Dr. Thomas C. Pekin

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Experience

Postdoctoral Researcher, Institut für Physik
SEPT. '18 – PRESENT

Humboldt-Universität zu Berlin, Structure Research and Electron Microscopy group *Berlin, Germany*

- Led the successful experimental realization and development of a computational imaging technique called ptychography on a Nion UltraSTEM microscope, in collaboration with several theorists. Published and presented the results both in journal articles as well as through conferences.
- Taught more than 60 first-year students over two semesters "Introduction to Python for Physicists", receiving extremely high (above average) reviews and positive feedback. Several students have continued to work in our group using Python after the conclusion of the course.
- Currently mentor two PhD and several masters and bachelor students while maintaining several of my own research projects. Have successfully shepherded three bachelor theses to completion.

Graduate Student Researcher, Materials Science and Engineering
AUG. '13 – AUG. '18

University of California, Berkeley, Prof. Andrew Minor *Berkeley, CA*

- Was one of the primary researchers worldwide advancing the electron microscopy field of 4D-STEM, with regards to both experimental technique and image analysis algorithm development.
- Investigated a wide variety of metallic materials, from aluminum and steel, to bulk metallic glasses and high entropy alloys, across length scales from the angstrom (10^{-10} m) to the centimeter, discovering fundamental mechanisms of deformation.
- Summarized and presented the results of my research at several international conferences and published four first-author papers and many more as a contributing author.

Research Mentor, Science Undergraduate Laboratory Internships (SULI)
APR. '17 – AUG. '17

National Center for Electron Microscopy, Lawrence Berkeley National Laboratory *Berkeley, CA*

- Mentored an undergraduate student at Lawrence Berkeley National Lab.
- Collaborated with a professor as well as a staff scientist to develop the student's skills in electron microscopy, data processing, and MATLAB.
- Successfully improved NCEM's amorphous materials characterization capabilities. Improvements were added to the open source py4DSTEM software package, and student went on to complete a PhD in the same lab in which I mentored her.

Intern, Light Metals Systems
AUG. '16 – NOV. '16

General Motors, Research and Development *Detroit, MI*

- Performed microstructural and chemical validations using a variety of TEM, SEM and STEM experiments on several novel automotive sheet and extruded aluminum alloys to verify the suppliers were delivering acceptable materials.
- Materials researched can be found in a variety of Corvette and Cadillac products, from 2019 onwards.

Intern, Light Metals Systems
AUG. '14 – NOV. '14

General Motors, Research and Development *Detroit, MI*

- Investigated the microstructural phenomena responsible for work-hardening and toughening in 5xxx and 6xxx series aluminums, now used, for example, in the 2020 Corvette.
- Developed state of the art *in situ* experimental procedures on GM's JEOL microscope and successfully transferred my knowledge to R&D scientists.

Please refer to my LinkedIn profile for a more complete list of work experiences along with recommendations.

Education

Doctor of Philosophy in Materials Science and Engineering
2013 – 2018

University of California, Berkeley *Berkeley, CA*

Dissertation title: *in situ* Deformation Studies with Scanning Nanobeam Electron Diffraction

Master of Science in Materials Science and Engineering
2013 – 2015

University of California, Berkeley *Berkeley, CA*

Thesis title: Evaluation of neon focused ion beam milling for TEM sample preparation

Bachelor of Science in Materials Science and Engineering
2009 – 2013

University of California, Berkeley *Berkeley, CA*

Teaching

- Spring 2021 – CP 1 – Computational Physics 1 laboratory, Humboldt Universität zu Berlin (~40 students, above average 5.8/6 rating)

- Spring 2020 – CP 1 – Computational Physics 1 laboratory, Humboldt Universität zu Berlin (undergraduate level course, ~20 students, introduction to scientific Matlab and Python, above average 5.6/6 rating)

- Spring 2014 – MSE 241 – Transmission Electron Microscopy laboratory, U.C. Berkeley (graduate level practical hands-on course, above average 4.91/5 rating)

Technical Skills

Electron microscopy: Highly qualified using state-of-the-art transmission electron microscopes of all types, including the use of high framerate pixelated detectors and spectroscopy (EDS/EELS). Very experienced using JEOL, ThermoFisher (FEI), and Nion microscopes. Highly experienced running the gamut of *in situ* and 4D-STEM experiments, often simultaneously. Interested and experienced in experimental technique development.

Significant experience using scanning electron microscopes (SEM) and focused ion beams (FIB) for sample characterization and fabrication, including both traditional Ga FIBs as well as the Orion NanoFab, a He/Ne gas field ion source (GFIS) beam. The SEM characterization methods include novel electron backscattered diffraction (EBSD)-based techniques as well as *in situ* deformation.

Significant experience writing code to automate image acquisition and analysis, including working with large datasets (>1 TB) in both Matlab and Python.

Other technical skills: x-ray diffraction, mechanical testing (tensile, compressive, hardness, micro and nano-indenation), dynamic mechanical analysis (DMA), differential scanning calorimetry (DSC), thermogravimetric analysis (TGA), differential thermal analysis (DTA), cryogenic TEM sample preparation and handling procedures, data analysis, atom force microscopy, lathe and mill machining, standard metallurgical sample preparation techniques (arc melting, annealing, thermomechanical forming, polishing/etching for microstructure retrieval)

Computer Skills

Advanced: Python (incl. Numpy, Scipy, Matplotlib, etc.), MATLAB, Git (and Github/Gitlab/Bitbucket etc.), Bash, Linux, LaTeX, Adobe Illustrator, Adobe Lightroom, Adobe CameraRAW, Microsoft Office

Intermediate: Mathematica, Regex, Slurm, SQL, KaleidaGraph, OpenOffice, Adobe Photoshop, Adobe Premiere Pro, Computer Assembly and Hardware Selection

Publications, Service and Recognition

- Ten peer-reviewed journal publications, cited over 250 times (Google Scholar)

- Eleven invited talks to both university departments as well as international conferences (list upon request)

- Recognized subject expert by and have reviewed manuscripts for *Nature* and other peer-reviewed academic journals

- Winner, Best Postdoctoral Paper Award, Microscopy & Microanalysis 2021

- Coauthor, Best Graduate Student Paper Award, Microscopy & Microanalysis 2021

- Organizer, "Multimodal *in situ* Characterization of Hard/Soft Materials Across Interfaces and Multiple Scales, Parts I & II", a symposium at the Molecular Foundry User Meeting 2018

- Organizer, "*in situ* TEM of nanoscale materials and electronic devices for phase transformation studies", a symposium at the Microscopy and Microanalysis (M&M) 2019 meeting

- Advisor to two PhD students, and several masters and bachelors students

- Active contributor to the py4DSTEM open source software package for 4D-STEM data analysis

Interests

In any order: volleyball, kitesurfing, surfing, reading, food, cycling, scuba diving, cars, sailing, live music

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