

THE BICENTENNIAL

LEHIGH UNIVERSITY'S CONTRIBUTION
TO
ENGINEERING EDUCATION

by Alan S. Foust, Chem. E.

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Acknowledgment

Nothing in this compilation is original with this author except bits of continuity to join reports of earlier writers, who knew much more about the subject than the current author.

Primary sources are:

“A History of Lehigh University” by Catherine Drinker Bowen (The personal touches included all arise from her close personal friendship with the faculty)

“The Twenty-Year Book of Lehigh University” by E. H. Williams, Jr.: (as Credited by C.D. B, though it states no authorship)

“Seventy-five Years of Lehigh University” by William A. Cornelius. M.E. ‘89, L. U. Publications Vol. 16 No. 1, 1942

“Ninety-seven Years of Metallurgy at Lehigh University” by Allison Butts (1963)

“A History of Chemistry and Chemical Engineering of Lehigh University” by R. D. Billinger, B.S. in Chemistry, ‘21 (1941)

“A Brief History of the Electrical Engineering Department from its Origin to the Present Time” by J. L. Beaver, E.E. ‘04 (1941)

Various “Registers” of Lehigh University

Notes, comments and reports from any accessible person or department of the University.

EARLY DAYS OF UNIVERSITY

If one searches in the background of the Honorable Asa Packer for clues to the origin of the broad and deep understanding of the needs of the American economy which he perceived later in his life, one does not find any single incident which should be credited with having generated his outstanding accomplishments. His material accomplishments were major, and all were pointed to the development and growth of eastern Pennsylvania. The outstanding attainments of his benevolence: are a genuine credit to his perception. Not only were his benevolences immediately beneficial in the directions he pointed them, but the contributions have continued to accumulate.

From his birth into rather humble circumstances in December of 1805 of a totally correct and industrious family, but one unsuccessful in business, it became necessary for him to contribute to his own support quite early. A very promising early connection in a tannery might have changed the whole history of the Lehigh Valley if it had continued. Unfortunately for him at that time but very fortunately for Pennsylvania, his employer died prematurely, and Packer returned to the unsatisfying and unpromising labors of a Connecticut farm. His enterprising temperament could not let him remain so attached very long, and at the age of 18 he set-out on foot for northern Pennsylvania. In Susquehanna County, he followed the usual pattern of taking up land, clearing it, and developing it to make the place fit for subsistence and habitation. He supplemented this meager subsistence of his early days in Pennsylvania by working as a carpenter in Tunkhannock in the winter time. Mostly, he built and repaired boats for use on the canals. A few years later he left the farm, though he retained possession, and moved to Mauch Chunk where he continued his handicraft, but soon the urge for more activity led him to charter a canal boat. The traffic which he built up from Mauch-Chunk to Philadelphia, based on moving the raw materials of the region into the markets of Philadelphia was so successful that he quite quickly secured another boat; and thereby doubled his business potential. As this business increased, he was led into a continually broadening spectrum of businesses.

Among his business associates of the Lehigh Valley, several names remain well-known: Robert H. Sayre with whom he was involved in the building of Lehigh Valley Railroad; a brother William H. Sayre, and with them Garrett B. Linderman of the Bethlehem Iron-Company. These were the strong men of the dynamic group which was leading the development of the resources of the Lehigh Valley. These men realized the genuine need for well-trained technical men, having the broadening of some requisite accompanying liberal flavoring of their education. They were not content to depend on imports from Europe such men, and moved toward the establishment of a source of such

capability for the growing businesses.

At the time of the seventy-fifth year celebration, the then president, C.C. Williams wrote of the founding, and the philosophy of the founder:

"The conception of Lehigh University and the goal toward which to build developed gradually in the Founder's mind as the result of his observation and experience, since he was not college bred. At that time, the nation was emerging from the turmoil of a terrible civil war which had diverted attention from normal developments, although it had revealed in highlight the vital importance of the scientific utilization of natural resources and had given an impetus to education in that direction. The adolescent railroad was spreading prodigiously throughout the domain, as typified by the racing Pacific lines and Mr. Packer's bustling Lehigh Valley and the nascent telegraph was keeping pace. The epochal discoveries of natural gas and petroleum, together with methods of refining to yield gasoline cast a new light around the power horizon. New-found bituminous anthracite and the Bessemer process were yielding cheap steel. These and other similar events indicated to anyone who could read the *signs* of the times that technical education would be the 'open sesame' of industrial development.

"A variety of technical schools had been established in Europe and America in response to the early-century inventions, --the applications of the steam engine, dynamo electric currents, analysis of stresses in Structure -and the new -chemists: The rise of **technischen Hochschulen** in Germany in the middle third of the century was notably promoting her industrial success; Rensselaer. School had been remodeled (1849) into a 'polytechnic institute' at collegiate level; Lawrence and Sheffield scientific schools were taking root (1847-50) at Harvard and Yale respectively. But the pilot educational experiment for most of the new-type institutions was Norwich University, which had grown out of the American Literary, Scientific and Military Academy, established (1820) at Norwich; Vermont, Partridge, a graduate of and former teacher at West Point. This college had been moved to Middletown, Conn. (1825), and back to Norwich (1829) at a time to attract the avid attention .of one Jonathan B. Turner, then a preparatory and college student at nearby New Haven. Under the aegis of the 'Association for the Promotion of Useful Education' , the .American Literary, Scientific and Military Academy was transformed into Norwich University (1.834) with a curriculum in engineering the year following Turner's graduation at Yale, and moved to Northfield, Vt., the year. Lehigh opened its doors (1566). The principles of this association had been advocated by Benjamin Franklin three quarters of a century earlier in founding the Academy (1749) which later became the University of Pennsylvania, and the Association preceded by a year the 'Society for the Diffusion of Useful Knowledge in London.

"The Association for the Promotion of Useful Education, recognizing 'that the universities and' colleges of the United States were generally modeled after those Of Europe, set out to devise anew type of university for a new world to 'prepare youth to discharge in the best possible manner the various duties likely or devolve upon them in after life.' The general principles of education adopted

(1831) for this new-type institution included the following items:

1. Reducing the cost of college education as much as compatible with competence of instruction.
2. Allowing persons desirous of pursuing any branch of science or literature to do so without being obliged to attend to any others.
3. Permitting each individual to proceed in his studies as rapidly as possible, not being subject to delay by being classed with others of less requirements, talent, or industry.
4. Affording the most ample means of instruction in the applications of science to the practical purposes of life.

"Captain Partridge, President of Norwich and a sponsor of the Association petitioned Congress (1841) to devote funds from the sale of public lands to establishing similar colleges in the respective states. In 1853, the Legislature of Illinois, at the instigation of J. B. Turner, who in the meantime had become a protagonist of 'useful education' in the Midwest, petitioned Congress to establish 'industrial universities' in the various states in 1856, Congressman Justin S. Morrill from Vermont, a neighbor and disciple of Partridge, offered a resolution of inquiry and, in 1857, introduced a bill to found a college in each state 'to teach such branches .of learning as are related to agriculture and mechanic arts in order to promote liberal and -practical education of the industrial classes in Congress 1853-57 and-listened to the debates on these measures. The Morrill Bill was-passed in 1859, but was vetoed by President Buchanan as 'extravagant, impolitic, and unconstitutional.' (With some modifications, the chief of which was the inclusion of military instruction, the bill was re-enacted and approved by President Lincoln in 1362) Mr. Packer, an intimate friend of President Buchanan and fellow strict-Constructionist, with a strong sense of Yankee frugality and an abhorrence of political control of education, doubtless shared the President's views.

Nevertheless, being convinced of the merits of a college devoted to 'useful education' as related to industry, he determined to found one under independent auspices.

"Bishop Stevens, entering earnestly into the scheme, for Mr. Packer proposed a generous endowment, made extensive inquiries into systems and philosophies of higher education. From that collaboration, the classics and a 'School of General Literature' were added to Mr. Packer's original technological concept. Emphasis on fundamental science rather than-mechanic arts and the omission of agriculture were the chief variants from the land-grant college type. A strong Yale infusion was transmitted in the persons of the first president and faculty. Mr. Packer's influence continued through the thirteen formative years

comprising his membership 'on the Board of Trustees.

