

DEDICATION TO PROFESSOR RICHARD HUGO GALLAGHER  
17.11.1927–30.09.1997

We planned for the special issue to be available at the start of the 10th International Conference on Finite Elements in Fluids in Tucson (5–9 January 1998) to celebrate the 70th birthday of Prof. Richard Gallagher, who had both the vision and the imagination to anticipate the success which would accompany the introduction of finite elements into the realm of fluid mechanics.

Unfortunately this was not to be. The untimely death of Professor R. H. Gallagher on the 30th of September 1997 after a long and gallant fight intervened. It is therefore our wish to dedicate this work to his memory. His outstanding and unique contribution to engineering education, to computational mechanics and to the wide applications of the finite element method will long be remembered.

He has an assured place in the Hall of Fame of Engineering and in the hearts of his many friends.

This special issue contains papers written to represent the “state-of-the-art” in the solution of fluid mechanics problems by the finite element following the 9th International Conference on Finite Elements in Fluids which was held in September 1995 in Venice.

A hardback version of this issue continuing the series of books on *Finite Elements in Fluids* (Vol. 8) will be available in Tucson and later for purchase from the publishers.

M. MORANDI-CECCHI, K. MORGAN and O. C. ZIENKIEWICZ  
*Guest Editors*

IN MEMORIAM  
TO  
A GREAT ENGINEERING SCIENTIST AND EDUCATOR  
Professor Richard Hugo Gallagher  
17 November 1927 – 30 September 1997



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Richard H. Gallagher, known as Dick to his numerous friends, passed away quietly on the 30th of September 1997 after a long illness, which he fought, gallantly to the end. We mourn his untimely death as we lose a close colleague, a brilliant engineering educator and, above all, a man with a big heart.

He took early retirement two years ago to enjoy the closeness and happiness of this family but this retirement was cut short. In the words that follow we celebrate his achievements and his life and give our thanks for it.

It is appropriate that this volume associated with the series of International Conferences on Finite Elements in Fluids should be dedicated to his memory. In this field he was one of the few with vision and imagination to anticipate the success and importance finite elements would play in fluid mechanics. Indeed modern aeronautics would be much the poorer without its existence in modelling the complex flow patterns (as well as, of course, the structural behaviour) of aircraft.

Dick was born on 17 November 1927 in New York City from a Catholic marriage uniting a father with Irish roots and a mother born in Bohemia which was then part of the Austro–Hungarian Empire. He had therefore all the attributes of a true American. He graduated from the Cardinal Hayes High School and, after serving in the U.S. Navy, enrolled in a Civil Engineering degree course at New York University where he obtained his Bachelor Degree in 1950.

During the next five years Dick worked first as a field engineer with the U.S. Department of Commerce and then as a design engineer with the Texas Corporation at their New York office. Throughout this time he also worked hard as an external graduate student at New York University and was awarded his Master's Degree in Civil Engineering in 1955. With this qualification and his wide knowledge of structural mechanics he was soon recruited to the aerospace industry which was at the time undergoing an important expansion. His work not only led to the development of new aircraft but also inevitably to the achievement of space flight. His employer was the Bell Aero Systems Company in Buffalo where his talents were recognised and he was soon promoted to the post of Assistant Chief Engineer.

Dick stayed with Bell Aero Systems until 1967 during the most active period in the aerospace industry when the power of electronic computers was first utilized to perform complex structural analyses. It was here he realized the immense possibilities that were being placed in the hands of the engineer. Here he encountered the concept of finite elements, introduced by the rival company Boeing, for the solution of complex stress distributions in continua in the mid-fifties. The opportunities offered by the finite element method fired his imagination and led to much creative research. Whilst still employed by Bell Aero Systems he became a part-time teacher of evening courses at Buffalo University. He was simultaneously working to obtain his Doctor's Degree. He presented a thesis on the analysis of thin shells by curved elements—a subject of great novelty at the time—and was awarded his Ph.D in 1966. However, as early as 1962 he had published the first three-dimensional form of the finite element method using tetrahedral elements in a paper, which remains even today a very often cited classic.

