

# Erik B. Helgren

Department of Physics, CSU East Bay  
231 North Science  
Hayward, California 94542

Work: (510) 885-4604  
erik.helgren@csueastbay.edu

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## Education:

University of California Los Angeles, Ph.D., Condensed Matter Physics 2002  
Dissertation: "Electrodynamics of Coulomb Glasses" Advisor: Dr. George Grüner

University of California Los Angeles, M.S. in Physics 1999

University of California Los Angeles, cum Laude and departmental honors, B.S. in Physics, 1996

## Professional Experience

Chair of the Physics Department, CSUEB, Hayward, CA 2014 – present  
Academic Affairs Budget Advisory Committee, CSUEB 2017 – present  
Co-Director CSUEB Social Impact Solar Program, 2015 – present  
Board of Directors, CSUEB Institute for STEM Education, 2015 – present  
Associate Professor, Dept. of Physics CSUEB, Hayward, CA 2014 – present  
Director of the CSUEB Louis Stokes Alliance for Minority Participation 2010 – 2015  
Assistant Professor, Dept. of Physics CSUEB, Hayward, CA 2008 – 2014  
Staff Research Associate, UC Berkeley, CA 2005 – 2008  
Post-doctoral Researcher, UC San Diego, CA 2003 – 2005  
Systems Engineer, Hughes Aircraft Co. / Raytheon, Defense Systems, El Segundo, CA 1997

## Teaching Experience

CSUEB Department of Physics, 2008 – present

- Physics 2701, 2702 & 2703 – Introduction to Physics Lecture and associated labs
- Physics 4001, 4002 & 4003 –Electricity and Magnetism
- Physics 3101 & 3102 –Analytical Mechanics
- Physics 2005 – Science of Energy
- Physics 4600 – Solid State Physics
- Physics 3080 – Hands on Science Teaching (HOST) Lab
- Physics 3280 – Electronics
- Physics 3281 & 3283 – Advanced Experimental Physics Lab Series
- Physics 3999 – Social Impact Through Sustainable Solar Design – Solar Suitcase Program
- Physics 4250 – Selected Topics – Solar Technology
- Physics 4850 – Undergraduate Research
- Physics 4900 – Independent Study

Instructor, Los Angeles Valley College, Electricity, Magnetism and Electrical Circuits, 2002

Teaching Assistant/Associate, UCLA Physics Department, 1998 – 2002

## **Current Research and Professional Activity**

### **Transport Properties of Polymer Photovoltaics Materials**

2009 - present      California State University East Bay

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We study the materials used in organic conducting polymer photovoltaic (PV) cells, similar to those materials currently found in OLED displays, and focus on techniques to improve the efficiencies of the PV cells by altering the materials used. Our current research has focused on the fundamental electrical transport properties in conducting polymers tuned close to the Metal Insulator Transition (MIT) where we have found many universal properties as compared to traditional semiconductors, like silicon. Another project focused on using oriented carbon nanotubes embedded in the active region of a polymer PV device, and quantify any changes in the transport properties of oriented, spun-cast embedded nanowires polymer films.

### **Social Impact Solar Program – The Solar Suitcase Class**

2015 - present      California State University East Bay

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I am co-director of the Social Impact Solar Program (SIS) along with my colleague Dr. Karina Garbesi, Professor and Director of Environmental Studies. The program centers around a course piloted during the 2015-16 academic year, and co-taught by Dr. Garbesi and myself annually, where students learn basic STEM concepts associated with solar technology as well as the social justice and environmental justice implications that solar technology can have on the society. Students in our CSUEB class assemble a working off-grid solar energy system, i.e., the Solar Suitcase, developed by our partner non-profit We Share Solar. These suitcases are then donated and delivered to energy poor regions of the world, including orphanages, medical clinics and schools in sub-saharan Africa where energy poverty is a life-threatening issue. Our CSUEB program includes having our own university students mentor middle and high school students in local Hayward schools when they too learn about solar technology in their classrooms by building solar suitcases as well. We have found that our students serve as ambassadors and role models while participating in this service learning opportunity.

This past year, in 2017-18 we have expanded our program with generous support from PG&E as well as from the CSU Chancellor's Office to partnering CSU campuses across California, including to Cal Poly San Luis Obispo, CSU Monterey Bay, San Francisco State University and Humboldt State University.