"The undergraduate program contemplated two years of general studies to be followed by two years of specialization. The research function, the distinguishing characteristic of a university, was included as well-as the teaching and learning functions of a college. Graduate study was outlined at the beginning- and provision for the Ph.D. and Sc.D. degrees was made within the first decade, although the first American doctorate had been conferred only in 1861. In the schematic organizational diagram, three undesignated brackets were left blank for future expansion. The 'School of General Literature' and the studies in 'political economy' and 'civil polity' were the embryonic College of Arts and Science and College of Business Administration of a later day. The character and scope of the new institution were presaged in the pregnant words of Francis Bacon, 'Man, the minister and interpreter of nature,' which (September 4, 1865) were emblazoned on the University seal.

"Where was the new institution to be located? Mr. Packer first considered' home town of Mauch Chunk at the upper end of the Valley, and investigated possible sites. Topography, sparse population and other factors of access and environment seemed unfavorable. He then went to Easton (1864) at the lower end of the Valley and discussed with the president of Lafayette College the possibility of attaching the new venture to that institution. Probably an unwillingness to subordinate his idea of technical Science as a fundamental principle of education to a department in a small denominational arts college (Lafayette then numbered 50 students) caused him to decide to start afresh, although tradition ascribes influences, chiefly personal, as entering into the decision.

"He saw at Bethlehem, near the geographical center of the area which he wished of benefit, a favorable social and physical environment. The educational theories of the great .Moravian teacher, Tolin Amos Comenius, who had pioneered two centuries previously in founding the realschule type in Germany and Sweden, had entered into the joint thinking of Bishop Stevens and Mr. Packer. He saw at Bethlehem, moreover, in the zinc and steel works, clear evidence of a future industrial center. To an alumni committee who expressed in 1878 the belief to Mr. Packer that Bethlehem offered exceptional opportunities for instruction in technology, he replied 'That is what I thought when I first decided to put the University at Bethlehem, and that is why I put it there'.

"Lehigh's birth, therefore, occurred on the eve of an epochal advance in education which resulted in establishing science and technology alongside traditional learning as college curricula and in creating agencies for research in the technical field. Contemporaneously with Lehigh, came Massachusetts Institute, Cornell and the state universities which stemmed from the Morrill Act. Largely as a result of that introduction of technology into education, Lehigh's seventy-five year span has witnessed unprecedented achievements in invention and industry. These include electric lights and machinery,

telephone, radio, motion pictures, steam turbine, internal combustion engine, automobile, airplane-, typewriter, linotype, aluminum-, modern steel and alloys, plastics, rayon, mass production, central heating, tall buildings, long bridges, water purification, sewage treatment, and" a thousand other labor-and-health saving devices. The numerous graduates of Lehigh and similar schools of this group fruitfully cultivated any seed of invention wherever dropped. Technologic achievements, and in the industrial development of this period, Lehigh University, through its faculty and alumni, has had an important part.

"In seventy-five years of life, Lehigh has attained a significant role in higher education, not only in rendering a specific service in the professional training of young men but al-so as an institution of distinctive character in molding the educational ideology of the nation. Realistic in its tradition and associations, it-stands for independent and thorough-going scholarship and holds to the freedoms and faiths, the duties and obligations which enoble the- American heritage. On the theory that good citizenship is not a subject of course specialization, the University includes the fundamentals of civic responsibilities and sound social attitudes as ingredients in all phases of its educational program.

This is not done by indoctrination but by a way of- life on the campus that is a vestibule to the way of life characteristic of the civilization which we call

He and John Fritz, the Iron Master of the Bethlehem Iron Company, seem to have been the two of these close business and personal friends who were ready to move toward the establishment of a school with a strong technical flavor, but .not to be a purely technical one.

These men were not highly educated, but clearly evaluated the need. Since they felt their need, and were willing to support such a program, they approached as their educational advisor Bishop William B. Stevens, the then Bishop of Pennsylvania of the Episcopal Church. He was an excellent complement to these - men of action and was probably the principal formulator of the descriptions of bifurcated educational program which was sought, and the evaluation of various areas which should be covered. As the charter correspondence and documents proceeded, Bishop Stevens guided them to Dr. Henry Coppee to become the first president of the newly founded university. Dr. Coppee at that time was occupying the Chair of Belles Lettres at the University of Pennsylvania. He was a man of broad education and diversified experience. After graduating from Yale in 1840 and from West Point in 1845, he served as Lieutenant and Captain in the Mexican War. He had found time for three years of engineering experience between Yale and West Point and accordingly had the familiarity- With the two-branched curriculum which Packer and Fritz wanted. His educational experience included as assistant professorship in geography, History, and Ethics at West Point, and ten years of teaching experience at Pennsylvania. His first responsibility in his new job was that of recruiting an appropriate faculty to start the newly launched university on its illustrious course. Those experiences

gave him more than ample training and maturity for the great challenge he was to meet at Lehigh.

The contributions of Bishop Stevens and succeeding Bishops of the Episcopal Church to the guidance of Lehigh in its early years is well known. There is an interesting little sidelight on this in that on at least two occasions, there was inserted into the Lehigh -Register "for short periods of time a statement indicating that Lehigh was associated with the Protestant Episcopal Church. In each such case, the statement was removed within very few years. It apparently would require rather extensive research to establish the reasons for this vacillation.

The highly dynamic atmosphere of South Bethlehem at the time of chartering in 1865 made the prospect of success particularly good. The Borough had just been incorporated the year before, and three years earlier the Bethlehem Iron Company had lighted its first blast furnace, and rolled its first rails for the Lehigh Railroad. The Lehigh Zinc and Iron Co. (predecessor of the N.J. Zinc) was starting operations in Saucon Valley. The men whom Dr. Coppee recruited to constitute the first faculty, and their titles reflect the determination of the founders that the school would maintain a breadth of education. In implementing this, Dr. Coppee's Belles Lettres background assured that he could carry through. The first faculty is very interesting:

Henry Coppee

President and Professor of History and English Literature

Rev. Eliphalet Nott Potter

Moral and Mental Philosophy and Christian Evidences

Charles M. Wetherill

Chemistry

E. W. Morgan

Mathematics and Mechanics

William T. Roepper

Professor of Mineralogy and Geology, and
Curator of the Museum (there was no museum)

Then there was Mr. Graham, instructor in Latin and Greek and Secretary to the Faculty.

Characteristic of the breadth and humanity of the founders, the name of the janitor, George Washington Smith, was printed in the first register as a part of the faculty list.

When the school opened in 1865, 40 students were ready to embark upon the studies of the first two years devoted to 'as described in the Register: "elementary branches in which every young man should he instructed, for whatever profession or business in life he may be intended, vis: Mathematics, languages, Chemistry, Drawing, Elementary Physics, Physiology, History, Rhetoric, Logic, Declamation, and Composition. At the end of two years the student could follow the bent of his mind with the guidance of the faculty and his parents and select some special course to which all of his studies and efforts would then be directed..."'

The organization contemplated five divisions in the upper years of the University entitling them "Special Schools." These included: Civil Engineering, Mechanical Engineering, Mining and Metallurgy, Analytical Chemistry, and a School of General Literature. These "Special Schools" were opened in the fall of 1867, with the students comprising them to be known as Junior and Senior Schoolmen. Graduates of other schools were to be received without preliminary examination into them.

It is interesting in the early years and with the commitment to technical education that there were not established professorships in Engineering at the time instruction started. Charles McMillan was procured in 1871 as the first professor in Engineering; he was head of the Department of Civil and Mechanical Engineering.

In this period of establishment, the civilian associates of Judge Packer contributed to identifying and recruiting personnel of competence -for the staff. Typical of this was Robert Sayre's bringing to Lehigh of Mr. Stanley Goodwin, a vigorous young engineer of the Lehigh Valley Railroad who 'had impressed him. He was brought in as demonstrator in Civil Engineering in 1865.

The vigor and success of Dr. Coppee and his associates during his ten-years as President was the building of a faculty commensurate with the expectations of the founder. The names of the men carefully recruited, and enticed to the new school included a significant number who became men of outstanding national and international reputations. A significant number of them spent the rest of their lives in the service of Lehigh.

An interesting detail of Dr. Coppee's development of the school was the existence in these early years of a lecture course in Industrial Jurisprudence which was included in each of the three engineering schools. As described in the first Register, the content of these lectures bore on "methods- of employing men, and keeping their accounts.

