whole had peaked in 1948. The electrical engineering enrollment dropped quite radically in 1950 and still more in 1951 after which the trend was reversed. Since then the increase has been more rapid for electrical engineering than that for the university as a whole.

The cause of the rapid decrease after 1949 was the nation wide publicity just previous to that time, predicting there would be far more engineering graduates available than engineering jobs. Contrary to this prediction the demand for engineering trained graduates, and especially those with advanced training, increased. This was especially true in this part of the state due largely to the growth of the Boeing Company and the activity of the many companies supplying Boeing with many special types of devices. The same was quite generally true in the West as a whole.

In 1949 the Engineering Experiment Station initiated its quarterly magazine "The Trend." This magazine was intended to offer a means of reporting the results of research work in the various departments. The Engineering Experiment Station Bulletins were largely replaced by using reprints of papers published by the technical journals and magazines.

With the enrollment down and the department located in the new building things appeared to be moving along very well. With faculty salaries maintained at a more or less constant level due

to the failure of the legislature to increase the budgets, several of the more valuable faculty members were being offered better salaries in the commercial field or by other institutions, with the result that some left the department. The result was a continued shortage of faculty which was partly overcome by using a considerable number of graduate student assistants.

During the early fifties several of the faculty were quite active in research of various types since grants from the government and various other sources were increasing. This offered fine opportunities for special work suitable to students seeking masters degrees. Thus a graduate department was slowly developing.

In 1951 Bonneville Power Administration was experiencing some unusual difficulties with excess corona on some of their high voltage transmission lines. The cause was not known but they suspected it might be due to the strong winds in Eastern Washington, oftentimes laden with dust. The so-called bridge wind tunnel specially constructed for and used by Professor Farquharson for studies on small models of the Tacoma Narrows suspension bridge which had been wrecked by a strong gale, appeared to be an ideal place to make the necessary tests to prove or disapprove suggested theories, or perhaps discover the cause of these corona difficulties. Professors Smith and Jacobson were given a grant by Bonneville to conduct such tests. The results were not as conclusive as were hoped for but a considerable amount of valuable information was obtained.

By 1952 the electrical engineering enrollment again returned to a definite increase and with some of the faculty leaving the need for more help became critical.

James H. Fisher, B.S. in E.E. (1944), B.S. in E.E. (1947) University of Washington, M.S. in M.E. (1950), Ph.D. (1953) Purdue, was appointed as Assistant Professor in Electrical Engineering in 1953. Professor Fisher proved to be an excellent addition to the faculty but again outside offers enticed him to leave in 1957.

In 1953 the Electrical Engineering Department was given permission by the faculty senate to offer the degree of Ph.D. in Electrical Engineering. Previous to this time a few Ph.D. degrees had been granted to electrical engineering students through an agreement with the Physics Department to grant them having supplied a required number of physics credits.

Paul C. Leach; B.S. in E.E. (1949) University of Washington, was appointed Instructor in Electrical Engineering in 1954 but only served until 1957.

Robert E. Wall; B.S. in E.E. (1949), M.S. in E.E. (1953) University of Washington, was appointed Instructor in Electrical Engineering in 1954 and served to 1960 when he accepted an outside position.

Gedaliah Held; M.S. (1950) Hebrew University, Israel, Ph.D. (1953) University of California, was appointed as Assistant Professor in Electrical Engineer in 1954 and became Professor in 1960. Professor Held's special field was microwave circuits and antenna research. Professor Eastman hoped Professor Held would greatly aid in building up a strong graduate department, especially now having been given the permission of offering Ph.D. degrees. During his service on the faculty, Held acted as consultant to Boeing, Hughes Aircraft in Culver City, California, I.B.M. Corporation and Electro Development Company, both of Seattle.

Held was quite demanding in his desires and needs, regardless of the effect on other senior faculty members. He appeared to be a successful instructor for the unusual student but was far

from popular with the average one. Outside salary offers caused him to leave the department in 1960.

In October 1954, the Daily reported that the engineering enrollment for that autumn was 2062, now the largest on the Pacific Coast. This increase in enrollment demanded more faculty help with the result that four new members were added.

Jack W. Carlyle; B.A. (1954) University of Washington, was appointed as Instructor in Electrical Engineering in 1955. He only remained until 1957.

