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FRANK L. DIMAGGIO BIOGRAPHICAL NOTE AND BRIEF RECAP OF ACHIEVEMENTS

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Frank DiMaggio was born in New York City on September 2, 1929. After elementary education in the New York City's public school system, his excellent academic performance earned him admission to Stuyvesant High School, which he attended from 1942 to 1946. At that time, as it is now, Stuyvesant had very strict admission standards and unmatched success in producing future scientists and engineers.

University studies at Columbia followed, with Frank receiving the B.S. degree in 1950, M.S. in 1951, and Ph.D. in 1954, all from the Civil Engineering Department at Columbia University. During his graduate studies, Frank served as research Assistant and Instructor in the area of structural mechanics.

The flow of his academic career was interrupted in the years from 1955 to 1956, which he spent on active duty in the U. S. Army. During that period, he served as a Structural Analyst in the Armed Forces Special Weapons Project, at The Pentagon, Washington, DC. It is likely that due to that experience, much of Frank's research work was somewhat related to the problems of this country's national defense.

Frank's entire academic career was spent at Columbia University, Department of Civil Engineering and Engineering Mechanics, with the milestones being: 1956, Assistant Professor; 1960, Associate Professor; 1964, Professor; 1975-1978, Chairman of Department; 1978, appointment as the Robert A. W. and Christine Carleton Professor.

Frank's reputation as a teacher became legendary among undergraduate and graduate students in several Departments of the School of Engineering. He has been known for outstanding performance in teaching established courses in dynamics and vibrations. He also introduced several courses in new, at the time, fields of engineering, notably a graduate course in the theory of plastic analysis of structures and an advanced graduate course in nonlinear vibrations. He supervised doctoral dissertations of 21 students (they are listed at the end of this note). Their work proved to be uniformly of excellent quality and, in many instances, truly brilliant. There is no doubt that Frank's careful attention and dedication to the task of dissertation supervisor deserve a large measure of credit for his students' results.

Frank is a registered professional engineer in the State of New York. Among his professional engineering contributions is the plastic limit analysis of the structure of the Beinecke Library at Yale University in New Haven, Connecticut, – one of the first such analyses of a structure in the United States. During his stay at the Turin Polytechnic Institute, Italy, he performed model analysis of large dams. For several years, he served as Technical Consultant to the Implements and Ball Committee of the United States Golf Association. He participated in numerous other engineering projects as a consultant to Weidlinger Associates, Inc., New York.

The research by Frank DiMaggio and his collaborators has been mainly centered in the areas of structure-fluid and structure-soil interactions. He has developed a substructuring method for the transient response of submerged shells with complex internal structure, which does not require determination of the structural stiffness matrix. This method has been incorporated into a program called ELSHOCK (written by Dave Ranlet) used for the practical determination of elastic response of submarines subjected to underwater explosion.

Developed (with Ivan Sandler and Margareta Rehak) an analytical procedure for determination of the dynamic response of floating structures subjected to underwater explosion including the effects of bulk cavitation. This method is extensively used in the analysis of surface ships.

Utilized acoustic approximations (such as the doubly asymptotic approximation, introduced by Tom Gears in the United States, or the curved wave approximation developed with Bedros Bedrosian) in fluid-structure interaction problems in two ways: (a) on the surface of a submerged shell to uncouple the equation of motion of the fluid from that of the structure; (b) to create absorbent, i.e. non-reflecting boundaries in the far fluid field. These methods are extensively used in acoustic problems involving submarine noise and in the structural response of submarines to underwater explosions. It is worth noting that Frank's and co-worker's research on structure-fluid interaction was quoted in the Soviet technical literature of the period.

Frank, in collaboration with Ivan Sandler, has developed the so-called CAP models for the inelastic constitutive behavior of soils under dynamic loading. These models have proven to be extremely versatile in describing the nonlinear, inelastic behavior of soils under very general loading conditions. An important advantage of these models is in the fact that their mathematical structure is such that spurious lack of uniqueness or instabilities do not develop in their implementation in numerical codes. The influence of Frank's ideas is evident in the modern geotechnical literature. Frank's continuing interest in the CAP models has been in utilizing them in the analyses of the interactive response of structures and geological materials under explosive or earthquake generated ground shock.

Frank DiMaggio is a fellow of the American Society of Civil Engineers. At various times from 1957 he served on ASCE Technical Committees (Factors of Safety, Dynamics, Stability) and from 1980 to 1986 on the Executive Committee of the Engineering Mechanics Division, becoming its Chairman in 1985-1986.