Along with the accumulation of men of outstanding repute, there was cultivated a strong friendly spirit between the town and the University. The faculty included two Chief Burgesses of South Bethlehem -- Harvey Housekeeper, and Stanley Goodwin. Professor William T. Roepper, the first professor of Geology and Mineralogy made a major contribution in discovering the Saucon Valley Zinc

deposits. He was a Moravian from the old country, and his reputation as a scientist and as a church musician carried his name back to the land where he was born. He was the organist in the Central Moravian Church for many years. Along with these three were Severin Ringer, and Arthur Meaker, effective professors and citizens of the community.

It is not greatly surprising that the persistence in their jobs was not particularly great for all of the first faculty recruited to start the new school. Only Professor William T. Roepper continued for any length of time in his first assignment. Dr. Coppee's total tenure with the University was significant, but after about ten years he asked to be relieved of the presidency, and returned to his first love--teaching.

There must have been some reappraisals in about 1870, because the year of 1871 produced several additions to the faculty. New members who joined in 1871 include four names which are written boldly on Lehigh's history. Professor B. W. Frazier took charge of the Department of Mining and Metallurgy, in which he started the building of the record of preeminence over the succeeding century. The particular organizational structure under which Mining Engineering; Metallurgy, and Geology were taught at Lehigh changed several times perhaps to accommodate a strong personality, and to give him more freedom of action, perhaps because of changing emphasis in the fields over the decades until the turn of the century. Certainly, Frazier's contribution to the foundations on which the preeminence in Metallurgy has persisted is a major contribution.

Professor Severin Ringer was one of those broadly educated Europeans who contributed the cultural flavor in the faculty. Ringer had been a fighter in the Polish Revolution, as a consequence of which he spent some time in jail. It may seem a bit strange that such a background would lead him to a long career in teaching foreign languages in the new and growing frontier school. William H. Chandler was another of the additions of 1871, taking over the Chemistry Department as a successor to Professor Wetherill, in which position he contributed thirty-five years of his life to the building of the University as well as a strong Chemistry Department. He served as librarian for thirty years, and twice was acting president of the University. During those thirty-five years, he supervised and directed the building of the chemical laboratory which has borne his name since his time. He was a strong taskmaster for his students, insisting on perfection in the chemical laboratories.

A few years later, Professor Charles L. Doolittle joined the staff in 1874 to teach mathematics and astronomy. He stayed for 20 years during which he wrote highly respected treatises, best-known of which is probably "Practical Astronomy". Under his guidance, the Mathematics Department earned a reputation of complete sacrifice young lambs on the altar of Olney, the deity of calculus.

In the spring of 1881, George Leighton, a member of the class of 1883, who was also member of the "Literary Society", became impressed with the idea that the time was favorable for starting a campus paper, and took into his confidence one Charles C. Hopkins, and John D. Ruff, both of the class of 1882. To these three the University owes the Burr. They recognized the prevailing spirit at Lehigh to decry anything new, and felt that to this were added class and fraternity feeling, there would be little chance of life for their project. After deliberation, they determined that a certain board of editors should be chosen; that this board should elect its own successors, and thus insure permanency as well as remove the paper from the control of Classes or Fraternities.

To give the board an impartial start, they determined that Mr. Leighton should take the board chosen before the Literary Society, and have them endorse and "select the board". So well was his work done that the Society was-pleased to elect the men proposed by Leighton, and thus furthered the scheme. The Men to whom were committed the trust were Charles C. Hopkins and John D. Ruff froth 1884 N. O.- Goldsmith, George Leighton and from 1883; and H. -B. Douglas and A. P. Smith from 1884. The projector of the scheme was, forced to leave Lehigh at the end of the year, from no fault of his, at the December following. The board elected S. D. Morford of 1884 to take his place at their first meeting, on September 12, 1881, when the officers were elected. The choice of a name was the-topic of -every meeting that followed till October 2, 1881, when "The Lehigh Burr" was chosen, with the motto, "Don't sit on me." This never appeared on the paper and is perhaps unknown to the majority of Lehigh men. The first number was issued October 22, 1881. The Burr speaks for itself, and has been a great educator, in that it has helped to weed out many poor customs; has advanced the tone of Lehigh; and has united many classes by breaking down petty jealousies.

For several years in the 1880s, one of the very successfully ridiculous and amusing columns signed "Conway Maur" was rich with exaggerated parodies and commentaries on college life. It later evolved that the writer of this column was non-other-than Richard Harding Davis, nephew of Professor. H. Wilson Harding of the Department of Physics in earlier years. He is widely credited with having been the guiding spirit which led to the establishment of Lehigh's "Arcadia".

The Burr was so successful as a monthly that in 1887 it became a semi-monthly, and in 1891 the editors, desiring to "make the paper more eminently a college newspaper" began bringing it out every ten days. One reason for the success of Burr in early days- is laid perhaps in the Modest and sensible aims of its editors. "We do not pretend", they announced, "to publish stories of thrilling adventure or side-splitting jokes, but sensible and readable articles".. In 1895 the Burr made a mistake that proved its downfall. The editors stated that the paper was henceforth to be a "strictly literary magazine." In three years the Burr was dead, and the editors had learned that being "strictly literary" is at best a dangerous business, and should be carried out under cover or it will frighten away the most ardent

subscriber. Incidentally, the Editor-in-Chief in 1895, J. J. Gibson, '95, composed the Lehigh Alma Mater.

In 1904- the Burr was revived and flourished, until the next suspension. In 1912 it was established for the third time, after which it continued until its termination in 1934.

The Burr was not the first periodical published on the campus. In 1868, a group of students of literary inclination formed a literary society at the instigation of Rev. E. M. Potter. They chose the name, The Junto, after Benjamin Franklin's famous society. The Junto produced a literary monthly paper for about a year, after which it disappeared. -The Class of 1878 brought forth in its sophomore year the first Epitome.

After The Junto and the Chemical Society, the next serious society activity was in 1872 when the Engineering Society published the "Journal of The Engineering Society". It was impossibly in debt in 1890 and suspended publication, though since that time there have been several attempts to resuscitate it, but it had too many rivals at that time. The Brown and White first appeared in 1894, and seems to have been the most durable of these periodicals, though it remains junior to the Epitome, which started in 1876.

Lehigh's student Chemical Society is probably the senior disciplinary under-graduate organization which has been in almost continuous existence in this country for over 100 years. It was organized in the fall of 1871 at the instigation of Professor Chandler, and has been continuously active since that time, except for a short interruption in the 1880s.

Another of the towers of strength in the first generation of Lehigh joined the faculty in 1878, succeeding Professor A. J. Dubois as the Professor of Civil Engineering. Mansfield Merriman threw himself immediately into the work of building the Civil Engineering, Department into its outstanding repute. He was a man of boundless energy and imagination, and used both fully. His impact upon the technical departments is reflected by the fact that four years after he arrived at Lehigh, the record indicates that "one-half of the Junior Technicals belonged to the School of Civil Engineering".

With very meager equipment, by his own genius and drive he trained and sent forth year after year an increasing number of competent engineers. His activities outside the University were numerous. He was appointed Assistant Editor of the 1892 revision of Johnson's Universal Encyclopedia, and had charge of all articles relating to Civil Engineering. His book on "Mechanics of Materials" ran through its tenth edition in 1910; his treatise on "Hydraulics" and "Strength of Materials" were in the ninth and sixth editions respectively, in 1912 and 1913. Textbooks written by him, and also by Alexander MacFarlane continued to hold high respect from teachers of civil engineering. At various times he acted as vice-president and president of the American Association for the Advancement of Science; the

Society for the Promotion of Engineering Education; as American Secretary for the International Association for Testing Materials. He was on Mayor Seth Lowe's New York bridge commission which supervised the Williamsburg Bridge project in 1902. He had a large, public spirited view, and one to advance the broader interests of the University. For instance, in 1901 he sent a circular to all the County Commissioners in Pennsylvania offering to test their cement for them free of charge. Nevertheless he gave the best of his genius to teaching. His courses were vital—alive with the inspiration which came from his own broad view. He showed himself a man of tremendous force; quiet, contained. On looking at his picture one is impressed with the calmness of his expression in a face which reveals, behind the quiet, such a storm of energy and strength. In 1913, Lehigh endeavored to express the debt she felt toward Mansfield Merriman by conferring upon him the degree of Doctor of Science.