David D. McNelis; B.S. in E.E. (1952) Gonzaga, M.S. in E.E. (1957) University of Washington, was appointed Instructor in Electrical Engineering in 1955. He left the department in 1961.

David L. Johnson; B.S. in E.E. (1948) Idaho, Ph.D. (1955) Purdue, was appointed Associate Professor in 1955, and became Professor in 1961. Professor Johnson raised the computer component to an important part of the curriculum, which up to this time had been sponsored largely by Professor Lewis. Professor Johnson initiated the studies of computer translation from one language to another, as well as problems involved in the transfer of information between humans and computing machines. He did consulting work for Boeing and network analysis and consulting for Purdue Network Analysis Staff.

John L. Bjorkstam; B.S. in E.E. (1949), M.S. (1952), Ph.D. (1958) University of Washington, was appointed Assistant Professor in Electrical Engineering in 1955, then advanced to Professor in 1965.

Professor Bjorkstam has specialized in solid state electronics and studies of molecular motion and ferroelectrics. He has done consulting work for Boeing on solid state maser research. In 1967-68 he spent a year's leave of absence in France and Yugoslavia working on ferroelectricity.

By 1955 the need for a mechanical engineering building became so urgent that plans were already on the drawing board to replace the old Engineering Hall with a new and much larger building to be joined to the old shop and foundry as one unit.

Now in 1956 the old Engineering Hall was vacated and in the months following, salvaging companies were removing much of the heavy wooden timbers, now far more valuable than when first installed in about 1908. The unusually thick and solid outside walls were the next objects for destruction by the heavy pounding ball. The few older members of the electrical engineering faculty, who spent so many years in, and were acquainted with, every nook of the old structure, surely shuddered many times as the sturdy old citadel gave way to the tortuous pounding, and to see the truck loads of resulting debris hauled away to the dump.

The sight from our office windows across the roadway brought recollections of at least four critical incidents in which the old inflammable inside structure was saved, perhaps by only a few minutes, of being incinerated to a heap of ashes, which would doubtless have delayed the development of both the mechanical and electrical engineering departments by many years.

The first incident was not many years after moving into the building when Dr. Magnusson, during after hours, happened to stroll through the part basement under the electrical laboratory, discovered someone had carelessly left a gas heater running with the result that nearby inflammable material was overheated and already blazing. However, very little damage resulted.

The second was when the gas generator in the part basement under the mechanical laboratory was found to have charred the woodwork near it. The gas generator produced gas from wood chips to be used in a gas engine in the laboratory.

The third occurred a couple of years after the impulse generator had been installed in the high voltage laboratory. As Professor Smith was leaving his office to have some lunch at the faculty club, he noticed through the side windows in the laboratory a faint fluff of smoke arising from the control table for the impulse generator. Opening the door he found the underside of the table well covered with a lively blaze. Using some heavy old curtain material he quickly smothered the blaze, but the whole of the equipment under the table must be replaced. The fire was caused by a faulty relay overheating. Dr. Magnusson was never informed of this occurrence. Everyone was aware of his extreme fear of fire since in early days he always kept a heavy rope curled up on the floor of his office near the south window to be used as an escape if needed. Later he was able to have the Buildings and Grounds Department construct a steel platform and stairway from that window down near enough to the ground that a person could drop the remainder of the distance without injury.

The fourth case was discovered when the electrical laboratory was completely rewired using rigid conduit. In removing the old wiring, one wire was found with the insulation completely charred. At some time someone had unknowingly heavily overloaded this wire and only the fact that the wooden timbers were protected by ceramic tubes through which the wire passed and ceramic knobs to hold the wire at other portions, was the building spared a fire.

Ever since Professor Eastman became head of the Electrical Engineering Department, he had been working to improve the graduate department and attempt to gain some of the prestige enjoyed by several of the California colleges. One of the chief obstacles was the low salaries offered by the University causing the double difficulty of attracting high quality Ph.D. candidates, or holding them after they had been added to the faculty. In 1956 he made an extended trip to visit most of the Western colleges and gain information on their salary levels, their methods in graduate work, concessions for the advancement of faculty members, and range of the newer fields of knowledge they were attempting to cover.

