

## CURRICULUM VITAE

### NAME

Stanley J. Kleis

### BIRTH DATE

November 19, 1944

### EDUCATION

|       |                           |      |                        |
|-------|---------------------------|------|------------------------|
| Ph.D. | Michigan State University | 1974 | Mechanical Engineering |
| M.S.  | Michigan State University | 1968 | Mechanical Engineering |
| B.S.  | Michigan State University | 1967 | Mechanical Engineering |

### PROFESSIONAL EXPERIENCE

1981-present Associate Professor, Department of Mechanical Engineering, University of Houston.

1975 – 1981 Assistant Professor, Department of Mechanical Engineering, University of Houston.

1973 – 1975 Visiting Assistant Professor, Department of Mechanical Engineering, University of Houston.

1971 – 1973 Graduate Research Assistant, MSU; supported by a grant from NASA Lewis Research Center to study "The Multiple Round-Jet/Plane Wall Flow Field", developed hardware and instrumentation and supervised development of for a computer controlled data acquisition facility. Carried primary responsibility for the specification and implementation of a new mini-computer and peripherals for the automated data acquisition system.

1971 – 1972 Graduate Teaching Assistant, MSU; consultant for undergraduate fluid mechanics labs and graduate research.

1971 Project Supervisor, MSU; supervised two students on a special problem course to design, build, and test a fluidic carburetor, very successful.

1970 – 1971 Graduate Teaching Assistant, MSU; supervised undergraduate fluid mechanics labs and taught one section per term. Responsible for lab set up, handouts for students, quiz preparation, instructor preparation sessions, grading.

1970 – 1971 Graduate Research Assistant, MSU; supported by a grant from NASA Lewis Research Center to study "The Round-Jet/Plane-Wall Flow Field", supervised development of hardware and software for a computer controlled data acquisition system supervised research project from 9/70 to 6/71 (Foss on Sabbatical).

1968 – 1970 Instructor, MSU; responsible for evaluating and restructuring the material and instruction methods used in the two undergraduate fluid mechanics laboratory courses. Developed several new experiments, made video tape preparatory lectures for each lab, developed machine scored test to evaluate the student preparation for an experiment and tests to evaluate the effectiveness of meeting the educational objectives, taught one lab section per term. Sponsored by the MSU Education Development Program.

1968 Graduate Research Assistant, MSU; supported by a grant from Harry Diamond Laboratories to study "The Defined Region Geometry for High Gain Proportional Fluid Amplifiers", developed hardware and supervised development of software for semi-automated data acquisition facility, responsible data acquisition and reduction.

1967 – 1968 Graduate Teaching Assistant, MSU; taught undergraduate fluid mechanics laboratory sections.

1967 Mechanical Engineering General, Harry Diamond Laboratories, Washington, D. C.

## **RECOGNITION OF TEACHING**

Mortar Board Outstanding Educator, 1983

Pi Tau Sigma Teaching Excellence Award, 1983.

Outstanding Teacher, Cullen College of Engineering, (Halliburton Award), 1984.

Faculty advisor Formula SAE Car Design Competition, (winning 5 national awards in 3 years 1982-84, including first place overall and "Excellence in Design and Engineering" in 1984).

American Society for Engineering Education: The John Fluke Award for "Excellence in Laboratory Instruction", Presented by the Division of Experimentation and Laboratory-Oriented Studies & the Division of Instrumentation, 1995.

ASEE Summer Faculty Fellowship recipient, NASA/JSC, 1995.

ASEE Summer Faculty Fellowship recipient, NASA/JSC, 1996.

ASME South Texas Section Claude L. Wilson Award for lifetime achievement of outstanding engineering educator, 1998.

ASME Student section, "Professor of the Year, 1999", Dec., 1999.

University of Houston, Enron Teaching Excellence Award April, 2000.

ASME Student section, "Professor of the Year, 2001", Dec., 2001.

ASME Student Section "Professor of the Year 2004", Dec., 2004.

Cullen College of Engineering W. T. Kittenger Outstanding Teacher Award, 2006-2007.

## **RECOGNITION OF RESEARCH**

NASA Public Service Medal, this national award "recognizes exceptional contributions to the mission of NASA by those who are not government employees". One of NASA's highest honors, given in recognition of contributions as lead investigator of a team from UH, NASA/Glenn, NASA/JSC, Wyle Laboratories, and Universities Space Research Associations developing the Hydrodynamic Focusing Bioreactor for Space. (2004)

Best Paper Award, ASME/JSME/JSES International Solar Energy Conference for Solar Ponds and OTEC, "A Gradient Maintenance Technique for Seawater Solar Ponds", March, 1995.

Principle Investigator for Fluid Dynamics Studies for NASA Bioreactor Development EDU-1 Space Shuttle Flight Experiments flown on STS-70, July, 1995.

Principle Investigator for Fluid Dynamics Studies for NASA Bioreactor Development EDU1-R Space Shuttle Flight Experiments flown on STS-85, August, 1997.

Consultant NASA/JSC Bioreactor Development Team, 2001-2003.

Principle Investigator, KC-135 Flight Experiments for NASA HFB-S Bioreactor Fluid Dynamics, July 2002.

Principle Investigator, KC-135 Flight Experiments for NASA HFB-S Bioreactor Fluid Dynamics, January 2003.

Principle Investigator, HFB-S Directed Technical Objective (DTO) space flight experiments, 2003 – 2004.

Consultant Multiple Modular Rotating Bioreactor (MMRB) project for International Space Station Biotechnology Facility, 2003 - 2004.

Consultant Automated Static Culture System (ASCS) project for International Space Station Biotechnology Facility, 2003 - 2004.

Consultant for Technical Information Meeting (TIM) on the Light Microscope Module (LMM) for the International Space Station Biotechnology Facility, 2003-2005.

## **TEACHING**

Applications of Fluid Mechanics (Professional)

Experimental Methods (Undergraduate)

Thermodynamics I (Undergraduate)

Thermodynamics II (Undergraduate)

Thermal Sciences Lab (Undergraduate, New course)

Fluid Mechanics (Undergraduate)

Advanced Fluid Mechanics I (Viscous Flow) (Graduate)

Senior Design Project Course

Real-Time Computer Applications (Graduate, New course)

Advanced Experimental Methods (Graduate, New course)

Heat Transfer (Undergraduate)

Advanced Fluid Mechanics II (Turbulence) (Graduate)

Controls and Vibration Laboratory (Undergraduate)

## **SUPERVISION OF RESEARCH**

### Graduate Students Completed

1. Ruey Tang Chen (MS) "Thermal Performance Testing of Flat-Plate and Moderately-concentrating Solar Collectors", 1979.
2. Jeff Richichi (MS) "Separation Control Using Multiple Jets", 1985.
3. Naveed Anwar, (MS) "Design, Construction, and Testing of a Two Stream Mixing Layer Wind Tunnel Facility", 1985.
4. Yvette Loh (MS) "Forced Convection from Inclined Finite Plane Surfaces in Laminar Flow", 1985.
5. Min Hong (MS) "Simultaneous Measurements and Flow Visualization in a Two Stream Mixing Layer", 1986.