In the summer of 2018 we are planning a workshop at the Hoopa Valley High School in Humboldt county, which predominantly serves members of the Hoopa native American tribe. Over one quarter of the students that attend this high school go home to no electricity. Thus we are holding this workshop along with faculty and students from our Partner CSU campuses to teach about solar technology through building solar suitcases. These suitcases will remain with the Hoopa tribe to serve as a "solar lending library" for member of the tribe to use and learn about the capabilities of solar technology. The end goal is to convince members of the tribe to go solar and to help alleviate the energy poverty that exists here at home in the state of California.

## Publications

26. Ryan P. Smith, Angela An-Chi Hwang, Tobias Beetz, and **Erik Helgren** "Introduction to Semiconductor Processing: Fabrication and Characterization of p-n Junction Silicon Solar Cells" submitted to American Journal of Physics March 2018.
25. **E. Helgren**, Keith Penney, Matt Diefenbach, Maryna Longnickel, Mark Winwright, Eldridge Walker, Sarah Al-Azzawi, Hendrix Erhahon, and Jason Singley "Electrodynamics of the conducting polymer polyaniline on the insulating side of the metal-insulator transition" *Physical Review B* 95, 125202 (2017)
24. **E. Helgren** "Physics and the Common Good" CSUEB Service Learning Voices & Visions Special Edition: Service Learning and STEM, *Laying the Foundation 2010-11*
23. L. Zeng, H. Zutz, F. Hellman, **E. Helgren**, J. W. Ager III and C. Ronning "Magnetoelectronic properties of Gd-implanted tetrahedral amorphous carbon" *Physical Review B* 84, 134419 (2011)
22. M. Alemani, A. Huegel, **E. Helgren**, D. R. Queen and F. Hellman "Effect of magnetic Gd adatoms on the transport properties of ultrathin gold films" *Physical Review B* 82, 195447 (2010)
21. L. Zeng, J. X. Cao, **E. Helgren**, J. Karel, E. Arenholz, L. Ouyang, D. J. Smith, R. Q. Wu and F. Hellman "Distinct local electronic structure and magnetism for Mn in amorphous Si and Ge" *Physical Review B* 82, 165202 (2010)
20. Z. Boekelheide, D. W. Cooke, **E. Helgren** & F. Hellman "Resonant impurity scattering and electron-phonon scattering in the electrical resistivity of Cr thin films" *Physical Review B* 80, 134426 (2009)
19. Vladimir Orlyanchuk, M. B. Weissman, **E. Helgren**, L. Zeng and F. Hellman "Tracking spin-glass barriers versus field and temperature in a-Gd<sub>0.19</sub>Si<sub>0.81</sub>" *Physical Review B* 79, 224402 (2009)
18. H.-J. Lee, **E. Helgren** and F. Hellman "Gate-controlled magnetic properties of the magnetic semiconductor (Zn,Co)O" *Applied Physics Letters* 94, 212106 (2009)
17. L. Zeng, A. Huegel, **E. Helgren**, F. Hellman, C. Piamonteze, and E. Arenholz "X-ray absorption study of the electronic structure of Mn-doped amorphous Si" *Applied Physics Letters* 92, 142503 (2008)
16. L. Zeng, **E. Helgren**, F. Hellman, R. Islam, B.J. Wilkens, R.J. Culbertson and David J. Smith "Quenched magnetic moment in Mn-doped amorphous Si" *Physical Review B* 77, 073306 (2008)
15. Z. Boekelheide, **E. Helgren**, and F. Hellman "Spin-density wave in polycrystalline Cr films from infrared reflectivity" *Physical Review B* 76, 224429 (2007)
14. **E. Helgren**, F. Hellman, L. Zeng, N. Sinenian and David J. Smith "Magnetic and transport properties of amorphous Gd<sub>x</sub>Ge<sub>1-x</sub> alloys near the metal-insulator transition" *Physical Review B* 76, 184440 (2007)
13. L. Zeng, **E. Helgren**, F. Hellman, R. Islam, David J. Smith and J.W. Ager III "Microstructure, magnetotransport, and magnetic properties of Gd-doped amorphous carbon" *Physical Review B* 75, 235450 (2007)

