

J. Michael McCarthy
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Professor
Department of Mechanical and Aerospace Engineering
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Education

9/75 - 6/79 Stanford University, Stanford, CA, Ph.D. Mechanical Engineering
9/74 - 6/75 Stanford University, M.S. Mechanical Engineering
9/70 - 6/74 Loyola Marymount University, Los Angeles, CA, B.S. Mechanical Engineering

Experience

7/2009-present Professor, Step VII, Department of Mechanical and Aerospace Engineering. The Henry Samueli School of Engineering, University of California, Irvine.
12/2007-present Founding Editor, *ASME Journal of Mechanisms and Robotics*—Responsible for managing the review and production process for the journal for ASME International, the professional society for mechanical engineers.
7/2006-present Henry Samueli Chair and Director, Center for Engineering Science in Design—School of Engineering center supporting team-based extramural projects to promote engineering leadership.
12/2002-12/2007 Editor, *ASME Journal of Mechanical Design*—Responsible for managing the review and production process for the journal. During this time the journal grew from 900 to 1400 pages, from quarterly to monthly, and from an impact factor of 0.27 to 1.24.
1/2001-6/2002 Chief Technical Officer, Accuray Incorporated, Sunnyvale, CA. Reported to Dr. John Adler, CEO (Dept of Neurosurgery, Stanford University)—responsible for 25 hardware, software and field service engineers focused on the transition of the CyberKnife image-guided robotic radiosurgery system to a commercial product.
7/92-6/2006 Professor, Department of Mechanical and Aerospace Engineering. The Henry Samueli School of Engineering, University of California, Irvine.
9/92-12/92 Visiting Professor, Department of Mechanical Engineering, Massachusetts Institute of Technology, Prof. Steve Dubowsky, host.
7/91-6/92 Associate Dean for Undergraduate Studies, School of Engineering--Responsible for admissions, probation, disqualification, and curriculum planning, scheduling, and advising for all Engineering undergraduates.
7/89-6/91 Undergraduate Advisor, Department of Mechanical Engineering--Responsible for organizing and scheduling the Mechanical Engineering undergraduate program, and for recruiting students and monitoring their progress.
7/88-6/92 Associate Professor in the Department of Mechanical Engineering--Research in the mechanical design of manipulators and manipulator systems and mathematical methods for spatial mechanism synthesis.
7/86-7/88 Assistant Professor in the Department of Mechanical Engineering at the University of California, Irvine. Adjunct Assistant Professor in the Department of Mechanical Engineering and Applied Mechanics at the University of Pennsylvania, Phila., PA.
1/83-6/86 Assistant Professor in the Department of Mechanical Engineering and Applied Mechanics at the University of Pennsylvania, with a Secondary Appointment in the Computer and Information Sciences Department, Dr. J. Bordogna, Dean, Dr. M. Lesser, Chairman (MEAM), Dr. Ruzena Bajcsy, Chairman (CIS)--Research and teaching in mechanism design and automation. Joint research with C.I.S. Department in robotics and computer graphics.
9/80 - 12/82 Assistant Professor in the Department of Mechanical Engineering at Loyola Marymount University, Los Angeles, CA., Prof. J. Callinan, Dean--Undergraduate and Masters level teaching with special projects in robotics and computer graphics; designed and supervised the microcomputer based computer-aided engineering laboratory.
8/79 - 9/80 Senior Engineer in the Applied Mechanics Group, Central Engineering Laboratories of FMC Corp., 1185 Coleman Ave., Santa Clara, CA., Dr. J. Wiederrich, supervisor--Provided

mechanical design consulting support to FMC divisions, performed experimental vibration and modal analysis studies.

Honors and Awards

- 2010 Certified Visiting Professor (2010-2015), Beijing University of Posts and Telecommunications. Award ceremony, July 26, 2010.
- 2010 Teaching Excellence in Undergraduate Engineering for the Henry Samueli School of Engineering, awarded by the UCI Division of Undergraduate Education at the UCI Celebration of Teaching event, May 27, 2010.
- 2010 Mechanical and Aerospace Engineering Professor of the Year, voted by MAE students.
- 2009 ASME Machine Design Award. The Machine Design Award recognizes eminent achievement or distinguished service in the field of machine design, which is considered to include application, research, development, or teaching of machine design.
(http://www.asme.org/Governance/Honors/SocietyAwards/Machine_Design_Award.cfm)
- 2009 Henry Samueli School of Engineering Fariborz Maseeh Best Teaching Award.
(<http://www.eng.uci.edu/news/2009/7/outstanding-engineering-professors-honored-fariborz-maseeh-best-research-and-teaching-aw>)
- 2009 Springer *Handbook on Robotics* awarded two PROSE Awards by the American Association of Publishers, Professional and Scholarly Publishing Division. Awards for Excellence in Physical Sciences & Mathematics, and for Excellence in Engineering & Technology.
- 2008 ASME Outstanding Service Award, awarded by the ASME Design Engineering Division for service as the Editor of the ASME Journal of Mechanical Design.
- 2008 Outstanding Engineering Educator Award, Orange County Engineering Council.
- 2007 Outstanding Engineering Professor, voted by the senior class, organized by the UCI Yearbook.
- 2005 Advisor Participation Award, UCI Dean of Students.
- 2005 Best Paper Award, 2005 ASME Mechanisms and Robotics Conference, "Synthesis of Compliant Mechanisms with Specified Equilibrium Positions," with H. Su, J. Vance.
- 2003 Elected to Senior Member of the Institute of Electrical and Electronics Engineers (IEEE), Robotics Society.
- 2002 MDI Best Paper Award, 2002 ASME Design Engineering Technical Conferences. "An Extensible Java Applet for Spatial Linkage Synthesis," with H. Su, C. Collins.
- 2001 Elected Fellow, American Society of Mechanical Engineers
- 1999 Faculty Speaker for the UCI Honors Convocation.
- 1999 Award Winner, PVA Student Design Competition, "A Wheelchair based Mounting System for Automated Positioning of an Electronic Augmentative Communication Device," D. A. Ruth, RESNA'99, June 29, 1999, Long Beach, CA.
- 1997 MAE Professor of the Year, voted by students.
- 1993 AMR Unique Contribution Award for contributions to the growth of the science of applied mechanisms and robotics.
- 1990 School of Engineering, Outstanding University Service Award.

Service Activities

- Associate Editor, Chinese Journal of Mechanical Engineering (English Edition), August 2010-present.
- Chair, Board of Governors, Southern California Section, SAE International, 2010-2011.
- Chair, Board of Governors, Southern California Section, SAE International, 2009-2010. Organized the Future Vehicle Technologies lecture series: Presentations by Quantum Technologies (Walter Dubno, September 28, 2009, UCI), Honda (Ryan Harty, October 26, 2009, UCI), Mazda (Tod Kaneko, November 23, 2009, UCI), AC Propulsion (Thomas Gage) and US Hybrid (Abas Goodarzi, February 24, 2010, CSUF), General Motors (Mark Korich, March 24, 2010, CSUF), Toyota (Justin Ward, April 28, 2010, CSUF)
- Secretary, Department of Mechanical and Aerospace Engineering, 2009-present. Prepared minutes for Departmental faculty meetings.
- Secretary, School of Engineering Faculty, Member of the Executive Committee. 2008-2010. Prepared minutes for School of Engineering Executive Committee Meetings.
- Editor (founding), ASME Journal of Mechanisms and Robotics, 2008-present.
- MAE Senior Project Coordinator, 2005-present
- Faculty Advisor:
ASME student club, 2003-present

Pi Tau Sigma, Mechanical Engineering Honor Society, 2003-present
 MAE, Undergraduate Studies Committee, 2003-2009.
 Editor, ASME Journal of Mechanical Design, 2003-2008, impact factor: 0.268 (2002), 1.103 (2007)
 Member Board of Editors, American Society of Mechanical Engineers. 2003-present.
 Associate Editor *Journal of Robotics Systems*, 1993 to 2005.
 Chair, Honors and Awards Subcommittee, ASME Mechanisms Committee 1998-2000.
 General Conference Chair for ASME Design Engineering Technical Conferences and Computers in Engineering. August 18-21, 1996
 Conference Chair, Mechanism Conference August 18-21, 1996.
 Chair, Mechanisms Committee, ASME Design Engineering Division 1994-1998.
 Chair, Mechanisms Committee, ASME Design Engineering Division 1994-1996
 Member, Mechanisms Committee, ASME Design Engineering Division 1988-1992.
 Invited participant NSF-ASME Workshop on Research Needs in Machine Dynamics, Denver, CO, August 10-13, 1986.
 Associate Editor, *ASME Journal of Mechanical Design*, 1989-1993 (previously *ASME Journal of Mechanisms, Transmissions, and Automation in Design*)
 Host, L.A. Area Robotics and Automation Symposium, November 18, 1994. 80 attendees.
 Chartered Review Panel Member, National Science Foundation, 1991
 Paper Review Chairman, 1990 ASME Mechanisms Conference
 Member Program Committee for 1989 IEEE Robotics and Automation Conference

Ph. D. Students:

