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Microscopy and Microanalysis, **30** (Suppl 1), 2024, 2142–2143
https://doi.org/10.1093/mam/ozae044.1058

Microscopy AND Microanalysis

Meeting-report

In Memory of Lena Kourkoutis and Her Unfinished Work

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Lena Fitting and her twin sister Sylvia were born in Rostock, East Germany on June 6, 1979. When they were six years old, her family moved to Eritrea so the children could experience life outside the Soviet Union, where her father taught physics at the university in Asmara. In 1988, with the civil war heating up, the family moved back to Rostock. The fall of the Berlin wall in 1989 and the subsequent reunification of Germany opened new opportunities. These formative experiences may have helped reinforce Lena's strong sense of fairness and her willingness to speak up on behalf of students, staff and colleagues when things needed to be addressed. Lena attended the University of Rostock for her undergraduate diplom in physics from 1997-2003, and a Fulbright Fellowship supporting her studies at the North Carolina State University in Raleigh, NC from 2002-2003.

She started her PhD at Cornell in August 2003, just as I had moved there from Bell Labs, and became the first student to join my group. Figure 1A shows her uncrating our new electron microscope. Much of her thesis research focused on the development of atomic-resolution electron energy loss spectroscopy (EELS) to study structure and bonding in complex oxides and their heterostructures (Figure 2). Abberation-correction made it possible to perform atomic-resolution spectroscopic maps [1]. One of the nicest demonstrations of bonding changes at the atomic scale is Lena's map in Figure 3, which she reported in 2010 at M&M. [2], but never wrote up for a full paper, feeling that our earlier work of ref [1] had already made the point. She applied these new tools to show how complex oxides accommodated cation defects, and how previously-assumed instrinsically"dead" electronic layers at interfaces were instead the result of cation intermixing driven by off-stoichiometric growth, and could in fact be supressed [3-6].

Despite her hard work in the lab, she still found time for outside activities including music and volunteering for Loaves and Fishes. Here she met, and later married, Chris Kourkoutis and became embedded in the Ithaca community. She wanted to stay in Ithaca, so after the birth of her son Quinn and completing her PhD in 2009, she stayed on as a postdoc while the department arranged plan to bring her on board as a faculty member.

To learn a set of skills to differentiate herself from the physical sciences work of her graduate advisor, she took up a Humboldt Fellowship for Postdoctoral Research at the Max Planck Institute of Biochemistry in Martinsried from 2011-2012. There she learned cryo electron microscopy methods used to preserve and prepare the native state of biological systems for imaging in the vacuum of an electron microscope. After returning to Ithaca, she built her research program around combining the cryogenic methods she had learned for biology with the focused-beam approach of materials physicists to study a class of materials problems that was previously inaccessible to electron microscopy. Her group developed new cryogenic scanning transmission electron microscopy techniques to gain access to low-temperature electronic states, to study processes at liquid/solid interfaces, and to image thick biological specimens.

She will not only be remembered for her research but also for her passion, kindness and mentorship. Kourkoutis is survived by her husband, Chris Kourkoutis; their two children, Quinn and Elise; her twin sister Sylvia Fitting; her younger brother, Martin Fitting; and her parents, Hans-Joachim and Tatjana Fitting. She will be greatly missed by all who knew her [7].

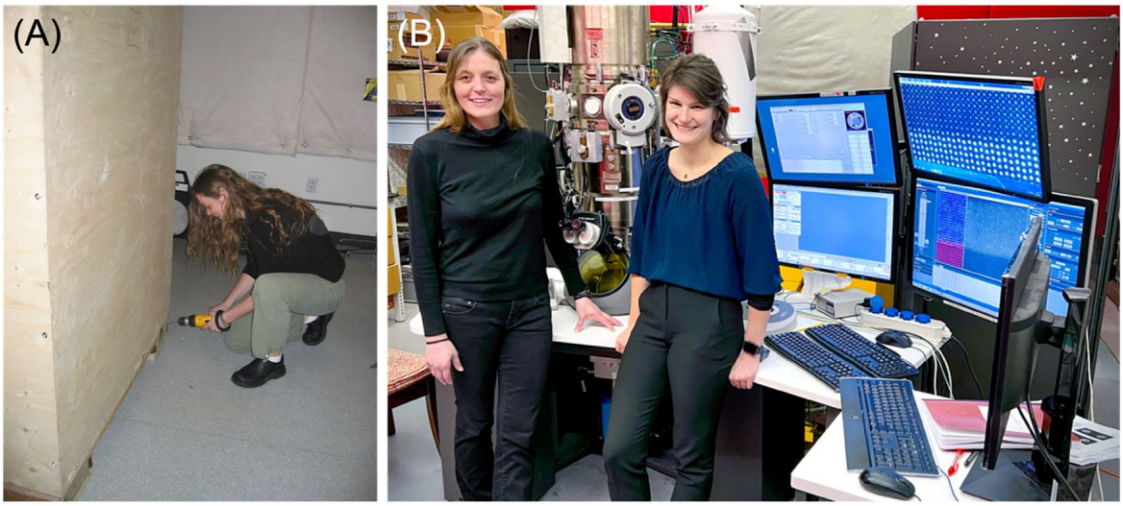

Fig. 1. (A) Lena as a first-year graduate student in early 2004, uncrating the Tecnai f20 she did most of her thesis work on. (B) Lena as a professor by her aberration-corrected Themis, along with her PhD student Berit Goodge, where their cryo-EM work was performed.

