

## ENGINEERING ECONOMY - A Historical Perspective

Gerald J. Thuesen, William G. Sullivan  
Georgia Institute of Technology/Virginia Polytechnic Institute and State  
University

The purpose of this paper is to acquaint the reader with the accomplishments and contributions made by four individuals in the field of engineering economics. These “pioneers” of the profession enabled the field to develop from its infancy in the 1870's to become a critical component of engineering practice and education. Their introduction of fundamental ideas, the development of methodologies of analysis, the organizing of the body of knowledge and their writings to disseminate this knowledge were the formative forces necessary to create and support the field of engineering economy.

The four pioneers considered here are Arthur Mellen Wellington, H.G. Thuesen, E. Paul DeGarmo and Arthur Lesser, Jr. For each individual their contributions are presented in chronological order with important milestones described.

### I. Arthur Mellen Wellington<sup>1</sup>

December 20, 1847

Born: Waltham, Massachusetts

Son of Oliver Wellington, a physician and his wife Charlotte Wellington.

Arthur was a descendant of Roger Wellington, who came to the Massachusetts Bay Colony in 1636 and Benjamin Wellington, who founded Lexington.

1863-1866

Graduated from the Boston Latin School and began an apprenticeship in civil engineering in the office of John B. Hande.

1868

Began work in railway engineering with the Blue Ridge Railroad in South Carolina.

1873-1876

When the depression of 1873 temporarily halted railway building, he turned to research and published Methods for the Computation from Diagrams of Preliminary and Final Estimates of Railway Earthwork.

1876

He expanded some short articles he had published into “Justification Expenditure for Improving the Alignment of Railways,” Railroad Gazett, Sept. 1-Dec. 29, 1876.

1877

Published the first edition of The Economic Theory of Location of Railways, a 200 page book.

1878

Married Agnus Bates and later had one daughter, Elizabeth Elliot Wellington.

1881

Began working for the Mexican National Railway as Engineer-in-Charge of Location and Surveys. He also became a member of the American Society of Civil Engineers (ASCE).

1884

Became one of the editors of the Railway Gazette.

1887

Published the 2<sup>nd</sup> edition of his book The Economic Theory of the Location of Railways, his classic work that was his most enduring contribution to engineering economy. This detailed and expanded book of more than 900 pages focused on the scientific analysis and the proper consideration of all aspects of railway location.

He also became part owner and one editor of “Engineering News”. In two years, the subscriptions doubled.

1894

Gave up work at “Engineering News” because of poor health and took a trip to Norway.

1895

On May 15, 1895 had an operation for removal of a kidney and died May 16, 1895 of heart failure.

## II. Holger George Thuesen<sup>2</sup>

March 13, 1898

Born: Grundy County, Iowa on family farm.

Parents: Jorgen Jensen Thuesen and Christine Juliana Oerth Thuesen

Jorgen was born in Kabdrup, Denmark on April 4, 1849 and he died in Cedar Fall, Iowa on March 8, 1924. Christine was born in Stallig, Denmark October 19, 1858 and she died on June 4, 1921.

They were married on February 6, 1880. Jorgen came to the U.S. in April 1869 to avoid military service of the German Republic after seizure of Slevig in 1864. Jorgen and Christine had nine children and H.G. was the youngest. Four of these children died prior to 1893.

1914

Applied for a patent on a speed-indicator which was granted November 9, 1915. Patent No. 1,159,551.

1917

Enrolled Fall semester in Mechanical Engineering at Iowa State College, where mathematics was his best subject.

1919

Enlisted in the Signal Corps at the end of first semester on February 15, 1918 as a private. He travelled to England for World War I as part of a motor maintenance organization and was discharged November 30, 1918.

Iowa State College introduced an Option in Industrial Engineering open to seniors in Mechanical Engineering (M.E.). Courses in this option were taught by J.O. Keller. Keller had been an E.E. major at Penn State and he transferred to I.E. ( a program started at Penn State in 1908) and graduated with an I.E. degree in 1911 (He was the world's first to receive an I.E. designated degree).

1924

At Oklahoma A&M College in Stillwater, Oklahoma an I.E. degree was approved within the Industrial Arts Education Program.

1925

While working for General Electric in Ft. Wayne, Indiana accepted a job as Assistant Professor of Industrial Engineering for \$2,400 per year.

1926

Graduated Earl Kightlinger with B.S. in Industrial Engineering. First such degree conferred by a department of Industrial Engineering west of the Mississippi River.

1927

Received a Professional Degree in M.E. from Iowa State College for work completed over the summer.

1930

Granted a Masters of Science degree in M.E. from Iowa State College for Spring and Summer work.

