

*International Research for  
Undergraduates:  
How do we make a research rich  
curriculum global?*

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# *Benefits of Study Abroad Experiences*

- ❖ Students recognize that international opportunities cost something, yet see the value and relevance of the experience
- ❖ Students understand the connection between the on-campus and the global learning experiences
- ❖ Students learn to appreciate cultural differences.



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# Challenge

- ❖ Study abroad experiences typically offer very little in the way of science instruction, especially in non-English speaking countries.
- ❖ In a global world it is becoming increasingly important for science students to have an international experience.



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# *Summer Research Abroad*

- ❖ Within science education a research-rich curriculum is now considered a best practice.
- ❖ Students conduct summer research at a host facility (not necessarily a university) in another country.
- ❖ Students bring that research back home, and maintain connections with foreign host.



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# *The Hungarian Experience*

- ❖ Research Institute for Solid State Physics and Optics of the Hungarian Academy of Sciences – Complex Fluids section.
- ❖ Student stipend, travel and living expenses from NSF-IRES Grant.
- ❖ Open to a total of 4 rising juniors and seniors.



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# *Pre-departure- Spring semester*

- ❖ Students enroll in Physics or Chemistry Independent Study – 2 credits.
- ❖ Develop skills necessary for laboratory work at host institution. Learn about fundamentals of complex fluids.
- ❖ Begin instruction in basic Hungarian.



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# *Pre-departure - First four weeks of summer.*

- ❖ Conduct guided research at home institution on relevant problems to be worked on in Hungary.
- ❖ Continue instruction in basic Hungarian, 2 hours per day (late afternoon).
- ❖ Cross-cultural experience instruction.



# *Arrival*

First week in Budapest.

- ❖ Get settled in dormitory, purchase public transportation pass.
- ❖ Orientation in Budapest.



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# *Six weeks in Budapest!*

- ❖ Students are assigned a laboratory based on interests and skills. They work on cutting edge research.
- ❖ Cultural activities are planned, including weekend excursions and the Night of the Museums.
- ❖ Students meet Hungarian students in the dorm. Get to use their Hungarian!



