

DAVID SOONG-HUA LEE

Current Employer:

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EDUCATION

Ph.D. & M.S.E. in Applied Physics, *California Institute of Technology*. 1993.

Thesis Advisor: Professor Bill Johnson (Mettler Professor of Applied Physics & Materials Science).

Thesis title: Metastable Thermodynamics & Kinetics of the Oxygen Sublattice in $\text{YBa}_2\text{Cu}_3\text{O}_{7-\delta}$.

B.S.E. in Electrical Engineering and Computer Science, *Princeton University*. 1986.

Major Concentration: Engineering-Physics.

Senior Thesis title: Hot Electron Transport Across GaAs/AlGaAs Quantum Wells.

Minor: Creative Writing.

RELEVANT PROFESSIONAL & TEACHING EXPERIENCE

07/2012 – 06/2013 – President and Chief Technical Officer, Glassimetal Technologies, Inc., Pasadena, CA.

Technology startup company focused on development and processing of bulk metallic glass alloys.

Profitable in first year of operation through technology licensing fees (\$8MM in revenue booked).

07/2012 – 06/2013 – Visiting Professor, California Institute of Technology, Pasadena, CA.

06/2012 – Present – Founder, ADE3D, Wenham, MA. Technology startup company focused on developing acoustic drop ejection as a technology for 3-d microprinting. Co-founded company with Gordon physics grad whose senior honors thesis involved using this technology to measure properties of viscous fluids.

01/2007 – Present: Professor of Physics, Gordon College. Dept Chair, Engineering Program Coordinator.

Research interests and activities: (i) Scanning probe microscopy of advanced materials properties and applications, particularly metallic alloys and biological materials. (ii) Preparation and characterization of advanced metallic & composite materials, (iii) properties, performance and manufacturing issues in the use of novel metallic and composite materials in industrial applications. (iv) nonlinear acoustics for manipulation of fluids. I also consult for manufacturers in the golf industry and am a member of the Technical Advisory Panel for Golf Digest.

Other research: (i) I hold a 'Visiting Research Associate' position at Caltech. My interest lies in questions about the ultimate stability of crystal lattices and the properties of metastable metallic materials. (ii) I am also interested in how advanced materials, discovered or designed to have specific characteristics in research laboratories, make their way into commercial applications. To this end, I consult in the field of advanced materials processing and application, with an emphasis on metallic and composite materials. (iii) Finally, I have some ideas at the intersection of biology, materials physics and nonlinear acoustics, based on past industrial research experiences.

Courses taught - engineering: Introduction to Engineering (including labs), Engineering Statics, Strength of Materials, Fundamentals of Materials Science (including labs).

Courses taught - physics: Introductory Physics with Calculus (including labs), Modern Physics (including labs), Classical Mechanics, Quantum Mechanics, Statistical Mechanics, Advanced Physics Lab, Solid State Physics, Freshman Physics Seminar, Senior Thesis Research.

Committees & other university-related service: (i) Coordinator of the 3-2 Engineering Program, (ii) Physics department chair, (iii) teach optional physical education class (flyfishing & flytying), (iv) member of admissions committee, (v) member of Undergraduate Research Symposium organizational committee, (vi) close work with admissions office to improve the prospective student yield and visitation experience for prospective students and parents, (vii) close work with admissions office on Gordon Science Day experiences, (viii) close work with development office to raise funds for build-out of engineering lab and to help with general fundraising for the science center and for the college itself, (ix) member of Summer Working Group for Enrollment, (x) member of the Presidential Transition Team, (xi) faculty advisor for student-run Physics Club and for Physics Study Hall sessions (outreach to local high school physics students), (xii) member of provost search committee.

2003 – 2006: Associate Professor of Physics, Biola University.

I spent 3.5 years as a faculty member teaching introductory and upper division physics courses and labs. I also directed the 3-2 engineering program at the school.

2000 – 2003: Picoliter, Incorporated (now Labcyte, Inc). Senior Director, Mfg & Product Development.

Responsibilities included studying the physics of fluids in focused acoustic fields and the commercial development of microfluidic techniques based on the physics of high frequency (~100 MHz) acoustic waves used to generate droplets of the fluid and eject them from a dispensing container. I was the 2nd employee of this company, which three years ago closed its Series C round of funding and successfully merged with LabCyte Inc.

1999 – 2000: Symyx Technologies. Manager, Materials & Product Development.