1933

January meeting with engineering department heads and Carl C. Magee, Editor of Oklahoma News and Chair of Traffic Committee of the Chamber of Commerce. Magee suggested that Oklahoma A&M have a parking meter design and model building contest. On May 6, 1933 the contest was judged.

On May 1933, he devoted time to a practical parking meter design. Brought in Gerald A. Hale, a 1927 I.E. graduate from Oklahoma A&M. Hale was an instructor in the M.E. department at the time.

Fall 1933, the first operating parking meter was built (Black Maria).

1934

Blueprints of the Black Maria were developed from January to July. The Dual Parking Meter Company was organized in Oklahoma City.

1935

On July 16, 1935, 150 meters were installed in Oklahoma City. Design problems occurred and Dual Parking Meter Co. became interested in a second design by Thuesen and Hale using punchpress parts. A model was constructed by the Summer 1935.

1936

Applied for parking meter patent on March 9, 1936 and it was granted November 15, 1938. Patent No. 2,237,111. Hale accepts employment with the Dual Parking Meter Co.

H.G. Thuesen became the Professor and Head of I.E. at Oklahoma A&M.  
Became a Professional Engineer (PE).

1941

M.R. Lohmann hired as Assistant Professor of I.E. to create a two-person I.E. department.  
H.G. Thuesen helped form the I.E. Division of ASEE in Ann Arbor, Michigan.

1942

Served as Chairman of I.E. Division of ASEE during the Spring.

1944

Originated the idea of an Automatic Time Recorder with Ralph M. Barnes of the University of Iowa. Timed and recorded elapsed time to 10,000ths of a minute.

1948

Fall semester sabbatical to write Engineering Economy, the text, for Prentice Hall, Inc.  
Developed the functional system for interest factors.

1949

Joined IIE in March.

1950

Engineering Economy published.

1954

Elected Fellow in IIE on May 7.

1957

Stepped down as I.E. department head after 24 years in that position.

1961

National Science Foundation grant to develop Memo-Activity Camera.

1963

Retired from Oklahoma State University after 38 years of teaching and administration.

1964

Received the Frank and Lillian Gilbreth Award from IIE and received Life Membership in ASEE.

1973

Died of heart attack in Ponca City, Oklahoma on October 7, 1973 with burial in Stillwater, Oklahoma.

### III. E. Paul DeGarmo<sup>3</sup>

January 29, 1907

Born: Lucerne, Missouri on January 29, 1907

Parents: Arthur and Editha DeGarmo

Arthur worked for the Chicago, Milwaukee and St. Paul Railroad and in 1910 was transferred to Marion, Iowa. There Paul completed his freshman year of high school.

1925

Paul graduated from Roosevelt High School in Seattle, Washington in 1925. He became a licensed radio operator and went to sea with the Alaska Steamship Company.

1926

Entered University of Washington to study engineering and graduated with a B.S. degree in Mechanical Engineering in 1930.

1930

Began graduate study in Mechanical Engineering on a part-time basis at the University of Washington..

1934

Employed as a Factory Control Engineer at the Firestone Tire and Rubber Company in Los Angeles.

Married Mary Elizabeth Turner in Seattle.

1936-1937

Continued part-time graduate study at the California Institute of Technology and received his M.S. degree in Mechanical Engineering in June 1937.

Accepted a position as Instructor of Mechanical Engineering at the University of California in Berkeley.

He founded the curriculum in Industrial Engineering at UC-Berkeley and served as Chairman of that department.

1942

Published with B.M. Woods, " Introduction to Engineering Economy; Macmillan Company. This was the first edition of a book that is now in its 10<sup>th</sup> edition.

1948

Received the Lincoln Gold Medal from the American Welding Society and its Meritorious Certificate Award in 1957.

Served as Assistant Dean of Engineering for three years.

1963

Presented an engineering economy course for the Japan Productivity Center at the request of the Japanese government.

1967

Elected Fellow in IIE.

1971

Retired from active teaching at UC-Berkeley, but continued research, writing and consulting.

IV. Arthur Lesser, Jr.<sup>4</sup>

May 17, 1909

Born: Newark, New Jersey

Founding Editor of The Engineering Economist.

1954

Held Summer Symposium on Engineering Economy at the University of Illinois on a break even basis.

1955

Volume 1, No. 1 of The Engineering Economist published June 1955. Adam Abruzzi wrote the first paper. Also discussed issues with Norman Barish, New York University and Gayle W.

McElrath, University of Minnesota. These two became the first Associate Editors.

Only 50-60 Engineering Economy Division members of ASEE.

1956

Gerald Matchett of Illinois Institute of Technology agreed to be the Associate Director for Promotion.