His annual department report to the Dean that year was a quite extensive recording of his findings on the extensive trip. He called attention to the loss of several of the excellent and promising members of the faculty in recent years and to others who would very likely be enticed to leave because of better offers. He also called attention to other benefits offered by various colleges such as encouraging consulting work, encouraging industries to locate nearby and many other items. He summed up his report with four proposals which he considered important in attracting high quality faculty additions and increasing the prestige of our graduate school.

1. Increase salary levels.
2. Provide more technicians as well as secretary help for professors.
3. Allow and promote more consulting activity.
4. Provide better laboratory equipment and facilities.

The results in later years have appeared to indicate the report resulted in much improvement in all the items he called attention to.

The year 1957 appeared to be a turning point in the acquiring of faculty members with one to four added almost every year, and apparently most of them of high quality especially for the advancement of graduate work.

Robert N. Clark; B.S. in E.E. (1950), M.S. in E.E. (1951), Michigan, Ph.D. (1968) Stanford, was appointed as Assistant Professor of Electrical Engineering in 1957 and became Professor in 1966. He previously spent six years as research engineer at Minneapolis-Honeywell Company in Minneapolis. His specialty is automatic control systems. In 1961 his text, "Introduction to Automatic Control Systems," was published by John Wiley and Sons. He has served as consultant to Boeing and has supervised a contract between that company and the University on adaptive control systems.

Dean W. Lytle; B.S. in E.E. (1950) California, M.S. (1954), Ph.D. (1957) Stanford, was appointed Assistant Professor in 1957, became Associate Professor in 1962 and Professor in 1969. His teaching and research work is largely in networks, communication theory, and probability theory. He has published two texts, "Electrical and Mechanical Networks" with W. W. Harman, by McGraw-Hill Co., in 1962, and "Introduction to Random Processes" by McGraw-Hill Co., in 1969. He has done consulting work with Boeing, Minneapolis-Honeywell Regulator Co., and Bell Telephone Co.

For some time employees in the Boeing Company had been asking for possible means of obtaining advanced work largely in seeking advanced degrees. In 1957, a series of such evening classes were offered and taught. A somewhat similar extension of such offerings was arranged for graduate training to be carried on at Hanford under the supervision of the Electrical Engineering Department.

In 1958, the Alaska Communications System transmitter site in West Seattle was turned over to the University. This was given to the Electrical Engineering Department for use to study radio waves through the troposphere and ionosphere layers of air high above the earth's surface.

Alistair D. C. Holden; B.S. (1955) Glasgow, M.S. (1958) Yale, Ph.D. (1964) Univ. of Wash., was appointed Acting Instructor in Electrical Engineering in 1958, Assistant Professor in 1964. His field is largely bioengineering, computers, machine learning and artificial intelligence.

Katsunori Shimada; B.S. (1945) Tokyo University, M.S. (1959) Brown, Ph.D. (1961) Stanford, was appointed Assistant Professor in Electrical Engineering in 1958, Associate Professor in 1962, He did work on electrical noise produced by gases. He left the department in 1965.

Chih-Chi Hsu, B.S. in E.E. (1945) Chio-Tung Univ., M.S. (1949) Michigan, Ph.D. (1951) Ohio State, was appointed Assistant Professor in Electrical Engineering in 1958, became Associate Professor in 1962. Before his work at the University he spent six years as project engineer with Bendix Aviation Corp., developing electronics circuits.

Endrik Noges; B.S. in E.E. (1954), M.S. (1956), Ph.D. (1959) Northwestern, was appointed Assistant Professor in Electrical Engineering in 1958, became Professor in 1969, and Assistant Dean of Engineering in 1966. His interests are largely with control systems. In 1963-64, he served as a Fulbright Lecturer at the Finnish Institute of Technology, Otaniemi, Finland. He has acted as consultant for Boeing and Hydranamic Systems Inc.

Akira Ishimaru; B.S. in E.E. (1951) University of Tokyo, Ph.D. (1958) University of Washington, was appointed Instructor in Electrical Engineering in 1958, became Professor in

1965. Professor Ishimaru has a quiet, undemanding personality, but is most courteous and cooperative; always eager to be of assistance. He has both a fine record as a teacher as well as a research worker. His first research work, under the direction of Professor Held, was on antennas for the U.S. Air Force. Later he carried this project on by himself. He is also interested in microwaves and propagation. Many of his reports have appeared in European publications.