His simultaneous preoccupation with industrial application, academic studies and research is typical of the tremendous effort Dick has put into his work throughout his life. The fact that by the time he obtained his Doctorate he was a happily married man and the father of five children probably provided much motivation, and many times throughout his career he has acknowledged the contribution made by his wife Terry. As a father, Dick succeeded as a role model for all his children. His four sons and one daughter all became engineers in different but important fields. Surely this is a unique achievement.

It was at that conference that we recognized our common interest in the subject of finite elements. The Newcastle conference was followed in the same year by a much larger one in Dayton, Ohio where now a worldwide group of researchers met at the Wright Patterson Air Force Base for the first conference on 'Matrix Methods and Structural Mechanics' a name which at that time was almost synonymous with 'Finite Elements'.

Shortly after that event Dick was invited to become a Professor at the prestigious Cornell University where George Winter held the Chairmanship of the Department and the distinguished Professorship of Steel Structures. Two years after his initial appointment Dick became the successor to Professor Winter and soon was very influential in making Cornell University into one of the most important centres of finite element research in the United States.

By the time Dick became a Professor at Cornell his publications were numerous and his research had already made a significant impact on the profession. His earliest published work was motivated by the needs of the aircraft industry for which he worked and here both analytical and experimental approaches are evident. The subjects of "Low Aspect Ratio" wings and of heating of structures point clearly to high-speed flight and aerospace applications. On the margin of this work he made the first contribution to three-dimensional stress analysis (1962) using tetrahedral shaped elements, which we have already mentioned, and extended further the possibilities of finite element analysis to the subject of structural optimisation.

Indeed it was this last area which became a continuing pre-occupation of his in later endeavours. These resulted in two major edited texts (one in 1979 and one in 1986) on optimization. However, at Cornell he continued other areas of work in which he had already recorded his contribution in the

“industrial period”. These were the stability (buckling) analysis of structures and the analysis of shells. In both areas he made major contributions and in his famous compilation of works on curved thin shells (with Ashwell 1976) he not only explained the various alternative approaches but presented a new and exciting development of his own based on the potential energy formulation. It was during the Cornell period that Dick’s interest widened beyond the field of structural engineering and engaged him in the subject of environmentally important shallow water flows (with Liggett and Chen in 1973). This naturally led to the general field of fluid mechanics. Here he felt that this subject of his research had reached a sufficient maturity for a general conference on Finite Elements in Flow Problems and he played a leading role in launching this venture in 1974. The first meeting was held in January of that year at Swansea where Dick was spending his sabbatical. This became the start of a series of conferences and corresponding “state-of-the-art” books. The current year sees the 10th conference at Tucson, Arizona, which had become the home of Dick and his family, and will also see the publication of the most recent state-of-the-art volume. We planned that Dick would be chairman of this meeting but his death intervened. We shall however remember him and his impact on Computational Fluid Mechanics there.

The six months sabbatical period spent by Dick and Terry in Swansea in 1974 as the U.K. Science Research Council Fellow was preceded by a similar period in the University of Tokyo in the fall of 1973. There he held the post of a visiting professor founded by the Japan Society of the Promotion of Sciences. Both periods allowed him time for writing and research and doubtless were well used in preparing Dick’s “magnum opus”. This was the book on *Finite Element Fundamentals*, which appeared first in 1975. This book was an instant success and continued through many printings and translations (the last of this being one into the Turkish Language in 1994).

The teaching ability of Dick was at that time fully employed not only in regular courses but also in a series of external advanced seminars. These were first started at Cornell University by himself and later were given in various parts of the world under the auspices of the MARC Analysis Research Corporation. As both of us participated in these it gave us an opportunity to get to know each other well and here I realised that Dick was not completely satisfied with the excellence he already reached in pure teaching and research. He thought that time had arrived for him to leave and “organise” the academic world. For this he was eminently suitable in my opinion, as he was a man who liked people and indeed was very good at interacting with them.