1. Qiaode (Jeff) Ge, "Kinematic Constraints as Algebraic Manifolds in the Clifford Algebra of Three Dimensional Projective Space," Department of Mechanical Engineering, UCI, June 1990. (Assoc. Prof., State University of New York, Stony Brook)
2. R. Mohan C. Bodduluri, "The Design and Planned Movement of Multi Degree of Freedom Closed Kinematic Chains," Department of Mechanical Engineering, UCI, August 1990. (Co-founder, Vice President for Research & Development, Restoration Robotics, Inc., Sunnyvale, CA.)
3. John R. Dooley, "Dynamic Analysis of Spatial Mechanisms Using Dual Quaternion Coordinates," Department of Mechanical Engineering, UCI, January ,1993. (Research Scientist, Accuray, Inc., Sunnyvale, CA.)
4. Pierre Larochelle, "Design of Cooperating Robots and Spatial Mechanisms," Department of Mechanical Engineering, UCI, June 1994. (Assoc. Prof., Florida Institute of Technology, Melbourne, FL).
5. Andrew Murray, "Global Properties of Constraint Manifolds in the Kinematic Synthesis of Closed Chains," Department of Mechanical Engineering, UCI, June 1996 (Assoc. Prof., University of Dayton, Dayton, OH).
6. Fangli Hao, "A Geometric Approach to the Singularity Analysis of In-Parallel Robot Manipulators," Department of Mechanical Engineering, UCI, June 1996. (Research scientist, Lam Research Corp.)
7. Bernard Soriano, "A Biomechanical Investigation of Human Movement during the Golf Swing," Department of Mechanical Engineering, UCI, August 1996. (Science Advisor, California Governor Pete Wilson.)
8. Curtis Collins, "Singularity Analysis and Design of Parallel Manipulators"-- Department of Mechanical Engineering, UCI, August 1997. (Research Scientist, Jet Propulsion Laboratory, Lecturer, California Institute of Technology.)
9. Alba Perez, "Dual Quaternion Synthesis of Constrained Robotic Systems," Department of Mechanical Engineering, UCI, September 2003. (Assistant Professor, Idaho State University)
10. Haijun Su, "Computer-Aided Constrained Robot Design Using Mechanism Synthesis Theory." Department of Mechanical Engineering, UCI, July 2004. (Assistant Professor, University of Maryland, Baltimore Campus.)
11. Nina Robson, "Synthesis of Spatial Serial Chains to Match Acceleration Constraints," Department of Mechanical Engineering, UCI, September 2008. (Assistant Professor, Texas A&M University)
12. GimSong Soh, "Complex Mechanism Design by Constraint of Robotic Systems," Department of Mechanical Engineering, UCI, December 2008.

Master's of Science Students: **University of Pennsylvania:**

1. D. Carmel, "The Mechanical Design of the Pennsylvania Anthropomorphic Robotic Manipulator - A Seven Degree of Freedom Kinematically Anthropomorphic Robot," May 1984.
2. A. Gillett, "Kinematic and Dynamics Analysis of an Anthropomorphic Manipulator," August 1984.
3. W. Holzmann, "On Grasping a General Solid Object with a Multi-Fingered Mechanical Hand," December 1984.
4. E. Donskoy, "The Mechanical Design of a High Speed Robotic Electronic Component Insertion System," September 1986.
5. Qiaode Ge, "The Kinematic Geometry of the Hypersphere as an Image Space of Rotational Motion," September 1986.
6. Scott Leaver, "The Mechanical Design of a Three Jointed Two-degree-of-freedom Robot Fingers," September 1986.
7. Mohan Bodduluri, "The Design of Spherical Four Bar Linkages Using Interactive Computer Graphics," September 1986.
8. S. Mantha, "The Synthesis of Four Bar Linkages using Kinematic Mapping," December 1986.

University of California, Irvine:

9. Y. M. Tsai (M. S. Engineering), "The Workspace of Two Adjacent Planar Manipulators, One with One Link, Another with Two Links, Holding an Object of One Dimension" March 1988.
10. Dawn T. Duerre (M. S. Engineering), "Compliance Control of Robotic Fingers," August 1989.
11. Frank Ma (M. S. Engineering), "The Design of a Four Fingered Mechanical Hand," December 1989.
12. John R. Dooley (M. S. Engineering), "Analysis of Mechanisms in the Image Space of Planar Displacements," June 1990.
13. Kevin Quirk (M. S. Engineering), "Symbolic Model Derivation and Trajectory Generation for the UCI Robotic Finger System," December 1990.
14. Tony Wu (M. S. Engineering), "Computer Aided Design of Planar and Spherical 4R Linkages with an Added Driving Dyad," May 1991.
15. Pierre Larochelle (M. S. Engineering), "Maximizing Payload for Cooperating Robot Systems using Time-Optimal Control"--August 1991.
16. Philip Wong (M. S. Engineering), "System Integration and Control of the UCI Three Fingered Mechanical Hand,"--December 1991.
17. Andrew Murray (M. S. Engineering), "Central Axis and Circling Axis Congruences as Projections of the Constraint Manifold of the Complementary Screw Quadrilateral,"--March 1993.
18. Dore C. Mark (M. S. Engineering), "Spherical Linkage Classification and Singularity Analysis"--December 1993
19. Chris Muller (M. S. Mechanical Engineering), "Static Analysis and Deflections of Spherical 4R Linkages."--March 1996.
20. Karl Etzel (M. S. Mechanical Engineering), "Biquaternion Theory and Applications to Spatial Motion Analysis."--March 1996.
21. Da-Yu Chang, (M. S. Mechanical Engineering), "Kinematic and Static Analysis of 4C Spatial Mechanism,"--August 1998.
22. Lance Kwock (M.S. Mechanical Engineering), "Four Position Synthesis Algorithm for 4C Mechanisms,"--February 1999.
23. Alba Perez (M.S. Mechanical Engineering), "The Analysis and Synthesis of Bennett Linkages,"--March 1999.
24. Shawn Ahlers (M.S. Engineering), "Motion Interpolation using Double Quaternions," May 2000.
25. Jeong Wu Kim, (M.S. Engineering), "Geometric Design of Bicycle Linkage Suspensions." June 2006.
26. Gim Song Soh, (M.S. Engineering), "Analysis and Design of Complex Planar Mechanisms." September 2006.
27. Jerome Choe, (M.S. Engineering), "Driving linkages for deployable planar and spherical articulated systems," January 2010.

Post-Doctoral Researchers

Gregory Long, 1990-1991, Ph.D., University of Pennsylvania, UC President's Fellow.
 Pierre Larochelle, 1994, Ph.D., University of California, Irvine
 Gregory Long, 1997, President, Reflex Technologies.
 Curtis Collins, 2002, Assistant Researcher, III.
 Alba Perez, 2003-2004, Assistant Researcher, I.
 HaiJun Su, 2004, Assistant Researcher, I.

GimSong Soh, 2009, Assistant Researcher, I.

Visiting Scholars

Chuen Sen Lin, Summer 1989, Asst. Prof., Dept. of Mechanical Engineering, Calif. State Univ., Fullerton.
 Peter Dietmeier, 1991-1992, Professor, Technical University of Graz, Austria.
 Warren Seering, 1994-1995, Professor, Dept. of Mechanical Engineering, MIT.
 Pierre Dauchez, 1995-1996, Professor, University of Montpellier, and Research Scientist LIRMM
 Francois Pierrot, 1995-1996, Research Scientist LIRMM
 Qizheng Liao, 1997, Professor, Beijing University of Posts and Telecommunications.
 Thomas Chase, 1998, Professor, University of Minnesota.
 Narcis Gascons, 2001, Assistant Professor, University of Girona.
 Duanling Li, 2008-2009, Lecturer, Beijing University of Posts and Telecommunications.

Research Grants

University of Pennsylvania:

Spatial Rigid Motion and the Curvature Theory of Line Trajectories--National Science Foundation 1984-1985, \$71,000, awarded May 1984 (duration 12 mon.).
 Advanced Computation and Graphics Workstation (with J. Bassani, H. Bau, M. Nansteel, and B. Paul, MEAM)--National Science Foundation, \$45,000, awarded Sept. 1984 (duration 12 mon.).
 Advanced Actuator/Sensor/Control System for Robotic Applications (with S. Goldwasser, CIS University of Pennsylvania, and A. Guez, Drexel University, and Clifton Precision Co.)--Ben Franklin Partnership (State of Pennsylvania), \$70,000, awarded Sept. 1984 (duration 12 mon.).
 The Design of a Flexible Electronic Assembly Station--Burroughs Advanced Manufacturing Technology Center (with Prof. R. Paul, CIS), Ben Franklin Partnership (State of Pennsylvania), \$88,000, awarded Sept. 1985 (duration 12 mon.).
 A Formal Methodology for the Graphical Synthesis of Spatial Mechanisms (with Prof. N. Badler, CIS Dept., University of Pennsylvania)--National Science Foundation, \$152,900, awarded January 1986 (duration 24 mon.).
 Artificial Intelligence for the Mechanical Design of Injection Molded Parts (with Prof. T. Finan, CIS Dept., University of Pennsylvania)--Scott Paper Co., \$85,000, February 1986 (duration 12 mon.).