12. L. Zeng, **E. Helgren**, F. Hellman, R. Islam and David. J. Smith “Growth and microstructure dependence of electronic and magnetic properties in magnetically doped Gd-Si amorphous semiconductors” *Physical Review B* 75, 184404 (2007)
11. **E. Helgren**, F. Hellman, L. Zeng, R. Islam and David J. Smith „Concentration dependent microstructure and transport properties of the magnetic semiconductor GdSi“ *Journal of Applied Physics* 101, 093712 (2007)
10. E. Guillotel, L. Zeng, **E. Helgren**, F. Hellman, R. Islam and David J. Smith “Effects of Annealing on Amorphous GdSi Near the Metal Insulator Transition” *Journal of Applied Physics* 101, 23908 (2007)
9. **E. Helgren**, L. Zeng, F. Hellman, K. Burch and D. Basov “Field and Concentration Tuned Scaling of a Quantum Phase Transition in a Magnetically Doped Semiconductor” *Physical Review B* 73, 155201 (2006)
8. D. Querlioz, **E. Helgren**, D.R. Queen, F. Hellman, R. Islam and D. J. Smith “Beneficial Effects of Annealing on Amorphous Nb-Si Thin-Film Thermometers”, *Applied Physics Letters* 87, 221901 (2005)
7. **E. Helgren**, J.J. Cherry, L. Zeng and F. Hellman, “Characteristic Temperature in Magnetically-Doped Amorphous Semiconductors”, *Physical Review B* 71, 113203 (2005)
6. N.K.Chumakov, S.V.Gudenko, V.V.Tugushev, A.B.Davydov, V.I.Ozhogin, **E. Helgren**, F.Hellman, “Interplay between charge localization and magnetic ordering in amorphous  $Gd_xSi_{1-x}$ ”, *Journal of Magnetism and Magnetic Materials* 272, 1351 (2004)
5. M. Briman, N.P. Armitage, **E. Helgren** and G. Gruner, “Dipole Relaxation Losses in DNA” *Nano Letters* 4, 733 (2004)
4. **E. Helgren**, N.P. Armitage and G. Gruner, “The Frequency Dependent Conductivity of Electron Glasses” *Physical Review B* 69, 14201 (2004)
3. N.P. Armitage, **E. Helgren** and G. Gruner, “Taxonomy of Electron Glasses”, Proceedings of the NATO ARW on ‘*Concepts in Electron Correlation*’, Kluwer: The Netherlands (2003)
2. **E. Helgren**, N.P. Armitage and G. Gruner, “Electrodynamics of a Coulomb Glass in n-type Silicon”, *Physical Review Letters*, Vol. 89, 246601 (2002)
1. **E. Helgren**, G. Gruner, M.R. Ciofalo, D.V. Baxter and J.P. Carini, “Measurements of the Complex Conductivity of  $Nb_xSi_{1-x}$  Alloys on the Insulating Side of the Metal-Insulator Transition”, *Physical Review Letters*, Vol. 87, 116602 (2001)

### Book Chapter

N. P. Armitage, **E. Helgren** and G. Gruner “Taxonomy of Electron Glasses,” in *Concepts in Electron Correlation*, edited by V. Zlatic and A. C. Hewson (Springer 2003), p. 189.

## **Invited Talks/Presentations**

“Expanding to Other CSU Campuses: Social Impact Solar Program” CSUEB Office of Research and Sponsored Programs (ORSP) Seminar Series invited speaker, CSUEB April 2018

“Engaging URM students in STEM: The Social Impact Solar Program” CSUEB Week of Inclusive Excellence – Faces of STEM invited speaker, CSUEB January 2018

“Outreach Efforts in the Hayward Community - Social Impact Solar Program at CSUEB,” – Hayward Rotary Club, Hayward, CA November 27, 2017

“Social Impact through Sustainable Solar Design,” Invited presentation at Mission College for students in the HIS STEM program, Sant Clara, CA August 2017

“Social Impact Through Sustainable Solar Design – The Solar Suitcase Program at CSUEB” Osher Life-long Learning Institute, CSUEB Concord campus April 2017

“Charge Transport and Terahertz Electrodynamic Response of a Conducting Polymer” CSUEB Spitzer Memorial Seminar March 2017

“Solar Suitcase Program at CSUEB” Innovate East Bay 2017, CSUEB February 2017

“CSUEB Solar Suitcase Program” CSUEB Rising in the East Gala, CSUEB September 2016

“Social Impact Through Sustainable Solar Design: Much More than a Course” Award Presentation for 2016 Energy Efficiency and Sustainability Best Practice Award for Sustainability in Academics – STEM, California Higher Education Sustainability Conference (CHESC), CSU Fullerton June 27, 2016

“The Solar Suitcase Program at CSUEB” San Ramon Rotary Club – invited guest of Marv Remmich – June 9, 2016