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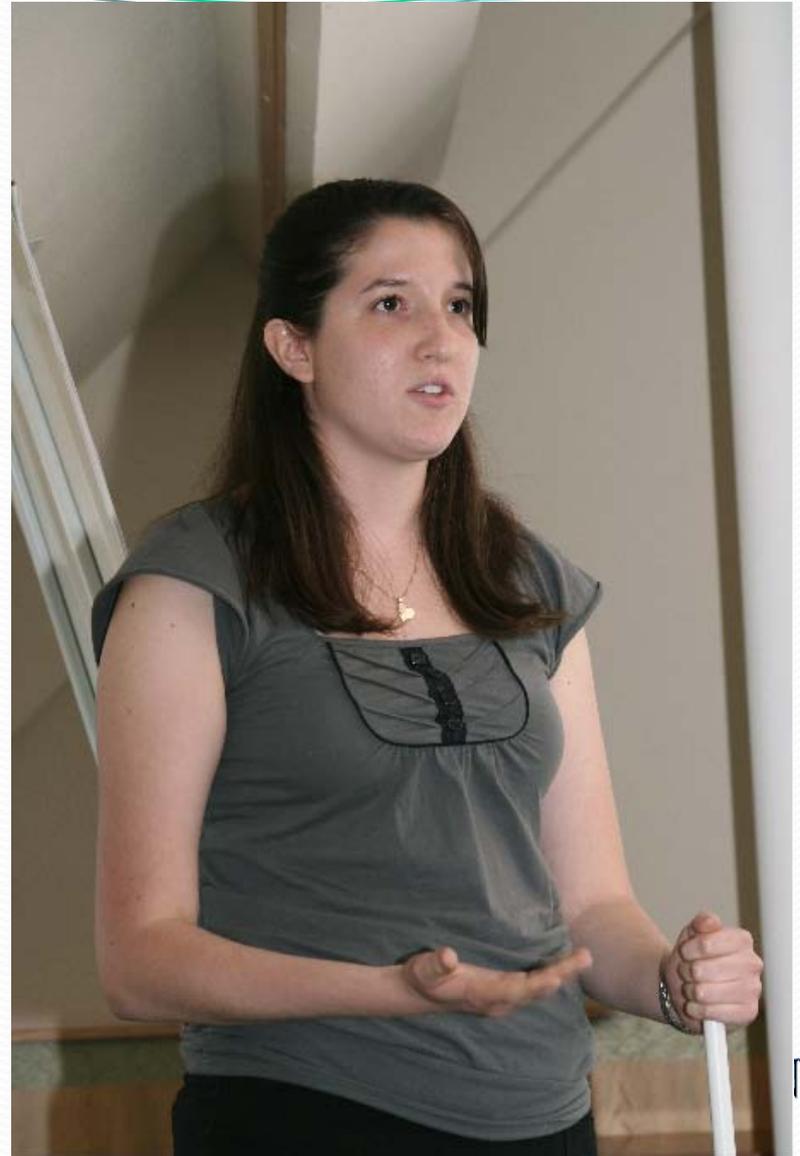
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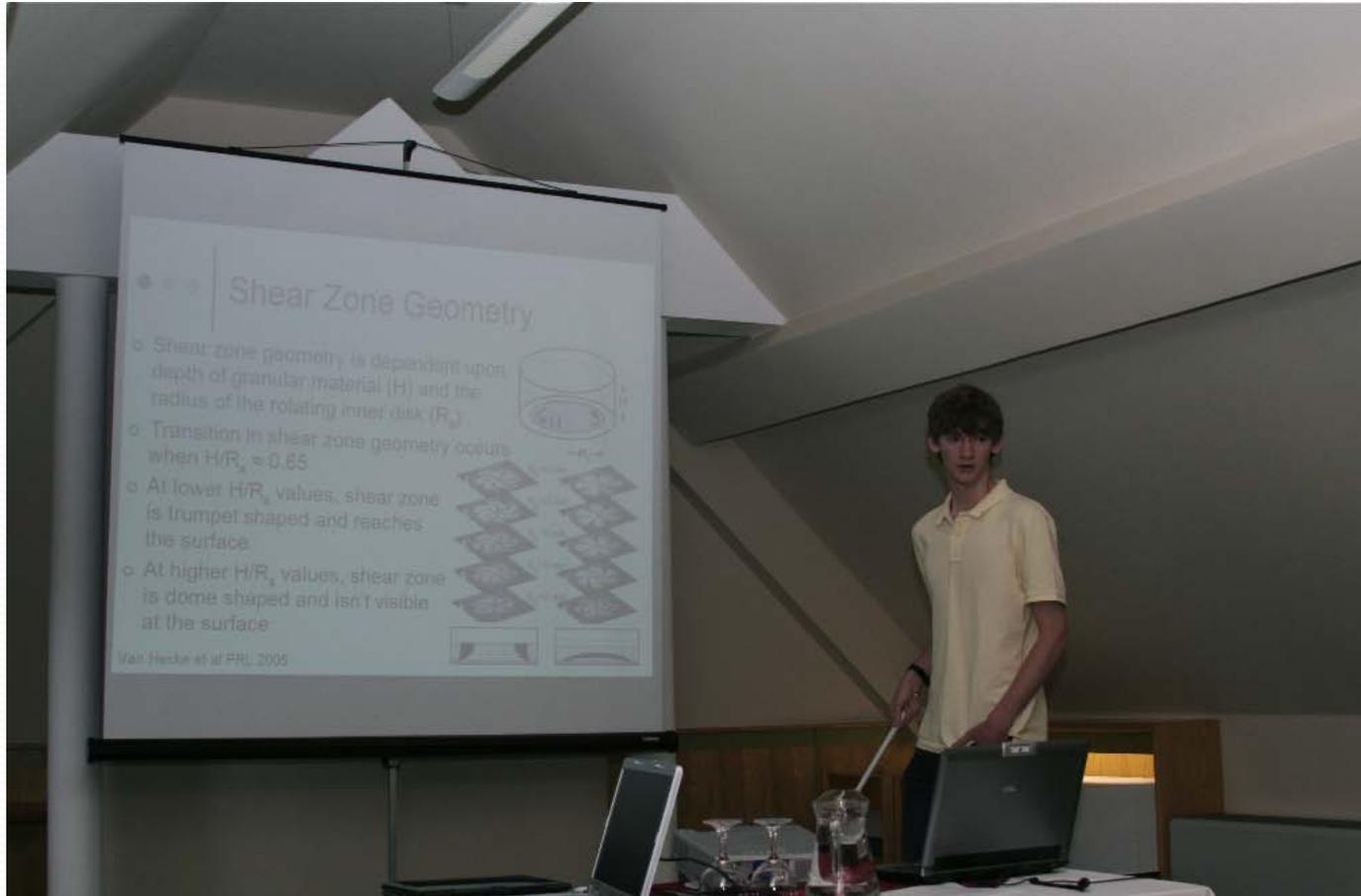
# *International Research Conference*

- ❖ Towards the end, each student presents their work at a conference attended by students and scientists from other European and American Universities. This conference is typically in a city of cultural importance.



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● ● ● Shear Zone Geometry

- Shear zone geometry is dependent upon depth of granular material ( $H$ ) and the radius of the rotating inner disk ( $R_0$ )
- Transition in shear zone geometry occurs when  $H/R_0 \approx 0.65$
- At lower  $H/R_0$  values, shear zone is trumpet shaped and reaches the surface
- At higher  $H/R_0$  values, shear zone is dome shaped and isn't visible at the surface

Van Hecke et al PRL 2005



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# Back at Allegheny – Fall semester

- ❖ Students give on campus presentation of research done abroad and discuss experiences abroad.
- ❖ Students continue research started during the summer as part of the Senior Project.



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