University of California, Irvine:

Mathematical Foundation for a Design Methodology based on Kinematic Mappings--National Science Foundation, \$130,000, awarded June 1986 (duration 24 mon.)
 Analytical and Experimental Investigation of Coordinated Manipulation in Mechanical Hands--UCI Faculty Research Fellowship, \$4000, awarded Sept. 1986.
 The Analysis of Cooperating Manipulators in the Configuration Manifold of the Workpiece--National Science Foundation, \$156,504, awarded May 1988 (duration 24 mon).
 The Geometric Representation of Functional Constraints Using Clifford Algebras--National Science Foundation, \$30,000, awarded September 1989 (duration 12 mon).
 Supplement to the "Analysis of Cooperating Manipulators in the Configuration Space of the Workpiece"--National Science Foundation, \$34,000, awarded May 1990 (duration 6 mon).
 Motion Optimization and Design of Closed Chain Robotic Systems--National Science Foundation, \$217,000, w. James Bobrow, awarded Jan. 1991 (duration 36 mon.)
 Interactive Design of Single and Multi-degree of Freedom Spatial Mechanisms--National Science Foundation, \$120,000, awarded June 1991 (24 mon.)
 Telerobotics and Automation in Clean-up of Potentially Hazardous Materials--UC Davis/Caltrans, Advanced Highway Maintenance Technology Program, \$46,000, w. Gregory Long, awarded August 1991, (12 mon.).
 Advances in the Design of Spatial Mechanisms for New Products and Processes--National Science Foundation, \$269,000 awarded January 1994 (36 mon.).
 Task-Driven Design of Robotic Mechanisms--National Science Foundation, \$156,000, co-PI with J. E. Bobrow, Frank Park (P.I.), awarded March 1994 (36 mon.)
 Engineering Design in Industry Internship:
 Spring 94: Printronix, Co. \$3500.
 Engineering Design Research
 Summer 94: Unisen, Corp., \$3600.

Virtual Reality Environment for Spherical Mechanism Design--National Science Foundation, Subcontract through Iowa State University, \$8600 (24 mon.).

Design Task Specification using Hyperspherical Motion Interpolation--National Science Foundation, \$210,000 awarded April 1997 (36 mon.).

Research Experience for Undergraduates--National Science Foundation with grant "Virtual Reality Environment for Spherical Mechanism Design," \$5000, Summer 1997.

Acquisition of Equipment for a Virtual Reality Laboratory for Vision, Visuomotor and Synthetic Environment Research--National Science Foundation, \$335,000 Equipment Grant, co-PI with M. D'Zmura (PI) and others from the Dept. of Cognitive Sciences, UCI.

Spatial Linkage CAD Primitives for the Mechanical Inventor (9900391)--National Science Foundation, \$273,000 awarded Sept 1999 (36 mon.).

Management of Design Innovation--Image-guided Robotic Radiosurgery, Accuray, Inc., \$30,000, January-March 2001

Management of Design Innovation---Image-guided Robotic Radiosurgery, Accuray, Inc., \$30,000, September-December 2001

Management of Design Innovation---Image-guided Robotic Radiosurgery, Accuray, Inc., \$30,000, January-March 2002

An Extensible Architecture for the Synthesis of Constrained Robotic Systems (0218285)--National Science Foundation, \$306,000 awarded July 2002 (36 mon.).

Morphing Wing Project---Next Gen Aeronautics, Inc. \$36,000, June 2003-November 2004.

Computing Configuration Manifolds for the Synthesis of Spatial Serial Chains (0456213)--National Science Foundation, \$300,000 awarded June 2005 (36 mon.). \$40,000 supplement awarded October 2007.

Robot Failure Recovery Planning---University Affiliated Research Center (UARC) NAS2-03144. \$38,297 August 2005, (13 mon).

Geometric Synthesis of Articulated Systems (0758359)--National Science Foundation, \$340,000 awarded August 2008 (36 mon.).

Instructional Grants

13 Apple Mac IIcx workstations for the Mechanical Engineering Computer Aided Engineering Laboratory--Apple Computer Co., \$124,000, UCI Matching Grant \$20,000 (with J. E. Bobrow and D. Dunn-Rankin) 1989.

Engineering Design in Industry (with J. E. Bobrow, and D. Dunn-Rankin):

- Winter 94: McDonnell-Douglas, Steelcase, Inc. and Printronix, \$6000,
- Spring 94: Lumenyte, Corp., Tektrix, Co., and Texceed, Inc., \$6000.
- Fall 94: Texeed, Printronix, Balseal Eng., Odetics, STI Inc., \$14,000.
- Winter 95: Balseal Eng., Baxter Healthcare, STI Inc., Ceromet, Inc. \$12,000
- Spring 95: Balseal Eng., Baxter Healthcare, Shutt Medical Co., Packard-Hughes, \$12,000

Southern California Coalition for Education in Manufacturing Engineering (SCCEME), w. J. Bobrow, D. Dunn-Rankin, K. Mease--\$70,000 for 12 months.

Engineering Design in Industry (with J. E. Bobrow, K. Mease and D. Dunn-Rankin):

- Fall 1995, \$30,000 support from a consortium of 10 companies.
- Fall 1996, \$3,000, Anaheim Manufacturing Co.
- Spring 1997, \$9,000 from Lumenyte, Inc, Foam Pro Mfg., ASP, Inc.
- Fall 1997, \$3000, Knowledge Research, Inc.

Engineering Design in Industry (with D. Dunn-Rankin):

- Spring 1998, \$9000, Toshiba, Inc., Parker Aerospace Inc., Pacific Press.
- Fall 1998, \$3000, MicroMotors, Inc.
- Winter 1999, \$7000, Packard-Hughes Interconnect.
- Spring 1999, \$10,000, Orthodyne, Inc., Road and Track Mag., UCI IRU in Grav. Biology
- Fall 1999, \$7000, Toshiba Information Systems, New Hair Institute
- Winter 2000, \$7000, Parker Aerospace, Eaton Inc.
- Spring 2000, \$7000, Cherry Textron, Inc., Edwards Lifesciences, Inc.
- Fall 2000, \$3500, Packard-Hughes Interconnect.
- Spring 2002, \$3500, private inventor.
- Fall 2002, \$3500, Driessen Aerospace.

PUBLICATIONS:**Patents**

Patent No. 4,865,376 Sept. 12, 1989, Mechanical Fingers for Dexterity and Grasping, S.O. Leaver and J. M. McCarthy, inventors.

Books

1. J. M. McCarthy (Editor), *Kinematics of Robot Manipulators*, MIT Press, Cambridge, MA, 1987, (reprint of IJRR 5:2.)
2. J. M. McCarthy, *An Introduction to Theoretical Kinematics*, MIT Press, Cambridge, MA, 1990.
3. J. M. McCarthy, *Geometric Design of Linkages*, (Interdisciplinary Applied Mathematics Series), Springer-Verlag, New York, 2000.
4. J. M. McCarthy and G. S. Soh, *Geometric Design of Linkages 2nd Edition*, (Interdisciplinary Applied Mathematics Series), Springer-Verlag, New York, 2010 (in print).

Book Chapters

1. J. M. McCarthy and R. M. C. Bodduluri, "A Bibliography on Robot Kinematics, Workspace Analysis, and Path Planning," *Robotics Review 1*, edited by O. Khatib, pp. 267-281, MIT Press, 1990
2. J. M. McCarthy and K. J. Waldron, "Chapter 5: Analysis and Synthesis of Spatial Mechanisms," *Forty Years of Modern Kinematics: A Tribute to Ferdinand Freudenstein*, edited by A. G. Erdman, John Wiley, 1993
3. R. M. C. Bodduluri, Q. J. Ge, J. M. McCarthy and B. Roth, "5.4: The Synthesis of Spatial Linkages," *Forty Years of Modern Kinematics: A Tribute to Ferdinand Freudenstein*, edited by A. G. Erdman, John Wiley, 1993.
4. J. M. McCarthy, "4.6: Dual Quaternions and the Pole Triangle," *Forty Years of Modern Kinematics: A Tribute to Ferdinand Freudenstein*, edited by A. G. Erdman, John Wiley, 1993.
5. J. M. McCarthy and G. L. Long, "20: Linkages and Cams," *The Engineering Handbook*, edited by R. C. Dorf, pp. 203-209, CRC Press, 1995.
6. D. A. Ruth and J. M. McCarthy, "The Design of Spherical 4R Linkages for Four Specified Orientations," *Computational Methods in Mechanisms*, (J. Angeles, and E. Zakhariyev, eds.), Springer-Verlag, 1998.
7. S. G. Ahlers and J. M. McCarthy, "The Clifford Algebra of Double Quaternions and the Optimization of TS Robot Design," *Applications of Clifford Algebras in Computer Science and Engineering*, (E. Bayro and G. Sobczyk, editors), Birkhauser, 2000.
8. J. M. McCarthy and Leo Joskowicz, "Kinematic Synthesis," *Formal Engineering Design Synthesis*, (J. Cagan and E. Antonson, eds.), Cambridge Univ. Press 2002.
9. J. M. McCarthy and G. L. Long, "20: Linkages and Cams," *The Engineering Handbook*, 2nd edition edited by R. C. Dorf, CRC Press, 20:1-8, 2004
10. J. M. McCarthy and Hai-Jun Su, "The Computation of Reachable Surfaces for a Specified Set of Spatial Displacements," In: E. Bayro, ed., *Handbook of Computational Geometry for Pattern Recognition, Computer Vision, Neurocomputing and Robotics*, Springer Verlag, 2005.
11. Victor Scheinman and J. M. McCarthy, "Chapter 3: Mechanisms and Actuation," In B. Siciliano and O. Khatib, ed. *Robotics Handbook*, Springer Verlag, 2008.