“PHYS/ENVT 3999 - Co-teaching the Solar Suitcase Class” Global Learning and High Impact Practices (HIPs) Workshop, Biella Room CSUEB May 13, 2016

“Faculty and Students of the Solar Suitcase Project at CSUEB” Presidential Salon, Danville CA April 21, 2016

“Lessons Learned from the Course Redesign for Renewable Energy Engineering Physics Advanced Lab – Campus as a Living Lab Chancellor’s Office Award” San Francisco State University, Cesar Chavez Center – Jack Adams Hall July 2015

“The Metal Insulator Transition in Organic Conductors and Terahertz Spectroscopy” CSUEB Spitzer Memorial Seminar, Oct. 2014

“Course Redesign for Renewable Energy Engineering Physics Advanced Lab” California Higher Education Sustainability Conference (CHESC) Topic Area: Curriculum – Institutionalizing Sustainability, San Diego State University, June 2014

“Terahertz Spectroscopy Techniques for Explosive Detection and the Ultrafast Laser Lab at CSUEB” invited talk at Rapiscan Systems Inc. Sept. 2012

“The Science and Educational Impact of the CSUEB Fuel Cell” CSUEB Educational Foundation Board of Trustees invited talk, Hayward, California May 2012

“Magnetism and Optical Properties of Doped Semiconductors” California State University Sacramento Department of Physics Colloquium, Sacramento, California March 2009

“Amorphous Magnetic Semiconductors: a Comparison of Gd and Mn Dopants” UC Berkeley Department of Physics Condensed Matter Seminar, Berkeley, California April 2008

“Magnetism and Optical Properties of Doped Semiconductors” California State University East Bay Physics Seminar invited speaker, Hayward, California February 2008

“Magnetic Semiconductors” UC Berkeley Department of Physics Condensed Matter Quantum Materials Seminar invited speaker, Berkeley, California November 2007

“XAS on the Rare-Earth Doped Magnetic Semiconductor a-GdSi” Lawrence Berkeley National Laboratory Advanced Light Source User’s Meeting invited speaker, Workshop on Advanced Magnetic Spectroscopy, October 2006

“Ultrafast Pump Probe X-Ray Spectroscopy on Magnetic Semiconductors: Survey of Results and Potential Experiments on magnetically doped semiconductors” LBNL ALS invited speaker, Ultrafast Beamline Users Meeting, Berkeley, CA June 2006

“The Metal Insulator Quantum Phase Transition” UC Davis Condensed Matter Seminar invited speaker, Davis, California June 2006

“Universal and Non-Universal Behavior at the Metal Insulator Transition” Baltimore, Maryland, APS March meeting 2006

“Disorder and the Metal Insulator Transition” Oregon State University Physics Colloquium invited speaker, Corvallis, Oregon, February 2006

“Optical Properties of Disordered Systems: Terahertz Spectroscopy of Doped Silicon” Harvey Mudd Physics Colloquium invited speaker, Claremont, California, February 2006

“Concentration vs. Magnetic Field Tuned Scaling at the Quantum Phase Transition in a-Gd<sub>x</sub>Si<sub>1-x</sub>” 50<sup>th</sup> Annual MMM Conference San Jose, California, November 2005

“Magnetic Semiconductors: A Nano-scale Look Using Photoemission” Lawrence Berkeley National Laboratory Advanced Light Source User’s Meeting invited speaker, Workshop on New Visions in Bandmapping, October 2005

“Scaling in Magnetically Doped Semiconductors”, Los Angeles, California, APS March meeting 2005

“Optical Properties of Disordered Systems: Terahertz Spectroscopy of Doped Semiconductors Near the Metal Insulator Transition” U. S. Naval Academy, invited speaker, Condensed Matter Seminar, Annapolis, MD Feb. 2005

“Characteristic Thermal Energy Scale for Suppression of Conductivity in Magnetically doped Amorphous Semiconductors”, Montreal, Canada APS March meeting 2004

“Electrodynamics of Coulomb Glasses; Disordered Insulating Systems near the Metal-Insulator Transition”, UCSD invited speaker, Condensed Matter seminar, May 2003

“Quasi-Optical Terahertz Spectroscopy” Rockwell Scientific Co. Invited speaker, Thousand Oaks, California, August 2002

“Microwave and Millimeter-wave Spectroscopy: Investigations of a Coulomb Glass” Lawrence Berkeley National Laboratory, Advanced Light Source User’s Meeting invited speaker, Workshop on Applications of Coherent Infrared Synchrotron Radiation, October 2002