6. Allen Chachere (MS), "Laminar Boundary-Layer Momentum Thickness Effects on Two-Stream Mixing-Layers", 1988.
7. Steve Tung (MS), "Phase Dependence of Coherent Structures in a Two-Stream Mixing Layer", 1988.
8. Lilia A. Sanchez (Ph.D.), "Instantaneous Screw Axis Identification Using Holographic Interferometry", 1988.
9. Stefan Schreck (Ph.D.), "Fluid-Particle Interaction in Solid-Liquid Two-Phase Grid Turbulence", 1988.
10. Amer Abdahlah (MS), "Numerical Simulation of the Viscous Pump Bioreactor Flow", 1989.
11. Steve Freitas (MS), "Mass Transport in Laminar Flow Bioreactors", 1991.
12. C.-H. Steve Tung (Ph.D.), "Initial Streamwise Vorticity Formation in a Two-Stream Mixing Layer", 1992.
13. Ghassan Eghneim (Ph.D.), "An Experimental and Numerical Study of Gradient Maintenance for Salt-Gradient Solar Ponds by Radial Injection", 1992.
14. Jordi Estevadeordal (MS), "Critical Withdrawal from the Storage Zone in Salinity-Gradient Solar Ponds", 1992.
15. Jacob Ho-Tung (MS), "Azimuthal Velocity Profiles in an Eccentric Cylinder Apparatus", 1992.
16. Zhe Shi (MS), "Seawater Solar Ponds and Thermal Refuge Areas for Mariculture", 1994.
17. Jordi Estevadeordal (Ph.D.), "Coherent Structure Dynamics in a Large Plane Mixing Layer", 1996.
18. Haoming Li (MS), "Mariculture Thermal Refuges Using Solar Pond Technology", 1996.
19. Qicong Guo (MS), "Thermal Performance of the Sea Water Solar Pond", 1996.
20. Robert Hart (MS), "An Experimental and Numerical Investigation of Double-Diffusive Convection in a Stratified Fluid Subject to Lateral Heating", 1997.
21. Cynthia M. Begley (Ph.D.), "Fluid Dynamic Studies of the NASA/JSC Rotating Wall Perfused Vessel for Cell Culture in Microgravity", 1999.

22. Ivan Rivera (Ph.D.), "Local Mass Transfer for Bioreactors in Microgravity", 2001.
23. Sandra K. Geffert (MS), "Modeling the Motion of Gas Bubbles and Particles in the NASA/JSC Hydrodynamic Focusing Bioreactor for Space (HFB-S)", 2003.
24. Ajay Rao (MS), "Local Mass Transport to a Sphere Suspended in a Shear Flow under Micro Gravity Conditions", 2004.
25. Ritesh Chhabra (MS), "Density Matching for Improved Space Bioreactor Ground Control Experiments", 2004.
26. Kunal Asher (MS), "Near Wall Drag Corrections for Spheres in Microgravity", 2004.
27. M. Wasy Akhtar (MS), "Rising Vapor Bubble Approaching An Inclined Heated Wall", 2006.
28. Sandra K. Geffert (Ph.D.), "An *In Vitro* Model for the Assessment of Recovery of Hypoxia/Reperfusion Injured Cardiomyocytes", 2007.
29. Holley C. Love (MS), "Hydrodynamic Effects of Left Ventricular Assist Device Implantation: a Numerical and Experimental Approach", 2009.

#### Undergraduate Honors Theses

30. James E. Bridges, "Scattering Phenomenon in Flow Birefringence", 1983.
31. Allan V. Chachere, "A Boundary Layer Control System", 1986.
32. Greg S. Aber, "A Low Shear Bench Top Bioreactor", 1989.
33. Robert Hart, "Development of a Computer Model to Study the Effects of a Horizontal Temperature Gradient on a Stably Stratified Fluid", 1993.
34. Charles Robeck, "Motion of a Sphere in a Space Flight Bioreactor", 1996.
35. Holley C. Love, "Design, Fabrication, and Implementation of a Shear Bioreactor to Investigate the Effects of Fluid Shear on Mammalian Cell Types", 2007.

#### Graduate Students in Progress

Holley C. Love (Ph.D.), expected 2013.

Mohammad Wasy Akhtar (Ph.D.), expected 2011.

### **CONTINUING EDUCATION**

Industrial Energy Auditing Short Course, (lecturer), University of Houston, 1978.

Industrial Energy Auditing Short Course, (lecturer), University of Houston, 1979.

## PUBLICATIONS

### Journal Articles

1. "The Oblique Impingement of an Axisymmetric Jet", J. F. Foss and S. J. Kleis, AIAA Journal, pp. 705-706, June, (1976).
2. "A 'Turbulent Spot' in an Axisymmetric Free Shear Layer, Part I", M. Sokolov, F. Hussain, S. J. Kleis, and Z. D. Husain, J. of Fluid Mechanics, Vol. 98, Part I, pp. 65-95, (1980).
3. "Instantaneous Collector Thermal Efficiencies in Less Time", S. J. Kleis, R. T. Chen, and R. B. Bannerot, Solar Energy, Vol. 24, pp. 111-112, (1980).
4. "A 'Turbulent Spot' in an Axisymmetric Free Shear Layer: Part 2", A. K. M. F. Hussain, S. J. Kleis, and M. Sokolov, J. of Fluid Mechanics, Vol. 98, Part I, pp. 97-135, (1980).
5. "A 'Turbulent Spot' in an Axisymmetric Free Shear Layer, Part 3: Azimuthal Structure and Initiation Mechanism", S. J. Kleis, A. K. M. F. Hussain, and M. Sokolov, J. of Fluid Mechanics, Vol. 11, pp. 87-106, (1981).
6. "The Large-Scale Coherent Structure Induced by Two Simultaneous Sparks in an Axisymmetric Mixing Layer", M. Sokolov, S. J. Kleis, and A. K. M. F. Hussain, AIAA, 19, No. 8, pp. 1000-1008, (1981).
7. "A Viscous Pump Bioreactor", S. Kleis, S. Schreck, and R. Nerem, Biotechnology and Bioengineering, Vol. 36, pp. 771-777, (1990).
8. "Dependence of Speed of Sound on Salinity & Temperature in Concentrated NaCl Solutions", S. J. Kleis and L. A. Sanchez, Solar Energy, Vol. 45, No. 4, pp. 201-206, (1990).
9. "Dependence of Sound Velocity on Salinity & Temperature in Saline Solutions", S. J. Kleis and L. A. Sanchez, Solar Energy, Vol. 46, No. 6, pp. 371-376, (1991).
10. "Fluid-Particle Interaction in Solid-Liquid Two-Phase Grid Turbulence", S. Schreck and S. Kleis, J. of Fluid Mechanics, Vol. 249, pp. 665-688, (1993).
11. "Fractal Properties of Isovelocity Surfaces in High Reynolds Number Laboratory Shear Flows", A. A. Praskovsky, J. F. Foss, S. J. Kleis, and M. Y. Karyakin, Phys. of Fluids A, Vol. 5, No. 8, pp. 2038-2042, (1993).

