R. Erik Spjut

Chemical engineer, educator, and engineering design professor whose work spans high-temperature materials processing, optical diagnostics, engineering education, adaptive optics, signal processing, and high-power rocketry. Former Director of the Harvey Mudd College Engineering Clinic and Professor of Engineering for 37 years. Developer of open educational resources including DOFPro.org and Creative Commons engineering curricula.

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Rancho Cucamonga, California

Emeritus Professor of Engineering, Harvey Mudd College (2025–present)

Education

Massachusetts Institute Of Technology, Cambridge, Massachusetts. Ph.D. degree in Chemical Engineering, January 1985.

University Of Utah, Salt Lake City, Utah. B.S. degree, magna cum laude, in Chemical Engineering, June 1981.

Academic Appointments

2000–2025	Professor of Engineering, **Harvey Mudd College**
2010–2015	Director, Engineering Clinic, **Harvey Mudd College**
2009–2010	Visiting Professor of Engineering, **Olin College**
Winter 2002	Visiting Lecturer in Chemical Engineering, **Cal Poly Pomona**
Fall 2001	Visiting Professor of Chemical Engineering, **Caltech**
1992–2000	Associate Professor of Engineering, **Harvey Mudd College**
1988–1992	Assistant Professor of Engineering, **Harvey Mudd College**
1985–1988	John Chipman Assistant Professor of Chemical Process Metallurgy, **MIT**

Open Educational Resources

- Founder and developer of DOFPro.org
- Creator of the Chemical & Thermal Processing (CTP) curriculum
- Creator of the High Power Rocketry (RCK) curriculum
- Development of Quarto-based educational websites
- Publication of Creative Commons engineering education resources
- Production of engineering video instruction series

Consulting

2015-2016	Glassimetal Technology Inc., Pasadena, CA. Assistance with electrostatic levitator.
2004-2008	Pacific Scientific Corporation, Duarte, CA. Modeling of fluid flow.
2002-2004	Caliper Technology Corporation, Mountain View, CA. Assistance with materials and process aspects of product development.

1998-2004 Radiant Technology Corporation, Fullerton, CA. Assistance with optical modifications to rapid-thermal-processing furnace. Modeling of heat transfer within rapid-thermal-processing furnace.

1988-2000 Jet Propulsion Laboratory, Pasadena, CA. Assistance with design and construction of an electrostatic levitator. Construction of an optical pyrometer. Construction and programming of computerized data acquisition systems. Assistance with proposal and manuscript preparation.

1996-1997 Space Systems/Loral, Palo Alto, CA. Assistance with design and construction of small-sample high-temperature electrostatic levitator, in particular the position-detection system.

1986-1988 Advanced Energy Dynamics, Natick, MA. Evaluation of experimental data and recommendations for modification of a proprietary separation process. Assistance with proposal preparation.

Awards/ Honors

1985-1988 John Chipman Chair in Chemical and Process Metallurgy

Grants/Fellowships

2011-2025 Union Oil Company Design Fellowship (Faculty chair in Engineering)

2010-2013 CCAO-Cam: A Remote-Access, Dual-Band (Optical/NIR) Adaptive Optics System for the Table Mountain 1-meter telescope," under the direction of Philip I. Choi, Bryan E. Penprase, R. Erik Spjut, Scott A. Severson. NSF MRI. $637,138

2004 Boeing Phantomworks grant for correcting atmospheric disturbances in wireless power transmission. $28,534

1989-1995 SCE Center of Excellence grant for measurement of electrical properties of materials, $100,000 with Joseph A. King.

1985-1988 DOE Grant on plasma processing of materials. Multiple MIT PIs joint with INEL. $500,000 for JF Elliott and RE Spjut portion.

Teaching Experience

The highlighted classes demonstrate the breadth of my teaching experience.

HMC

- **Engineering Design** (first-year level)
- Engineering Design Representation and Realization (first-year level)
- **Beginning Swedish** (first-year level)
- Introduction to Systems & Signals (second-year level)
- Chemical and Thermal Principles (second-year level)
- Engineering Laboratory (second-year level)
- **Music Fundamentals** (second-year level)
- **Materials Engineering** (third-year level)
- **Advanced Systems & Signals** (third-year level)
- **Digital Logic & Computer Engineering** (third-year level)
- **High-Power Rocketry** (third-year level)
- **Chemical Reaction Engineering** (fourth-year level)
- Preliminary Design (fourth-year level)
- Heat Transfer (fourth-year level)
- Advanced Engineering Thermodynamics (fourth-year level)
- Engineering Clinic (capstone course, fourth-year level).

Olin

- Design Nature (first-year level)
- Modeling and Control (first-year level)
- Introduction to Sensors, Instrumentation and Measurement (co-developed, first-year level)
- Senior Capstone Program in Engineering (SCOPE, fourth-year level)

Cal-Poly

- Stoichiometry Laboratory (second-year level)

Caltech

- Heterogeneous Kinetics (graduate level)

MIT

- Introduction to Solid-State Chemistry (first-year level)
- Physical Chemistry of Materials (second-year level)
- Chemical Metallurgy (fourth-year level)
- Kinetic Processes in Materials (graduate level)

Professional Skills

Computing

Quarto, Markdeep, Linux, Apache, PHP, MySQL

Engineering Software

MATLAB, Simulink, LabVIEW, Mathematica, DWSIM, PRO/II

CAD and Design

SolidWorks, PCB Design

Programming

Fortran, C, Python

Media Production

Audio production, video production, Csound

Certifications

- Amateur Radio General License – KJ6ZAX
- California Pyrotechnic Operator Rocket 3rd Class
- Tripoli Rocketry Association Level 2
- Responsible Person, Harvey Mudd BATF LEUP Permit

Languages Fluent Swedish, Rudimentary Spanish

Professional Memberships American Institute of Chemical Engineers

Teaching Interests

I am concerned with the pedagogy of engineering and design education, particularly with unorthodox but effective classroom and laboratory methods. I have developed courses utilizing the seminar-style case-study method, just-in-time learning, web-based video, and student-led course content. I completely restructured our second-year-level engineering laboratory to include a final field experience where the students launch a fully-instrumented rocket and report on the comparison between the flight data and the flight modeling.