In 1958, the new building for Mechanical Engineering was ready for occupancy. By this time Electrical Engineering Hall was so overcrowded that several offices as well as classrooms in the new building were now used by Electrical Engineering

Bell Telephone Laboratory scientists discovered, in 1947, that a tiny crystal of germanium could, if properly treated, perform most of the tasks which previously required the so-called vacuum tube used in electronics. This opened up a broad new field of solid state electronics for the electrical engineers in studying the characteristics of these new devices, seeking to improve them and devising suitable electronic circuits for their use. Other new developments were the ferroelectric substances, as well as high frequency radiation which became so important in communication through special types of conductors as well as through space. A somewhat later addition was the joint research using the techniques of engineering skill to assist the medical man in his problems. Thus biomedical engineering entered the engineering field of study.

The field of electrical engineering was gradually altered from the two fields of communications or electronics, and power to add a wide variety of subjects, many of which were previously considered the domain of the Physics Department. The Physics Department however, was in turn drifting away from these fields to seek more challenging fields in nuclear research.

The year of 1959 brought another new group of faculty members.

Lynn A. K. Watt; Ph.D. Univ. of Minnesota was appointed Assistant Professor in 1959, and became Associate Professor in 1963. In 1967 he left to resume teaching at the University of Waterloo.

Rubens A. Sigelmann; M.E. (1952) Univ. do San Paulo, Ph.D. (1963) Univ. of Wash., was appointed Acting Instructor in Electrical Engineering in 1959, became Associate Professor in 1968. Professor Sigelmann's special fields are antennas, surface waves, travel of sound in tissues and so on. He has done consulting work for Boeing on electromagnetic interference.

Hellmut Golde; initial work in Germany (1953), M.S. (1955), Ph.D. (1959) Stanford, was appointed Assistant Professor in 1959, and Professor in 1969. His chosen field is in the line of microwave tubes and computers. He was appointed as Assistant Director of the Computer Center in 1969.

Donald K. Reynolds; B.A. (1941), M.A. (1942) Stanford, Ph.D. (1948) Harvard, was appointed Associate Professor in Electrical Engineering in 1959, became Professor in 1960. Previous to this assignment, Professor Reynolds was employed by Stanford Research Institute doing applied research on antenna systems, digital computers and communication systems. From 1953-56 he was Associate Professor at the Institute de Aeronautics in Brazil, and he was Professor and Chairman of the E.E. Department at Seattle University from 1956 to 1959. Much of his work on the staff here has been on the West Seattle Antenna research, and more recently the Antarctic 21 mile antenna research with Professor Swarm. He has also been consultant for Boeing and for Minneapolis-Honeywell Development Laboratory.

Many remarks have been made that the field of engineering, and especially electrical engineering, has a great tendency to narrow the student's opportunities in life. This belief was probably more general in earlier years than for the recent newly expanded field of studies. That such beliefs have very little foundation was quite adequately disproven by a rather extensive investigation conducted in the 1940's, by Mr. M. M. Boring for the General Electric Co. Mr. Boring was head of the General Electric Testing Department and for many years made yearly visits to the various colleges to seek graduates for the testing department as a means of acquiring new engineering personnel for the company.

For this investigation, a questionnaire was sent out to a great number of engineers, both within the General Electric Co., as well as those in other companies, and especially engineering graduates who had taken positions in other fields of work such as banks, investment companies and a wide variety of non-engineering occupations. Two of the interesting questions were: Do you think some other type of training would have prepared you better for the type of occupation you have accepted than has the engineering training you received? Should an engineering position of the type your training was intended as a preparation, become available would you be willing or tempted to make a change?

The large percent of answers to the first question indicated the engineering training was very satisfactory for their present occupation, while the answers to the second was almost universal in that they were well satisfied with their present position.

There is little doubt that a study of the success of persons with engineering training, whatever their present line of endeavor, would indicate that such training can be a good preparation for an extremely wide variety of occupations, and that the engineer has been very capable of advancing successes in innumerable fields of endeavor.

The year of 1960 brought several more new members to join the faculty.

Charles Wang; B.S. (1957) Taiwan College, M.S. (1959) Brown, Ph.D. (1961) Stanford, was appointed as Assistant Professor in Electrical Engineering in 1960. However he left the faculty in 1963.

