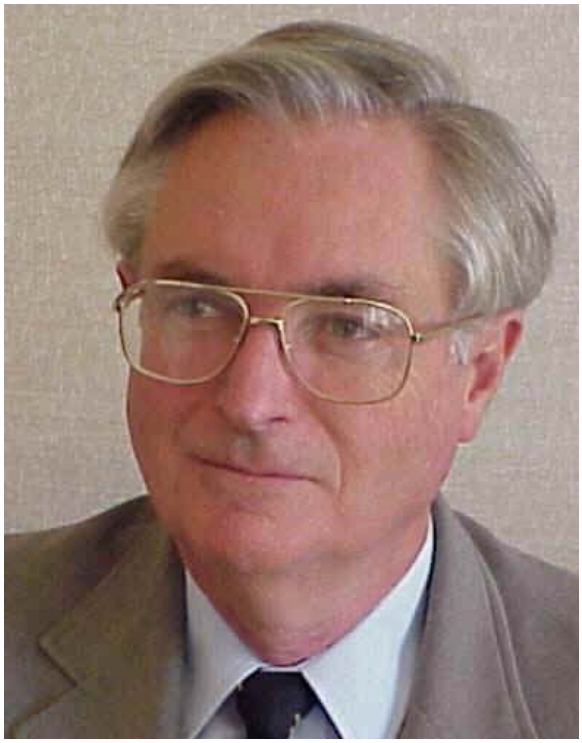
Professor Emeritus Edward L. Wilson



Edward L. Wilson

Education

D. Eng. University of California, Berkeley, 1963

M.S. University of California, Berkeley, 1959

B.S. University of California, Berkeley, 1955

Professional Societies

Member, ASCE, American Society of Civil Engineers

Member, EERI, Earthquake Engineering Research Institute

Member, USCOLD, United States Committee on Large Dams

Honorary Member, SEAONC

Biographic Details

Over sixty years of professional experience in Civil, Mechanical and Aerospace Engineering.

Former Professor and Vice Chairman of the Civil Engineering Department at University of California at Berkeley (1965-1991).

Published over 200 papers, reports and books. Supervised 29 Doctor's Degree Students

Appointed as the T.Y. and Margaret Lin Professor in Engineering, 1990.

Received Berkeley Citation, 1991

Elected to the National Academy of Engineering, 1985

Received the Huber, 1974, and Howard, 1995 awards by ASCE for his contributions to the Structural Engineering Profession.

Currently Member of

Seismic Review Committee for the UC Berkeley Campus

Recent Member of

BCDC ECRB 26 years

SAB CalTrans. 5 years

Selected Projects

Field Engineer Ten Mile River Bridge on State Highway 1, 1953

Project Engineer for the Model Analysis and Material Studies of Oroville Dam, 1958-60

Wrote the first automated finite element analysis computer program and analyzed Norfork Dam, 1960-62

Developed numerical methods and computer programs for the stress analysis of the Minuteman missile and the APOLLO space capsule 1963-65

Developed the original earthquake analysis programs SAP, 1969, ETABS, 1973, SAP80 1980 and the FNA method currently used by SAP2000.

Developed computer programs SMIS, 1963, and CAL, 1976, for the Computer Assisted Learning of static and earthquake analysis of structural systems. Various versions of these programs have been used worldwide.

Consultant on the new Bay Bridge, retrofit of the Richmond-San Rafael and Golden Gate Bridges and many other major projects.

BIOGRAPHICAL SUMMARY

Edward L. Wilson received his B.S. (1955), M.S. (1959), and D. Eng. (1963) Degrees in Civil (Structural) Engineering from the University of California, Berkeley. Professor Wilson joined the faculty of the Civil Engineering Department in 1965. From 1973 to 1976 he served as Chairman of the Division of Structural Engineering and Structural Mechanics. From 1987 to 1990 he was Vice Chairman of the Department of Civil Engineering. He is currently a member and past chairman of the Seismic Review Committee for the Berkeley Campus

At the University he taught courses and conducted research on structural analysis, dynamics and finite element methods for large three-dimensional structures. He has published over 200 technical papers, reports and books. During his years of teaching, 29 doctoral students completed their dissertations under his supervision.

From 1963 to 1965 he was a senior research engineer at Aerojet General Corporation, Sacramento, California. At Aerojet he developed numerical methods and computer programs for the thermal and stress analysis of the MINUTEMAN missile and the APOLLO space capsule. He has been responsible for the development of several computer programs which are extensively used by professionals in Civil, Mechanical and Aerospace engineering. The general three-dimensional finite element analysis program SAP and the TABS series of programs for the static and dynamic analysis of three-dimensional building systems are examples of programs initially developed by Professor Wilson. Since these programs have been extensively adopted by a large number of firms throughout the world he has been involved directly and indirectly as a consultant on a very large number of engineering projects.