Research Areas

As of late, I have pursued active learning as applied to engineering. To support my principal laboratory for active learning, the rocketry-based Engineering Laboratory course, I have also pursued inertial measurement and Kalman filtering, vibrational system ID, the physics of rocket flight, MEMS and other sensors, data acquisition and error analysis.

I was also involved in the engineering of an adaptive-optics retrofit to the Table Mountain telescope operated by Pomona College. My principal areas were the structural integrity and vibration isolation.

My previous research was principally in the area of high-temperature processing of materials — both in fundamental science and engineering applications. My primary thrust was in heterogeneous reaction kinetics and diagnostics. Specific areas of research were the intrinsic and overall kinetics of solid or liquid aerosols reacting at high temperatures with a gas, e.g., carbon combustion, metal-oxide formation, carburization and metal-carbide formation, gaseous reduction of metal oxides and oxidation of metal sulfides. The morphologies of the products and of the solid reactants as controlled by the reaction kinetics are also of interest.

As an adjunct to the materials research, I have pursued the areas of containerless processing of materials, non-contact temperature measurement, computer-controlled experimental design, radiative scattering, absorption and emission from metallic and non-metallic aerosols, tribocharging and charge stability on heated aerosols, and supercooling of metals and ceramics.

Service

Professional

- Proposals reviewed for the National Science Foundation, the Department of Energy, and NASA.
- Referee for the following publications: *Journal of Metals*, *Review of Scientific Instruments*, *IEEE Transactions*, and *Conservation & Recycling*.
- The Metallurgical Society of AIME (Secretary-Treasurer, Boston Chapter '86-'87; Vice Chairman, Boston Chapter '87-'88)

Departmental/College

2019-2020	Interim Faculty Advisor for Machine Shops
2017-2020	College Safety Committee
2010-2015	Director, Engineering Clinic – Responsible for annually recruiting 25 outside-sponsored capstone projects.
2010-2015	Departmental Professional Development Committee
2014-2015	College Curriculum Committee
2014-2015	Departmental Engineering Resources Planning Committee
2013-2014	College Safety Committee
2007-2009	College Diversity Committee
2004-2008	College Assessment Committee
2008-2009	College Computing Committee
1995-1998	College Computing Committee
1997-1999	College Scholarly Standing Committee
1999-2002	College Teaching and Learning Committee

Selected Publications

An electrostatic levitator for high-temperature containerless materials processing in 1-g, Rhim, Won-Kyu; Chung, Sang K; Barber, Daniel; Man, Kin F; Gutt, Gary; Rulison, Aaron; Spjut, R Erik; *Review of Scientific Instruments*, **64** (10), 2961-2970, 1993, American Institute of Physics

Noncontact technique for measuring surface tension and viscosity of molten materials using high temperature electrostatic levitation, Rhim, Won-Kyu; Ohsaka, Kenichi; Paradis, Paul-François; Spjut, R Erik; *Review of scientific instruments*,**70** (6), 2796-2801, 1999, American Institute of Physics

Measurements of thermophysical properties of molten silicon by a high-temperature electrostatic levitator, Rhim, WK; Chung, SK; Rulison, AJ; Spjut, RE; *International journal of thermophysics*, **18** (2), 459-469, 1997, Kluwer Academic Publishers-Plenum Publishers New York

Measurement of combustion kinetics of a single char particle in an electrodynamic thermogravimetric analyzer, Bar-Ziv, Ezra; Jones, Daniel B; Spjut, R Erik; Dudek, David R; Sarofim, Adel F; Longwell, John P; *Combustion and Flame*,**75** (1), 81-106, 1989, Elsevier

Photophoresis of irradiated spheres: absorption centers, Greene, WM; Spjut, RE; Bar-Ziv, Ezra; Sarofim, AF; Longwell, JP; *Journal of the Optical Society of America B*, **2** (6), 998-1004, 1985, Optical Society of America

Electrodynamic thermogravimetric analyzer, Spjut, R Erik; Bar‐Ziv, Ezra; Sarofim, Adel F; Longwell, John P; *Review of scientific instruments*, **57** (8), 1604-1610, 1986, American Institute of Physics

Laser heating and particle temperature measurement in an electrodynamic balance, Spjut, RE; Sarofim, AF; Longwell, JP; *Langmuir*, **1** (3), 355-360, 1985, American Chemical Society

KAPAO: a MEMS-based natural guide star adaptive optics system, Severson, Scott A; Choi, Philip I; Contreras, Daniel S; Gilbreth, Blaine N; Littleton, Erik; McGonigle, Lorcan P; Morrison, William A; Rudy, Alex R; Wong, Jonathan R; Xue, Andrew; *MEMS Adaptive Optics VII*, 8617, 58-67, 2013, SPIE

Integrating Theory and Hands-On Practice using Underwater Robotics in a Multidisciplinary Introductory Engineering Course, Lape, Nancy K; Bassman, Lori; Clark, Christopher; Dato, Albert; Lee, Angela M; Spencer, Matthew; Spjut, Erik; Blake, Laura Palucki; *2017 ASEE Annual Conference & Exposition*, 2017

Engineering design: A project based approach, Dym, CL; Little, P; Orwin, E; Spjut, R; Wiley, Hoboken NJ, 2004