The watershed in Dick’s career came in 1978 when he decided to accept the position of Dean of the college of Engineering at the University of Arizona in Tucson. When he discussed this possibility with me at the time he was well aware that his research effort would have to be curtailed – though he was sure it would never be abandoned. Despite the onerous task of administration he faced in this career change and indeed in later ones, which led him to the final post as a university president, he succeeded in remaining to the end a productive research worker with an up to date knowledge of the subject. Certainly the time in Arizona established Dick’s position as a creative academic administrator and leader. In the six years he spent there he succeeded in putting the School of Engineering in Arizona on the map. He appointed many new professors there, obtained new funds and steered many young people into new research and teaching directions. He contributed to and organised special conferences dealing with various applications of finite elements in such fields as Bio-engineering, Optimisation and Material Science. These established important landmarks as state-of-the-art books.

During the same period he became active in many national and international ventures. Outstanding here was his election to membership of the Computational Mechanics Committee of the National Research Council. His commitment to the United Nations took him on a visit to India. Above all the invitation he received from China to be a member of the first Finite Element Group visiting that country in 1981 was important. During that visit he established many contacts with China which at the time was just beginning to open its doors to the West. The participants of this group (which included also Ted

Pian, Tinsley Oden, Ed Wilson and myself together with our wives) shared many exciting, novel and different aspects of China including many memorable banquets. Here again Dick established his prowess as a public figure and was much called on as an after dinner speaker. In this function he seldom repeated the same stories or anecdotes and was always popular. This first and many subsequent visits to China established for Dick much contact with this country and undoubtedly contributed to his selection in 1992 for a honorary doctorate at the University of Shanghai. His book which was translated into Chinese also contributed much to his fame and connections there which resulted in new graduate students.

In 1984 Dick became the Provost and Vice President of the Worcester Polytechnic Institute in Massachusetts. The four years he spent at that institution were again a period of the extension of his leadership and activity.

During the last years of the Arizona, and Worcester period many national and international awards were awarded to Dick for his successes and achievements. First, in 1983 he was elected to the membership of the US National Academy of Engineering. Then in 1985 followed the award of the Worcester Reed Warner Medal by the American Society of Mechanical Engineers for his books and research writings which contributed so much to the profession. In 1987 he was elected to receive the honorary fellowship of Swansea University (equivalent to doctorate honoris causae). Later the same year he received another honorary doctorate from the Technical University of Vienna.

In 1988 Dick reached the pinnacle of his career and became the President of Clarkson University. He held this position until his retirement in 1995 when he returned to the family home in Arizona. Certainly Dick gave of his best to Clarkson University establishing it as one of the well-known national universities. During his period of office he more than doubled the endowment of the University, established a new aeronautical degree programme and built the Centre for Advanced Materials Processing (CAMP) after raising some \$80 million in fund gathering campaigns. Appropriately Clarkson University honoured him with an honorary doctorate and more recently by opening the Richard H. Gallagher Engineering Building commemorating his period of office and achievements.

Also during this period other awards were made. In 1990 he was awarded the AIAA gold medal after which followed the highest award of the American Society of Engineering Education, the "Benjamin Garver Lamme Award". In 1993 The American Society of Mechanical Engineers awarded him the ASME medal – their highest award – for his contributions made to the profession and in the same year The American Society for Engineering Education inducted him into their Hall of Fame and presented him their Centennial Medal.

Probably the most lasting memorial to Dick's professional work was his leading involvement in establishing the International Association of Computational Mechanics in 1982. He was the founding secretary of this association, which now has held four major World Congresses on Computational Mechanics. The next of these will be held in 1998 in Argentina. The Association hoped that Dick would be the special plenary lecturer during that meeting but it was not to be.

The IACM and its US associate, USACM have both awarded to Dick their highest medals; the Congress (Newton Gauss) Medal and the von Neumann medal, respectively.

In addition to the formal list of honours and awards made to Dick he leaves, however, an even more important legacy. This is the love and respect which will long remain in the hearts of his students and colleagues. Dick was justly proud of the many of his students who reached high positions in industry and academia. He was a trusted friend of his students, his colleagues and his associates who will miss his advice and generous manner.

We extend our heart felt sympathy to his wife Terry and his children.