Directed development efforts for discovery of novel functional inorganic materials. Managed \$6.75MM in projects, collaborations and funding for group of 12 Ph.D. scientists in fuel cell, phosphor, battery, magnetic, thermoelectric, spintronic and metallic materials. Our efforts focused on developing high-throughput, miniaturized combinatorial techniques to increase the rate of discovery of novel materials. Experience included successful campaign for \$4.75MM plus-up in final FY2000 Congressional budget. The company successfully IPO'd in November, 2001.

1995 – 1999: Liquidmetal Technologies (including Liquidmetal Golf)

Director of Technology (1998 – 1999)

Head of Manufacturing (1996 – 1998)

Senior Physicist (1995 – 1996)

Studied the metastable thermodynamics and kinetics of a family of bulk amorphous metals that were discovered by my thesis advisor. This company licensed the rights to the materials and I was charged with developing a viable process for making large-scale quantities. I was ultimately responsible for r&d and manufacturing scale-up of the material, which was tested and used in products ranging from sporting goods to kinetic energy penetrators and cell phone casings. The company successfully IPO'd in May, 2002.

1995 – 1999: California Institute of Technology. Member of the Professional Staff, Materials Science.

Managed space shuttle experiment on thermophysical properties of undercooled metals (MSL-1) in 1998. Co-investigator on this NASA project. This was a re-flight of our successful experiment on IML-2 in 1995. Gave scientific talks on the impetus for, details of, and results from the MSL-1 experiment. Managed graduate students with funding from NASA, DOE and Caltech. Taught and held office

hours for “States of Matter” when the instructor was out of town (graduate-level class in statistical and condensed matter physics).

1992 – 1994: California Institute of Technology. Post-Doctoral Research Fellow, Applied Physics.

Managed space shuttle experiment on heat capacity and thermal conductivity of amorphous and undercooled metals (IML-2). Refined the experimental technique in a \$250K/yr ground-based program, tested the flight hardware in zero-g parabolic flights, trained astronauts in the background physics and experimental procedure, and helped write the software for real-time data analysis in LabView and C. Taught “States of Matter” and held office hours when instructor was out of town. Taught “Applied Physics Lab” for undergraduate majors (included background lectures and labs for superconductivity, x-ray diffraction, lock-in techniques, holography, mechanical properties of materials, analog and digital electronics). Taught undergraduate lab on Failure Mechanics.

1986 – 1992: California Institute of Technology. Research & Teaching Assistant, Applied Physics.

Variously taught and held office hours for courses in Solid State Physics, Undergraduate Thermodynamics, Undergraduate Quantum Mechanics and Transmission Electron Microscopy.

EXPERIMENTAL & COMPUTER SKILLS

Scanning probe microscope techniques such as nanoindentation and AFM, non-linear acoustic techniques, microfluidics, optics and laser-based spectroscopic techniques, molten metal processing, UHV & low-T systems, PVD systems, electrostatic/RF levitation, XRD, EELS, TEM, SEM, DSC, lock-in techniques, mechanical properties testing, mechatronics, laser & e-beam welding, metal machining/finishing, analog and digital circuits and signals, basic MEMS, MATLAB, Labview, C, Processing, KeyCreator, AutoCAD, Sketchup Pro.

SCIENTIFIC PUBLICATIONS, AWARDS, GRANTS, AFFILIATIONS

- 2 Invited Talks, 12 Refereed Publications, 11 US Patents Issued, 7 Patents Pending.
- Appointed Member of the Caltech Professional Staff. 1995.
The highest non-tenured appointment for persons who make "unusual contributions in support of research and teaching. Appointment is made by professorial nomination, Division Chair recommendation, and concurrence of the Institute Academic Council...criterion for nomination include outstanding professional accomplishment in his/her field and unusually substantive assistance to faculty & students in research and class work."
- John W. Clarke Fellowship. 1991 – 1992.
- Co-investigator on two NASA flight projects to study thermophysical properties of undercooled metal alloys, 1995 – 1999.
- Directed DOE Fuel Cell project, ONR thermoelectric materials project and DARPA spintronic materials project while at Symyx. Also successfully lobbied for and received a \$4.75MM line-item in FY2000 Congressional budget for a project to replace depleted uranium with amorphous metal in kinetic energy penetrators.
- Consultant on advanced materials properties, applications & manufacturing.
- Consultant to the golf industry.
- Member of the Golf Digest Hot List Technical Advisory Panel, 2005 to present.
- Member of: APS, MRS, ASM, AAPT, Sigma Xi Honor Society.