Editor:

- J. M. McCarthy, Guest Editor, *International Journal of Robotics Research*, Vol. 5, No. 2, June 1986, special issue featuring the Kinematics of Manipulators.
- J. M. McCarthy (with S. Derby and A. Pisano) *Proceedings of the 1990 ASME Design Technical Conferences: DE-Vol. 24, Flexible Mechanism, Dynamics, and Robot Trajectories*, DE-Vol. 25, *Mechanism Synthesis and Analysis*, and DE-Vol 26, *Cams, Gears, and Robot and Mechanism Design*.
- J. M. McCarthy (with F. Park), Guest Editor, *J. of Robotics Systems*, special issue "Perspectives in Robotics," June 1995.
- S. Azarm, D. Dutta, H. Eschenauer, B. Gilmore, M. McCarthy, M. Yoshimura, editors, *Advances in Design Automation, Proceedings of the 1995 Design Engineering Technical Conferences*, Sept. 17-20, 1995, Boston, MA.

- J. M. McCarthy, editor, *CD-ROM Proceedings of the ASME 1996 Design Engineering Technical Conferences and Computers in Engineering Conference*, August 18-22, 1996, Irvine, CA.
- J. M. McCarthy, editor, *Abstracts of the ASME 1996 Design Engineering Technical Conferences and Computers in Engineering Conference*, August 18-22, 1996, Irvine, CA.
- J. M. McCarthy, editor, *CD-ROM Proceedings of the Celebratory Symposium for Bernard Roth*, June 20-21, 2003, Stanford, CA.

Software

- Sphinx, 0.4*, (June 1993). Interactive graphics system for the design of spherical 4R mechanisms.
Developed using several NSF research grants and distributed free to research institutions to promote design of spatial mechanisms. **Universities:** MIT, Boston Univ., Purdue Univ., Notre Dame Univ., Univ. of Minn., Univ. of Florida, Univ. of Wisconsin, Milwaukee. **Industry:** John Deere, Inc.
- Sphinx, 1.0*, (September 1994). Interactive graphics system for the design of spherical 4R mechanisms (a detailed revision of version 0.4) distributed to attendees of the "Design of Spatial Mechanisms" Tutorial. September 10, 1994, ASME Design Technical Conferences, Minneapolis, MN. Sponsored by the ASME Mechanisms Committee.
- SphinxPC 96* (August 1996). Windows95 based C++ and OpenGL version of Sphinx 1.0 with the added capability to design planar 4R linkages. Distributed to over 50 university and industrial researchers.
- SphinxPC 97* (March 1997). A revision of SphinxPC 96, distributed 30 university and industry researchers. Used by students in ME183, Spring 97. Featured in Mechanical Engineering Magazine "Software Exchange," September 1997.
- SphinxPC AdCap* (August 1998). Latest revision of SphinxPC 97. Used by students in ME183. Distributed free of charge via Internet.
- Synthetica 1.0* (September 2002). Java-based computer aided design system for constrained robotic systems.
- Synthetica 2.0* (September 2004). Design system for constrained robotic systems with expanded synthesis routines including a generic synthesis solver.
- Mechanism Generator* (August 2010). Approved SolidWorks Add-in for the automated generation of solid models for four-bar and six-bar linkages. Collaboration with Alex Arredondo. Distributed on <http://mechanicaldesign101.com>

Book Review

- Review of H. H. Mabie and C. F. Reinholtz, *Mechanisms and Dynamics of Machinery*, Fourth Edition, John Wiley & Sons, New York, NY, 1988, for *Mechanism and Machine Theory*, Vol 23, No. 2, pp. 170.
- Review of D. H. Myszka, *Machines and Mechanisms: Applied Kinematic Analysis*, Prentice-Hall, 1999, for *Applied Mechanics Reviews*.
- Review of Robert L. Norton, *Design of Machinery*, (3rd Ed.) McGraw-Hill, 2004, for the *ASME Journal of Mechanical Design*. September 2003
- Review of John J. Uicker, Gordon R. Pennock, and Joseph E. Shigley, *Theory of Machines and Mechanisms*, (3rd Ed.) Oxford Press, 2003, for the *ASME Journal of Mechanical Design*. September 2003

Refereed Journal Articles

1. J. M. McCarthy and B. Roth, "The Curvature Theory of Line Trajectories in Spatial Kinematics," *ASME Journal of Mechanical Design*, Vol. 103, No. 4, October 1981.
2. J. M. McCarthy and B. Roth, "The Instantaneous Properties of Trajectories Generated by Planar, Spherical and Spatial Rigid Body Motion," *ASME Journal of Mechanical Design*, Vol. 104, No. 1, January 1982.
3. J. M. McCarthy, "Planar and Spatial Rigid Motion as Special Cases of Spherical and 3-Spherical Motion," *ASME Journal of Mechanisms, Transmissions, and Automation in Design*, Vol. 105, No. 3, Sept. 1983, pp. 569-575.
4. W. Holzmann and J. M. McCarthy, "Computing the Friction Forces Associated with a Three-Fingered Grasp," *IEEE Journal of Robotics and Automation*, Vol. RA-1, No. 4, Dec. 1985, pp. 206-210.
5. J. Abel, W. Holzmann and J. M. McCarthy, "On Grasping Planar Objects with Two Articulated Fingers," *IEEE Journal of Robotics and Automation*, Vol. RA-1, No. 4, Dec. 1985, pp. 211-214.

6. J. M. McCarthy, "The Generalization of Line Trajectories in Spatial Kinematics to Trajectories of Great Circles on a Hypersphere," *ASME Journal of Mechanisms, Transmissions, and Automation in Design*, Vol. 108, March 1986, pp. 60-64.
7. J. M. McCarthy and B. Ravani, "Differential Kinematics of Spherical and Spatial Motions Using Kinematic Mapping," *ASME Journal of Applied Mechanics*, Vol. 53, March 1986, pp. 15-22.
8. J. M. McCarthy, "On the Relation Between Kinematic Mappings of Planar and Spherical Displacements," *ASME Journal of Applied Mechanics*, Vol. 53, June 1986, pp. 457-459.
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80. H-J Su and J. M. McCarthy, "Dimensioning a Constrained Parallel Robot to Reach a Set of Task Positions," *Proceedings of the International Conference on Robotics and Automation*, April 18-22, 2005, Barcelona, Spain.
81. N. Robson and J. M. McCarthy, "The Synthesis of Planar 4R Linkage with Three Task positions and Two Specified Velocities," *Proceedings of the ASME International Design Engineering Technical Conferences*, September 25-28, 2005.