“Frequency Dependent Variable Range Hopping in Fermi Glasses and Coulomb Glasses” University of Stuttgart, Vaihingen, Germany; Condensed Matter Physics Department, June 2001

## **Memberships and Service**

CSUEB Member of the Applied Sciences Center Steering Committee Jan. 2018 - present

CSUEB AVP Resources and Planning search committee Dec. 2017 – March 2018

CSUEB Joan Sieber Collaboration Award referee 2017

CSUEB Chair, College of Science IREE committee Dec. 2017

CSUEB Academic Affairs Budget Advisory Committee, 2017 – present

CSUEB Member of the Academic Senate, 2016 – present

CSUEB Executive Committee of the Academic Senate, 2016 – 2017

CSUEB Chair, College of Science Dean search committee 2015 - 2016

CSUEB Dept. of Physics Chair, 2014 – present

CSUEB College of Science Curriculum Committee 2014 - present

CSUEB Dept. of Physics – Chair of the Tenure Track Search Committee, 2016 – 2017

CSUEB Department of Physics 2700 series lab coordinator, 2015 – present

CSUEB Representative to National Council on Science and the Environment's Council of Environmental Deans and Directors (CEDD) 2014 – 2015

CSUEB Dept. of Physics – Chair of the Tenure Track Search Committee, 2014 – 2015

CSUEB Faculty Learning Community – Affinity Hires, 2014 – 2015

CSUEB CIC University Writing Skills Requirement subcommittee member, 2014 - 2015

CSUEB Planning for Distinction – Support Group committee member, 2012-2013

CSUEB Interim Chair, Dept. of Physics Fall, 2012

CSUEB Joan Sieber Award referee 2011

CSUEB Tri-Valley/LLNL Entrepreneurship Faculty Advisor 2011

CSUEB College of Science A2E2 IREE committee 2011 – present

CSUEB Director of the LSAMP Program 2011- 2014

CSUEB Science Festival Department Coordinator 2011 - present

CSUEB Campus Laser Safety Officer 2009 -2014

CSUEB Department Radiation Safety Officer 2008 - 2012

CSUEB Member of the Academic Senate 2009 – 2011

Session Chair – Metal Insulator Transitions APS March Meeting - 2008

Physical Review Letters referee

Physical Review B referee

Journal of Physics and Chemistry of Solids referee

Journal of Applied Physics referee

Graduate Student Recruitment Committee, UCLA Physics Department, 2002

American Physical Society member

Materials Research Society member  
California Faculty Association

Volunteer Science Assistant in the San Ramon Valley Unified School District  
Volunteer Referee/Umpire and Assistant Coach San Ramon Youth Soccer and Baseball

### **Awards**

California Higher Education Sustainability Conference (CHESC) 2016 Energy Efficiency and Sustainability Best Practice Award for Sustainability in Academics – STEM

2002 UCLA Physics and Astronomy Alumni Alliance Award for Outstanding Graduate Student

### **Selected Current and Former Research Students**

Michael Norcross (2016 – present)	Student researcher
Guanhao Su (2016 – 2017)	Student researcher
Maryna Longnickel (2014 – 2016)	Graduated CSUEB 2016, attending graduate school U. Florida
Matthew Diefenbach (2012 – 2015)	Graduated CSUEB 2015
Eldridge Walker (2013 – present)	LSAMP Scholar
Hendrix Erhahon (2012 – 2016)	LSAMP Scholar, CSUEB ASI President 2016-2017
Mark Wainwright (2011 – 2014)	Graduated 2013 LSAMP Program (2011 – 2013) UCLA David Geffen School of Medicine (Class of 2020) 2016 - present
Nicholas Pollard (2010 – 2013)	Ph.D. from UCR Jan. 2018 UC Riverside Physics graduate program 2013 - 2017 New Source Technology – Laser Technician (2011 – 2013)
Terrence Wong (2009 – 2012)	McNair Scholar (2009 – 2011) University of Iowa Medical School 2013-2017 Residency in General Surgery at NY Presbyterian/Queens Hospital 2017 - present
Keith Penney B.S. CSUEB 2009 – 2011 M.S. SFSU 2013 – 2016	Graduate work done at CSUEB via SFSU Master's Program Helgren served as co-Thesis advisor with Dr. AKM Newaz at SFSU 2011 Outstanding Physics Student of the Year Sandia National Labs - Laser and Optics Technologist (2011 – present) New Source Technology – Laser Technician (2010 – 2011)