Frank is a member of Tau Beta Pi and Sigma Xi, and in 1962 he was the recipient of the National Science Foundation Senior Postdoctoral Fellowship. His teaching excellence was recognized by Columbia's Society of Older Graduates by their Great Teacher Award in 1970. Noteworthy are the appointments as Guest Scholar at the University of Ancona, Italy (1982) and Kyoto University, Japan (1986).

The DiMaggio line of Great Engineers will continue. His two sons, Sam (Columbia Ph.D.) and Peter (Columbia M.S.) are most promising young individuals, making their mark in the fields of Engineering Mechanics and Structural Engineering.

To the list achievements, this writer wishes to add the deep admiration and respect that his colleagues in the Department of Civil Engineering and Engineering Mechanics have developed for Frank's competence, his professional and personal integrity, and unwavering loyalty to his friends.

DOCTORAL STUDENTS

NAME	DEGREE	YEAR
1. Silbiger, Alexander	Ph.D.	1961
2. Shiraishi, Naruhito	DES	1962
3. Hayek, Sahib	DES	1965
4. Rand, Richard	DES	1966
5. Yen, Timothy	DES	1966
6. Chang, Kung	DES	1969
7. Bedrosian, Bedros	DES	1971
8. Talhouni, Osama	DES	1974
9. Lee, Tom	DES	1976
10. Nikolakopoulou, Georgia	DES	1978
11. Vasudevan, Ranganathan	DES	1980
12. Daddazio, Raymond	DES	1982
13. Soliman, Mohamed	Ph.D.	1982
14. Rehak, Margareta	DES	1983
15. Wawa, Jean C.	DES	1983
16. Panayotidi, Tom	DES	1986
17. O'Regan, Stephen	DES	1989
18. Yeh, Jiin-Po	Ph.D.	1989
19. Yip, Shui-Cheung	Ph.D.	1991
20. Messana, Salvatore	DES	1992
21. Hinman, Eve	DES	1994

PUBLICATIONS - ARTICLES IN TECHNICAL JOURNALS

1. "Lateral Buckling of Beams in Bending and Compressions," *J. Aero. Sci.*, August 1952, pp. 574-575 (with A. Gomza, W.E. Thomas and M.G. Salvadori).
2. "On the Development of Plastic Hinges in Rigid Plastic Beams," *Q. App. Math.*, July 1953, pp. 223-230 (with M.G. Salvadori).
3. "A Strain Energy Expression for Thin Cylindrical Shells," *J. App. Mech.*, Sept. 1953, pp. 448-449 (with H.H. Bleich).