SELECTED PATENTS, SCIENTIFIC PUBLICATIONS & INVITED TALKS

1. US Patent #8147352. "Golf Club having Hydrophobic and Hydrophilic Portions." 04/2012.
2. US Patent #7993216. "Golf Club Head or Other Ball-striking Device Having Multi-piece Construction." 08/2011.
3. US Patent #7481511. "Droplet Dispensation from a Reservoir with Reduction in Uncontrolled Electrostatic Charge." 01/2009.
4. US Patent #7270986. "Ejection of Localized Volumes from Fluids." 09/2007.
5. US Patent #7185969. "Droplet Dispensation from a Reservoir with Reduction in Uncontrolled Electrostatic Charge." 03/2007.
6. US Patent #7070260. "Droplet Dispensation from a Reservoir with Reduction in Uncontrolled Electrostatic Charge." 07/2006
7. US Patent #6916083. "Controlling Overflow of an Acoustic Coupling Fluid." 07/2005.
8. US Patent #6869551. "Precipitation of Solid Particles from Droplets Formed Using Focused Acoustic Energy." 03/2005.
9. US Patent #6849423. "Focused Acoustics for Detection and Sorting of Fluid Volumes." 02/2005.
10. US Patent #6610223. "Focused Acoustic Energy in the Generation of Solid Particles." 08/2003.
11. US Patent #6596206. "Generation of Pharmaceutical Agent Particles Using Focused Acoustic Energy." 07/2003.
12. S. Glade, D. Lee, R. Busch and W. Johnson, "Thermodynamics of Bulk Amorphous Metal Alloys", J. Appl. Phys. 2000, 87 (10).
13. W. Johnson, D. Lee, C. Hays and J. Schroers, "Physical Properties and Processing of Undercooled Metallic Glass Forming Liquids." Appl. Phys. Lett.
14. S. Glade, D. Lee, R. Wunderlich and W. Johnson, "AC Modulation Calorimetry of Undercooled Liquid TiZrCuNi and ZrNbNiAlCu: An MSL-1 Experiment." Proceedings of the Fall MRS Symposium, 1999.
15. R. Wunderlich, R. Sagel, H. Fecht, D. Lee, S. Glade and W. Johnson, "Measurement of Thermophysical Properties of Bulk Metallic Glass Forming Liquid Alloys Under Reduced Gravity Conditions." *Solidification 99*; editors Hofmeister et al: TMS Publications, 1999. 53-64.
16. R. Wunderlich, D. Lee, W. Johnson, H. Fecht, "Noncontact Modulation Calorimetry of Metallic Liquids in Low Earth Orbit." Phys. Rev. B, 1997. 55(1): 26-29.
17. *Invited talk*: D. S. Lee and W. L. Johnson, "Calorimetric Measurements in Microgravity." 4th Asian Thermophysical Properties Conference, Tokyo, Japan. 1995.
18. *Invited talk*: D. S. Lee, W. Hofmeister, R. Bayuzick and W. L. Johnson, "Noncontact AC Calorimetry of Liquid $Zr_{76}Ni_{24}$ and $Ni_{60}Nb_{40}$." Gordon Research Conference on Gravitational Effects in Physicochemical Systems, New Hampshire. 1995.
19. D. Lee, D. Uffelman, W. Johnson, "Non-contact AC Calorimetry on Undercooled Alloys." In *Science and Technology of Rapid Solidification and Processing*; ed. M. Otonari: Kluwer Academic Publishers; 1995; 278: 327-337. (NATO ASI Series E: Applied Sciences).
20. J. A. Kittl, C. W. Nieh, D. S. Lee and W. L. Johnson, "YBCO Films Grown *In situ* by Sequential Ion Beam Sputtering." Mat. Lett. 9 (1990), p. 336.
21. J. A. Kittl, C. W. Nieh, D. S. Lee and W. L. Johnson, "Correlations Between Deposition Parameters and Structural/Electrical Properties of *In situ* Grown YBCO Thin Films." Appl. Phys. Lett. 56 (1990), p. 2408.
22. E. Hellstern, L. Schultz, R. Bormann and D. Lee, "Phase Formation in Mechanically Alloyed Nb-Al Powders." Appl. Phys. Lett. 53 (1988), p. 1399.

23. D. S. Lee, C. C. Ahn and K. Samwer, " L_{2-3} White Line Splitting of Copper in the Electron Energy Loss Spectrum of YBCO." Proc. of the MRS Symposium, 99 (1988), p. 793.
24. D. S. Lee, Z. Fu, E. Hellstern, W. L. Johnson, P. Pietrokowsky and K. Samwer, "DSC and Guiner Camera/Hi-T XRD Studies of the Oxygen Sublattice Phase Transition in the YBCO System." Proceedings of the MRS Symposium, 99 (1988), p. 923.