Merriman had as a classmate at Yale, a man very different from him in characteristics, who was to join him on the teaching force at Lehigh University. In 1881, he came to Lehigh to take up the teaching of Mechanics, relinquished in that year by Professor Harding; When he died thirty-seven years later--having given all those years to Lehigh he left hundreds of friends who realized that when Lehigh lost Professor Joseph F. Klein, she lost one of the warmest, kindest spirits which has ever brightened her halls. He used to spend his days-- we might almost add his nights-- at the University. Students happening to be up so early, or perhaps so late, as five o'clock in the morning would meet Professor Klein cheerfully plodding up the hill. He was so sympathetic, so approachable. "Yes-yes-yes-yes-yes," he would nod rapidly; "Friend, Friend!" What person who knew him does not remember his "Friend, Friend!"

It was Klein who instituted, in 1903, the short lived course in Marine Engineering. Two tributes to Professor Klein were so eminently fitting that we cannot resist mentioning them. The class of ninety-six presented him with a roller top-desk. Somehow the corpulence of a roller top-desk and Professor Klein seem perfect complements. In 1907, to celebrate the twenty-fifth anniversary of his residence at Lehigh, more than one hundred and fifty alumni and students of his Department gathered at Williams Hall and gave him a Surprise Party. Who could be a more delightful subject for a Surprise Party than Professor Klein? His portrait now hangs in Williams Hall. Besides having decorative value --his was a magnificent head--his photograph has escaped that dull blankness common to most records of the camera, and the gentleness of his nature seems to beam out from those kind grey eyes behind their glasses.

Professor Klein's long tenure as the Professor of Mechanical Engineering stabilized the alignment between the Special Schools of Civil Engineering and Mechanical Engineering and teaching assignments for Mechanics, which was taught in Civil for many years. Physics had also been among the varying assignments in the early years before the arrival of Professor W.S. Franklin. Soon after Professor F.V. Larkin succeeded him, a

curriculum of Industrial Engineering was established in the Department of Mechanical Engineering.

The M.E. Department found laboratory space for its developing and growing Laboratories--first identifiably assigned to the new Physics Building, late in the Wilbur Power House, and in 1902 some expansion into Williams Hall. All were consolidated into Packard Laboratory when it opened in 1929.

EDUCATIONAL POLICY

In 1870, Lehigh's five "Special Schools" gave the degrees of Bachelor of Arts, Civil Engineer, Mechanical Engineer, Analytic Chemist; and Engineer of Mines. The course in Mining started off with five students from the classes - of '70 and '71, among them Henry S. Drinker, Richard P. Rothwell, a graduate of the **Ecole des Mines**, a practicing engineer of Wilkes-Barre, was in charge of the course with the title of Demonstrator By the time Henry Drinker reached his Senior year, he was the sole survivor, the other four students having dropped by the wayside. Dr. Coppee sent for him and announced that he could not maintain a Mining -Department solely for the benefit of one student, and that young Drinker had better change his mind and become a Civil Engineer wider the instruction of Mr. Stanley Goodwin, then Assistant General Superintendent of the Lehigh Valley Railroad. Here the young man in question-balked; stating that during his-three years at Lehigh, the University had encouraged him to pursue the course in Mining and that he desired to an through with it. All this in spite of the fact that Mr. Rothwell had returned to Wilkes-Barre, and there was no instructor of any kind in sight. Dr. Coppee knew absolutely nothing about mining--at the University of Pennsylvania he had been Professor of Belles Lettres, and at Lehigh his teaching followed the same lines but with the resourcefulness of an old campaigner he rose to the occasion and said he could teach Drinker himself. So the boy bought three large books on Metallurgy -- Crookes and Rohrig, he says it was—and daily lectured to himself making copious notes. Next day Dr. Coppee would gravely examine him from these same notes. This, with an occasional visit to Mr. Rothwell's office at Wilkes-Barre and a few trips to the zinc mines, then the operation at Friedensburg, constituted Drinker's Senior year course in Mining. In June he received his degree of E.M.

Such were the groupings toward technical education half a century ago. This student, three years after graduation, as engineer-in-charge, built the mile-long Musconetcong Tunnel on the Lehigh Valley Railroad between Easton and New York; and two years later published an exhaustive work on "Tunneling Rock Drills and Explosive Compounds," a book which gave the author, according to the Engineering News for June, 1905, a world-wide reputation. In 1919 Governor Sproul appointed him a member of the State Board regulating the Licensing of all Engineers in Pennsylvania.

Now and then throughout Lehigh's history we see a new and random course or subject spring to popularity for a year or five years, and then sink to oblivion. Christian Evidences, for instance, was born with the University, blossomed under Professor Wm. A. Lamberton, then struggled for years to keep its head above water only to die a lingering and painful death. In early years the University conducted a thriving Preparatory Department, with about fifty members. Then there was the Law Department, which started off bravely in 1878 with twenty-four matriculates among them The Hon. George Wickersham, afterward Attorney General of the United States-- who came to hear General Doster lecture on Practice in Pennsylvania, and Dr. Coppee on International Law. After its first flourishing year General Doster withdrew, the course subsided, and the campus knew no more mock trials until the jury sat upon King Calculus. The middle eighties were witness to a course in photography; and, more serious and lasting than all of these, came in 1889, the course in Architecture. A course in Marine Engineering was very brief. This course in Architecture was under the direction of the Civil Engineering Department, and the students complained of too little art and too much mechanics-- art, they said, being replaced by "Boilers, Bridges, Hydraulics, etc., which though useful, are not nearly so important." Professor Merriman evidently thought differently, but the course died.

In the early years of rather small enrollment, and the possibility of reacting in organization or curriculum to the enthusiasm of a professor, or a group of students, to some particular field, there occurred rather frequent fusions and splits between fields of knowledge which could be so rearranged today only with considerable stress. One of the interesting such arrangements occurred at the time Professor E. H. Williams, Jr., joined Lehigh in 1881. He succeeded B.W. Frazier as Professor of Mining, and Dr. James Kimball, who had accepted the appointment of United States Director of Mints as Professor of Geology, He was much interested in biology, and taught that subject for over twenty years. He released it in 1902 to Professor R. W. Hall who was joining Lehigh as an instructor. He took full charge of the courses after Williams' resignation in 1904.

As a scion of the predecessor firm of the Baldwin Locomotive Works, Professor Williams was in position to do more of material things for Lehigh than most of his colleagues. For some years, he bore all of the expenses of his department and purchased equipment and apparatus to equip the laboratories. Williams Hall stands as a testimonial to his generosity to Lehigh. Along with being a very effective head of the Mining Engineering course, he was an enthusiastic participant in all student activities, particularly those of an athletic flavor. There is hardly a record of a game or contest during his years with Lehigh that does not bear the name of E. H. Williams as judge or referee. He recorded one of the compilations of the early history of Lehigh in his "Twenty-Year Book", which was published in 1892. He was the recipient, in 1913, of the degree of Doctor of Laws from Lehigh.

His accomplishment which probably spreads the name of Lehigh University, and himself: as widely as any other single act was his leadership in accomplishing the organization and establishment of Tau Beta Pi, the Engineering Honorary Society, which has recognized outstanding scholarship of undergraduate engineers for these ninety years. Each member of Tau Beta Pi has a certificate on which the seal carries the embossing "Founded at Lehigh University", and a part of the required reading is the story of Professor Williams' part in organizing the society in 1885.

The success of Dr Henry Coppee during his early years with Lehigh shows in the strength of the faculty at the end of the first decade. There must have been some feeling of accomplishment in Dr. Coppee's mind when his four recruits of 1871 gave indication of their permanence and productivity. It is not greatly surprising that at the end of a decade as president, this scholar of liberal fields asked to be relieved as president, and moved to a Professorship of English Literature, International Law, and Philosophy of History. These courses constituted the central framework around which the Literary Course was built. He returned to harness as acting president in 1893 at the death of Dr. Robert A. Lamberton, and continued to 1895 when Dr. Thomas M. Drown was inducted as president.

RESEARCH ORGANIZATIONS

Soon after World War I, the necessary contribution of university personnel to the industrial research establishment was recognized. The United States had much work to do if it was to overcome the lead of European technical competence. In many Universities, at about that time, organizations were established to facilitate the accomplishment of scientific research, and the offering of it to industry. The Lehigh Institute of Research was created in 1924, "to encourage and promote scientific research and scholarly achievement in every division of learning represented in the organization of the university..."