OLGIERD C. ZIENKIEWICZ  
CEDRIC TAYLOR

## CURRICULUM VITAE: RICHARD H. GALLAGHER

*EDUCATION*

- New York University Bachelor of Civil Engineering (1950)
- New York University Master of Civil Engineering (1955)
- SUNY, Buffalo Ph.D. (Civil Engineering) (1966)

*POSITIONS HELD*

- 1988–1995 President, Clarkson University
- 1984–1988 Provost and Vice-President for Academic Affairs, Worcester Polytechnic Institute, Worcester, MA
- 1978–1984 Dean, College of Engineering, University of Arizona
- 1967–1978 Cornell University, Professor of Civil and Environmental Engineering, Chairman, Department of Structural Engineering (1969–1978)
- 1955–1967 Bell Aerosystems Co., Buffalo, NY, Assistant Chief Engineer, Structural Systems Department (1965–1967)
- 1958–1967 State University of New York at Buffalo (taught evening courses in statics, dynamics and fluid mechanics)
- 1952–1955 Structural Designer, The Texas Co., New York, NY
- 1950–1952 Field Engineer, CAA (now FAA), U.S. Department of Commerce, NY

*VISITING PROFESSORSHIPS*

- Japan Society for Promotion of Science Visiting Professor, University of Tokyo (Fall, 1973)
- U.K. Science Research Council Fellow and Visiting Professor, University of Wales (Spring 1974)
- Visiting Scholar, People's Republic of China (invited by Chinese Society of Mechanical Engineers) (May 1981)

*REGISTRATION*

- Licensed Professional Engineer, States of New York, Arizona and Massachusetts; Licensed Land Surveyor, Arizona

*HONOURS*

- Member, National Academy of Engineering (elected 1983)
- Southwest Mechanics Research Lecturer (1969–1970, 1977–1978); Midwest Mechanics Lecturer (1981–1982)
- Fulbright Fellow, Australia (August 1973)
- Fellow, American Society of Mechanical Engineers
- Who's Who in America; Who's Who in Engineering; Who's Who in American Education; Who's Who in Science & Engineering, Who's Who in the East; Who's Who in the World
- Biographical chapter in *Early FEM Pioneers*, J. Robinson Publ. Co. (1984)
- Dedicattee, Conference on Unification of Fine Element Software Systems, University of Connecticut (May 1985)
- Worcester Reed Warner Gold Medal, American Society of Mechanical Engineers (1985)
- Fellow, American Institute of Aeronautics and Astronautics (elected 1986)
- Fellow (Honorary Degree), University College of Swansea, University of Wales, U.K. (1987)
- Honorary Fellow, American Society of Civil Engineers (1995)
- Dr. Tech. (Honoris Causa), Technical University of Vienna, Austria (1987)
- Dr. Phil. (Honoris Causa), Shanghai University of Technology, China (1992)
- Dr. Sci. (Honoris Causa), Clarkson University, Potsdam, NY (1995)
- Structural Dynamics and Materials Award, American Institute of Aeronautics and Astronautics (1990)
- Benjamin Garver Lamme Award, American Society for Engineering Education (1990)
- Clifford C. Furnas Memorial Award, University of Buffalo Alumni Association (1991)
- Congress Medal, International Association of Computational Mechanics (1991)
- Fellow, American Society for Engineering Education; Inductee, Hall of Fame; awarded their Centennial Medallion (1993)
- ASME Medal (the highest award), American Society of Mechanical Engineers (1993)
- Von Neumann Medal, U.S. Congress on Computational Mechanics (1995)
- Dedicattee, Richard H. Gallagher Engineering Laboratories Building, Clarkson University (1996)

*HONORARY SOCIETIES*

- Tau Beta Pi, Sigma Chi, Chi Epsilon

*PROFESSIONAL JOURNAL ACTIVITIES*

- Editor and founder (in 1967), with Professor O. C. Zienkiewicz, of *International Journal for Numerical Methods in Engineering* (monthly journal), published by John Wiley and Sons, Ltd.