Edward C. Guilford; B.A. (1942), M.S. (1950) Utah, Ph.D. (1959) California, was appointed Assistant Professor in Electrical Engineering in 1959, and became Associate Professor in 1961. His specialty is problems in energy conversion as applied to electrical engineering. The new concepts involved should enable students interested in the power phases of training to broaden their understanding of this field.

Gordon H. Hanson; Ph.D. (1957) Univ. of Minnesota, was appointed Assistant Professor in Electrical Engineering in 1960. He had spent some years with the Bell Telephone Laboratories at Allentown, Pa., and was especially interested in transistors and solid state devices. He left the department in 1965.

William E. Creedon; B.S. in E.E. (1929) Mass. Inst. of Tech., M.E. (1938) California, was appointed as Lecturer in Electrical Engineering in 1960. His field is largely teaching the fundamental courses.

Changing the curriculum to accommodate the many new phases of study created by the new discoveries and developments could not avoid some confusion. The many new and eager faculty members were anxious to exercise their abilities in new proposed courses. However their

enthusiasm could be quite readily absorbed in the rapidly expanding graduate work since this demanded much work of the research type.

The number enrolling for masters as well as doctoral degrees increased as the demands for graduate training by industry became more and more evident. A new two year postgraduate degree of Master of Engineering was now offered but was little called for. The first Ph.D. degree in Electrical Engineering was granted by the Department to Akira Ishimaru in 1958. The second was in 1959, with three in 1961.

In 1961 three new members were added to the faculty.

Peter R. Metz; B.S. in E.E. (1956) Univ. of Wash., S.M. in E.E. (1958) Mass. Inst. of Tech., Ph.D. (1965) Univ. of Wash., was appointed Acting Instructor in 1961 and Assistant Professor in 1965, He had engaged in biomedical work, had worked on solid state engineering for Minneapolis-Honeywell Development Laboratory in Seattle and similar other items.

Robert W. Albrecht; E.E. (1957) Purdue, M.S. in E.E. (1958), Ph.D. (1961) Michigan, was appointed Assistant Professor in Electrical Engineering in 1961, and Associate Professor of Nuclear Engineering in 1966. He divides his work between nuclear and electrical engineering with some interest in biomedical studies.

M. Irene Carswell; B.S. in E.E. (1947) Colorado, Ph.D. (1962) Stanford, was appointed Assistant Professor in 1961, and Associate Professor in 1964. She is thus far the only feminine member on the regular faculty and after her marriage to Mr. Leo Peden, is now known as Dr. Irene Carswell Peden. Her early work was on microwaves. She spent seven years with the Stanford Research Institute and two years with the Delaware Power and Light Co. She is making a study of the effects of ferrites on transmission at microwave frequencies with the U.S. Air Force. She has given a considerable amount of time in encouraging female students into engineering types of studies, and is the only woman to have served as Chairman of the Seattle Section of the I.E.E.E. (1965) thus far.

Dr. Betsy Ancker-Johnson; B.A. (1949) Wellesley College, Ph.D. (1953) Tulbingen University of Germany, was appointed Research Associate Professor in Electrical Engineering in 1964, and Affiliate Professor in 1969. She became the second feminine member to be associated with the department, though not a regular faculty member. Her interests are largely in research on solid state physics, microwaves, and plasmas.

It might be stated here that during the period of over 50 years the department has been in existence, some 10 to 15 women have graduated in Electrical Engineering. One of these became the wife of Professor Lindblom.

Because of the high caliber of the personnel accepted as faculty members during the last several years, as well as those to follow, almost all with doctoral degrees, to mention more than a few of their items of activity or attempt to list their technical publications would require far more length to record than was intended or would be desirable. Thus only a few of the outstanding items can be included.

Only one new member was added to the faculty in 1962.

Robert E. Lindsay; B.S. (1957), M.S. (1958), Ph.D. (1962) Stanford, was appointed Assistant Professor in 1962. However he left the faculty in 1967.

In 1963, there were no new additions to the faculty which was rather unusual compared to the number added each year before as well as after.