World War II brought sharply into focus the need for better communication between government industry, and the universities in the technical fields. In order to facilitate Lehigh's contribution to the national research program through the Institute of Research, it was reorganized in 1945 to broaden its scope, to coordinate activities, and to increase its effectiveness for its original purpose: A number of research programs were in progress on the campus, which gave some direction to the reorganization.

The 1946 report of the Institute of Research, as reported by Dr. H. A. Neville, then director of the University's Institute characterizes the growth and contributions of that activity as well as any source:

"The governmental divisions sponsoring research at Lehigh include the Air Materiel Command, the Army Service Forces-Ordnance Department, the Navy Department Bureau of Ships, the Quartermaster Corps and the Signal Corps. The investigations for these agencies cover a wide range of subjects--bomb damage, corrosion, leather, lubricants, plastic models, radar, x-ray analysis.

"Each of the programs being conducted under the auspices of the Lehigh Institute of Research deserves individual description, but only a few can be mentioned in this brief report.

"In the Laboratory of Industrial Biochemistry a related group of studies in leather technology has been in progress for some years under the direction of Professor Edwin R. Theis. This research has received world-wide recognition, with due honors to Professor Theis. It now enjoys the support and cooperation of twelve companies in the leather and allied industries and also includes a project for the U.S. Quartermaster Corps.

"The Fritz Engineering Laboratory has recently undertaken additional strength tests of a varied nature. These include the study of vibration fatigue of wires, sponsored by the Bethlehem Steel Company; and a coordinated program of structural strength investigations supported by the Association of Iron

and Steel Engineers, the American Institute of Steel Construction, and the Structural Steel Committee of the Welding Research Council. The latest addition to this group, conducted jointly with the Department of Metallurgical Engineering, is a study of the effect of fabrication processes upon various steels, through the support and cooperation of the Pressure Vessel Research Committee of the Welding Research Council. The investigations of the Fritz Laboratory in structures and materials are supervised by Dr. Bruce C. Johnston, Associate Director of the Laboratory.

"The National Printing Ink Research Institute was established at Lehigh University in February, 1946, as part of the Institute of Research. This organization is supported by thirty-three companies in the printing ink industry and has for its purpose the study, in a fundamental manner, of the technical problems common to that industry. This program is supervised by Professor A.C. Zettlemoyer and engages the full time services of a research director, Mr. I.M. Bernstein, who has had many years of experience in the printing ink industry. The staff at present also includes a secretary and three research assistants.

"The activities of the Institute of Research have resulted in the acquisition of much valuable new equipment during the past year. All departments participating in cooperative research have improved their facilities to some extent. This has been accomplished through the gift or loan of equipment by the research sponsor, or by the purchase of special apparatus from funds supplied under contracts or granted by the Institute of Research. This equipment, while primarily for research, will also be utilized in advanced instruction, particularly at the graduate level. It is the policy of the Institute of Research to return a considerable portion of its income to the support of fundamental research in all departments of the University.

"In view of the common interests of industry and the universities, the two must cooperate more effectively than ever before to further progress in education and research. Industry has long relied upon the universities as the basic source new knowledge and has freely drawn upon the stream 'and reservoir of this fundamental information. The universities, particularly the private institutions, are no longer able to maintain the flow and supply of new knowledge, to meet a continually increasing demand, without the aid and cooperation of industry. The Lehigh Institute of Research constitutes one agency through which this responsibility can be shared and the mutual advantages of cooperation effected."

CENTERS AND INSTITUTES

During the 1950s, the need for a new type of organization on the campus recognized, as research programs became broader in scope and more demanding in particular aspects. The growth in the use, capabilities, and versatility of plastics; ceramics, semi-conductor high temperature-- thermoelectric-, and cryogenic- materials, to name some of the more important classes, lent new impetus to both theoretical and practical study in this field and demanded teamwork competence for best answers.

Lehigh's response to this challenge evolved from a committee composed of representatives of the various technical and engineering departments on the campus. Dean L. V. Bewley of the College of Engineering, in 1960 appointed such a committee to study the implications for Lehigh, and the steps which should be taken here. Dr. Jos. F. Libsch, then Chairman of the Metallurgical Department was appropriately named Chairman of this committee.

The recommendation's of the committee in 1961 led to the establishment of a Materials Research Center and to Setting up of research programs in Materials Science in which several departments would cooperate.

These centers were contemplated as non-teaching, and non-degree granting with staffs largely drawn from members of the various departments. The possibility of flexible division of effort by a staff man between his academic department, and the center was foreseen.

In this center- we now find most of the campus work being done on solid-state theory and applications, on thin-film technology, and on directionally-oriented composite materials.

The Materials Research Center has been so successful that similar Research Centers have been organized in other areas where interdepartmental effort appears be desirable. These are : the Center for the Application of Mathematics, the Center for Health Sciences, the Center for Marine and Environmental Studies, the-Center for Social Research, the Center for Surface and Coatings Research. Institutes with a similar objective, in a more restricted area are also functioning. - These include: the Institute for Eighteenth Century Studies, the Institute for Fracture and Solid Mechanics, the Institute for Metal Forming, the National Printing Ink Research Institute, and the Wetlands Institute.

The newest is the Emulsion Polymers Institute, in which interested scholars from any pertinent discipline can join fellow workers.

Probably the oldest such organization on the campus is Fritz Laboratory, which has added significant programs in plastic design, tall buildings, and earthquake resistance.

Most people in the country have heard of the aluminum cap at-the top

of the Washington Monument, but few realize that at the time it was placed there as the tip of the lightning rod which protects the monument, it was so precious that its use for commercial purposes was prohibited. For a generation in which aluminum is ubiquitous, it is difficult to realize that it was so expensive when it was first isolated. J. W. Richards, Class of '86, wrote the first version of his book on "Aluminium" very soon after his graduation. The book was updated as the industry advanced, and on the basis of his contributions, the price of aluminum came steadily downward to make it possible for it to be used anywhere that its lower density give it an advantage over steel and other heavy metals. Richards continued to be a Consultant for the Aluminum Company of America until his untimely death in 1921.

In the third "Joseph W. Richards Memorial Lecture" in 1934 before the Electrochemical Society, Dr. W. S. Landis, a former professor of chemistry at Lehigh and for many years the senior technical person in the Aluminum Company of America expressed his belief that Richards' "Metallurgical Calculations" was his outstanding contribution to technology. This book began to appear in the Lehigh curriculum long before the first book version was published. It began to be used very widely from the original English text before the foreign translations began to appear.

Probably his most significant contribution to industry was "Aluminium" as he always spelled and pronounced it--perhaps reflecting his British birth, which he published in his first edition very shortly after his graduation at Lehigh. The original edition may have been a compilation of information more or less difficultly accessible in its -original versions.

He was a close friend of the Hall brothers of Oberlin fame maintaining contact with them as they evolved their more widely known contribution to reduction of aluminum with the fused cryolite bath for the electrolysis of oxides of aluminum.

Technically knowledgeable people in the industry give Richards credit for having reduced this to profitable practice, thereby gaining a position of Father of the Aluminum Industry, as the Hall idea was incorporated into an economical and workable process.

Richards was one of six men who issued a call for a meeting in Philadelphia which resulted in the founding of The Electrochemical Society in 1902. This society has, grown with the electrochemical industries and has made great contributions to them. He was chosen as the first President at the organization, then became Secretary until his death in 1921. During all this time he was also editor of the Transactions, maintaining the national headquarters of the society, and the editorial offices of Transactions alongside the Departmental offices in the basement of Christmas Hall.

The first published curriculum in the program for Analytical Chemistry is interesting in its contrast with today's Material incorporated in a chemical curriculum. It was:

JUNIOR SCHOOLMEN

Qualitative Analysis (Fresenius) English Translation.
 Use of the Blowpipe (Plattner).
 Use of the Spectroscope.
 General Chemistry (Miller's Inorganic).
 Lectures by the Professor, and constant practice in the Laboratory.
 Physics-Lectures on chemical physics.

SENIOR SCHOOLMEN

Qualitative Analysis (Liebig).
 Specific Gravity of Vapors and Gases.
 Volumetric Analysis (Mohr).
 Quantitative Blowpipe Analysis (Plattner)
 Chemistry Applied to the Arts (Knapp).
 Lectures in Chemical Physics.
 Metallurgical and Technical Analysis and Assaying (Bodemann's
 Probirkunst)
 Dialysis, Bunsen's Gas Analysts.
 Chemistry applied to Agriculture and the Arts.
 Methods of Analyzing Soils.