- Advisory Editor, *Computers and Mathematics with Applications* (quarterly journal)
- Co-chairman, Editorial Advisory Board, *Communications in Applied Numerical Methods*
- Advisory Editor, *International Journal for Numerical Methods in Fluids* (quarterly journal)
- Technical Editor, *Journal of Pressure Vessel Technology*, Transactions ASME (1977–1980)
- Editorial Board, *Computer Methods in Applied Mechanics and Engineering*

#### TECHNICAL SOCIETY MEMBERSHIPS

- American Society for Engineering Education (Fellow)
- American Society of Civil Engineers (Honorary Fellow)
- American Society of Mechanical Engineers (Fellow)
- American Institute of Aeronautics and Astronautics (Fellow)
- Society for Experimental Stress Analysis
- American Academy of Mechanics (Fellow)
- International Association for Computational Mechanics (Founding Secretary)

#### PROFESSIONAL ACTIVITIES since 1980

- Consultant, United Nations, Mission to Structural Engineering Research Centre, Madras, India (April 1980)
- Chairman, Pressure Vessels and Piping Division, ASME (1981–1982)
- Advisory Board, Control Data Corp. (CDC)
- National Research Council, Computational Mechanics Committee (1981–1983), Engineering Research Board (1984–1986)
- Visitor for Civil Engineering Programs, Accreditation Board for Engineering & Technology (1981–1987)
- Member, NSF–DOD Committee on Large-Scale Computation ('Lax Committee' on Supercomputers) (1982)
- Board of Directors, Massachusetts Technology Park Corp. (1985–1988)
- Vice-President (Council on Engineering Materials and Structures Group), ASME (1987–1990)
- ASEE Task Force on Future of Engineering Education (1987–1988)
- National Academy of Engineering, Finance Committee (1990–1995)
- Advisory Board, Technology-Based Engineering Education Consortium (1988–1995)
- Member, Committee on Long Range Planning, Stone and Webster Engineering Corp., Boston, MA (1991–1992)

#### BOOKS (with a selection of edited books, volumes and major reports)

- *Finite Element Analysis Fundamentals*, Prentice-Hall, Englewood Cliffs, NJ, 1975 (10 printings); published in Japanese by Maruzen, Tokyo, 1976; published in German by Springer, Berlin, 1976; published in French by IPSI, Paris, 1977; published in Chinese in Taiwan and in P.R.C., 1979; published in Russian by MIR, Moscow, 1985; published in Turkish, 1994
- *Introductory Matrix Structural Analysis* (with W. McGuire; senior/first-year graduate level text), Wiley, New York, 1979
- *Optimum Structural Design* (author of first three chapters; editor with O. C. Zienkiewicz), Wiley, New York, 1979
- *A Correlation Study of Matrix Methods of Structural Analysis*, Pergamon, Oxford, 1964
- *Recent Advances in Matrix Methods of Structural Analysis and Design*, Proceedings of 1969 Tokyo Conference (editor with Y. Yamada and J. T. Oden), University of Alabama Press, Huntsville, AL, 1971
- *Theory and Practice in Finite Element Structural Analysis*, Proceedings of 1973 Tokyo Conference (editor with Y. Yamada), University of Tokyo Press, Tokyo, 1973
- *Computational Methods for Nuclear Reactor Structural Design*, Survey Report for Oak Ridge National Laboratory, Report ORNL-4756, July 1972
- *Buckling Strength of Structural Plates*, NASA Space Vehicle Design Criteria (Structures), NASA SP 8068, June 1971
- *Finite Elements in Flow Problems*, Proceedings of January 1974, Swansea, Wales, Conference (editor with J. T. Oden, C. Taylor and O. Zienkiewicz), University of Alabama Press, Huntsville, AL, 1974
- *Finite Elements in Fluids*, Vols 1 and 2 (editor with J. T. Oden, C. Taylor and O. Zienkiewicz), Wiley, New York, 1975 (contains survey articles and feature lectures from conference held at Swansea, Wales, 1974)
- *Finite Elements in Fluids*, Vol. 3 (editor with M. Cecchi, J. T. Oden and O. C. Zienkiewicz), Wiley, New York, 1978 (contains survey articles and feature lectures from conference held at St. Margherita, Italy, 1976)
- *Finite Elements in Fluids*, Vol. 4, (editor with D. Norrie, J. T. Oden and O. C. Zienkiewicz), Wiley, New York, 1982 (contains survey articles and feature lectures from conference held at Banff, Alberta, Canada, 1981)
- *Finite Elements for Thin Shells and Curved Members* (editor with D. Ashwell; author of two chapters), Wiley, New York, 1976 (contains lectures from conference held at Cardiff, Wales, May 1974)
- *Finite Element Grid Optimization* (editor with M. Shepard), ASME Special Publication PVP-38, June 1979
- *Finite Elements in Biomechanics* (editor with B. Simon, P. Johnson and J. Gross), Wiley, New York, 1982 (contains feature lectures and articles from conference held at Tucson, AZ, 1980)
- 'Computational Methods of Nonlinear Structural Analysis' (with A. K. Dhalla), Chap. 3.5 in *Pressure Vessels and Piping: Design Technology, 1982; A Decade of Progress*, (edited by S. Zamrick and D. Dietrich), ASME, New York, 1982, pp. 185–202
- *Hybrid and Mixed Finite Element Methods* (editor with S. Atluri and O. Zienkiewicz), Wiley, New York, 1984 (contains survey lectures and feature articles from conference held at Atlanta, GA, 1981)