82. H. P. Schrocker, M. L. Husty and J. M. McCarthy, "Kinematic Mapping-based Evaluation of Assembly Modes for Planar Four-bar Synthesis," *Proceedings of the ASME International Design Engineering Technical Conferences*, September 25-28, 2005.
83. H. J. Su, M. J. M. McCarthy, and J. Vance, "Synthesis of Compliant Mechanisms with Specified Equilibrium Positions," *Proceedings of the ASME International Design Engineering Technical Conferences*, September 25-28, 2005.
84. G. S. Soh, A. Perez, and J. M. McCarthy, "The Kinematic Synthesis of Mechanically Constrained Planar 3R Chains", Proceedings of the first European Conference on Mechanism Science (EUCOMES), Obergurgl, Austria, 2006.
85. G. S. Soh and J. M. McCarthy, "Mechanically Constrained nR Planar Serial Chains," *Advances in Robot Kinematics*, Ljubljana, Slovenia, June 2006.
86. G. S. Soh, and J. M. McCarthy, "Synthesis of Eight-bar Linkages as Mechanically Constrained Planar Parallel Robots," *Proceedings of the 2007 IFToMM World Congress*, Besancon, France, June 18-21, 2007.
87. N. P. Robson, and J. M. McCarthy, "Synthesis of a Spatial 5S Serial Chain for a Prescribed Acceleration Task," *Proceedings of the 2007 IFToMM World Congress*, Besancon, France, June 18-21, 2007.
88. G. S. Soh and J. M. McCarthy, "Synthesis of Constrained nR Planar Robots to Reach Five Task Positions," 2007 Robotics Science and Systems Conference, Atlanta, GA, June 27-30, 2007.
89. G. S. Soh and J. M. McCarthy, "Assessment Criteria for the Conceptual Design of Six-bar Linkages," *Proceedings of the ASME 2007 International Design Engineering Technical Conferences*, Sept. 4-7, 2007, Las Vegas, NV.
90. N. P. Robson and J. M. McCarthy, "Kinematic Synthesis with Contact Forces and Curvature Constraints on the Workpiece," *Proceedings of the ASME 2007 International Design Engineering Technical Conferences*, Sept. 4-7, 2007, Las Vegas, NV.
91. G. S. Soh and J. M. McCarthy, "Synthesis and Analysis of a Constrained Spherical Parallel Manipulator," *Advances in Robot Kinematics*, 11th International Symposium, June 22 - 26, 2008, Bats-sur-Mer, France.
92. G. S. Soh and J. M. McCarthy, "Five Position Synthesis of Spherical (6, 7) Linkages," *Proceedings of the ASME 2008 International Design Engineering Technical Conferences*, Aug. 3-6, 2008, New York City, NY.
93. J. Choe, D. L. Li, G. S. Soh, and J. M. McCarthy, "Synthesis of a 10-bar Driver for a Planar Scale Change Linkage," *Proceedings of the ASME/IFToMM International Conference on Reconfigurable Mechanisms and Robots*, June 22-24, 2009, London, UK.
94. N. P. Robson, J. M. McCarthy, "Applications of the Geometric Design of Mechanical Linkages with Task Acceleration Specifications," DETC2009-87415, *Proceedings of the IDETC09 33rd Mechanisms and Robotics Conference*, Aug. 30-Sept. 2, 2009, San Diego, CA.
95. G. S. Soh, J. M. McCarthy, "Seven-Position Synthesis of a Spatial Eight-bar by Constraining a TRS Serial Chain," DETC2009-87366, *Proceedings of the IDETC09 33rd Mechanisms and Robotics Conference*, Aug. 30-Sept. 2, 2009, San Diego, CA.
96. J. M. McCarthy and J. Choe, "Difficulty of Kinematic Synthesis of Usable Constrained Planar 6R Robots," *Advances in Robot Kinematics*, 12th International Symposium, June 28 – July1, 2010, Portoroz, Slovenia.
97. D. L. Li, J. Dai, J. M. McCarthy, Z. Zhang, "Configuration Based Improved Synthesis Approach of Metamorphic Mechanisms," DETC2009-87747 *Proceedings of the IDETC09 33rd Mechanisms and Robotics Conference*, Aug. 30-Sept. 2, 2009, San Diego, CA.

PRESENTATIONS:**Workshops and Tutorials**

- Advanced Robot Kinematics Workshop*, Linz, Austria, "Motion Optimization of Closed Chain Robotics Systems," September 10-12, 1990. (One of six speakers invited for opening talks, two for each of the three days of the conference).
- Workshop on Constraints in Obstacle Avoidance, Parts Mating, and Assembly Verification*, presented at the 1990 IEEE Robotics and Automation Conference, Cincinnati, OH, May 13-18, organizer: J. M. McCarthy, additional speakers: B. Ravani (UC Davis), S. DeSa (Carnegie-Mellon). (35 attendees)
- Workshop on Kinematics and Robotics*, Bad Munster am Stein--Ebernberg, Germany, "Avoiding Singular Positions in the Design of Spherical 4R Mechanisms," July 12-17, 1992. (One of 31 invited speakers).
- IMA Workshop on Robotics*, J. Baillieul, S. Sastry, organizers, "Planning Spatial Movement Using Constraint Manifolds," Institute for Mathematics and its Applications, University of Minnesota, Jan. 25-29, 1992. (One of 16 invited speakers).
- Conference on Geometry, Kinematics, and Robotics*, Seggauberg, Austria, "Dual Quaternions and the Spatial Triangle Associated with the Composition of Two Displacements," July 4-9, 1993, (One of 2 speakers invited from the US).
- Tutorial : Design of Spatial Mechanisms*, 1994 ASME Design Engineering Technical Conferences, Minneapolis, MN, Sept. 1994, sponsored by the Mechanisms Committee, organizer: J. M. McCarthy. (19 attendees)
- Tutorial : Spatial Mechanism Design*, 1996 ASME Design Engineering Technical Conferences, Irvine, CA, Aug. 1996, sponsored by the Mechanisms Committee, organizer: P. Larochelle.
- Mechanisms Committee Research Workshop*, (organizer w. Sridar Kota, Univ. of Michigan) 1998 ASME Design Engineering Technical Conferences, Atlanta, GA, Sept. 14 and 15, 1998, sponsored by the Mechanisms Committee, 60 attendees.
- Workshop on Robot Mechanics*, Versailles, France, "Finite Position Synthesis of RRSS Robots," July 12, 13, 2001. (One of eight invited speakers.)
- Workshop on Metrology and Standards Needs in Medical Robotics*, National Institute of Standards and Technology, "Xray Image Guided Robotic Radiosurgery," September 10, 2001. (One of five invited speakers.)
- Tutorial : Robot Design using Mechanism Synthesis Theory*, 2004 ASME Design Engineering Technical Conferences, Salt Lake City, UT, Oct. 2, 2004, sponsored by the Mechanisms Committee, organizer: J. M. McCarthy, 13 attendees.
- Tutorial : Robot Design using Mechanism Synthesis Theory*, 2005 IEEE International Conference on Robotics and Automation, Barcelona, Spain, April 22, 2005, organizer: J. M. McCarthy, 17 attendees.
- Geometric Methods in Mechanism Science*, (GeMS '07), University of Notre Dame, March 1-7, 2007, organizers: J. M. McCarthy, Charles Wampler, and Andrew Somese. 40 attendees.

Short Courses

- Applications of Quaternions, Dual Numbers and Screw Theory in Mechanical Design*, National Cheng Kung University, Tainan, Taiwan, organized by Prof. Ming June Tsai, August 8-12, 1992. Lectured 18 hrs. of the 54 hr. course. Other speakers were Prof. J. R. Philips (University of Sydney) and Prof. A. T. Yang (University of California, Davis)
- Constraint Manifolds and Spatial Movement*, McGill University, organized by Prof. J. Angeles, December 10-14, 1992, Lectured 7 hrs.
- Kinematics and Dynamics of Mechanisms and Manipulators*, Course 2.05, Department of Mechanical Engineering, Massachusetts Institute of Technology, with Prof. S. Dubowsky, Lectured 22.5 hrs of 45 hr. course, Sept. 10-Dec. 17, 1992.
- Geometric Design of Robots*, Beijing University of Posts and Telecommunications, organized by Prof. Qizheng Liao. September 6-14, 1999. Lectured 11 hrs.

Conference Presentations

- "The Curvature Theory of Line Trajectories in Spatial Kinematics," ASME Mechanisms Conference, Los Angeles, CA, October 1982, (w. B. Roth).
- "The Instantaneous Properties of Trajectories Generated by Planar, Spherical and Spatial Rigid Body Motion," ASME Mechanisms Conference, Los Angeles, CA, October 1982, (w. B. Roth).
- "Computer Algebra and Computational Geometry," Panel Session on Computational Geometry, ASME Computers in Engineering Conference, Las Vegas, NV, August 1984.

- "The Generalization of Line Trajectories in Space to the Trajectories of Great Circles on a Hypersphere," ASME Mechanisms Conference, Boston, MA, October 1984.
- "Differential Kinematics of Spherical and Spatial Motions Using Kinematic Mapping," ASME Winter Annual Meeting, Applied Mechanics Division, Miami, FL, October 1985, (w. B. Ravani).
- "The Instantaneous Kinematics of Line Trajectories in Terms of a Kinematic Mapping of Spatial Rigid Motion," ASME Mechanisms Conference, Columbus, OH, October 1986.
- "On the Scalar and Dual Formulations of the Curvature Theory of Line Trajectories," ASME Mechanisms Conference, Columbus, OH, October 1986.
- "The Design of a Three Jointed Two Degree-of-freedom Mechanical Finger Based on the Human Finger," The Applied Robotics Conference, sponsored by Oklahoma State University, St. Louis, MO., November 1986, (w. S. O. Leaver and J. E. Bobrow).
- "The Hypersphere and Dual Hypersphere as Configuration Spaces of Three Link Manipulators," Proceedings of the IASTED International Symposium on Robotics and Automation, May 27-29, 1987, Santa Barbara, CA.