12. "Gradient Zone Erosion by Extraction in Solar Ponds", J. Estevadiordal and S. J. Kleis, ASME J. of Solar Energy Engineering, Vol. 117, No. 2, pp. 144-150, (1995).
13. "Effect of Polymer on Flow in Journal Bearings", A. Berker, M. G. Bouldin, S. J. Kleis, and W. E. VanArsdale, J. of Non-Newtonian Fluid Mechanics, Vol. 56, pp. 333-347, (1995).
14. "Determining Screw Axes Using Holographic Interferograms", L. A. Sanchez, S. J. Kleis, and T. E. Shoup, Mechanism and Machine Theory, Vol. 31, pp 245-259, (1996).
15. "Initial Streamwise Vorticity Formation in a Two-Stream Mixing Layer", C-H. S. Tung and S. J. Kleis, J. of Fluid Mechanics, Vol. 319, pp. 251-279, (1996).
16. "A Two-Region Model for Gradient Modification of Salt-Gradient Solar Ponds by Radial Injection", G. A. Eghneim and S. J. Kleis, ASME J. of Solar Energy Engineering, Vol. 118, pp. 37-44, (1997).
17. "A Gradient Maintenance Technique for Seawater Solar Ponds", S. J. Kleis, H. Li, and J. Shi, ASME J. of Solar Energy Engineering, Vol. 119, pp. 8-12, (1997).
18. "Gradient Zone Erosion in Seawater Solar Ponds", J. Shi, R. A. Hart, S. J. Kleis, and R. B. Bannerot, ASME J. of Solar Energy Engineering, Vol. 119, pp. 2-7, (1997).
19. "High-resolution measurements of two-dimensional instabilities and turbulence transition in Plane Mixing Layers", J. Estevadeordal and S. J. Kleis, Experiments in Fluids, Vol. 27, (1999).
20. "Double-Helical Pairing in Plane Mixing Layers", J. Estevadeordal and S. J. Kleis, Physics of Fluids, Vol. 11, Number 6, (1999).
21. "Core Instabilities and 'Bridging' in the First Pairing of Plane Mixing Layers", J. Estevadeordal and S. J. Kleis, Physics of Fluids, Vol. 11, Number 6, (1999).
22. "The Fluid Dynamic and Shear Environments in the NASA/JSC RWPV Bioreactor", C. M. Begley and S. J. Kleis, Biotechnology and Bioengineering, Vol. 70, No. 1, pp 32-40, (2000).
23. "Influence of Vortex Pairing Location on the Three-Dimensional Evolution of Plane Mixing Layers: An Experimental Study", J. Estevadeordal and S. J. Kleis, J. of Fluid Mechanics, Vol. 462, pp 43-77,(2002).
24. "RWPV Bioreactor Mass Transport: Earth-Based and in Microgravity", Cynthia M. Begley, Stanley J. Kleis, Biotechnology and Bioengineering, Vol. 80, No. 4, pp 465-476, (2002).

25. "Time Scales for Unsteady Mass Transfer From a Sphere at Low-Finite Reynolds Numbers", Stanley J. Kleis and Ivan Rivera-Solorio, J. of Heat Transfer, Vol. 125, No. 4, pp 716-723, (2003).
26. "Model of the Mass Transport to the Surface of Animal Cells Cultured in a Rotating Bioreactor Operated in Micro Gravity", Ivan Rivera-Solorio and Stanley J. Kleis, Biotechnology and Bioengineering, **94**, No. 3: 495-504, (2006).
27. "Characterization of a Novel Miniature Cell Culture Device", Moore, S.K., and Kleis, S.J., Acta Astronautica, Vol 62, pp 632-638, (2008).
28. "A Computational Model for Vapor Bubble Growth", Akhtar, M. W., and Kleis, S. J., (in revision).
29. "Assessment of Fetal Canine Cardiac Myocyte Survival in a Dual-Side Flow Bioreactor with Modeled Hypoxia/Reperfusion Injury", Moore, S. K., Kleis, S. J., and Geng, Y. J. , Biotechnology and Bioengineering, **103**, No. 1: 199 – 206, (2009).
30. "Effect of Cytokines Secreted by Adipose Derived Stromal Cells on the Recovery of Hypoxia/Reperfusion Injured Cardiomyocytes", Moore, S. K., Kleis, S. J., and Geng, Y. J. (in preparation).
31. "Flow Visualization Techniques in a Mock Ventricle Supported by a Nonpulsatile Left Ventricle Assist Device", Khalil, H. A. , Metcalfe, R. W., Kleis, S. J., Lee, E. L., Gilbert, N, L., and Kerr, D. T., American Society for Artificial Internal Organs, **55**, No 4: 323-327, (2009) .
32. "Sensitivity of Digital Thermal Monitoring Parameters to Reactive Hyperemia", Akhtar, M. W., Kleis, S. J., Metcalfe, R. W., and Naghavi, M., ASME Journal of Biomechanical Engineering, May 2010, Vol. 132, 051005(1-14).
33. "Low fingertip temperature rebound measured by digital thermal monitoring strongly correlates with the presence and extent of coronary artery disease diagnosed by 64-slice multi-detector computed tomography", Ahmadi, N., Nabavi, V., Nuguri, V., Hajsadeghi, F., Flores, F., Akhtar, M., Kleis, S., Hecht, H., Naghavi, M., Budoff, M., Int J Cardiovasc Imaging, 2009, **25**(7): 725-738. (Epub 2009 Jul 26)
34. "A Volume of Fluid Phase Change Model on Adaptive Octree Grids", Akhtar, M.W., Kleis, S.J., Journal of ASTM International, **8**(3), (21 pages in special issue on boiling), (2011)..

#### Book Chapters

"Digital (Fingertip) Thermal Monitoring of Vascular Function: A Novel, Noninvasive, Nonimaging Test to Improve Traditional Cardiovascular Risk Assessment and

Monitoring of Response to Treatment", in Asymptomatic Atherosclerosis: Pathophysiology, Detection and Treatment, (Ed. M. Naghavi), Humana Press, a part of Springer Science + Business Media, New York. pp. 247-263, 2010.

### Refereed Papers

1. "A Note on the Defined Region Geometry for High-Gain Proportional Amplifiers", J. F. Foss and S. J. Kleis, ASME Paper No. 70-WA/Flcs-12, July, 1970.
2. "Vorticity and Acoustics Measurements in Impinging Jet Flows", Proceedings 3rd Interagency Symposium on University Research in Transportation Noise, pp. 425-434, November, 1975.
3. "A Spark-Induced Turbulent 'Spot' in a Turbulent Mixing Layer", M. Sokolov, A. K. M. F. Hussain, and S. J. Kleis, Proceedings of 2nd Symposium on Turbulent Shear Flows, pp. 11.13-11.18, July, 1979.
4. "Forced Convection From a Finite-Length Wedge in Laminar Flow", Y. L. Yin and S. J. Kleis, Proceedings ASME 25th National Heat Transfer Conference, 1988.
5. "Salinity Probe for Salt-Gradient Solar Ponds", S. Kleis and L. A. Sanchez, Proceedings Annual ASES Conference, Solar '90, Austin, Texas, pp. 401-406, March, 1990.
6. "In Situ Evaluation of a Salinity Probe for Solar Ponds", S. J. Kleis, L. A. Sanchez, P. Golding, and A. H. P. Swift, Proceedings Progress in Solar Ponds: 2nd International Conference, Rome, Italy, March, 1990.
7. "Determining Screw Axes Using Holographic Interferograms", L. A. Sanchez and S. J. Kleis, Proceedings of the Eighth World Congress on the Theory of Machines and Mechanisms, Vol. 1, pp. 141-144, Prague, Czechoslovakia, August, 1991.
8. "A Numerical Model for Gradient Modification by Radial Injection", G. A. Eghneim and S. J. Kleis, Solar Engineering 1992 Proceedings, Vol. 1, pp. 681-690, 1992.
9. "Gradient Zone Erosion by Extraction in Solar Ponds", J. Estevadiordal and S. J. Kleis, Solar Engineering 1993 Proceedings, pp. 273-282, 1993.
10. "A Gradient Zone Modification Scheme for Solar Ponds", G. A. Eghneim and S. J. Kleis, Solar Engineering 1993 Proceedings, pp. 263-272, 1993.
11. "The Effect of Polymer on Azimuthal Velocity Profiles in an Eccentric Cylinder Apparatus", J. N. Ho-Tung, S. J. Kleis, and W. E. VanArsdale, Developments in Non-Newtonian Flows, AMD, Vol. 175, ASME, New York, pp. 65-70, 1993.