- *New Directions from Optimum Structural Design* (editor with E. Atrek *et al.*), Wiley, New York, 1985 (contains survey and feature lectures from conference held at Tokyo, Japan, 1982)
- *Mechanics of Engineering Materials* (editor with C. Desai) (contains feature lectures from symposium held at Tucson, AZ, January 1983)
- *Finite Elements in Fluids*, Vol. 6 (editor with G. Carey, J. T. Oden and O. C. Zienkiewicz), Wiley, New York, 1986

PUBLISHED PAPERS (co-author(s) not listed through end of 1968)

- 'Analytical and Experimental Determination Studies of Low Aspect Ratio Wings, Including the Effects of Aerodynamic Heating', *Symposium on High Speed Aerodynamics and Structures*, San Diego, CA, March 1958
- 'A Survey of the Analysis and Design Problems of Integral Propellant Tanks', *IAS Paper 59-108*, June 1959
- 'The Experimental and Theoretical Determination of the Elastic Characteristics of Modern Airframes', *AGARD Report 399*, NATO, Paris, 1960
- 'Elastic Instability of Cylindrical Shell under Arbitrary Circumferential Variation of Axial Stress', *Journal of Aerospace Sciences*, November 1960
- 'The Stress Analysis of Heated Complex Shapes', *ARS Journal*, May 1962
- Deformational Response Determinations for Practical Heated Wing Structures', *Proceedings of AIA-ONR Symposium on Structural Dynamics of High Speed Flight*, Los Angeles, CA, April 1961
- 'Techniques for Testing Thermally Affected Complex Structures', *Experimental Mechanics*, August 1961
- 'Matrix Structural Analysis of Heated Airframes', *Proceedings of ASD Symposium on Aerothermoelasticity*, Dayton, OH, November 1961
- 'An Experimental and Theoretical Study of Low Aspect Ratio Wings', *Aeronautical Quarterly Magazine*, November 1961, February, May 1962
- 'Optimum Design of Integral Fuselage Propellant Tanks for Use in High Performance Aircraft', *Aerospace Engineering Magazine*, February 1962
- 'Laboratory Simulation of Nonlinear Static Aerothermoelastic Behaviour', *Proceedings of AIAA Simulation for Aerospace Flight Conference*, August 1963
- 'Techniques for the Derivation of Element Stiffness Matrices', *AIAA Journal*, June 1963
- 'Discrete Element Approach to Structural Instability Analysis', *AIAA Journal*, June 1963
- 'Sandwich Cylinder Instability under Nonuniform Axial Stress', *AIAA Journal*, February 1964
- 'Stresses in Sandwich Cylinders', *Machine Design*, March 26, 1967
- 'Determining Maximum Stresses and Displacements in Sandwich Panels, Part 1, Uniform Surface Pressure and Uniaxial Compression', *Machine Design*, December 1967
- 'Determining Maximum Stresses and Displacements in Sandwich Panels, Part 2, Thermal Gradients and Uniaxial Compression', *Machine Design*, January 1965