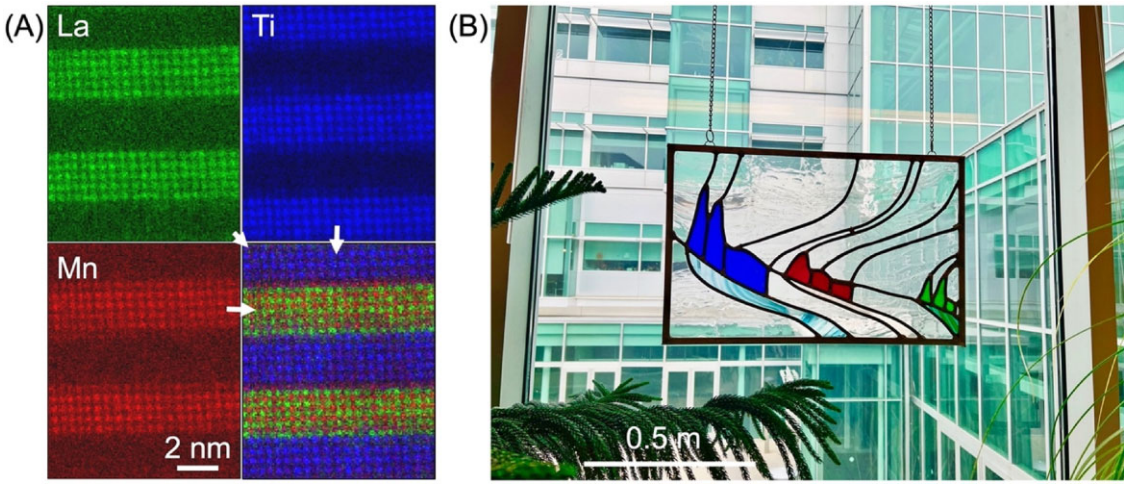

Fig. 2. (A) Atomic Resolution EELS map of LaMnO3/SrTiO3 superlattice, mapped in the La-M, Ti-L and Mn-K edges. (B) EELS spectrum showing the Ti, Mn and La edges color coded by their maps from panel (A). This was one of Lena's favorite projects as a student, and the stained-glass panel was later made by her husband Chris, and she displayed it in her office as a faculty member.

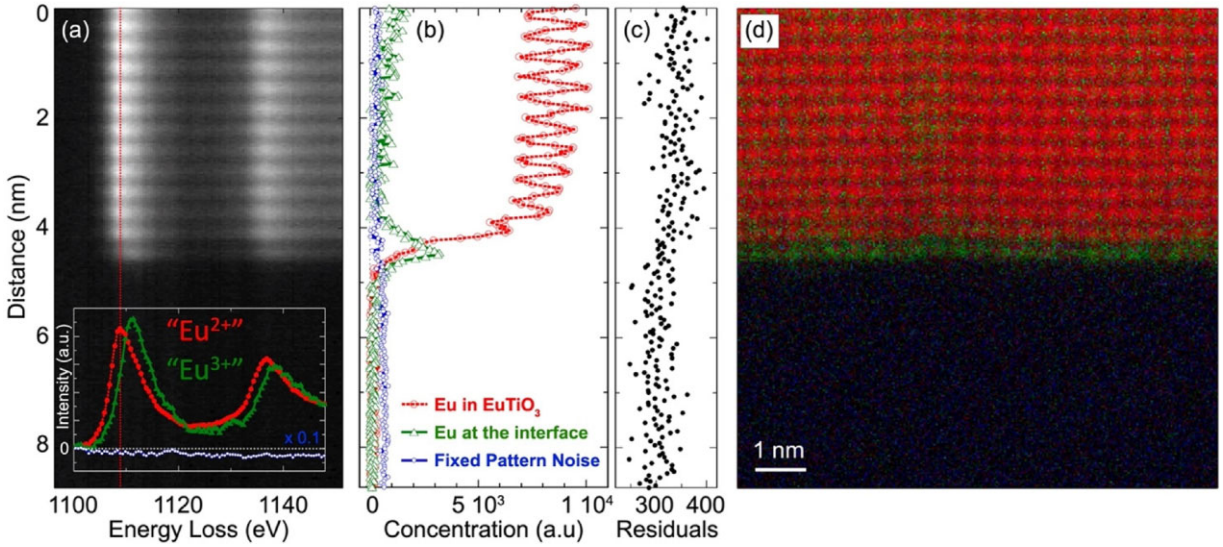

Fig. 3. Mapping bonding changes at the $EuTiO_3/DyScO_3$ interface through spectrum imaging. (a) Evolution of the horizontally averaged Eu-M edge fine structure across the interface and the three components extracted using MCR methods. (b) The three-component fit to the experimental data shows the increase in Eu valence at the interface, and as a goodness of fit, (c) no structure in the residuals. (d) Three-component fit to the full SI demonstrating 2D mapping of bonding changes with atomic resolution.

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7. Funding from the PARADIM Materials Innovation Platform (NSF DMR DMR-2039380), and the Cornell Center for Materials Research (National Science Foundation grants MRI-1429155, DMR-1719875).

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