Invited Presentations

- 1982 "Planar and Spatial Rigid Motion as Special Cases of Spherical and 3-Spherical Motion," Department of Mechanical Engineering, University of California, Davis, CA, February 1982.
- "Planar and Spatial Rigid Motion as Special Cases of Spherical and 3-Spherical Motion," Department of Mechanical Engineering and Applied Mechanics, University of Pennsylvania, Philadelphia, PA, March 1982.
- 1985 "The Image Curves of Planar, Spherical and Spatial Rigid Motion," Mechanical Engineering Seminar, University of Southern California, Los Angeles, CA, February 14, 1985.
- "Mathematical Methods for Manipulator Kinematics," Joint M.E.M. and E.C.E. Depts. Robotics Seminar, Drexel University, Philadelphia, PA, February 28, 1985.
- "The Image Curves of Spherical and Spatial Rigid Body Motion," MEAM Colloquium, University of Pennsylvania, Philadelphia, PA, April 4, 1985.
- "Differential Kinematics in an Image Space of Spherical Motion," General Motors Research Laboratories, Power Systems Research Dept. (Roland Maki), Warren, MI, October 14, 1985.
- 1986 "Engineering Opportunities in Robotics," presented at the 28th Annual Science-Engineering-Technology Career Day, February 15, 1986, at Drexel University, sponsored by the Engineering and Technical Societies Council of Delaware Valley.
- "Mechanism Design Research and the Image Curves of Rigid Body Motion," Seminar in the Department of Mechanical Engineering (Prof. J. Bobrow), University of California, Irvine, February 21, 1986.
- "The Cutting Edge of Robotics Research," Delaware Valley Conference on Engineering and Technology, February 28, 1986, at the Valley Forge Convention Center, sponsored by the Engineers' Club of Philadelphia.
- "Mechanical Design and Robotics at the University of Pennsylvania," presentation to graduate students in Advanced Mechanisms Course (Prof. D. Yang), University of California, Los Angeles, March 6, 1986.
- "Basic Studies in the Design of Mechanisms and Manipulators," Seminar in the Department of Mechanical Engineering (Prof. B. Ravani), University of Wisconsin, Madison, March 21, 1986.
- "Research Issues in Mechanical Design and Robotics," invited presentation, Department of Mechanical Engineering (Prof. W. Milestone), University of Wisconsin, Madison, May 7, 1986.
- 1987 "The Hypersphere and Dual Hypersphere as Image Spaces of Spherical and Spatial Rigid Body Motion," Seminar in Robotics, Department of Mechanical and Environmental Engineering (Prof. T. Kokkinis), University of California, Santa Barbara, February 19, 1987.
- "The Design of a Three Jointed Two Degree-of-freedom Mechanical Finger Based on the Human Finger," Distinguished Lecture Series of the Wisconsin Center for Space Automation and Robotics (WCSAR), Madison, WI, March 2, 1987.
- "The Hypersphere and Dual Hypersphere as Image Spaces of Spherical and Spatial Rigid Body Motion," Seminar in Robotics, Department of Mechanics (Prof. B. Ravani), University of Wisconsin, Madison, March 3, 1987.
- "Robots: Its a long way from what they can do to what we want them to do," Professional seminar (Carl Ingalls), Scott Paper Co., Philadelphia, PA. June 18, 1987.

- "The Hypersphere and Dual Hypersphere as the Configuration Manifolds of a Manipulated Workpiece: Part 1. The Hypersphere; Part 2. The Dual Hypersphere," Summer Program on Robotics, Week 3-Robot Manipulation (organized by Prof. M. Mason CMU), at the Institute for Mathematics and its Applications (IMA) University of Minnesota, Minneapolis, August 17-21, 1987.
- 1988 "The Analysis of Cooperating Planar Robot Arms in the Image Space of the Workpiece," UC, Irvine, Seminar in the Department of Mechanical Engineering, Feb. 5, 1988.
- 1989 "The Analysis of Cooperating Planar Robot Arms in the Image Space of the Workpiece," UC, Santa Barbara (Prof. B. Paden), Seminar in the Department of Mechanical Engineering, UCI, April 19, 1989.
- "The Analysis of Cooperating Planar Robot Arms in the Image Space of the Workpiece," UC, Davis, Seminar for the Robotics group (Prof. B. Ravani), July, 1989.
- 1990 "Motion Optimization of Closed Chain Robot Systems," Seminar in the Department of Aerospace and Mechanical Engineering (Prof. M. Stanisic), Notre Dame, IN, May 1990.
- "Motion Optimization of Closed Chain Robot Systems," Seminar in the Department of Mechanical Engineering, New Jersey Institute of Technology, Newark, NJ, October 24, 1990
- "The Analysis of Cooperating Planar Robots in the Configuration Manifold of the Workpiece," Seminar in the Department of Mechanical Engineering, Drexel University, Philadelphia, PA, October 25, 1990.
- 1992 "Planning Spatial Movement Using Constraint Manifolds," Boston University, Robotics and Control Seminar, Department of Mechanical Engineering (Prof. P. Dupont), Oct. 30, 1992.
- "Planning Spatial Movement Using Constraint Manifolds," Midwest Mechanics Symposium, Prof. P. G. Kessel, University of Wisconsin, organizer:
Tour A, November 3-6, 1992:
Notre Dame University, Dept. Mechanical and Aerospace Eng., Prof. M. Stanisic,
Illinois Institute of Technology, Dept. Mechanical and Aerospace Eng., Prof. M. Achaya,
University of Illinois, Urbana-Champaign, Dept. Theo. and Appl. Mech., Prof. D. Stewart,
Purdue University, School of Mechanical Engineering, Prof. J. S. Bolton,
- 1993 "Planning Spatial Movement Using Constraint Manifolds," Midwest Mechanics Symposium, Prof. P. G. Kessel, University of Wisconsin, organizer:
Tour B, April 4-9, 1993:
University of Michigan, Dept. of Mechanical Engineering, Prof. S. Kota,
Michigan State University, Dept. of Material Science and Mechanics, Prof. A. Lee,
University of Wisconsin, Dept. of Eng. Mechanics and Astronautics, Prof. J. Downer,
University of Minnesota, Dept. of Aerospace Engineering and Mechanics, Prof. A. Alving.
- "Research in Robotics at the University of California, Irvine" Seminar at the Robotics Laboratory (Dr. Jadran Lenarcic), Josef Stefan Institute, Ljubljana, Slovenia, , July 10, 1993.
- "Cooperating Robots and Constraint Manifolds," Seminar at the Institute for Mechanics (o.Univ. Prof. Dr. K. Wohlhart), Technical University, Graz, Austria.
- 1994
- "Five Position Synthesis of Planar and Spherical RR and Spatial CC Dyads," Institute for Mechanics (o.Univ. Prof. Dr. K. Wohlhart), Technical University, Graz, Austria, July 1, 1994.
- "Planning Spatial Movement Using Constraint Manifolds," INRIA, Sophia-Antipolis, France (organized by Jean Pierre Merlet), July 11, 1994.
- "Planning Spatial Movement Using Constraint Manifolds," Ladoratoire d'Informatique de Robotique et de Microelectronique de Montpellier (LIRMM), France (organized by Pierre Dauchez), July 12, 1994.
- "Five Position Synthesis of Planar and Spherical RR and Spatial CC Dyads," Seminar at Iowa State University, Dept. of Mechanical Engineering, Sept. 1994 (Prof. Judy Vance).
- 1995
- "Dual Quaternions and Spatial Linkages," Seminar in the Dept. of Mechanical Engineering, Department of Mechanical Engineering, University of Michigan. (host: Panos Papalambros) January, 1995.
- "Dual Quaternions and the Design of Spatial Mechanisms and Cooperating Robots," Seminar in the Dept. of Mechanical Engineering, University of Victoria, (host: Ron Podhorodeski), June 17, 1995.
- "Dual Quaternions and the Design of Spatial Mechanisms and Cooperating Robots," Seminar in the Dept. of Mechanical Engineering, Columbia University (host. Michael Lai), June 26, 1995.
- 1996

- "Teamwork and Vision: The University, Industry and the Professional Society," Keynote Lecture, Professional Development Seminar on Mechatronics and Automation, by the Orange County Chapter of the American Society of Mechanical Engineers, Flour Daniel Complex, April 27, 1996
- 1998
- "Geometric Design of Reduced Complexity Robotic Systems," Seminar in the Dept. of Mechanical Engineering, University of Pennsylvania (host. Jim Ostrowski), Sept. 17, 1998.
- 1999
- "Geometric Design of Robots," Seminar in the Dept. of Mechanical and Aerospace Engineering, Seoul National University (host. Chongwoo), Sept. 16, 1999.
- "The Geometric Design of Spatial Linkages and Robotic Systems," Seminar in the Dept. of Mechanical and Aerospace Engineering, (host. Bahram Ravani), UC Davis, Oct. 28, 1999.
- 2000
- "The Geometric Design of Spatial Linkages and Robotic Systems," Seminar in the Dept. of Mechanical and Aerospace Engineering, (host. Jami Shah), Arizona State Univ., Apr. 14, 2000.
- "The Geometric Design of Spatial Linkages and Robotic Systems," ECE 294 Colloquium, Dept. of Electrical and Computer Engineering (host. Harut Barsamian), UCI, May 31, 2000.
- 2002
- "Dual Quaternion Synthesis of Constrained Robotic Systems," Seminar in the Dept. of Mechanical and Aerospace Engineering, (host. Judy Vance), Iowa State Univ., Nov. 18, 2002.
- 2003
- "Dimensional Synthesis of the Bennett Mechanism," Celebratory Symposium for Bernard Roth (Ken Waldron and Steve Dubowsky, organizers), Stanford University, June 21, 2003.
- 2004
- "Geometric Design of Mechanically Reachable Surfaces Using Polynomial Homotopy," Department of Mathematics, (host Tangan Gao), California State University Long Beach, February 27, 2004.
- "Geometric Design of Mechanically Reachable Surfaces Using Polynomial Homotopy," Department of Mechanical Engineering, (host Mohamed Trabia), University of Nevada, Las Vegas, May 29, 2004.
- 2005
- "The Kinematic Synthesis of Mechanisms," Keynote Lecture, ASME DETC2005 Mechanisms and Robotics Conference, Long Beach, CA, Sept. 27, 2005.
- 2006
- "Kinematic Synthesis of Mechanisms," Research Seminar, University of Bologna, Italy, (host Vincenzo Parenti-Castelli) July 5, 2006.
- "Kinematic Synthesis of Constrained Robotic Systems," Department of Mechanical and Aerospace Engineering, (host Venkat Krovi), University at Buffalo (SUNY), Buffalo, NY, November 6, 2006.
- "Kinematic Synthesis of Constrained Robotic Systems," Department of Mechanical and Aerospace Engineering, (host Qiode Ge), Stony Brook University (SUNY), Stony Brook, NY, November 8, 2006.
- 2007
- "Geometric Design of Linkage Systems," Workshop on Geometric Methods in Mechanism Science (GeMS '07), (host: Andrew Somese) University of Notre Dame, March 4, 2007
- "Geometric Design of Linkage Systems," Institut für Grundlagen der Bauingenieurwissenschaften Arbeitsbereich für Geometrie und CAD, (host: Manfred Husty) University of Innsbruck, March 6, 2007.
- "Major Design Projects and Engineering Education at UCI," Faculty Retreat for the Department of Electrical Engineering and Computer Science, University of California, Irvine, September 17, 2007 (host: Jean-Luc Gaudiot)
- "Engineering and Product Design," for the UCI Design Alliance Symposium: *The Book, the Brand and the Box*. University of California, Irvine, November 2, 2007 (host: Julia Lupton)
- 2009
- "Kinematic Synthesis of Complex Articulated Systems," Research Seminar, University of Texas, (host Delbert Tesar and Vijay Srinivasan), March 5, 2009.
- "Task Centered Design of Complex Articulated Systems," Chinese Mechanical Engineering Society Workshop on Task Centered Design of Mechanisms and Robotic Systems, Shanghai Jiao Tong University, August 14, 2009 (host Prof. Feng Gao)