- 'Thermal Stress and Instability of Sandwich on Rigid Supports', *AIAA Journal of Aircraft*, January-February 1965
- 'Buckling of Sandwich Panels under Nonuniform stress', *AIAA Journal of Aircraft*, May-June 1965
- 'Automated Minimum Weight Design of Framework Structures', *International Symposium on the Use of Digital Computers in Structural Engineering*, University of Newcastle-Upon-Tyne, July 1966
- 'A Procedure for Automated Minimum Weight Design, Part 1, Theoretical Basis', *Aeronautical Quarterly*, August 1966
- 'A Procedure for Automated Minimum Weight Design, Part 2, Applications', *Aeronautical Quarterly*, November 1966
- 'A Discrete Element Procedure for Thin Shell Instability Analysis', *AIAA Journal*, January 1967
- 'Finite Elements and the Minimum Weight Design of Structures', *ASCE Structural Conference*, Seattle, WA, 1967
- 'A Survey of Framework Finite Element Instability Analysis', *ASCE National Meeting*, New Orleans, LA, January 1969
- 'Elastic Instability Predictions for Doubly-Curved Sheels', *Proceedings of 2nd Conference on Matrix Methods in Structural Mechanics*, Dayton, OH, 1968
- 'The Finite Element Method in Elastic Instability Analysis', *ISD/ISSC Symposium on Finite Element Techniques*, Stuttgart, June 1969
- 'Analysis of Plate and Shell Structures', *Proceedings of Conference on Applications of Finite Element Methods in Civil Engineering*, Vanderbilt University, 1969, pp. 155-206
- 'Large-Scale Computer Programs for Structural Analysis', in *On General Purpose Finite Element Computer Programs* (edited by P. Marcal), ASME Special Publication, New York, 1970
- 'Finite Element Analysis of Torsional and Torsional-Flexural Stability Problems' (with R. Barsoum), *International Journal for Numerical Methods in Engineering*, Vol. 2, 1970, pp. 335-252
- 'Finite Element Analysis in Brittle Material Design', *Journal of the Franklin Institute*, Vol. 290, No. 6, December 1970, pp. 523-537
- 'Trends and Directions in the Applications of Numerical Analysis', in *Numerical and Computer Methods in Structural Mechanics* (edited by S. J. Fenves *et al.*), Academic, 1973, pp. 543-555
- 'A Selective Review of Contributions to the Literature of Finite Element Analysis—1970', in *American Academy of Mechanics Yearbook—1971* (edited by N. C. Lind)
- 'Finite Element Plate and Shell Pre- and Post-Buckling Analysis' (with S. Lien and S. Mau), *Proceedings of Third Air Force Conference on Matrix Methods in Structural Mechanics*, Dayton, OH, 1971, AFFDL TR71-160, pp. 857-880
- 'Survey and Evaluation of the Finite Element Method in Fracture Mechanics Analysis', *Proceedings of International Conference on Structural Mechanics in Reactor Technology*, Berlin, 1971