In 1985 he was elected to the National Academy of Engineering. He was appointed as the first T. Y. and Margaret Lin Professor in Engineering in 1990. He received the Berkeley Citation at the time of his retirement from teaching in 1991. In 2012 he was elected to membership in the Civil and Environmental Engineering Academy of Distinguished Alumni.

In 1981 he received a Research Award in Structural Mechanics from the American Institute of Aeronautics and Astronautics. For his contributions to the profession he received the Huber (1974), Friedman (1980), and Howard (1995) awards by ASCE. In 1998 he received the Lifetime Achievement Award from the Los Angeles Tall Building Design Council. In 2003 he received the Von Neumann Medal from the United States Association of Computational Mechanics. In 2008 he was made an Honorary Member of the Structural Engineers Association of Northern California

GENERAL AREAS OF RESEARCH CONTRIBUTIONS

FINITE ELEMENT ANALYSIS PROGRAMS

"Finite Element Analysis of Two-Dimensional Structures", University of California, UC-SESM 63-2, June 1963 (D. Eng. Dissertation).

This dissertation presented numerical methods and computer programming techniques for the finite element analysis of linear and nonlinear two-dimensional structures. It was the first computer program which automatically formed the basic equations and solved a complete finite element system given an unique definition of node and member properties. The programs SAP (1970), NONSAP (1974) and SAP-80 (1980) are other programs which have evolved from this fundamental work.

ANALYSIS OF MULTISTORY BUILDINGS

"Large Capacity Multistory Frame Analysis Programs" (with R. W. Clough and I. P. King), ASCE Journal of the Structural Division, ASCE, Aug. 1963.

This was the first in a series of publications on the static and dynamic analysis of three-dimensional building systems. The program TABS (1972) and ETABS (1975) resulted from this work and are currently used extensively by the profession for the analysis and design of buildings subjected to static and earthquake loading.

ANALYSIS OF AXISYMMETRIC SOLIDS

"Structural Analysis of Axisymmetric Solids", AIAA Paper No. 65-143, AIAA 2nd Aerospace Sciences Meeting, New York, January 1965; also, AIAA Journal, Vol. 3, pp. 2269-2274, December 1965.

This paper presented the first finite element formulation for the analysis of axisymmetric solids subjected to non-axisymmetric loads. The computer program described in this publication was initially used for the thermal stress analysis of the Apollo space capsule. Several different versions of this basic computer program are still being used by a large number of aerospace firms.

HEAT TRANSFER ANALYSIS

"Application of the Finite Element Method to Heat Conduction Analysis" (with R. E. Nickell), Nuclear Engr. and Design, No. 4, pp. 276-286, 1966.

This paper presented the first application of the finite element method to the solution of heat transfer analysis. The paper provided the basis for several computer programs for general heat transfer analysis and was initially used to predict the temperatures developed in Dworshak Dam during construction.

COUPLED FIELD PROBLEMS

"Finite Element Analysis of Seepage in Elastic Media" (with R. Sandhu), ASCE Journal of the Engineering Mechanics Division, Vol. 95, No. EM 3, June 1969.

This paper presented the first application of the finite element method to the solution of coupled field problems. Most of the computer programs used in consolidation analysis today are based on this work.

FINITE ELEMENT TECHNOLOGY

"Incompatible Displacement Models" (with R. Taylor, W. Doherty and J. Ghaboussi), Proceedings ONR Symp. on Numerical and Computer Methods in Structural Mechanics, Univ. of Illinois, Urbana, Sept. 1971.

This paper introduced the use of incompatible displacement modes in order to improve the behavior of finite elements based on a displacement formulation. The three most widely used computer programs, NASTRAN, ANSYS and SAP, use elements which are based on various modifications of the basic ideas which were given in the paper.

THE WILSON THETA METHOD

"Nonlinear Dynamic Analysis of Complex Structures" (with I. Farhoomand and K. J. Bathe), Earthquake Engineering and Structural Dynamics, Vol. 1, pp. 241-252, 1973.

This paper presents a "theta factor" in order to increase the stability limits of Newmark's step-by-step integration method. It has found wide acceptance for engineering applications throughout the world and has been extensively studied by applied mathematicians.

SOLUTION OF EIGENVALUE PROBLEMS

"Large Eigenvalue Problems in Dynamic Analysis" (with K. J. Bathe), Proceedings of the American Society of Civil Engineers, Journal of the Engineering Mechanics Division, EM6, pp. 1471-1485, December 1972.

This paper presented the "subspace iteration" method for the exact solution of large eigenvalues in structural mechanics. Prior to this publication, it was necessary to lump masses or use other condensation techniques in order to obtain approximate eigenvalues for large structures. This basic method is used in the majority of computer programs for dynamic analyses which are currently used in the profession.

EDUCATIONAL SOFTWARE

"SMIS--Symbolic Matrix Interpretive System", University of California, UCSESM 73-3, April 1973; and, "CAL--A Computer Analysis Language for Teaching Structural Analysis", Computers and Structures, Vol. 10, pp. 127 - 132, 1979.