"Beyond Four-bar Linkages: A Design Strategy for Six and Eight-bar Linkages and More," Keynote Lecture, 8th International Chinese Conference on Applied Mechanisms and Machine Science, Wuhan, China, August 18, 2009.

"Kinematic Synthesis of Complex Articulated Systems," Mechanical Engineering Department Seminar, University of Maryland, Baltimore Campus (host, HaiJun Su), October 16, 2009.

"Kinematic Synthesis of Complex Articulated Systems," Mechanical Engineering Department Seminar, Pennsylvania State University (host, H. J. Sommer), October 20, 2009.

"Kinematic Synthesis of Complex Articulated Systems," Plenary Lecture, Chinese Society of Mechanism and Machine Theory (host, Zhang Hua Fong, Dean National Chung Cheng University), Taiwan, November 6, 2009.

2010

"Kinematic Synthesis of Complex Articulated Systems," Lecture, Indo-US Workshop on Product Design – Impact from Research to Education to Practice. (host, P. Radhakrishnan Director, PSG Institute of Advanced Studies, Coimbatore, India), March 15-17, 2010.

"Probability of Usable Solutions in Kinematic Synthesis," Lecture, Mini-symposium on Kinematics and Numerical Algebraic Geometry, (Charles Wampler, organizer), SIAM Conference, Pittsburgh, PA, June 13-14-2010.

"Opportunities and Challenges in Kinematic Synthesis," Keynote Lecture, Chinese Conference on Mechanism and Machine Science, (host, Feng Gao), Shanghai, China, July 22, 2010.

"Opportunities and Challenges in Kinematic Synthesis," Lecture, Award Ceremony for Certified Visiting Scholar, Beijing University of Posts and Telecommunications, (host, Qizheng Liao), Beijing, China, July 27, 2010.

"Opportunities and Challenges in Kinematic Synthesis," Seminar, Beijing Jiaotong University, (host,), Beijing, China, July 29, 2010.

"Opportunities and Challenges in Kinematic Synthesis," Seminar, Tsinghua University, (host,), Beijing, China, August 1, 2010.

"Opportunities and Challenges in Kinematic Synthesis," Seminar, Tianjin University, (host, Tian Huang), Tianjin, China, August 1, 2010.

"Opportunities and Challenges in Kinematic Synthesis," Seminar, Yanshan University, (host, Yongsheng Zhao, Dean of Engineering), Qinhuangdao, China, August 2, 2010.

TEACHING:**Courses Taught****University of California, Irvine:**

	<u>Fall Quarter.</u>	<u>Winter Quarter.</u>	<u>Spring Quarter.</u>
10/11	Robotics Proj. Engr. 1A Racecar Engineering I	Advanced Mechanism Design Racecar Engineering II	Theory of Machines Racecar Engineering III
09/10	CADes. of Mechanisms Proj. Engr. 1A Racecar Engineering I	Theoretical Kinematics Racecar Engineering II	Theory of Machines Racecar Engineering III
08/09	Robotics Racecar Engineering	Advanced Mechanism Design Formula Hybrid	Theory of Machines Formula Hybrid
07/08	CADes. of Mechanisms Formula SAE: Design	Theoretical Kinematics Formula SAE: Manufacture Formula Hybrid A	Theory of Machines Formula SAE: Test Formula Hybrid B
06/07	sabbatical Eng. Project Dev. A	Spatial Mechanism Design Eng. Project Dev. B XGR Car Design	Theory of Machines Eng. Project Dev. C XGR Construction
05/06	Robotics Eng. Project Dev. A	Eng. Project Dev. B XGR Car Design	Theory of Machines Eng. Project Dev. C XGR Construction
04/05	CADes. of Mechanisms Eng. Project Dev. A	Spatial Mechanism Design Eng. Project Dev. B	Theoretical Kinematics Theory of Machines Eng. Project Dev. C
03/04	Algebraic Kinematics Eng. Project Dev. A	Eng. Project Dev. B	Protein Kinematics Theory of Machines Eng. Project Dev. C
02/03	CADes. of Mechanisms Geom. Meth. in Mechanics Eng. Des. in Industry	Spatial Mechanism Design Mgmt. Design Innovation	Theoretical Kinematics sabbatical
01/02	Intro. Theo. Kinematics	Robotics	Theory of Machines Eng. Des. in Industry
00/01	CADes. of Mechanisms Eng. Des. in Industry	Spatial Mechanism Design	Theory of Machines
99/00	Alg. Geo. in Kinematics Eng. Des. in Industry	Robotics Eng. Des. in Industry	Theory of Machines Eng. Des. in Industry
98/99	Theory of Machines Robotics Eng. Des. in Industry	Eng. Des. in Industry	CADes. of Mechanisms Eng. Des. in Industry
97/98	Theory of Machines Eng. Des. in Industry	Spatial Mechanism Design	Differential Kinematics Eng. Des. in Industry
96/97	Theory of Machines Eng. Des. in Industry	Intro. Theo. Kinematics	CADes. of Mechanisms Eng. Des. in Industry
95/96	Eng. Des. in Industry	Spatial Mechanism Design	Intr. Theo. Kinematics
94/95	Appl. Mech: Statics CADes. of Mechanisms Honors Prog. Seminar	sabbatical Eng. Des. in Industry	Intr. Theo. Kinematics Eng. Des. in Industry
93/94	Appl. Mech: Statics Intr. Theo. Kinematics	Differential Kinematics Eng. Des. in Industry	CADes. of Mechanisms Eng. Des. in Industry
92/93	sabbatical	Appl. Mech: Statics Adv. Mechanism Design	Elementary Dynamics (E80)
91/92	Design of Mechanisms	Appl. Mech: Statics Intr. Theo. Kinematics	Senior Design C
90/91	Grad. Dynamics		Senior Design C Grad. Kin. and Robotics

89/90	Senior Design A		Senior Design C
			Grad. Kin. and Robotics
88/89	Senior Design A	Grad. Diff. Geometry	Senior Design C
			Grad. Kin. and Robotics
87/88	Senior Design A	Grad. Diff. Geometry	Senior Design C
			Grad. Kin. and Robotics
86/87	Kinematics of Mach.	Grad. Kin. and Robotics	Senior Design C

University of Pennsylvania:

	<u>Fall Semester.</u>	<u>Spring Semester.</u>
86/87	Graduate Theoretical Kinematics Kinematics of Machinery	Graduate Kin. and Rob. (w. R. Paul)
84/85	Adv. Topics in Kinematics Kinematics of Machinery	Elementary Dynamics
83/84	Graduate Advanced Calculus	Elementary Dynamics
82/83		Elementary Dynamics Kinematics of Machinery (w. B. Paul)

Loyola Marymount University:

	<u>Fall Semester.</u>	<u>Spring Semester.</u>
82/83	Kinematics of Machinery Solid Mechanics Lab (w. G. Blaine) Graduate Numerical Analysis Introductory Computer Programming (Graphics)	(moved to Univ. of Pennsylvania)
81/82	Kinematics of Machinery Solid Mechanics Lab (w. G. Blaine) Graduate Numerical Analysis Statics	Elementary Dynamics (2 sections) Heat Transfer for Electrical Engineers
80/81	Kinematics of Machinery Solid Mechanics Lab (w. G. Blaine) Graduate Numerical Analysis	Elementary Dynamics (2 sections) Graduate Dynamics