In 1963, the Department of Electrical Engineering together with the Boeing Scientific Research Laboratories and the Seattle Section of the I.E.E.E., acted as host to the autumn meeting of the United States National Committee of the International Scientific Radio Union (URSI). The local committee consisted of Dr. J. Noyes of Boeing, A. Ishimaru and H. M. Swarm of the Electrical Engineering Department.

In 1964, two new members were added to the faculty.

Frank J. Alexandro; B.S. in E.E. (1956), M.E.E. (1959), D.S.C. (1964) New York University, was appointed Assistant Professor of Electrical Engineering in 1964, and Associate Professor in 1968. His previous technical experience was with Ford Instrument Co., on Long Island City, N. Y. 1956-59, Sperry Gyroscope Co., Syosset, N. Y. 1959-60, consulting for Boeing 1965. His specialty is control systems and pulse frequency control.

Robert B. Pinter; B.S. in E.E. (1959), M.S. (1960) Marquette, Ph.D. (1964) Northwestern, was appointed Assistant Professor in Electrical Engineering in 1964. He is interested in biomedical engineering.

In 1964, the Daily announced a lecture by Professor Bjorkstam on the laser beam and its possible uses.

Later, some of the members of the faculty began studies of lasers and holographs which can be produced by means of lasers.

Peter O. Lauritzen; B.S. (1956) Cal. Inst. of Tech., M.S. (1958), Ph.D. (1961) Stanford, was appointed Assistant Professor in Electrical Engineering in 1965. He became Associate Professor in 1968. His interests lie in solid state devices and semiconductors. He has acted as consultant for Radar Engineering in Seattle in 1966, and for Automotive Industries Inc., X-Ray Division in 1967.

In 1965, Dean Wessman reached the age of retirement for deans, but remained as Professor in the Civil Engineering faculty until he was retired in 1969 and assigned title Dean Emeritus. Charles H. Morris; B.S. in C.E. (1931) Univ. of Wash., S.M. in C.E. (1932), Sc.D. (1942) Mass. Inst. of Tech., who has been teaching in Civil Engineering, was appointed as Dean of Engineering in 1965.

On May 7, 1965, the Daily reported that three Boeing employees laid a 21 mile radio antenna in the Antarctic under the supervision of Professors Swarm, Reynolds, Helms and Peden. In later years some of these professors took turns going to the Antarctic to do on-the-spot supervision of this research. Graduate students remained at the site to carry-on the work for continuous periods through the coldest portion of the season.

On Sept. 29, 1965, a Daily report stated that Professors Robert N. Clark, and Robert W. Albrecht made twice weekly flights from Seattle to Richland, starting at 2 p.m., from Sand Point Naval Air Station, taught from 3 to 5 p.m. at Hanford, then returned home for the evening.

In 1966, three new members were added to the faculty.

Graham L. Duff; B.Eng. (1961) McGill, M.S. (1963), Ph.D. (1966) Illinois, was appointed Assistant Professor of Electrical Engineering in 1966. His interests lie largely in radiation patterns, small loop dipoles and antennas in general.

Jay H. Harris; B.E.E. (1958) Poly. Inst. Brooklyn, M.S. (1959) Cal. Inst. of Tech., Ph.D. (1965) U.C.L.A., was appointed Assistant Professor of Electrical Engineering in 1966. His interests are radiations, plasmas and some biomedical engineering.

Sinclair S. Yee; B.S. (1959), M.S. (1961), Ph.D. (1965) California, was appointed Assistant Professor of Electrical Engineering in 1966. His interests are radiations, transistors, single crystal and semiconducting characteristics.

In 1965, an intensive four week course, to be held usually during June, called "Modern Engineering for Managers," was developed for the Boeing Company to enhance the engineering executive's background for understanding modern engineering techniques, and to assist them in cultivating a better rapport with the younger professional staff, to equip them with the technical ability to continue advanced study, and increase their awareness of the significant advances in science and technology. It was later made available to participants from other companies and by 1969 was drawing executives from many parts of the United States. In 1969, several of the electrical engineering staff were taking part, including Professors Albrecht, Alexandro, Noges, Swarm, and Watt. (The latter formally of the University.)

In 1967, three new members were added to the faculty.

Jonny Andersen; B.S. in E.E. (1960) Colorado, S.M. in E.E. (1962), Ph.D. (1965) Mass. Inst. of Tech., was appointed as Assistant Professor of Electrical Engineering in 1967.