The computer programs SMIS and CAL are designed to assist in the teaching of matrix and direct stiffness methods for structural analysis. These programs, or modified versions of the programs, are used in most of the major engineering schools in the United States and in a large number of foreign universities.

SOLUTION OF LINEAR EQUATIONS

"Solution or Reduction of Equilibrium Equations for Large Structural Systems", Advances in Engineering Software, Vol. 1, No. 1, 1979, 19-25.

A very efficient blocked, out-of-core equation solver, with a substructure option, was presented which can be used with both supercomputers or microcomputers. Since the FORTRAN listing was given it has been incorporated into a large number of research and production programs.

NEW METHOD FOR DYNAMIC ANALYSIS

"Dynamic Analysis by Direct Superposition of Ritz Vectors", (with M. Yuan and J. Dickens), Earthquake Engineering and Structural Dynamics, Vol. 10, 1982.

This paper presents a new and significantly different approach for the dynamic analysis of linear structural systems. A simple algorithm is given in which a sequence of orthogonal vectors are generated and used in a mode superposition dynamic response analysis. The approach eliminates the need for a costly eigenvalue analysis. Since this publication a large number of additional papers have been written. The method has been extended to nonlinear analysis and heat transfer analysis.

NUMERICAL METHODS FOR MULTIPROCESSOR COMPUTERS

"Linear and Nonlinear Finite Element Analysis on Multiprocessor Computers" (with C. Farhat), Communications in Applied Numerical Methods, Vol. 4, 1988.

This is one in a series of papers on the use of multiprocessor computers for the solution of problems in computational mechanics. A new automatic subdomain algorithm is introduced in order to maximize the efficiency of each processor and minimize the communication between processors.

LIST OF PHD STUDENTS

1.	David W. Murray	Large Deflection Analysis of Plates (1968)
2.	R. Sandhu	Stress Analysis of a Porous Media Subjected to Fluid Flow (1968)
3.	S. Ghosh	Dynamic Stress Analysis of Axisymmetric Structures Under Arbitrary Loading (1970)
4.	Peter G. Smith	Membrane Shapes for Shell Structures (1970)
5.	I. Farhoomand	Nonlinear Dynamic Stress Analysis of Two-Dimensional Solids (1970)
6.	Eduardo Rukos	Earthquake Analysis of Interacting Ground-Structure Systems (1971)
7.	J. Ghaboussi	Dynamic Stress Analysis of Porous Elastic Solids Saturated with Compressive Fluid (1971)
8.	William P. Doherty	Dynamic Response of Human Tibia (1971)
9.	Klaus-Jurgen Bathe	The Structural Eigenvalue Problem (1971)
10.	L.R. Jones	Unification of the Ritz and Finite Element Method (1973)
11.	Harvey H. Dovey	Extension of Three-Dimensional Analysis to Shell Structures Using the Finite Element Idealization (1974)
12.	R.M. Polivka	Finite Element Analysis of Nonlinear Heat Transfer Problems (1976)
13.	J.P. Hollings	Use of Substructure Technique for Linear Elastic Analysis (1978)
14.	John Dickens	Numerical Methods for Dynamic Substructure Analysis (1980)
15.	Martin Button	Numerical Techniques for Dynamic Stochastic Structural Analysis (1980)

16.	Tetsuji Itoh	Adaptive Finite Element Methods in Two-Dimensional Structural Problems (1980)
17.	Mehdi Khalvati	Finite Element Analysis of Interacting Soil-Structure-Fluid Systems with Local Nonlinearity (1980)
18.	Eduardo Bayo	Numerical Techniques for the Evaluation of Soil-Structure Interaction Effects in the Time Domain (1982)
19.	Hassan Said Saffarini	New Approach in the Structural Analysis of Building Systems (1982)
20.	Marc I. Hoit	Computer Program Development Techniques for Structural Engineering (1984)
21.	Van Jeng	Dynamic Analysis of Base Isolation Systems (1985)
22.	Pierre Leger	The Use of Load-Dependent Vectors for Dynamic and Earthquake Analysis (1986)
23.	Javier Cartin	Build-86: A Computer Program for the Preliminary Design of Buildings (1986)
24.	Nielen Stander	Analysis of Prismatic Structures by Means of a Recursive Substructure Technique (1986)
25.	Charbel Farhat	Parallel Computations in Structural Mechanics (1987)
26.	Kuan-Jung Joo	Elastic-Plastic Finite Element Analysis with Mixed Adaptive Mesh Refinement (1988)
27.	James David Hart	Simplified Earthquake Analysis of Buildings Including Site Effects (1989)
28.	Adnan Ibnan Ibrahimbegovic	Dynamic Analysis of Large Linear Structure-Foundation Systems with Local Nonlinearities (1989)
29.	Y.C. Yiu	Reduced Vector Basis Method for Dynamic Analysis of Large Damped Linear Structures (1990)