12. "'Activity' Intermittency in a Two-Stream Shear Layer", J. F. Foss, D. G. Bohl, and S. J. Kleis, Proceedings Tenth Symposium on Turbulent Shear Flows, 1995.
13. "Transverse Vorticity Measurements in a Two-Stream Mixing Layer at High Reynolds Number", J. F. Foss, D. G. Bohl, and S. J. Kleis, Proceedings Sixth Asian Congress of Fluid Mechanics, 1995.
14. "A Gradient Maintenance Technique for Seawater Solar Ponds", S. J. Kleis, H. Li, and J. Shi, Solar Engineering 1995 Proceedings, Vol. 2, pp. 1019-1024, 1995.
15. "Gradient Zone Erosion in Seawater Solar Ponds", J. Shi, R. A. Hart, S. J. Kleis, and R. B. Bannerot, Solar Engineering 1995 Proceedings, Vol. 2, pp. 1011-1028, 1995.
16. "A Numerical Simulation of the Sea Water Solar Pond", Q. Guo and S. J. Kleis, Solar Engineering 1997 Proceedings, pp. 229-236, 1997.
17. "A Numerical Model for Double Diffusive Convection in a Stratified Fluid Subject to Lateral Heating", R. A. Hart and S. J. Kleis, Solar Engineering 1997 Proceedings, pp. 213-222, 1997.
18. "Mass Transport Considerations for Micro-Gravity Cell Cultures in the NASA/JSC Bioreactor", S. Kleis and C. Begley, Advances in Heat and Mass Transfer in Biotechnology 1997, 1997.
19. "Evaluation of a Computational Model for Sea Water Solar Ponds", S. J. Kleis, I. Rivera, Qicong Guo, Solar Engineering 1998 Proceedings, pp. 339-344, 1998.
20. "Performance of Different Sea Water Solar Ponds Under Similar Operating Conditions", S. J. Kleis, I. Rivera, Solar Engineering 1998 Proceedings, pp. 345-350, 1998.
21. "Flight Studies of Particle Trajectories in the NASA/JSC RWPV Bioreactor", C. Begley and S. Kleis, Advances in Heat and Mass Transfer in Biotechnology 1998, ASME HTD-Vol. 362/BED-Vol. 40, pp 43-48, 1998.
22. "Fluid Dynamic Evaluation of the NASA/MMRB Bioreactor Concept", S. Kleis, T. Trinh, T. Troung, and T. Goodwin, NASA/TM-2004-213145.

#### Presentations at Technical Meetings

1. Annual Meeting of Fluid Dynamics Division of the American Physical Society, "The Effect of Exit Conditions on the Development of an Axisymmetric Free Jet", November, 1973.
2. Annual Meeting of Fluid Dynamics Division of the American Physical Society, "A Spark Induced 'Spot' in an Axisymmetric Free Shear Layer", November, 1978.

3. Annual Meeting of Fluid Dynamics Division of the American Physical Society, "The Asymptotic State of the Plane Mixing Layer", November, 1979.
4. Annual Meeting of Fluid Dynamics Division of the American Physical Society, "Evolution of a Large-Scale Structure in an Axisymmetric Mixing Layer", November, 1979.
5. 2nd Symposium on Turbulent Shear Flows, "A Spark-Induced Turbulent "Spot" in a Turbulent Mixing Layer", July, 1979.
6. Annual Meeting of Fluid Dynamics Division of the American Physical Society, "The Spark-induced Large-Scale Coherent Structure in a Plane Mixing Layer", November, 1980.
7. Annual Meeting of Fluids Dynamics Division of the American Physical Society, "Controlled Perturbation of the Plane Mixing Layer", November, 1980.
8. Annual Meeting of Fluid Dynamics Division of the American Physical Society, "Large-Scale Structures in an Excited Plane Mixing Layer", November, 1981.
9. American Chemical Society, "Hydrodynamic Studies in Space Bioreactors", March, 1986.
10. Fifth Annual Conference on Biomedical Engineering Research in Houston, "Hydrodynamic Studies in Space Bioreactors", March, 1987.
11. Annual Meeting of the Division of Fluid Dynamics of the American Physical Society, "Modification of Turbulence by High Concentrations of Neutrally Buoyant Particles", November, 1987.
12. Annual Meeting of the Division of Fluid Dynamics of the American Physical Society, "Fluid and Particle Velocity Correlations in a Liquid-Solid Two-Phase Flow", (with S. Schreck), November, 1988.
13. Annual Meeting of the Division of Fluid Dynamics of the American Physical Society, "Effects of Solid Particles on Grid-Generated Turbulence", (with S. Schreck), November, 1989.
14. Annual Meeting of the Division of Fluid Dynamics of the American Physical Society, "Streamwise Vorticity Development in a Two-Stream Mixing Layer", (with S. Tung), November, 1991.
15. Annual Meeting of the Division of Fluid Dynamics of the American Physical Society, "The Development of a Turbulent Boundary Layer Beneath a Two-Stream Layer", (with H. Bourgoigne and D. K. Hollingsworth), November, 1991.

16. 1992 Joint ASME-JSES-KSES International Solar Energy Conference, "A Numerical Model for Gradient Modification by Radial Injection", (with G. A. Eghneim), April, 1992.
17. 1992 Joint ASME-JSES-KSES International Solar Energy Conference, "Effect of Indirect Insolation, Turbidity and Bottom Reflectance on Transmittance in a Solar Pond", (presented for Chang and Bannerot), April, 1992.
18. Annual Meeting of the Division of Fluid Dynamics of the American Physical Society, "Transverse Vorticity measurements in a Two-Stream Mixing Layer", (with J. F. Foss and S. D. Larson), November, 1992.
19. ASME ISEC Conference, "A Gradient Zone Modification Scheme for Solar Ponds", April, 1993.
20. ASME ISEC Conference, "Gradient Zone Erosion by Extraction in Solar Ponds", April, 1993.
21. Annual Meeting of the Division of Fluid Dynamics of the American Physical Society, "Vorticity-Vorticity Correlation functions in a Two-Stream Mixing Layer", (with J. F. Foss and D. G. Bohl), November, 1993.
22. Annual Meeting of the Division of Fluid Dynamics of the American Physical Society, "Vorticity Based Intermittency in a Large  $R_\theta$  Two-Stream Mixing Layer", (with J. F. Foss and D. G. Bohl), November, 1994.
23. Annual Meeting of the Division of Fluid Dynamics of the American Physical Society, "Second Subharmonic Phase Influence in Forced Mixing Layers", (with J. Estevadeordal), November, 1994.
24. Annual Meeting of the Division of Fluid Dynamics of the American Physical Society, " $R_\theta$  Failure/  $R_\lambda$  Success in Describing the Two-Stream Shear Layer Vorticity Field Properties", (with J. F. Foss and D. G. Bohl), November, 1995.
25. Annual Meeting of the Division of Fluid Dynamics of the American Physical Society, "The Three-Dimensional Evolution of a Forced Plane Mixing Layer", (with J. Estevadeordal), November, 1995.
26. Aquaculture America 1996, "Seawater Solar Pond Refuge Areas for Fish Overwintering", February, 1996.
27. The 1996 International Solar Engineering Conference, "Thermal Refuge Designs for Sea Water Solar Ponds in Commercial Mariculture Operations," Haoming Li, S. J. Kleis, March, 1996.

