

**Ferenc Borondics, Ph.D., Physics**

Years of Fellowship: 2007-2008

Collaborating Institution: Eötvös Loránd University, Hungary

Currently: Staff Scientist, Canadian Light Source

**Project: Very low-temperature optical measurements and optical conductivity of graphene.**



As an ALS Postdoctoral Fellow, Ferenc (Feri) Borondics worked in

three areas: very low-temperature optical measurements, optical conductivity of graphene, and troubleshooting beamline operations for users. His support was half funded via a scholarship from the external Rosztochy Foundation. Feri is now a Beamline Scientist for the mid-IR beamline at the Canadian Light Source.



Feri came to the ALS as an expert in FTIR spectroscopy on fullerenes, the instrumentation of FTIR and cryogenics. His first project was to work on coupling under vacuum a  $^3\text{He}$  very low temperature cryostat to our IFS 66v/S spectrometer for performing far-infrared spectroscopy with samples at temperatures below 1 Kelvin. He worked together with Thomas Schenkel's group members to take apart the full cryogenic system, and operate it with several different samples made to demonstrate aspects required to develop quantum computers. Not only did the work result in a publication, Feri also developed

novel methods of experimental control, including automated monitoring of the cryostat system which would text-message the operator whenever certain conditions were met or were out of spec. This enabled long overnight data acquisitions with maximizing the experimental productivity. This automated control and notification system resulted in a LBNL outstanding performance award for Feri.

Feri was also always looking for interesting projects from beamline users in which his expertise could be of use. One such project was brought forward by Robert Kaindl and Alessandra Lanzara who were studying epitaxially grown graphene. Graphene relates closely to Feri's PhD work on fullerenes, and the research needed included cryogenics as well as detailed optical constant

extraction, both of which Feri brought expertise to. This work with ALS users resulted in a true collaboration and two publications with Feri as second author.

Feri also helped with other tricky user problems, and with making sure the infrared instrumentation was best coupled with the synchrotron. One example of the latter is when he helped to measure and understand the problems that would be coming as the ALS transitioned to top-off operations, and he helped devise a way to correctly reject measurements being made when the top-off injection beam disturbance occurred. The ALS continues to use this system today, which makes top-off operations truly transparent to users.

Feri is now a Beamline Scientist at the Canadian Light Source where he continues to draw upon the experience and knowledge he gained while working as a post-doctoral fellow at the ALS.

[1] Cheuk Chi Lo, Arun Persaud, Scott Dhuey, Deirdre Olynick, Ferenc Borondics, Michael C. Martin, Hans A. Bechtel, Jeffrey Bokor, Thomas Schenkel, "Device fabrication and transport measurements of FinFETs built with 28Si SOI wafers toward donor qubits in silicon," *Semiconductor Science and Technology* **24**, 105022 (2009).

[2] H. Choi, Ferenc Borondics, D.A. Siegel, S.Y. Zhou, Michael C. Martin, Alessandra Lanzara, Robert A. Kaindl, "Broadband electromagnetic response and ultrafast dynamics of few-layer epitaxial graphene," *Applied Physics Letters* **94**(17), 172102 (2009).

[3] H. Choi, Ferenc Borondics, D.A. Siegel, S.Y. Zhou, Michael C. Martin, Alessandra Lanzara, Robert A. Kaindl, "Ultrafast Terahertz Dynamics and Broadband Optical Conductivity of Few-Layer Epitaxial Graphene," OSA / CLEO / QELS 2010, CMJJ7 (2010).

[4] Laetitia Vernoud, Hans A. Bechtel, Ferenc Borondics, Michael C. Martin, "Reconciling FTIR Spectroscopy with Top-off Operations at the Advanced Light Source," *AIP Conference Proceedings* **1214**, 36-38 (2010).