F. Paul Carlson; B.S. in E.E. (1960) Univ. of Wash., M.S. in E.E. (1964) Maryland, Ph.D. (1967) Univ. of Wash., was appointed Assistant Professor of Electrical Engineering in 1967.

Eugen Schibli; Dipl. Ing. (1961) E.T.H., Zurich, M.S. (1963) Technion Haifa, Ph.D. (1967) Mass. Inst. of Tech., was appointed Assistant Professor of Electrical Engineering in 1967.

In 1968, three more members were added to the faculty.

Curtis C. Johnson; B.S. in E.E. (1954), M.S. in E.E. (1955), Cal. Inst. of Tech., Ph.D. (1958) Stanford, was appointed Associate Professor of Electrical Engineering and Associate Director of the Bioengineering Program in 1968.

Ward J. Helms; B.S. in E.E. (1960) Wash. State, M.S. (1963), Ph.D. (1968) Univ. of Wash., was appointed as Assistant Professor in Electrical Engineering and Geophysics in 1968.

Jerre D. Noe; B.S. (1943) University of California, Ph.D. (1948) Stanford, was appointed Professor in Electrical Engineering and Computer Science, and Chairman of the Computer Science Group, in 1968. He had previously been associated with the Stanford Research Institute as well as with Hewlett-Packard Company of Palo Alto, California.

During the last couple of years, Professor Eastman had been requesting that he be relieved as Head of the Department, but no available candidate for this position seemed available until Dr. Daniel G. Dow was contacted in 1968. In 1968, Professor Dow was appointed Chairman of the Department and Professor Eastman continued to do some teaching through 1968 and 1969, when he retired as Professor Emeritus.

Daniel G. Dow; B.S. (1952), M.S. (1953) Michigan, Ph.D. (1958) Stanford, is the son of William G. Dow, a faculty member at the University of Michigan for nearly 40 years and served as Chairman for seven years. Professor Daniel Dow had taught at Stanford in 1957, and at the California Institute of Technology from 1958 to 1961. He is a specialist in vacuum and solid state microwave electronics. He had developed the Gunn-effect oscillator which can be used instead of the klystron.

For several years in the past there have been requests for additional room for electrical engineering and almost as many rumors that new additions to the building were contemplated, but too many other campus needs were given preference. Finally in 1969, plans for a fourth floor of the present building were completed and during the summer of 1969 the work is planned to be started.

Some relief was provided when Loew Hall, situated on the site of the Good Roads building during the A.Y.P. Exposition, was completed in 1968 and the upper floor was partly assigned to the Dean's Office and staff which included some of the electrical engineering faculty. Classrooms in Loew Hall are also available for use by electrical engineering. The hall was dedicated in honor of Dean Loew in the early summer of 1969.

Perhaps this brief account of the activities of the Department during these later years would not be complete without mentioning the valuable services of some of the assistants to the faculty who have so ably cared for the many details so vital to the successful operation of a growing department. Their services are perhaps of greatest importance when some radical change in the supervision of the department occurs. A highly efficient secretary, or shop supervisor knows almost as much about the operation and needs of his department as does his superior.

After Miss Northern's retirement in 1960, Mrs. Elfreda Pond was appointed Administrative Assistant for the department with Elizabeth Equals as senior secretary. Since during Miss Northern's later years she had been largely occupied with student registration, Mrs. Pond had been caring for most the duties she now assumed and was well versed in her new appointment. Doubtless Professor Dow found her knowledge of necessary details of great assistance in his newly assumed duties. Mrs. Equals had also been with the department for some time previously.

In a similar manner, Lawrence Prey who was appointed as Supervisor of Shops after the death of Professor Lindblom in 1960, together with Fred Hildebrand, senior Mechanist, have proven almost invaluable in avoiding a state of turmoil after Lindblom's departure, as well as extremely helpful to Professor Dow. Lawrence Frey, who had worked under Professor Lindblom for several years as meter repairman and caring for the laboratory equipment, was well able to assume his new duties. Now in 1969, he is being assigned to many of the duties in planning, constructing and installing laboratory equipment for the additional floor on the Electrical Engineering building, which were assigned to Professor Lindblom in 1948 when the new building was available.