28. Annual Meeting of the Division of Fluid Dynamics of the American Physical Society, "Coherent Structure Dynamics in a Large Plane Mixing Layer", (with J. Estevadeordal), November, 1996.
29. Annual Meeting of the Division of Fluid Dynamics of the American Physical Society, "Double-Diffusive Convection due to Lateral Heating of a Stratified Fluid", (with R. Hart), November, 1996.
30. ASME/ASES Solar Energy Forum, "A Numerical Simulation of the Sea Water Solar Pond", Q. Guo and S. J. Kleis, April, 1997.
31. ASME/ASES Solar Energy Forum, "A Numerical Model for Double Diffusive Convection in a Stratified Fluid Subject to Lateral Heating", R. A. Hart and S. J. Kleis, April, 1997.
32. ASME/IMECE, "Mass Transport Considerations for Micro-Gravity Cell Cultures in the NASA/JSC Bioreactor", S. Kleis and C. Begley, 1997.
33. ASME/ASES 1998 International Solar Energy Conference, "Evaluation of a Computational Model for Sea Water Solar Ponds", S. J. Kleis, I. Rivera, Qicong Guo, June 1998.
34. ASME/ASES 1998 International Solar Energy Conference, "Performance of Different Sea Water Solar Ponds Under Similar Operating Conditions", S. J. Kleis, I. Rivera, June 1998.
35. ASME/IMECE, "Flight Studies of Particle Trajectories in the NASA/JSC RWPV Bioreactor", C. Begley and S. Kleis, November, 1998.
36. ASME/ASES 2000 International Solar Energy Conference, "A Buoyancy Driven Gradient Maintenance Technique for Sea Water Solar Ponds", I.S. Rivera and S.J. Kleis, June, 2000.
36. NASA Cell Science Conference, "Flow of Fluid and Particle Assemblages in Rotating Systems", J. Kizito, D. Hiltner, C. Niederhaus, S. Kleis, E. Hudson, S. Gonda, (Kizito presented), Feb. 26-28, 2004.
37. NASA Cell Science Conference, Feb. 26-28, 2004, "Density Matching for Better Ground Control Experiments", S. J. Kleis, A. K. Rao, S. K. Geffert, E. Hudson, S. R. Gonda, (S. J. Kleis presented), Feb. 26-28, 2004.
38. NASA Cell Science Conference, Feb. 26-28, 2004, "Microgravity Experiments on Bubble Removal in the Hydrodynamic Focusing Bioreactor Space (HFBS)", C. E. Niederhaus, S. Robinson, E. Hudson, S. K. Geffert, P. J. Lupo, H. K. Nahra, J. P. Kizito, S. J. Kleis, S. R. Gonda, (Niederhaus presented), Feb. 26-28, 2004.

39. NASA Cell Science Conference, Feb. 26-28, 2004, "Modeling the Motion of Bubbles in the HFB-S", S. K. Geffert, S. J. Kleis, C. E. Niederhaus, S. Robinson, E. Hudson, H. K. Nahra, S. R. Gonda, (Geffert presented), Feb. 26-28, 2004.
40. NASA Cell Science Conference, Feb. 23-25, 2005, "Development of a Miniature Bioreactor for Space Applications", S. K. Geffert and S. J. Kleis, (poster).
41. NASA Cell Science Conference, Feb. 23-25, 2005, "Density Matching Studies For Better Microgravity Simulation", S.J. Kleis, R. Chhabra, S.K. Geffert, E. Hudson, and S.R. Gonda.
42. International Astronautical Conference, Valencia, Spain, October, 2006, "Characterization of a Miniature Cell Culture Device for Biosentinel and Other Remote Monitoring Systems", Sandra K. Geffert and Stanley J. Kleis. (presented by S. Geffert)
43. Houston Society for Engineering in Medicine and Biology (HSEMB) Conference, Houston, TX, February, 2008, "Localized Injury in Cardiomyocyte Monolayers: A New Experimental Model of Hypoxia/Reperfusion Injury." S. Moore and S. Kleis, (presented by S. Moore)
44. BMES Annual Meeting, October 7-10, 2009, Pittsburg, PA., "New Indicators for Digital Thermal Monitoring - A Measure of Vascular Reactivity," Akhtar, M. W., Kleis, S. J., Metcalfe.
45. HSEMB Conference on Biomedical Engineering Research, Houston, TX, 19-20 March, 2009, "Computer Simulation of Digital Thermal Monitoring of Vascular Reactivity – A Potential Indicator of Cardiovascular disease," Akhtar, M. W., Kleis, S. J., Metcalfe, R. W., Naghavi, M..
46. HSEMB Conference on Biomedical Engineering Research, Houston, TX, 19-20 March, 2009, "A Flow Loop to Visualize Flow Patterns in Hearts Implanted with Left Ventricular Assist Device," S. J. Kleis, H. C. Love, R. W. Metcalfe and W. E. Cohn.
47. BMES Annual Meeting, October 7-10, 2010, Austin, TX, *Inverted DTM - A Possible Solution to the Cold Finger Problem*, Akhtar, M. W., Kleis, S. J., Metcalfe, R. W.
48. 19th International Conference of the Cardiovascular System Dynamics Society, September 23-26, 2010, Higashi-ku, Fukuoka, Japan, "Digital (Fingertip) Thermal Monitoring of Vascular Function: A Novel Non-invasive Non-imaging Test to Improve Traditional Cardiovascular Risk Assessment and Monitoring of Response to Treatments", Naghavi, M., Ahmadi, N., Akhtar, W., Kleis, S., Metcalfe, R., Hecht, H., Hartley, C., Budoff, M.

#### Invited Seminars

1. Michigan State University, "Dynamics of Large Scale Coherent Structures", 1984.

2. The University of Texas, "Coherent Structure Eduction in Turbulent Free Shear Flows", 1986.
3. Rice University, "Coherent Structure Eduction in Turbulent Free Shear Flows", 1987.
4. NASA/JSC Bioreactor Development Seminar, 1987.
5. NASA/JSC Biotechnology Workshop, "Fluid Dynamics Studies in Space Bioreactors", 1988.
6. Energy Laboratory, "Sea Water Solar Ponds for Mariculture/ Aquaculture", Sept., 1989.
7. University of Texas at El Paso graduate seminar, "An Ultrasonic Salinity Probe", Nov., 1989.
8. UH Energy Laboratory Seminar, "Sea Water Solar Ponds for Mariculture/Aquaculture", Sept., 1989.
9. UH Rheology Seminar, "A Salinity Probe for Salt Gradient Solar Ponds", Oct., 1989.
10. UH Energy Laboratory Seminar, "Salt-Gradient Solar Ponds Research", Jan., 1991.
11. NASA/JSC Seminar, "Low Shear Bioreactor Design", Aug., 1993.
12. Texas Higher Education Coordinating Board, "Research on Seawater Solar Ponds for Mariculture in Texas", October, 1995.
13. ASME South Texas Section, "Bioreactor Fluid Dynamics in Micro-Gravity: STS-70", March, 1996.
14. Georgia Institute of Technology, Bioengineering Seminar, "Bioreactor Fluid Dynamics in Micro-Gravity: STS-70", November 1996.
15. NASA Glenn Research Center, "Fluid Dynamics Studies in the NASA RWPV Bioreactor", May 22 - 23, 2001
16. NASA/JSC, "Flow Field Calculations for the HFB-S and Possible Design Changes", June 11, 2001.

#### Technical Reviews

ERAP Annual Review, "Solar Pond Consortium", Sept., 1989.

NASA External Review, "Fluid Dynamics of Space Bioreactors", Nov., 1989.

NASA Headquarters Review, "Bioreactor Fluid Dynamics Studies", Dec., 1989.

ERAP Annual Review, "Solar Pond Consortium", Sept., 1990.

ERAP Annual Review, "Solar Pond Consortium", Dec., 1991.

ERAP Annual Review, "Solar Pond Consortium", Nov., 1992.

Texas ATP/ARP Program Review, 1996.

Biological Waste Water Processing in Microgravity Workshop, 1998.

NASA/JSC Biological Systems Office Configuration Control Board review panel, 2002.