Five individuals became Contributing Editors: Eugene L. Grant, Stanford University;

Ernest H. Weinwurm, DePaul University; James J. Weaver, Imperial Chemical Industries; Joel B. Dirlan, University of Rhode Island and Robert M. Eastman, University of Missouri

1959

Summer Symposium to finance The Engineering Economist held at the University of Pittsburgh netted \$1,500. It was decided to hold the symposium every three years.

1960

The Cumulative Index first appeared in Vol. 5, No. 4, Spring 1960. This index included Vols. 1-5.

1965

In January, a reader suggested the need for standardization of notation. An Ad Hoc Committee was formed, and it was chaired by Gerald A. Fleischer of USC.

1966

In Vol. 12, No. 1, Fall 1966 the 1<sup>st</sup> Annual Eugene Grant Award was announced for J. Morley English of UCLA for the best article published in The Engineering Economist for Vol. 11. The award was \$250.

Report of Ad Hoc Committee on Standardization of Notation in Vol. 11, No. 2, Winter 1966. Vol. 12, No. 1, Fall 1966 issue had a preliminary set of recommendations. Two sets of symbols proposed (1) Functional and (2) Mnemonic.

1967

The Final Report of the Ad Hoc Committee on Standardization of Notation appeared in Vol. 12, No. 4, Summer 1967. The American Standard Association adopted these recommendations.

1970

Richard H. Bernhard of North Carolina State University became Associate Editor, Manuscripts, while Gerald W. Smith of Iowa State University was Associate Editor, Review. Gerald J. Matchett continued as the Associate Editor, Promotion.

1971

In the summer, Ray Lutz of the University of Texas at Dallas became the Associate Editor, Manuscripts.

1972

In Vol. 17, No. 3, Spring 1972, the Reader's Forum began. Art Lesser wrote the first article for the Reader's Forum, "Reflection on Sunk Cost and Abandonment Decision". This feature was dropped because of lack of participation.

1973

The Engineering Economy Abstracts were initiated by Gerald W. Smith. Arthur Lesser, Jr. discontinued his role as Editor.

1974

Ray Lutz, University of Texas at Dallas became the Editor and Nancy Cole (Ray's wife) became the Managing Editor.

1999

Art and his wife are living in retirement in Ithaca, New York where their son is on the faculty at Cornell.

#### Bibliography

1. Engineering News and American Railway Journal, Vol. 33, No. 21, May 23, 1895, pp. 886-888.
2. "The First Forty Years of Industrial Engineering and Management at Oklahoma State University As I Saw It." Paper prepared by H.G. Thuesen in 1966-67. Archives Oklahoma State University Library catalogued with other H.G. Thuesen papers.
3. E. Paul DeGarmo Web page <http://www.me.berkeley.edu/faculty/degarmo/bio.html>
4. Lesser, Arthur Jr., Reminiscences of the Founder and Editor of "The Engineering Economist", The Engineering Economist, Vol. 20, No. 4, Summer 1975.
5. History of the Engineering Economy Committee of the American Society For Engineering Education," Paper prepared by Arthur Lesser, Jr., Stevens Institute of Technology, Oct. 1952.

#### GERALD J. THUESEN

Gerald J. Thuesen is Professor Emeritus in the School of Industrial and Systems Engineering at the Georgia Institute of Technology. He received his B.S., M.S. and Ph.D. in Industrial Engineering from Stanford University. His research interests include engineering economic analysis, capital budgeting and statistical decision theory. He has co-authored two college texts, Engineering Economy and Economic Decision Analysis. He served from 1981-1991 as Editor of The Engineering Economist and is a Fellow of the American Society for Engineering Education, where he was a member of the Board of Directors. Dr. Thuesen was recipient of the Eugene Grant Award in 1977 and 1989, and he received the Wellington Award in 1989 for outstanding contributions and service to the field of engineering economy. In 1990 he received the Outstanding Publication Award from IIE. He is a Fellow of the Institute of Industrial Engineers, where he serves as a member of the Board of Trustees.

#### WILLIAM G. SULLIVAN

William G. Sullivan is Professor of Industrial and Systems Engineering at Virginia Polytechnic Institute and State University. He is the author of seven books and over 100 technical papers. One of Dr. Sullivan's books, Engineering Economy (Macmillan) is now in its tenth edition. Dr. Sullivan's current research interests include justification of advanced manufacturing technologies and activity-based costing applied to the design process. He is also a two-time recipient of the Eugene L. Grant Award for the best paper in The Engineering Economist Volumes 29 and 36. Sullivan is a Fellow in the Institute of Industrial Engineers.