- ‘Direct Flexibility Finite Element Elastoplastic Analysis’ (with A. V. Dhalla), *Proceedings of International Conference on Structural Mechanics in Reactor Technology*, Vol. 6, Part M. Berlin, 1971
- ‘Efficient Solution Processes for Finite Element Analysis of Transient Heat Conduction’ (with R. Mallett), *Transactions of ASME, Journal of Heat Transfer*, August 1971, pp. 257–263
- ‘Geometrically Nonlinear Finite Element Analysis’, *Proceedings of Speciality Conference on the Finite Element Method in Civil Engineering*, McGill University, June 1972, pp. 3–17
- ‘Applications of Finite Analysis with Reference to Nuclear Reactor Structures’, in *Advances in Computational Methods of Structural Analysis and Design* (edited by J. Oden *et al.*), Proceedings of 2nd U.S.–Japan Conference on Matrix Methods of Structural Analysis and Design. UAH Press, Huntsville, AL, 1972, pp. 641–678
- ‘Finite Element Procedure for Nonlinear Pre-Buckling and Initial Post-Buckling Analysis’ (with S. Mau), *NASA CR-1936*, January 1972
- ‘A Method of Limit Point Calculation in Finite Element Structural Analysis’ (with S. Mau), *NASA Contractor Report CR-2115*, September 1972
- ‘Finite-Element Method of Limit Point Calculation’ (with S. T. Mau), *ASCE Houston Mfg. Reprint 1823*, October 1972
- ‘University Curricula for Computer-Oriented Design Analysis’, in *The Software User: Education and Qualification*, ASME Special Publication, New York, 1972
- ‘Higher Order Finite Element Analysis of Lake Circulation’ (with S. Chang), *Computers and Fluids*, Vol. 1, 1973, pp. 110–132
- ‘The Finite Element Method in Shell Stability Analysis’, *Computers and Structures*, Vol. 3, 1973, pp. 543–557
- ‘Optimization of Stiffened Panels’ (with W. E. Falby), *AGARD Conference Proceedings 123*, April 1973, pp. 11–1–11–14
- ‘Finite Element Analysis of Geometrically Nonlinear Problems’, *Theory and Practice in Finite Element Structural Analysis*, University of Tokyo Press, Tokyo, 1973, pp. 109–123
- ‘Finite Element Shallow Lake Circulation Analysis’ (with J. A. Liggett and S. Chan), *Journal of Hydraulics Division, ASCE*, Vol. 99, No. HY7, July 1973, pp. 1083–1096
- ‘The Finite Element Method in Plate and Shell Instability Analysis’ (with G. R. Thomas), *Proceedings of 4th Australasian Conference on Structures and Materials*, Brisbane, August 1973
- ‘Finite Element Lake Circulation and Thermal Analysis’, Chap. 6 in *Finite Elements in Fluids* (edited by R. Gallagher *et al.*), Wiley, New York, 1975
- ‘Vibration Analysis of Structures by the Finite Element Method’, *Journal of Japan Society of Mechanical Engineers*, Vol. 77, No. 667, June 1974, pp. 33–41
- ‘Finite Element Representations for Thin Shell Instability Analysis’, in *Buckling of Structures* (edited by B. Budiansky), Proceedings of IUTAM Symposium on Buckling of Structures, Springer, Berlin, 1974
- ‘A Triangular Thin Shell Finite Element: Linear Analysis’ (with G. R. Thomas), *NASA Contractor Report CR-2483*, 1975
- ‘Shear Buckling of Square Perforated Plates’ (with R. N. White and J. Grosskurth), *Proceedings of ASCE, Journal of Engineering Mechanics Division*, Vol. 102, No. EM6, December 1976
- ‘Problems and Progress in Thin Shell Finite Element Analysis’, Chap. 1 in *Finite Elements for Thin Shells and Curved Members* (edited by R. Gallagher and D. Ashwell, Wiley, New York, 1976)
- ‘A Triangular Element Based on Generalised Potential Energy’, Chap. 9 in *Finite Elements for Thin Shells and Curved Members* (edited by R. Gallagher and D. G. Ashwell, Wiley, New York, 1976)
- ‘Perturbation Procedures in Nonlinear Finite Element Structural Analysis’, in *Computational Mechanics Lecture Notes in Mathematics*, Vol. 461, (edited by J. T. Oden), Springer, Berlin, 1974, Invited Lecture presented at International Conference on Computer Methods in Nonlinear Mechanics, University of Texas, Austin, TX
- ‘Newtonian and Non-Newtonian Viscous Incompressible Flow: Finite Element Solutions (with O. C. Zienkiewicz and P. Hood), in *Mathematics of Finite Elements and Applications* (edited by J. R. Whiteman), Academic, New York, 1976
- ‘Enhancement of the Finite Element Method through Multidisciplinary Application’, Feature Lecture, *5th Canadian Congress of Applied Mechanics Conference Proceedings*, Fredericton, New Brunswick, 1975, pp. G-35–G-47
- ‘Shell Elements’, Invited Feature Lecture, *First World Conference on Finite Elements in Structural Mechanics*, Bournemouth, 1975
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