NASA/JSC Biotechnology Facility Preliminary Design Review, 2003.

Hydrodynamic Focusing Bioreactor for Space Science Readiness Review, Principal Investigator, 2005.

## **FUNDED RESEARCH**

### Grants and Contracts

1. UH Research Initiation Grant, \$3,250, 1973.
2. "Vorticity Measurements in an Impinging Jet", NASA Langley Research Center, Subcontracted from MSU, 1974, \$2,500.
3. "Acoustics Measurements in Normal Jet Impingement", NASA Langley Research Center, 1976, \$10,000.
4. "An Accelerated Collector Evaluation Technique", UH 1977 SEL Summer Program, 1977, \$8,100, with R. Bannerot.
5. "Reduction of Solar Insolation Data", Exxon Products Research Division, 1977, \$3,300, with R. Bannerot.
6. "Testing of Solar Collectors", UH 1978 SEL Program, 1978, \$7,749, with R. Bannerot.
7. "The High Reynolds Number Free Shear Layer (Behind a Backward Facing Step)", NASA/AMES, 1978, \$65,623, with A. K. M. F. Hussain.
8. "The High Reynolds Number Free Shear Layer (Behind a Backward Facing Step)", NASA/Ames 1979, \$78,089 with A. K. M. F. Hussain.
9. "The High Reynolds Number Free Shear Layer (Behind a Backward Facing Step)", NASA/Ames, 1980, \$78,089 with A. K. M. F. Hussain.

10. "The Distortion of Turbulence by a Circular Cylinder", UH New Research Opportunities Program, 1983, \$6,300.
11. UH Cullen College of Engineering, "Mixing Layer/Wind Tunnel Facility", 1984, \$75,000.
12. "Fluid Dynamics of Cell Bioreactors", University of Texas Health Science Center at Houston Subcontract, part of NASA Project; Project Funded for Three Years, 6/1/85-5/31/88, \$150,000, (Co-principal investigator with R. M. Nerem, principle investigator last two years).
13. "Solar Pond Consortium", State of Texas ERAP, 2/1/89-1/31/93, \$841,331 total \$139,453 UH.
14. "NASA Bioreactor Design", Krug International, 2/15/89-5/15/89, \$12,500.
15. "NASA Bioreactor Design and Evaluation", Krug International, 6/89-12/89, \$25,000.
16. "Bioreactor Fluid Dynamics: Measurement and Simulation", Krug International, 7/89-3/90, \$25,000.
17. "Bioreactor Fluid Dynamics: Analysis and Measurements", Krug International, 8/90-10/90, \$8,292.
18. "Bioreactor Fluid Dynamics: Concentration Distributions", Krug International, 12/15/90-2/15/91, \$8,235.
19. "Sea water Solar Pond - A Low Cost Energy Source for Mariculture", Texas ATP, 1/92-12/93, \$178,000, (Co-PI, with R. Bannerot).
20. "Transverse Vorticity Measurements in the University of Houston Two-Stream Shear-Layer Facility", USN/ONR, 10/1/92-9/30/93, \$20,233.
21. "Using Geothermal Well Water for Winter Survival in the Texas Mariculture Industry", Texas ATP, 1/94-12/95, \$132,291.
22. "Sea water Solar Ponds- Transfer to the Mariculture Industry", Texas ATP, 1/94-12/95, \$89,710, (Co-PI, with R. Bannerot).
23. "Bioreactor Fluid Dynamics: Measurement and Visualization", Krug Intl. (NASA/JSC), 7/94 -12/94, \$12,294.
24. "Microgravity Fluid Dynamics: Modeling in a Rotating Wall Perfused Vessel", USRA (NASA/JSC), 5/24/95-9/30/95, \$10,203.

25. "Winter Survival for Mariculture Using Geothermal Heat: Practical Thermal Refuge Areas", Texas ATPD, (1995-98), \$158,332.
26. "Studies on Salinity and Temperature Transients in Sea Water Aquaculture Ponds", Texas ATP, (1998-1999), \$152,274, (co-PI w/ N. Shamsundar).
27. "Hydrodynamic Evaluation of the NASA/HFB Bioreactor", Universities Space Research Association, 7/1/01-6/30/03, \$61,184.
28. "Mass Transport Studies for Mammalian Cell Cultures in Microgravity", Texas ATP, 1/1/02-12/31/03, \$94,810.
29. "Fluid Dynamic Evaluation of the NASA/MMRB Bioreactor Concept", Universities Space Research Association, 1/1/2004-7/1/2004, \$24,459.
30. "Development of a Miniaturized Cell Culture Device", Universities Space Research Association, 9/1/2004-8/31/2005, \$29,791.
31. "Visualization of blood flow patterns in a left ventricle emulator implanted with a nonpulsatile ventricular assist device", w/ William Cohn, Ralph Metcalfe, MacDonald General Research Fund, St. Luke's Episcopal Hospital, 12/1/07- 11/30/08, \$43,250.

#### Unfunded Proposals

1. UH Research Opportunities Program, 1973.
2. "Pressure Measurements in Turbulent Flows", NSF Research Initiation Grant Program, 1974, \$17,000.
3. "Research on Engine Fabrication, Preparatory Testing, and Demonstration of Subsonic Low Cost Expendable Engine", USAF, 1976, \$227, 866, with C. Dalton.
4. "The Testing and Evaluation of NOVA Solar Corp. Hybrid Solar Collector", NOVA Solar Corp., 1978, \$8,065.
5. "Turbulence Modification due to High Concentration of Microcarriers with Application to Mammalian Cell Bioreactors", NASA/JSC, (1986), \$122,516.
6. "Fluid Dynamic Studies of Space Bioreactors", NASA, (1987-92), \$401,698 (PI, with R. Nerem)
7. "Human Cell Culture in Microgravity", NASA/JSC, (6/88-5/91), \$188,595.
8. "Mammalian Cell Culture in Microgravity", NASA, (6/89-5/93), \$259,368.

9. "Energy for Aquaculture-Seawater Solar Ponds, "Texas ATP, (1989 -91), \$386,020 (with R. Bannerot).
10. "Turbulent Shear Flow Evaluation of Molecular Configurations", Texas ARP, (1989-91), \$202,917 (with W. VanArsdale).
11. "An Estimate of Microgravity Mass Transport within the Couette Flow Bioreactor", NASA/JSC, (8/91-7/94), \$223,000.
12. "Sea water Solar Pond - A Low Cost Energy Source for Mariculture", Texas ERAP, (1/91-1/95), \$296,411 (with R. Bannerot).
13. "Solar Pond Consortium", Texas ARP, (1991-93), \$198,000 (with R. Bannerot).
14. "Solar Pond Consortium: An Instrumentation and Operations Guidance System for Salt-Gradient Solar Ponds", Texas ARP, (1993-95), \$99,102.
15. "Assessment of Geothermal Refuges for Winter Survival in Texas Mariculture", Governor's Energy Advisory Council, (6/93-5/96), \$272,923.
16. "Mass Transport Studies in EDU#2", NASA/JSC Director Grant Program, 9/1/95-8/31/96, \$15,796.
17. "Mass Transfer in Microgravity within the NASA RWPV Bioreactor", NASA NRA-96-OLMSA-03, 1996, \$218,799.
18. "Pond Aeration for Texas Mariculture", Texas ATP, (1998-1999), \$173,226.
19. "Microgravity Mass Transport in the NASA RWPV Bioreactor", NASA NRA 97-HEDS-02, (1998-2001), \$228,519.
20. "Stratification Management in Mariculture Ponds", ARP/ATP, (2000-2001), \$144,254.
21. "Experimental and Numerical Studies on Aquaculture Pond Stability", w/ N. Shamsundar, ARP/ATP, (2000-2001), \$153,200.
22. "Cellular Level Mass Transport in NASA Bioreactor Systems in Unit and Micro Gravity", NASA NRA 00-HEDS-03, w/ T. Goodwin, (3/2001-2/2005), \$631,578.
23. "Advanced Bioreactor Development Studies", Universities Space Research Association, (9/1/2004-8/31/2005), \$69,384.
24. "The Dynamics of Liquid Microlayers Formed by Sliding Bubbles", w/ Keith Hollingsworth and Larry C. Witte, NSF, (9/1/05– 8/31/08), \$419,298.
25. "Characterization of a Novel Miniature Cell Culture Device through Cell Migration Studies", w/ Sandra Geffert, ISSO, (2006 – 2007), \$11,064.