The degree granted was Analytical Chemist, A.C., until 1906 at which time it was changed to B.S. in Chem., and for those students who elected the Chemical Engineering program, which was laid out and installed in 1903, the degree was Ch. E. until 1930, at which time it was changed to B.S. in Ch. E.

The first Ph.D. granted from the Chemistry Department was to J. W. Richards in 1893. The soundness of his training and the breadth of his education are reflected in his long and successful career in the Metallurgy Department at Lehigh. We had more to say about Richards earlier. H. E. Kiefer was the second doctorate in 1896. After that only the M.S. was granted until 1937; at that time the doctorate program was reestablished. The Chemical Engineering program was divorced in 1952 with the establishment of a separate Department of Chemical Engineering.

The Civil Engineering program seems to have been as stable and continuous as any. The only major change seems to be the divorce of Mechanics in the 1950s, leading to the establishment of a separate

department which was subsequently merged with the Department of Mechanical Engineering.

The Mechanical Engineering program was also quite stable, spinning off at about 1950 the program in Industrial Engineering. The area of raw materials and their extraction, geology, mineralogy, mining, and metallurgy has been rearranged several times. The geology, which was originally included in this Special School has for many years been taught as a Science in the College of Arts and Sciences, the successor to the School of General Literature of the early days. The Mining Engineering program existed quite stably and consistently until 1963 at which time the enrollment both locally and nationally had sunk below a viable minimum, leading to the elimination of instruction in Mining Engineering.

The Physics program seems to have been incorporated in the chemistry instruction in the early years, but to have grown up into a separate program after the arrival of Professor William S. Franklin who joined Lehigh in 1897. The Physics building was built for separate laboratory work in 1892-1893. It housed the Physics program and the electrical engineering program until Packard Laboratory was built and occupied about 1930.

Franklin, and his colleague, MacNutt were prolific writers of very successful books. This was another of the missionary efforts of the faculty of those days. The compiler of this small Story well remembers using "Light and Sound" by Franklin and MacNutt in a rather remote school few years after Franklin had moved from Lehigh to MIT. He was another of those very public spirited professors from Lehigh, and the city recognized him by naming the park on Sand Island after- Professor Franklin. As a separate curriculum, the engineering physics program was established in 1923, evolving to the first Ph.D. in 1943.

One could spend hours and pages recording and analyzing tile evolution of courses of instruction, curricula, organization of departments, and the responses of each to Changes in the other very boringly and endlessly. The Writer believes this is of such specialized interest and utility that it does not belong in a writing such as this.

It seems sufficient to say that Lehigh's educational programs have responded to the changing needs of society, to the improving methods of communicating information to successive generations of students, and to the ever-increasing amount of knowledge to which students should be exposed in each particular field.

It is a defensible position that the real measure of a university is the stature and-accomplishment of its alumni. A few are selected whose accomplishments have been evaluated as significant or outstanding-on the basis of honors and awards, conferred on these alumni in later life.

The choice of such things for listing arbitrary, and this writer has not

included, for instance, the engineering triumph of the New York City Grand Central Terminal, which was constructed without interfering with the schedule of any trains. There is no synopsis of the career of engineering contribution to the locks of the Panama Canal Dior more than just mention of Mr. James Ward Packard of automobile fame, and also a generous benefactor of the University --all of these accomplished by Lehigh alumni.

Jacob Blaustein

Jacob Blaustein, a member of the Class of '13 at the University received the --honorary- degree of Doctor of-Humane Letters in 1956. Mr. Blaustein organized with his father, the American Oil Company (AMOCO). Through series of mergers, this has become one of the major units of the Standard Oil (Indiana).

In 1945, he was appointed by President Roosevelt to serve as a Consultant to the American Delegation at the United Nations Conference at San Francisco. In 1951, President Truman appointed him to the Mobilization Policy Board. In 1955, he accepted appointment by President Eisenhower as a member of the United States delegation to the Tenth General Assembly of the United Nations. He has been President of the American 'Jewish-Committee and was Chairman of its delegation to the Paris Peace Conference in 1946.

As a result of his negotiations while he was a member of the Presidium of Five of the Conference on Jewish Material Claims against Germany, West Germany in 1953 agreed to pay \$822,000,000 over a period of 12 years for the rehabilitation of Israel, and elsewhere of victims of Nazi persecution.

His procession of appointments and invitations to serve on Human Rights Commissions, conferences and organizations has taken him into most of the Countries of the world, where his broad grasp of these problems has made him a respected participant.

He supported, and endowed a series of lectures in international Relations at Lehigh in 1965, which has brought to -the campus outstanding leaders from ail over the world.

Edwin H. Gott

Most of his associates think of Ed Gott as having been a one company man as were so many. This overlooks a seven-year stint with the Koppers Company before he joined the United States Steel in 1937. He had graduated from Lehigh in 1929 with a B.S. in I.E.

He climb up the ladder in U.S. Steel led him into most of the large mills then operated by the company. In 1956, he became vice president,

operations-steel for the parent company, executive vice-president in 1959 and a corporate director in 1966. He became president and chief administrative officer in 1967.

He has an outstanding record as a public-spirited citizen in Pittsburgh, longtime member of the Board of Trustees of Lehigh and of the American Iron and Steel Institute. His efforts were recognized by Lehigh with an honorary Eng. D. in 1968.

Eugene G. Grace

The name of Eugene G. Grace almost automatically brings to mind the whole story of his career as one of the greatest, if not the greatest steel man in the country, as Charles M. Schwab once characterized him. He graduated as valedictorian of the Class of 1899 in Electrical Engineering, and made the choice of an industrial career rather than go into professional sports to continue his extra-curricular activity. He started as an electric crane operator immediately upon graduation, and worked through the Steel-making department until 1902 when he was made Superintendent of Yards and Transportation.

In 1905, Charles M. Schwab purchased Bethlehem Steel, and in the reorganization and fusion with Schwab's other properties a reorganization of ore operations in Cuba was necessary. Grace was sent.

Soon after his return from that mission, when Bethlehem was in the middle of building new types of mills, and pioneering the wide-flange sections, Grace was appointed as general manager with wide supervisory powers to carry out the coordinated organization of new ventures.

In each of our great wars, Bethlehem Steel found itself in the vanguard of those "Arsenal of Democracy". Astronomical quantities of steel and armament were produced for the government

One of Mr. Grace's achievements in industry and in the development of the succession of men in the company was his -"Loop Course". A hundred or more college graduates are recruited each year and given a familiarization stint in a variety of assignments to find their most appropriate field for starting their careers.

During -hit -long career, he received countless awards and medals such as the Bessemer Golden Medal of the British Iron and Steel Institute in 1942. This is one of the most highly prized international awards in the steel industry. In 1948, he was awarded the Rand Medal of the A.I.M.M.E. In December 1951, the Gold Medal of the Pennsylvania Society for

"Distinguished Achievement". His Alma Mater remained dear to his heart, and was the recipient of unstinting support and dedication of effort. He was awarded the honorary Doctor of Engineering in 1927, and four other honorary degrees later. He served for many years as president of the Board of Trustees, and on the Board of Trustees of St. Luke's Hospital in Bethlehem.

His foresight in acquiring land on the top of South Mountain on the edge of the city of Bethlehem was vital in the establishment of the major and centralized Research Laboratories of the company, which carry the name of his successor, A. B. Homer.

Tom M. Girdler

Another Lehigh alumnus was very much in the public eye through the great Depression and for some time thereafter. He was Tom M. Girdler, Lehigh University Class of 1901, and while he was strictly a one-company Man, his career was completely in the steel industry. He started as a heater and blower salesman and moved through various companies, always up, until 1914 when he left the general manager's slot of Atlantic Steel Company to join Jones & Laughlin Steel Corporation as president at an outstanding annual salary of \$350,000.00.

In 1929, he was hired by Cyrus S. Eaton to head the new Republic Steel Corporation of which he became president and first board chairman. The company brought him to his widest publicity when he refused to follow the lead set by the United States Steel Corporation in 1937 in signing labor contracts with John L. Lewis for his C.I.O. which he headed.