4. "Effects of an Acoustic Medium on the Dynamic Buckling of Plates," *J. App. Mech.*, June 1956, pp. 201-206.
5. "Dynamic Elasto-Plastic Response of Rigid Frames," *J. Engrg. Mech. Div., ASCE*, July 1958, pp. 1693-1 to 1693-29.
6. "An Application of a Dynamic Reciprocal Theorem," *J. App. Mech.*, December 1959, pp. 678-679 (with H.H. Bleich).
7. "Principle of Virtual Work in Structural Analysis," *J. Struct. Div., ASCE*, Nov. 1960, pp. 65-78.
8. "Free Extensional Torsional Vibrations of a Prolate Spheroidal Shell," *J. Acoust. Soc.*, Jan. 1961, pp. 56-58 (with A. Silbiger).
9. "Longitudinal Vibrations of a Prolate Ellipsoid," *Q. Appl. Math.*, July 1962, pp. 182-183.
10. "Perturbation Solution for the Axisymmetric Vibrations of Prolate Spheroidal Shells," *J. Acoust. Soc.*, November 1962, pp. 1725-1731 (with N. Shiraishi).
11. "Statistical Indeterminacy and Stability of Structures," *J. Struct. Div., ASCE*, June 1963, pp. 63-75.
12. "Network Analysis of Structures," *J. Struct. Div., ASCE*, Vol. 89, EM4, June 1965, pp. 169-188 (with W. Spillers).
13. "Axisymmetric Vibrations of Prolate Spheroidal Shells," *J. Acoust. Soc.*, July 1966, pp. 179-186 (with R. Rand).
14. "Forced Vibrations of Submerged Spheroidal Shells," *J. Acoust. Soc.*, March 1967, pp. 618-626 (with T. Yen).
15. "Vibrations of Fluid-Filled Spherical and Spheroidal Shells," *J. Acoust. Soc.*, December 1967, pp. 1278-1286 (with R. Rand).
16. "Complex Natural Frequencies of Vibrating Submerged Spheroidal Shells," *Int. J. Solids and Struct.*, Vol. 6, 1970, pp. 333-351 (with S. Hayek).
17. "Vibrations of Cylindrical Shells in a Semi-Infinite Acoustic Medium," *J. Acoust. Soc.*, March 1971, pp. 759-767 (with K. Chang).
18. "A Material Model for Granular Soils," *J. Engrg. Mech. Div., ASCE*, Vol. 97, No. EM3, June 1971, pp. 935-950 (with I. Sandler).
19. "Transient Response of Submerged Spheroidal Shells," *Int. J. Solids Struct.*, Jan. 1972, pp. 111-129 (with B. Bedrosian).
20. "Acoustic Approximations in Fluid-Shell Interactions," *J. Engrg. Mech., ASCE*, June 1972, pp. 731-742 (with B. Bedrosian).
21. "Dynamic Response of a Fluid-Filled Spheroidal Shell -- An Improved Model for Head Injury," *J. Biomechanics*, Vol. 8, 1975, pp. 219-228 (with Q. Talhouni).
22. "Dynamic Response of Fluid-Filled Shells," *Shock and Vibration Digest*, May 1975, pp. 5-12.
23. "A Generalized Cap Model for Geological Materials," *J. Geotechnical Engrg. Div., ASCE*, July 1976, pp. 683-699 (with I. Sandler).
24. "Effect of Bending on the Axisymmetric Vibrations of a Spheroidal Model of the Human Head," *J. Biomechanics*, Vol. 9, 1976, pp. 803-812 (with T. Lee).
25. "Elastic Response of Submerged Shells with Internally Attached Structures to Shock Loading," *Int. J. Computers and Structures*, Vol. 7, 1977, pp. 355-364 (with D. Ranlet, H. Bleich and M. Baron).
26. "Dynamic Response of a Containment Vessel to Fluid Pressure Pulses," *Int. J. Computers and Structures*, Vol. 8, 1978, pp. 31-39 (with J. McCormick and H. Bleich).
27. "Transient Response of Shells with Internally Attached Structures," *Int. J. Computers and Structures*, Vol. 9, No. 5, 1978, pp. 475-481 (with D. Ranlet).
28. "The Inertial-Damping Collocation Approximation (IDCA) for Uncoupling Fluid-Structure Interaction Problems," *Mechanics Research Communications*, Vol. 5, No. 4, 1978 (with D. Ranlet, H. Bleich and M. Baron).
29. "Recent Research on the Dynamic Response of Fluid-Filled Shells," *Shock and Vibration Digest*, Vol. 10, No. 7, July 1978, pp. 15-19.
30. "Dynamic Elastic-Plastic Response of a Containment Vessel to Fluid Pressure Pulses," *Computers and*