26. "Visualization and Computation of blood flow in a left ventricle implanted with a Ventricular Assist Device", w/ William Cohn, Ralph Metcalfe, St. Luke's Episcopal Hospital/Texas Heart Institute, (2006 – 2007), \$50,000 (\$28,827 UH part).
27. "The Dynamics of Liquid Microlayers Formed by Sliding Bubbles", w/ Keith Hollingsworth and Larry C. Witte, NSF, (5/1/07 – 4/30/10), \$425,390.
28. "The Dynamics of Liquid Microlayers Formed by Sliding Bubbles", w/ Keith Hollingsworth and Larry C. Witte, NSF, (9/1/08 – 8/31/11), \$506,504.
29. "Adipose Derived Stromal Cells Enhance Recovery Of Hypoxia/Reoxygenation Injured Cardiomyocytes", w/ Yong-Jian Geng, MacDonald General Research Fund, St. Luke's Episcopal Hospital, 12/1/08- 11/30/09, \$30,970.
30. "Cardiomyocyte Hypoxia/Reperfusion Injury Reduction using Stromal Cells: A Perfused *In Vitro* Model", American Heart Association, Grant-in-aid, 6/1/2009-5/31/2011, \$140,000.

## SERVICE ACTIVITIES

### University Service

1. Undergraduate Affairs Committee (Department), 1973.
2. High School Visitation Subcommittee (College), 1974.
3. Lab and Shop Committee (Department), 1974.
4. Undergraduate Affairs Committee (Department, Chairman), 1974.
5. Director of Undergraduate Labs (Department), 1974.
6. Faculty Advisor, ASME Student Chapter, 1974.
7. Undergraduate Affairs Committee (Department), 1974.
8. Undergraduate Curriculum Committee (College), 1975.
9. Lab and Shop Committee (Department), 1975.
10. Director of Undergraduate Labs (Department), 1975.
11. Faculty Advisor, ASME Student Chapter, 1975.

12. Undergraduate Affairs Committee (Department), 1975.
13. Capital Equipment Inventory (Department), 1975.
14. Interim Space Utilization Committee (College), 1976.
15. Lab and Shop Committee (Department), 1976.
16. Director of Undergraduate Labs (Department), 1976.
17. Faculty Advisor, ASME Student Chapter, 1976.
18. Undergraduate Affairs Committee (Department), 1976.
19. Capital Equipment Inventory (Department), 1976.
20. Undergraduate Affairs Committee (Department), 1977.
21. Capital Equipment Inventory (Department), 1977.
22. High School Visitation Subcommittee (College), 1978.
23. Undergraduate Affairs Committee (Department), 1978.
24. Capital Equipment Inventory (Department), 1978.
25. Faculty advisor Pi Tau Sigma 1979.
26. Undergraduate Affairs Committee (Department), 1979.
27. Capital Equipment Inventory (Department), 1979.
28. Faculty advisor Pi Tau Sigma 1980.
29. Undergraduate Affairs Committee (Department), 1980.
30. Capital Equipment Inventory (Department), 1980.
31. Director of Shop Staff (Department), 1980.
32. Faculty advisor Pi Tau Sigma 1981.
33. Director Undergraduate Research Program (Department), 1981.
34. Undergraduate Affairs Committee (Department), 1981.
35. Capital Equipment Inventory (Department), 1981.

36. Director of Shop Staff (Department), 1981.
37. Undergraduate Council, (University), 1982.
38. Undergraduate Affairs Committee (Department), 1982.
39. Capital Equipment Inventory (Department), 1982.
40. Director of Shop Staff (Department), 1982.
41. Degree Requirement Committee, Undergraduate Council, (University, Chairman), 1983.
42. Undergraduate Affairs Committee (Department), 1983.
43. Capital Equipment Inventory (Department), 1983.
44. Director of Shop Staff (Department), 1983.
45. Undergraduate Council, (University), 1983.
46. Undergraduate Affairs Committee (Department), 1984.
47. Capital Equipment Inventory (Department), 1984.
48. Director of Shop Staff (Department), 1984.
49. Undergraduate Council, (University), 1984.
50. Undergraduate Affairs Committee (Department), 1985.
51. Capital Equipment Inventory (Department), 1985.
52. Director of Shop Staff (Department), 1985.
53. Computer Advisory Committee (Department), 1985.
54. Undergraduate Council, (University), 1985.
55. Computer Policy Committee (College), 1986.
56. Undergraduate Affairs Committee (Department), 1986.
57. Capital Equipment Inventory (Department), 1986.
58. Director of Shop Staff (Department), 1986.

59. Computer Advisory Committee (Department), 1986.
60. Computer Policy Committee (College), 1987.
61. Undergraduate Affairs Committee (Department), 1987.
62. Capital Equipment Inventory (Department), 1987.
63. Director of Shop Staff (Department), 1987.
64. Computer Advisory Committee (Department), 1987.
65. Undergraduate Affairs Committee (Department), 1988.
66. Capital Equipment Inventory (Department), 1988.
67. Director of Shop Staff (Department), 1988.
68. Computer Advisory Committee (Department), 1988.
69. Computer Policy Committee (College), 1988.
70. Undergraduate Affairs Committee (Department), 1989.
71. Capital Equipment Inventory (Department), 1989.
72. Director of Shop Staff (Department), 1989.
73. Computer Advisory Committee (Department), 1989.
74. Computer Policy Committee (College), 1989.
75. Undergraduate Affairs Committee (Department), 1990.
76. Capital Equipment Inventory (Department), 1990.
77. Graduate Affairs Committee (Department), 1990.
78. Director of Shop Staff (Department), 1990.
79. Computer Advisory Committee (Department), 1990.
80. Subcommittee on Undergraduate Design (Department), 1991.
81. Capital Equipment Inventory (Department), 1991.
82. Graduate Affairs Committee (Department), 1991.

83. Director of Shop Staff (Department), 1991.
84. Computer Advisory Committee (Department), 1991.
85. Governance Committee (College), 1992.
86. Capital Equipment Inventory (Department), 1992.
87. Graduate Affairs Committee (Department), 1992.
88. Subcommittee on Undergraduate Design (Department), 1992.
89. Director of Shop Staff (Department), 1992.
90. Computer Advisory Committee (Department, chair), 1992.
91. Graduate and Professional Studies Council (University), 1992.
92. Personnel Council (Department), 1992.
93. Graduate Affairs Committee (Department), 1993.
94. Governance Committee (College), 1993.
95. Director of Shop Staff (Department), 1993.
96. Graduate Affairs Committee (Department, chair), 1993.
97. Graduate Standard Committee (College), 1993.
98. Director of Graduate Studies (Department), 1993.
99. Computer Advisory Committee (Department, chair), 1993.
100. Personnel Council (Department), 1993.
101. Graduate and Professional Studies Council (University), 1993.
102. Governance Committee (College), 1994.
103. Graduate Standard Committee (College), 1994.
104. Graduate Affairs Committee (Department, chair ), 1994.
105. Director of Shop Staff (Department), 1994.