Tough, profane, crusty, and capable "Tough Tom" said he would go back to the farm and dig potatoes before he would sign a contract with the C.I.O. After a rather bloody strike, operations were resumed but Mr. Girdler did not sign the hated labor contract. It was eventually signed in 1942 under an order from the War Labor Board which was executed by other officers of Republic than Mr. Girdler.

He followed through by acquiring and merging Consolidated Aircraft and Vultee Division into Convair which turned out thousands of B-24 bombers and PBY Flying Boats during World War II. He retired as board chairman in 1956, and spent his remaining nine years largely devoted to raising and enjoying race horses. Lehigh conferred on him the honorary degree of Eng. D. in 1955.

C. Lester Hogan

C. Lester Hogan has been president and chief executive officer of the

Fairchild Camera and Instrument Corporation since 1968 and has earned the reputation of being one of the outstanding executives in the electronics field. He took his M. S. and Ph.D. in physics in Lehigh in 1947 and 1950, after graduating from Montana State University. His graduate work had already pointed him towards solid state devices and electromagnetic theory. He was a Gordon McKay professor of Applied Physics at Harvard, and was specializing in microwave phenomena. He was a member of the technical staff of Bell Telephone Laboratories, and in 1958 joined Motorola Company as Vice President of the Semi-Conductor Products Division, building that successfully from a single-line producer of transistors to one of the major solid state device producers in the world. Since 1968 he has been with Fairchild. Dr. Hogan has been honored with honorary degrees, A. M. from Harvard, D. Eng. from Montana State University, D. Sc. Worcester Polytechnic Institute, and the Eng. D. from Lehigh University in 1971. Certainly Lehigh's contribution to his development justifies her pride in him.

Lido Anthony Iacocca

Probably the most widely known-name of current Lehigh alumni is Lido Anthony Iacocca, '45, with a degree in M.E. He had grown up with a passion for automobiles, a life spent mostly "in one big parking lot". Even during the depression, the family always had cars. He was determined that he wanted to be in engineering, and was almost as strongly determined that he was going to join Ford.

At the time he graduated, recruitment of engineers was a wild scramble. Out of this scramble he was completely convinced that his desire to go to Ford right when the recruiter came to campus in a Continental Mark IV. Before he joined the corporation, he was offered a fellowship at Princeton to study for his master's degree in mechanical engineering. He asked Ford for a delay in reporting, and some study in Lehigh's College of Business Administration.

If Iacocca's charm and energy made him a thoroughly successful road man for stimulating dealers, his flamboyant influence began to be felt in the late 1950s, and really burst forth when Robert MacNamara left the corporation to become Secretary of Defense, Iacocca, in his new position as vice president and general manager of the Ford division in 1960 embarked on a sharp turn around from the plain and efficient cars of the MacNamara era. He put Ford back into the racing program, and started immediately on the Mustang. This became Ford's hottest model in 1964, and the biggest thing in the corporation since the elder Henry had introduced the Model T. In 1969, he became executive vice president of the Ford Motor Company, and President, Ford North American Automotive Operations. He has apparently been the leading divisional president since that time,

and all indications point to his success in keeping the Ford cars in step with the energy and pollution restrictions. He was given an honorary Eng. D. in 1969.

Bernard H. Jacobson

The Lehigh alumnus whose contribution to society is somewhat less glamorous-sounding than being chairman of the board of a major corporation is Bernard H. Jacobson. His career has been in the silent partner segment of the plastics industry, a career primarily in the manufacture of plasticizers, those little known materials which convert the hard horny and brittle Material which is characteristic of pure plastic components into the useful, tough, and durable materials which the public thinks of when it says "plastic".

Jacobson graduated with the degree of Electrometallurgist in 1917, spent ten years in research departments, first with Hooker Electrochemical, then with E.C. Klipstein. In 1927, he moved into managerial assignments and up the ladder to retire from the vice presidency of F M C Corp., into which his company of twenty years tenure had been merged just three years before. In his home town of Charleston, West Virginia, he has been on the board of directors of a local bank, the country public library, a fuel company, the YMCA and the Salvation Army. He has been active in the Kanawha Area Development Corp. and the Health Planning Council, Inc. He was on the Board of Trustees of Morris Harvey College for many years, and was awarded an honorary Doctor of Science degree by that college in 1959.

He was awarded Lehigh University Alumni Award in 1960, and in 1972, Lehigh conferred on him the honorary degree of Eng. D. During this strenuous business career, and the accumulation of an impressive record of public service to his home town, his home state, and his industry, at last count, he had accumulated seven patents.

He remains a consultant to the FMC Corp., and devoted Lehigh alumnus.

Earl F. Johnson

An alumnus who did not spend his whole career in one industry was Earl F. Johnson, civil engineer of the Class of 1907. His career included connections with one of the world's largest construction companies, one of the largest chemical companies, and the largest motor manufacturer, in that order. He joined McClintock [i.e. McClintic] Marshall Construction Company

upon graduation in 1907 and in 1909 joined DuPont Powder Company as operating Powder Manager. In 1919 he joined General-Motors as an executive in accessory manufacturing.

His was a career which seldom made headlines, but through it all he remained a devoted and loyal alumnus. He joined the Board of Trustees in 1931 as an alumnus trustee, and served continuously in that capacity or as a corporate trustee until his death in 1958.

He had retired from General Motors in 1930, but was asked by the federal government to come out of retirement and head the Ordnance Branch of the War Production Board in 1940. He returned to General Motors in 1942 as a vice president, retiring in 1946, but retaining the title of a director of the corporation. As Chairman of the Endowment Committee of the trustees from 1936-1949 he saw Lehigh's endowment increase from \$5.5 million to well over \$8 million.

Frank Gregg Kear

One of the outstandingly successful Lehigh alumni who has not been a one-company industrialist is Frank Gregg Kear, electrical engineer of the Class of 1926.

After receiving his master's and doctor's degree at MIT, he left in 1933 to work at the National Bureau of Standards. He was one of the team working on the development of the first aircraft instruments landing system which was initially installed at College Park and Newark.

After World War II experience in which he rose from a reserve officer commissioned in the Army Tank Corps to retire as a Naval Reserve Captain, he was involved in the development of Synchronization in Antenna Rays. This was his doctorate thesis at MIT, and was the basis for the theory underlying the reliability of low-frequency air navigation range systems.

He moved from this into the development of the highly specialized TV antenna systems and aircraft landing systems.

He joined with Mr. R.E.L. Kennedy in forming the consulting firm of Kear and Kennedy after World War II.

The most widely known of his designs is the multiple antenna system on the Empire State Building. Originally conceived to provide two television antennae the system now includes nine. An added FM antenna system has been added which will accommodate 17 FM transmitters. It has attracted very wide attention, and its technical success is witnessed by the fact that it has been virtually copied into a Japanese installation. A related and somewhat similar multiple antenna transmission system for Twin Peaks near San Francisco was

somewhat parallel to the Empire State installation, but problems of an acceptable design from the ground up to support multiple VH and UH television antennae.

Raymond F. Kravis

One of Lehigh's successful alumni who did not spend his whole career in one company is Mr. Raymond F. Kravis, Class of 1924 in the Mining Engineering Department. He spent 11 years with W.O. Ligon and Co. of Tulsa and Samuel J. Caudill & Co. both firms consulting petroleum production engineers and geologists, before opening his own office.

His consulting firm has specialized in oil and gas reservoir studies and economic evaluations, estimation of oil and gas reserves, and evaluation of and gas properties and companies for mergers, sales, dissolution and the financing of stock and debenture issues. He has been an advisor to banks and insurance companies on loans, and for federal and state gift and estate tax purposes. His clients include many of the small independent oil operators based in Tulsa and the remainder of Oklahoma, and the major oil companies. His advice is sought by financial institutions throughout the U. S. and Canada on oil and gas reservoir evaluation. He is director of businesses in Tulsa and several charitable organizations. Much of his energy has gone into his activities as a member of the Board of Trustees of the American Jewish Committee; he is a founder, treasurer, and director of the Tulsa Jewish Community Council. He has received the State of Israel Bonds Award in 1965, and the Herbert E. Lehman Human Relations of the American Jewish Committee in 1970. He is a member of the University of Tulsa College of Engineering and Physical Sciences Hall of Fame. Lehigh awarded him the honorary Eng. D. degree in 1971.

