WSIA : Wabash Summer Institute in Algebra

William J. Turner

Department of Mathematics & Computer Science

Ides of August
18 August 2006

WABASH COLLEGE
Run by Profs. Axtell, Phillips, and Turner
Funded by National Science Foundation
  2005 – 2007
Eight-week research experience
  5 June – 29 July 2005
  4 June – 28 July 2006
  3 June – 27 July 2007 (?)
Abstract Algebra
Undergraduate mathematics majors from around the country
WSIA’s Goals

1. To provide a meaningful mathematical research opportunity for undergraduates who are less likely to have a research-oriented experience than other student populations;

2. To encourage participants to attend graduate school in the mathematical sciences, and to provide them with some of the tools and confidence necessary to succeed there;

3. To provide the support and framework for the participants to share their results and experiences with the larger mathematical community;

4. To begin to provide the tools and knowledge necessary to become an independent, contributing member of the mathematical community;

5. To create a highly diverse and supportive environment where the participants learn to work and live with a wide variety of individuals;

6. To attempt to accurately measure the success or failure of this program through a wide variety of evaluative processes with the assistance of an experienced agency.
Who

- Undergraduate students
- Abstract algebra
  - Linear algebra may suffice in exceptional cases.
- Citizens or permanent residents of the United States or its possessions
- Emphasis on students from small colleges and universities
- Encourage female, minority, and disabled students to apply
Advertising

- NSF REU website
- Flyer at Joint Mathematics Meetings in January
- Mass emailings to mathematics departments
- Word of mouth (colleagues at other institutions)
- Website (http://www.wabash.edu/academics/math/wsia)
Application Process

- Application due 1 Mar
  - A letter of interest
  - A current undergraduate transcript
  - Two letters of recommendation
  - A document containing name, email, home address, college address, expected graduation date, a description of topics covered in Abstract Algebra course(s), and a list of honors and awards
  - Nonbinding research topic preference

- Review applications
  - Working in groups
  - Topic preference

- Invite candidates
  - Week to accept
Statistics

- **Applications**

<table>
<thead>
<tr>
<th>Year</th>
<th>Men</th>
<th>Women</th>
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<tbody>
<tr>
<td>2005</td>
<td>47 (69%)</td>
<td>21 (31%)</td>
</tr>
<tr>
<td>2006</td>
<td>69 (63%)</td>
<td>41 (37%)</td>
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- **Participants**

<table>
<thead>
<tr>
<th>Year</th>
<th>Men</th>
<th>Women</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005</td>
<td>7 (58%)</td>
<td>5 (42%)</td>
</tr>
<tr>
<td>2006</td>
<td>8† (62%)</td>
<td>5 (38%)</td>
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†Includes one international Wabash Student not funded by the NSF grant
Participants From...

- Agnes Scott College†
- Amherst College
- Anderson University
- Bryn Mawr College†
- Bucknell University
- California State University
- Carleton College
- Case Western Reserve University
- Emporia State University
- Harvey Mudd College
- Hastings College
- John Carroll University
- Kalamazoo College
- Lafayette College
- Lake Forest College
- Merrimack College
- Northwestern University
- University of Evansville
- University of Puerto Rico
- Wabash College†
- Youngstown State University

† Single-sex institution
Arrival

- **Driving**
  - Met by one of the professors

- **Flying**
  - Arrangements through CAE

- **Housed in two college-owned houses**
  - Cook their own meals

- **Temporary access to Allen Center, Library**

- **Access to WabNet (no email)**
Introduction

- First 2 – 3 weeks
- Introduce students to three research areas
  - Commutative Ring Theory (Axtell)
  - Automated Theorem Proving / Loop Theory (Phillips)
  - Symbolic Computation / Computer Algebra (Turner)
- Students give preferences at end
- We divide them into research teams
David Neidorf

- Vice President & Dean of the College, Deep Springs College
- Director, Educational Programs, Bioethics-In-Action, Inc.
- Formerly Director, Integrated Studies Program, Middlebury College

Three Goals

1. Provide promising students a significant and formative exposure to the interface between work in mathematics and ethics
2. Ensure that participants are thoughtfully aware of their responsibilities as both professionals and citizens, and are alert to the tensions and conflicts between these two roles
3. Empower the skillful discussion and resolution of concrete ethical problems through the examination of ethical case studies according to varying schema of conceptual evaluation
Ethics Component

- Five instructional days
  - Mornings in ethics component
  - Afternoons starting on research

- Three parts
  1. Analysis of case studies and associated background reading
  2. Student presentation of independent analysis of new case studies
  3. Group discussion of the student presentations
Research!

- Last 5 – 6 weeks
  - Half time with ethics component 1 week
  - Full time remaining 4 – 5 weeks
- Work in small groups
- Supervised by professor
Social Activities

- Organized by professors
  - Dinner at each professor’s house
  - Indianapolis Indians
  - Canoe trip
  - Hike at Shades State Park

- Student-initiated / Spontaneous
  - Meals, outings, etc.
  - Visit to University of Illinois
Outside Speakers

- Weekly lunch or afternoon talks
- Research talk – open to public
- More personal talk with participants about graduate school
- Question and answer session
Outside Speakers

- **Mathematics Department Graduate Student Directors**
  - Prof. Phillip Griffith, University of Illinois
  - Prof. David Manderscheid, University of Iowa
  - Prof. Julia Knight, University of Notre Dame

- **Graduate Students**
  - Dan Smith, Wabash ’03 – Indiana University
  - Paige Rinker, WSIA ’05 – Dartmouth College

- **Others**
  - Prof. Will Geller, Indiana University - Purdue University at Indianapolis
  - Prof. Reza Akhtar, Miami University
  - Prof. Carl Cowen, Indiana University - Purdue University at Indianapolis
    - President, Mathematical Association of America
Regular Reports

- Informal
- Weekly updates on research projects
- Include other students in department
- Practice for presentations
Assessment

- Questionnaires throughout program
  - Introductory (base-line) questionnaire
  - Short activities every few weeks
  - Longer essay at end

- Categories of questions
  - Expectations versus reality
  - High / low points
  - Change in self-perception and confidence, understanding of mathematics research
  - Living environment
  - Ethics component
  - Lectures
  - Outside speakers
  - Research
  - Group work
Undergraduate Conferences

- Indiana REU Student Conference
  - Last Thursday in July
  - Bloomington, IN
  - Students give 15 minute talks

- Joint Mathematics Meetings
  - Early January
  - Joint meeting of mathematical societies
    - American Mathematical Society (AMS)
    - Mathematical Association of America (MAA)
  - Undergraduate poster session
Other Presentations

- Students’ Institutions
  - Wabash College Celebration of Student Research
  - Bucknell University
  - Kalamazoo College
  - University of Evansville Math Club

- Regional Undergraduate Conferences
  - Rose-Hulman Undergraduate Research Conference
  - University of Dayton Undergraduate Research Day
All three groups (2005) wrote papers

Undergraduate journals

*E.g.*, *American Journal of Undergraduate Research*

At least one accepted for publication