Engineering Design in Industry Projects

- "Titanium Matrix Composite Piston Design," Juan Loera, Vincent Chiangtong, Conrado Galamgam, Tu Tran, for Parker Aerospace. Spring 98
- "Part Placement in Surface Mount Tech Line," Mark Setele, Tony Shen, Matthew Yacono, for Toshiba America Information Systems. Spring 98
- "Filter Press Modeling," Sergio Flores, Michael Mallari, Meric Wank, for Pacific Press. Spring 98
- "Air Motor Design for a High Speed Dental Drill"—Mai Bui, Jun Canaveral, Monish Doshi, David Perales, Ernesto Villasenor, for Micro Motors, Inc. Fall 98
- "High Volume Manufacturing of Gold Dot Miniature Mezzanine Interconnects," Jeff Chandsawangbhuwana, Charlie Chang, Sio Fu, Sabina Lin, for Packard Hughes Interconnect, Inc. Winter 99
- "No Tools, No Training Connector Development," Monish Doshi, Gus Monico, Marc Worrel, for Packard Hughes Interconnect, Inc. Winter 99
- "Hyper-Gravity Exercise System," Hiram Channell, Maria Godoy, Khiet Le, Raymond Le, Shelly Natarnicola, Eric Phan, for UCI Program in Gravitational Biology. Spring 99
- "Fine Wire Tensioner," Daniel Carpio, Ricardo Chavez, Manuel Salguero, Vincent Seah, Jung-Sik Moon, for Orthodyne Electronics, Inc. Spring 99
- "Single User Radar Speed Detector," Billy Lee, Billy Yim, Omar Miranda, Michael Bledl, Jay Chen, for Road and Track Magazine. Spring 99
- "Hair Graft Extraction Tool," Brian Kaino, Joe Luo, Mark Hermanto, Michael Kondo, for Pioneer Medical Inc. Fall 99
- "Environmentally Friendly Packaging," Patrick Couch, Jose Tong, Eric Martinson, Jeong Gim, for Toshiba America Information Systems. Fall 99
- "In-Line Hydraulic Fluid Particulate Detector," Jon Dannenberg, Derek Drenske, Emil Krapetian, Arnold Tuason, for Eaton Corp. Winter 2000
- "Aerospace Hydraulic Project," Sun Gov, Ryan Kelly, Thanh Nguyen, Terrence Yao, for Parker Aerospace, Inc. Winter 2000

- “Loading Stem-Sleeve Rivet Assemblies into the MS Press,” Carlos Sotelo, Claude Vol, Matthew Rickard, Chris Jung, for Cherry Textron Inc. Spring 2000
- “Quality Cutting of Pericardial Tissue,” Panda Chandsawangbhuwana, Ignacio Diaz, Charles Huang, Eugene Kwak, for Edwards Lifesciences, Inc. Spring 2000
- “Emerging Markets for Gold Dot Technology,” John Luong, Vu Minh Phi, Budiarto the, In Mo Yeo, for Packard Hughes Interconnect, Fall 2000.
- “The Allowance Calculator,” Joanne Francisco, Kristine Gamatero, Patusa Papartassee and Yu How Low, for a private inventor, Spring 2002.

Senior Projects

- 97-98 “Deployable Accessories for Quadriplegics,” Scott Cohen, Monish Doshi, Mark Setele, Tony Shen, Matthew Yacono.
- 98-99 “Human Powered Vehicle, “ Jun Canaveral, Jeff Chandasawangbhuwana, Hiram Channell, Sio Fu, Khiet Le, Izlay Mercankaya
- 2002-03 Mini-Baja race car. Demobilizer BattleBot. Battle-Zot BattleBot.
- 2003-04 Mini-Baja racecar. A student team (10 students) designed, constructed, tested, reengineered and retested an off-road vehicle as part of training in engineering leadership (MAE 195, three quarters). Competed in the SAE Mini-Baja West, April 22-24, 2004, Portland, Oregon. Ranked 75 out of 99 cars.
- 2004-05 Mini-Baja racecars: Two student teams “F-one” (12 students) and “Ramrod” (16 students). Two student teams designed, constructed, tested, reengineered and retested an off-road vehicle as part of training in engineering leadership (MAE 195, three quarters). Competed in the SAE Mini-Baja West, June 1-4, 2005, Tucson, AZ. F-one ranked 61 and Ramrod 85 out of 132 cars.
- 2005-06 Formula SAE race car. A student team “Formula iRacing” (30 students) designed, built a racecar and competed in the 2006 Formula SAE West competition at the Orange County Speedway on June 14-17, 2006. Ranked 48 out of 71 cars.
- 2006-07 Formula SAE race car. A student team “Formula A.E.” (25 students) designed and manufactured a racecar to compete in the 2007 Formula SAE West competition at the Orange County Speedway on June 13-16, 2007.
- 2007-2008 MAE 189 Formula SAE: Design (F07), Build (W08), Test (S08): A student team “Anteater Racing” (30 students) designed and built a racecar to compete in the 2008 Formula SAE West competition at the Orange County Speedway on June 18-21, 2008.
- 2008 MAE 189 Formula Hybrid (W08), Test (S08): A student team (15 students) modified the 2007 Formula SAE racecar to include electric motors driven by an ultra-capacitor and competed in the 2008 Formula Hybrid competition at the New Hampshire Motor Speedway, May 5-7, 2008.
- 2009 MAE 189 Formula Hybrid (W09), Test (S09): A student team (12 students) modified the 2008 Formula Hybrid racecar and competed in the 2009 Formula Hybrid competition at the New Hampshire Motor Speedway, May 4-6, 2009. They achieve 5th place out of 30 teams.
- 2010 MAE 189 Racecar Engineering (FWS 2009-2010): A student team of 30 students built the “Road Eater,” a CNG driven racecar and won first place at the 2010 UCI Energy Invitational, then converted the engine to a supercharged gasoline engine and took 24th place at the 2010 FSAE California competition and 1st place in fuel economy.

Undergraduate Independent Study Projects

- Mark Lengsfeld, Winter 98, Spring 98, “Belt-driven Track Bike,” 7 units.
- Maria Luisa Franco, Fall 99, “Analysis of Mechanisms,” 4 units.
- Scott Lassegard, Spring 99, “Bike Suspension Design,” 2 units.
- Chunliang Hsu, Fall 99, Winter 2000, “Design of a Prosthetic Thumb, “ 4 units
- Sabina Lin, Winter 2000, “Research in Robotics,” 2 units.

Other Teaching

- 1989 moderated 3 week session on Modern Technology, UCI Summer Science Institute for High School Science Teachers (Mare Taagapera and George Miller, directors).
- 1990 organized and moderated 1 week session on Modern Technology, UCI Summer Science Institute.
- 1990 Mentor, Student Recommended Faculty, Dr. Mohan Bodduluri, 1990-1991.

- 1991 Organized 3 week Course (w. Terry Shanahan) on Modern Technology, UCI Summer Science Institute.
- 1993 Organized a Graduate Special Topics course on mechanism design at University of Santa Clara, w. Prof. L. Sanchez and Dr. R. M. C. Bodduluri.
- 1993 Mentor for McNair/Star program, undergraduate research for minority students.
- 1993-2000 Faculty Advisor for the Engineering Academic Theme House, Arroyo Vista Housing.
- 96/97 Project: Mentors for Irvine Unified School District "Future Scientists and Engineers Clubs." (Serano Middle School)
 - 97/00 Project: Mentors for Future Scientist and Engineers Clubs in local Middle Schools.
- 2003-present Faculty Advisor, Pi Tau Sigma, Mechanical Engineering Honor Society
- 2004-present Faculty Advisor, ASME student chapter

University Committee Activities

- 2006-2010 Member, School of Engineering, Executive Committee
- 2008-present Member, Academic Senate Committee on Research, Computing and the Library.
- 1998-2001 Member, Academic Senate Council on Education Policy 1999-2001
- 00-01: Chair, Council on Educational Policy.
 - 99-00: Co-Chair, Acad. Rev. Planning Committee for School of Physical Sciences.
 - 98-99: Chair, CEP Subcommittee for the Review of the School of Humanities.
- 1993-1996 Chair, Academic Senate Committee on Undergraduate Admissions.
- 1993-1994 Chair, Faculty of the School of Engineering
- 1993-1994 Chair, Planning Group on Manufacturing and Materials Processing
- 1993-1994 Chair, Committee on Instructional Computing
- 1993-1994 Chair, Dean's Computer Advisory Committee
- 1990-1991 Chair, School of Engineering Undergraduate Studies Committee.
- Member, Executive Committee, School of Engineering.
- 1989-1991 Undergraduate Advisor, Department of Mechanical Engineering
- Member, School of Engineering Undergraduate Studies Committee
- 1988-1991 Chairman, Computer Committee, School of Engineering.
- 1988-1990 Member, Representative Assembly.
- Member, Executive Committee, School of Engineering.