Frank Lynn Magee

If one measures the accomplishments of a University in terms of the contributions of its alumni to industry and society, Lehigh's record is outstanding. Many of these alumni spent their entire career in a single employment, rising to the top of their chosen company.

One who is typical of the successful alumni in his career is Frank Lynn Magee who graduated in the wartime class of '17 in Electrical Engineering. In spite of the elimination of all frills from the curriculum to accelerate for more activity, Magee found time to play varsity soccer, earned the

respect of his fellow students to become the president of the Electrical Engineering Society and his fraternity during his senior year. It appears that perhaps Professor J. W. Richards had a significant influence on young Magee, perhaps on the basis of mutual liking and respect which they had found. The budding aluminum industry appealed to Magee and he mailed his application for employment with Alcoa directly to the president of the company. His ambition was in the direction of power economy and the application of the extensive hydro-electric developments of North Carolina and Tennessee to this new and intriguing industry.

As it happens his path to the top in the company came more through the sales activities than through improving power utilization and developing new technical applications of aluminum. He moved into the job of general production manager in 1943, vice president in '55, president in '57, and Chairman of the Board in 1960. In addition to Lehigh's honorary Eng. D., he holds an honorary LL.D. from Berryville (Tenn. College) and Lehigh's Life Award. During World War II he received the President's Citation of Merit.

Raymond L. McCann

It is not surprising that Lehigh men have been associated with the New Jersey Zinc Company, which has a connection back to the earliest years of Lehigh in the discovery of the Saucon Valley zinc depository Professor Wetherill, and that the Lehigh Zinc and Iron Company was born in Bethlehem at about the same time as Lehigh was. Such a man is Raymond L. McCann, mining engineer of the Class of 1917. He began work at the New Jersey Zinc Company's Franklyn mine in New Jersey immediately on graduation, and his whole career was spent with that company. In that parent company, he followed for much of his career the introduction of modern and efficient mining methods, and the modernization of the company's zinc smelting facilities. He led the company to join with Kennecott Copper in the formation of Quebec Iron and Titanium Corporation in Canada for the production of a titanium slag from ilmenite ore, a raw material for the white pigment, titanium dioxide.

Another joint venture is with Texaco Inc. in the Texas Zinc Minerals Corp. for the production of uranium oxide in Utah. This project includes both the mining and the processing of the uranium ore.

As he advanced through the ranks to become president in 1951, Mr. McCann was constantly pushing the company towards the newest, most efficient, and accordingly economical processing of minerals. He was awarded an honorary LL.D. by Lehigh in 1958.

The company has acknowledged his contribution by supporting in his name

fellowships and an endowed professorship at Lehigh since his death.

James H. Pierce

One of Lehigh's outstandingly successful alumni who was not widely known is Mr. James H. Pierce, graduate of 1907 in Mining Engineering. He worked for various of the anthracite coal mining companies in some of the soft coal of West Virginia. He was involved in some of the bitter strikes as the United Mine Workers was trying to organize the coal industry in 1912.

By 1914, he was vice president of the coal mining firm of Thorne, Neal and Co. He was given a "ninety days leave of absence" to handle a Russian assignment which generated a five-year periodic return to Russia to advise them in procuring the equipment and updating their mining activities.

He has continued his activity in public service, and as an advisor to heads of state, both domestic and foreign.

His seems to have been a charmed life, because he was one of a few who survived an airplane crash in 1965 in which the plane caught fire and burned. He refused to stay in the Williamsport Hospital, and had his wife drive from Scranton to Williamsport to take him home.

Monroe J. Rathbone

Another of Lehigh's leaders of the company in which he spent his whole career is Monroe J. (Jack) Rathbone of the Class of 1921. He studied chemical engineering which was not greatly surprising because he had a father, brother, uncle and cousin working for Jersey Standard in the Parkersburg, West Virginia, refinery of that company. He was assigned to the Baton Rouge refinery on graduation, starting as a design and drafting engineer.

Nineteen twenty-one was about the time of the birth of scientific refining of petroleum and as his company expanded and improved refining operations, Rathbone moved up the ladder to the presidency of Standard of Louisiana, the subsidiary operating in that state.

As war clouds were gathering over Europe, he watched his company at Baton Rouge the first fluid catalytic cracking unit and one of the first large scale producing installations for the blending agents required for 100 octane aviation gasoline.

In 1944 he was elected president of the principal domestic operating subsidiary and in 1949 became a full time director of the Company. He was made president of the parent company in 1954, and chairman and chief executive officer in 1956. During this time he led the company to what is probably the most widely diversified producing and refining establishment in the whole petroleum industry of the world.

During all of this, he never lost his contact with and appreciation for "the fellows".

These are the characteristics of the man who piloted a stupendous expansion in his company during an era of growth, served as Chairman of the Board of Trustees from 1957 to 1973, and has been awarded essentially every honor which his Alma Mater can bestow.

Mr. Rathbone was chosen in 1975 by the editors of Fortune Magazine for membership in "Annual Hall of Fame for Business Leadership". Nineteen men were drawn from two centuries of American life for the honor. His achievements in the refining and production of Jersey Standard are widely known. Only three other living men were elected at that time. He has earlier received the Palladium Medal, the "L-in Life Medal".

Robert C. Watson

Not all of Lehigh's outstandingly successful alumni have followed the route of industrial employment to the top as is exemplified by the career of Robert C. Watson, C.E. 1913, LLB. from George Washington University in 1917.

As an undergraduate, he was an eastern intercollegiate wrestling champion at the 175 lb. class in his senior year. He joined the law firm in Washington, D.C. of Watson, Cole, Grindle and Watson with whom most of his career has been spent. This was interrupted to serve as United States Commissioner of Patents under President Eisenhower from 1953 through 1961. He was awarded the Jefferson Medal of the New Jersey Patent Law Association in 1958. He was awarded the "Charles F. Kettering Award for Meritorious Work in Patent, Trademark, and Copyright Research and Education" in 1958 by George Washington University; which had awarded him an honorary LL.D. the previous year. He is a past president of the American Patent Law Association and a past chairman of the Section of Patent, Trademark, and Copyright Law of the American Bar Association. They have awarded him an honorary LL.D. in 1954, and he received the "L-in Life" award of the New York Lehigh Club in 1960.

Edward G. Uhl

Mr. Uhl is a 1940 Phi Beta Kappa graduate of Lehigh University with a bachelor's degree in Engineering Physics. He used this education in the service of the U. S. Army during World War making significant contributions to new arms development.

After the war, he joined the Martin Company as Research Engineer, and in 1953 was named vice president and chief engineer. His division was responsible for the engineering aspects of all Martin Company military projects including the Matador Missile, the P5M, P6M, B-57, and Viking Projects.

He was named vice president and general manager of a newly created separate operating division in Orlando, Florida, for the development of guided missiles and electronic systems. This division was assigned responsibility for five major military projects.

In 1961, Edward Uhl became president of and chief executive officer of Fairchild Industries and member of the Board of Directors. In this position, he is responsible for the business and technological progress of the company. Under him, Fairchild has gained quite a reputation for innovative development in both business and technical activities. He was awarded a D.Sc. by Lehigh in 1975.

**Leonard P. Poole
Dexter F. Baker**

Lehigh University likes to feel it has contributed to the successful growth of Air Products and Chemical, founded by the late Leonard P. Poole, on whom Lehigh conferred an honorary Eng. D. in 1961.

When this fledgling firm moved to the Lehigh Valley after World War II, a very close working relationship was established between the company and the appropriate departments at Lehigh University. Mr. Poole's concept of building and selling air separation equipment appropriate to the requirements of the gas had led him to start the company in Detroit in the late years of the great depression: World War II found him moving to Louisville, Kentucky, for a better labor market, and shortly after the war was over, he moved to the Lehigh Valley with his base of operations in Emmaus.

The cordial working relations resulted in a generous number of Lehigh graduates accepting employment in the company, in which they have progressed as the company grew, and merged to its present size. As this progressed, Mr. Poole was elected to and accepted membership on the Board of Trustees of Lehigh in which position he made significant contributions to the stature of Lehigh.

Since his recent and very untimely death, there has not been an

official reorganization- of the executive structure of the company. Certainly one of the two top men in the company is Mr. Dexter F. Baker, the executive Vice-President since 1968. He has been on the Board of Directors since 1964. Mr. Baker received-a B.S. in Ch. E. from Lehigh in 1950, and an M.B.A. in 1957.