- Structures, Vol. 10, 1979, pp. 659-667 (with G.Nikolakopoulou).
31. "Simplified Inertial-Damping Collocation Approximation (IDCA) in Steady-State Problems," *Mechanics Research Communications*, Vol. 7, No. 3, 1980, 171-174 (with R. Vasudevan and D. Ranlet).
 32. "Improved Acoustic Approximations for Submerged Shells," *J. Engr. Mech. Div., ASCE*, Vol. 107, EMI, Feb. 1980, pp. 39-54 (with R. Vasudevan).
 33. "Dynamic Response of Fluid Filled Shells -- An Update," *Shock and Vibration Digest*, Vol. 13, No. 6, June 1981, pp. 3-6.
 34. "Transient Response of Submerged Shells Using Improved Acoustic Approximations," *Computers and Structures*, Vol. 10, No. 3-4, 1981, pp. 187-194 (with R. Vasudevan).
 35. "Uncoupling Approximations in Fluid-Structure Interaction Problems with Cavitation," *J. Appl. Mech., ASME*, Vol. 48, Dec. 1981, pp. 753-756 (with I. Sandler and D. Rubin).
 36. "Doubly Asymptotic Approximations as Absorbing Fluid Boundaries," *Mechanics Research Communications*, Vol. 8, No. 6, 1981, pp. 349-354.
 37. "Pressure in a Submerged Fluid-Filled Cylindrical Shell Subjected to a Step Wave," *Computers and Structures*, Vol. 14, No. 5-6, 1981, pp. 495-500 (with J. Wright, A. Misovec and M. Baron).
 38. "Yield Surface for Thin Bars with Warping Restraint," *J. Engr. Mech., ASCE*, Vol. 3, No. 5, April 1983 (with R. Daddazio and M. Bienick).
 39. "Response of the STARTSAT Satellite to Shock and Retrieval Loadings During the Huron King Test," *Shock and Vibration Bulletin*, Proc. 52, Supplement 1, pp. 59-64, October 1982 (with C. Meyer, J. McCormick, M. Baron and I. Sandler).
 40. "Doubly Asymptotic Approximations as Non-Reflecting Boundaries in Fluid-Structure Interaction Problems," *Computers and Structures*, Vol. 17, No. 2, June 1982, pp. 193-204 (with M. Soliman).
 41. "Dynamic Response of Shells Containing Fluid," *Shock and Vibration Digest*, Vol. 16, No. 6, June 1984, pp. 3-9.
 42. "An Extension of the Cap Model -- Inclusion of Pore Pressure Effects and Kinematic Hardening to Represent an Anisotropic Wet Clay," Chapter 28, *Mechanics of Engineering Materials*, C.S. Desai, R.H. Gallagher, Eds., Wiley and Sons, U.K., 1984 (with I. Sandler and M. Baron).
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 44. "Interactive Approximations for a Cavitating Fluid Around a Floating Structure," *Computers and Structures*, Vol. 21, No. 6, December 1985, pp. 1159-1175 (with M. Rehak and I. Sandler).
 45. "Random Vibrations with MACSYMA," *J. Comp. Meth. App. Mech. Engrg.*, Vol. 61 (1987), pp. 61-70 (with M. Rehak, H. Benaroya and I. Elishakoff).
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 47. "Vibrations of Shells Containing Fluid," *Shock and Vibration Digest*, Vol. 20, No. 3 (1988), pp. 8-11.
 48. "Contribution of Gaussian Curvature to Strain Energy of Plates," *J. Engr. Mech. ASCE*, July 1989, pp. 1434-1440 (with C. Zhu).
 49. "Dynamic Response of Submerged Shells with Appendages," *J. Engrg. Mech. ASCE*, Vol. 116, No. 10 (October 1990) pp. 2275-2292 (with S. O'Regan).
 50. "Chaotic Motion of a Pendulum with Support in Circular Orbit," *J. Engr. Mech. ASCE*, Vol 117, No. 2, (February 1991) pp. 329-347, (with J.-P. Yeh)
 51. "Acoustic Radiation and Scattering from Submerged Structures Using Wet Modes," *J. Vib. and Acoust., ASME*, Vol. 114 (October 1992), pp. 433-439 (with M. Ettouney and R. Daddazio).
 52. "Routes to Chaos of a Pendulum with Vertically Rotating Pivot," *Computers and Structures*, Vol. 46, No. 4, 1993, pp. 725-740 (with J.-L. Yip).
 53. "Specification of Modal Participation Factors in Acoustic Scattering Problems," *J. Shock and Vibration*, Vol. 1, No. 1, 1993, pp. 55-58, (with M. Ettouney and R. Daddazio).

54. "Transient Scattering from a Submerged Cylindrical Shell with Appendages," *J. Engrg. Mech., ASCE*, Vol. 119, No. 7, July 1993, pp. 1434-1452, (with S. Messina).

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1. The Collected Papers of Raymond D. Mindlin, Vols. I and II, Edited by H. Deresiewicz, M. Bieniek, and F. DiMaggio, New York: Springer-Verlag, 1989.
2. Mechanics of Materials and Structures, "Maciej P. Bieniek -- A Biographical Sketch," pp. 1-10, Elsevier, 1994.

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1. "Dynamic Buckling of Submerged Plates and Shells," TR12, Contract No. 266(08), September 1954 (with H. H. Bleich).
2. "A Survey of Theories and Experiments on the Shortening of Life by Ionizing Radiation," AFSWP-608, June 1956 (with N. Berlin).
3. "Dynamic Response of Cylindrical Tanks," AFSWP-1075, May 1958.
4. "Extensional Axisymmetric Second Class Vibrations of a Prolate Spheroidal Shell," TR3, Contract No. 266(67), February 1961.
5. "Material Models for Rocks," DASA 2595, Oct. 1970 (with I. Sandler).
6. "The Effect of Strain Rate on the Constitutive Equations of Rocks," DASA 2801 T, October 1971 (with I. Sandler).
7. "On Improving and Extending the Design Shock Spectra Used in DDAM," ONR Contract N00014-72-C-0119, Tech. Note, Weidlinger Associates, New York, NY, September 1976.
8. "Monitoring the Integrity of Existing Pipelines by Measurements Made in the Interior of the Pipes," Technical Report to AMF, Inc., April 1976 (with H. Bleich).
9. "Dynamic Response of a Submerged Elastic Structure with Elastic Structures Attached to it by Inelastic Springs," ONR Contract N00014-72-C-0119, Tech. Note, Weidlinger Associates, New York, NY August 1977.
10. "Critical Wind Speed for Divergence of the Bronx-Whitestone Bridge," Technical Report to Triborough Bridge and Tunnel Authority, September 12, 1979.