106. Director of Graduate Studies (Department), 1994.
107. Graduate and Professional Studies Council (University), 1994.
108. Computer Advisory Committee (Department, chair), 1994.
109. Governance Committee (College), 1995.
110. Graduate Standard Committee (College), 1995.
111. Graduate Affairs Committee (Department, chair), 1995.
112. Director of Shop Staff (Department), 1995.
113. Director of Graduate Studies (Department), 1995.
114. Computer Advisory Committee (Department), 1995.
115. Graduate and Professional Studies Council (University), 1995.
116. Director of Shop Staff (Department), 1996.
117. Graduate Affairs Committee (Department), 1996.
118. Computer Advisory Committee (Department), 1996.
119. Thermal-Fluids Curriculum Committee (Department), 1997.
120. Computer Committee (Department), 1997.
121. Graduate Affairs Committee (Department), 1997.
122. Laboratory Safety Committee (Department, chair), 1997.
123. Director of Shop Staff (Department), 1997.
124. Computer Advisory Committee (Department), 1997.
125. Graduate Affairs Committee (Department), 1998.
126. Laboratory Safety Committee (Department, chair), 1998.
127. Thermal-Fluids Curriculum Committee (Department), 1998.
128. Computer Committee (Department), 1998.
129. Director of Shop Staff (Department), 1998.

130. Computer Advisory Committee (Department), 1998.
131. Thermal-Fluids Curriculum Committee (Department), 1999.
132. Computer Committee (Department), 1999.
133. Director of Shop Staff (Department), 1999.
134. Computer Advisory Committee (Department), 1999.
135. Laboratory Sequence Review Committee (Department, chair), 2000.
136. Thermal-Fluids Curriculum Committee (Department), 2000.
137. Computer Committee (Department), 2000.
138. Director of Shop Staff (Department), 2000.
139. Computer Advisory Committee (Department), 2000.
140. Faculty Senate (University), 2001.
141. Laboratory Sequence Review Committee (Department, chair), 2001.
142. Thermal-Fluids Curriculum Committee (Department), 2001.
143. Computer Committee (Department), 2001.
144. Director of Electronics Shop Staff (Department), 2001.
145. Educational Policies and Student Affairs Committee (University), 2001.
146. Computer Advisory Committee (Department), 2001.
147. Laboratory Sequence Review Committee (Department, chair), 2002.
148. Thermal-Fluids Curriculum Committee (Department), 2002.
149. Faculty Senate (University), 2002.
150. Faculty Affairs Committee (University), 2002.
151. Director of Electronics Shop Staff (Department), 2002.
152. Computer Committee (Department), 2002.

153. Computer Advisory Committee (Department), 2002.
154. Faculty Affairs Committee (University), 2003.
155. Faculty Senate (University), 2003.
156. Director of Electronics Shop Staff (Department), 2003.
157. Faculty Senate Budget and Facilities Committee (University), 2004.
158. Faculty Senate (University), 2004.
159. Design Sequence Review Committee (Department), 2004.
160. Director of Electronics Shop Staff (Department), 2004.
161. Faculty Senate Committee on Committees (University), 2005.
162. ABET committee, (Department), 2006.
163. ABET committee, (Department), 2007.
164. ABET committee, (Department), 2008.
165. Effective Instruction Committee (College), 2008.
166. Effective Instruction Committee (College), Chair, 2009.

#### Professional Service

1. Engineers Council of Houston (UH counselor), 1975.
2. Technical Reviewer for ASME, AIAA, J. of Fluid Mechanics, McGraw Hill, Springer Verlag.
3. NSF Fluid Mechanics Equipment Proposal Review Panel, 1987.
4. Computer Networking, Lamar Sr High, 1991-1992.
5. Session Chair (2 sessions), 1992 Joint ASME-JSES-KSES International Solar Energy Conference, April, 1992.
6. Session Chair, 1993 Joint ASME-JSES-KSES International Solar Energy Conference, April, 1993.

7. Session Chair, 3rd International Conference Progress in Solar Ponds, May 1993.
8. Session Chair, 1994 ASME/ISEC Conference.
9. Reviewer, John Wiley & Sons, Inc., 1994.
10. Session Chair, 1995 Joint ASME-JSES-KSES International Solar Energy Conference, March, 1995.
11. Chair of the Technical Committee on Solar Ponds and OTEC of the Solar Energy Division of ASME, 1995-1998.
12. Session Co-Chair, 1996 ASME/ISEC Conference, Solar Ponds and OTEC session.
13. Session Chair, 1997 ASME/ISEC Conference, Solar Ponds and OTEC session.
14. Organizer and Moderator of the Preston Lowrey Memorial Session for the Solar Energy Division of ASME, 1997.
15. ASEE Selection Committee for Fluke Award for Excellence in Laboratory Teaching, 1996.
16. ASEE Selection Committee for Fluke Award for Excellence in Laboratory Teaching, 1997.
17. Session Chair, 1998 ASME/ISEC Conference, Solar Ponds and OTEC session.
18. New Member Executive Committee, Solar Energy Division, ASME, 1998-1999.
19. Technical Program Chair, 1999 ASME International Solar Energy Conference.
20. Technical Editor for Testing and Measurements, ASME Journal of Solar Energy Engineering, 1998-2001.
21. Session Chair, 2000 ASME/ISEC Conference, Solar Ponds and OTEC session.
22. Member Energy Resources Board ASME, 2000-2002.
23. Secretary/Treasurer Solar Energy Division, ASME, 1999-2000.
24. Vice Chair Solar Energy Division, ASME, 2000-2001.
25. General Program Chair ASME Solar Energy Division for IMECE 2000, 1999-2000.
26. General Program Chair ASME for 2001 Solar Energy Forum, joint ASME/ASES conference, 2000-2001.

27. Chair Solar Energy Division, ASME, 2001-2002.
28. Past Chair Solar Energy Division, ASME, 2002-2003.
29. Executive Committee Solar Energy Division, ASME, 1998-2003.
30. Solar Energy Division representative to Energy Resources Board ASME, 2000-2002.
31. Solar Energy Division representative to ASME/TEC, 1998-2002.
32. Reviewer Physics of Fluids
33. Reviewer, Biotechnology and Bioengineering
34. Reviewer, ASME Journal of Solar Energy Engineering
35. Reviewer, ASME Journal of Biomedical Engineering
36. Reviewer, Energy, Journal of the ISES

## **CONSULTING ACTIVITIES**

Applied Acoustics Corp., Predicted noise generated by vented steam lines for Shell Research Facility, 1975.

Digicon Corp., Turbulence Measurements and Design, 1976.

Dodge Products, Evaluation of Solar Meter, 1977.

Bettis Corporation, Design Assistance of a new product line of fluid valve actuators, 1977.

Dodge Products, Performance Degradation Tests of Solar Cells, 1978.

Hydril Corp., Evaluation of 'low loss' pipe joint using birefringent fluid visualization, 1981.

Universities Space Research Association, Evaluation of the HFB-S Bioreactor, 2001-2003.

USRA Multiple Modular Rotating Bioreactor (MMRB) project for International Space Station Biotechnology Facility, 2003 - 2004.

USRA Automated Static Culture System (ASCS) project for International Space Station Biotechnology Facility, 2003 - 2004.

USRA support for Technical Information Meeting (TIM) on the Light Microscope Module (LMM) for the International Space Station Biotechnology Facility, 2003 - 2005.

Endothelix, Inc., Development of Digital Thermal Monitoring, 2006-present.