Research for Undergraduates in Math and Science: a research apprenticeship program at Old Dominion University

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Introduction
• Research for Undergraduates in Math and Science research apprenticeship program (RUMS) began 2011
• Funding support from ODU Honors College
• 6 apprenticeship students selected annually during their sophomore year
• Apprenticeship students are treated as graduate students-in-training during this time

Goals
1. Train students who can collaborate effectively between the disciplines of mathematics and biology
2. Provide an intensive research experience that will enable students to be highly competitive in top-rated graduate programs.

Skills Acquired
• Design and perform interdisciplinary experiments
• Write grant proposals
• Present findings at research symposia
• Produce manuscripts for either campus publication or consideration in peer-reviewed journals

Basic RUMS Timeline

<table>
<thead>
<tr>
<th>YEAR</th>
<th>SEMESTER</th>
<th>ACTIVITY</th>
<th>COURSES</th>
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</thead>
<tbody>
<tr>
<td>Sophomore</td>
<td>Spring</td>
<td>Recruitment, Interviews</td>
<td></td>
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<tr>
<td></td>
<td>Summer</td>
<td>Research Project</td>
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<tr>
<td>Junior</td>
<td>Fall</td>
<td>Design Experiment, Write Grants</td>
<td>Technical Writing</td>
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<td></td>
<td>Spring</td>
<td>Present Research</td>
<td>Bioethics, English Internship</td>
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<td></td>
<td>Summer</td>
<td>Independent Research</td>
<td></td>
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<tr>
<td>Senior</td>
<td>Fall</td>
<td>Complete Research, Analyze Data</td>
<td>Honors Research Part 1</td>
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<tr>
<td></td>
<td>Spring</td>
<td>Publish Manuscript, Present Research</td>
<td>Honors Research Part 2</td>
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</tbody>
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Outcomes
• 3 cohorts (18 students) selected

Cohort 1 (2011-2013)
• More than 10 presentations at local or national scientific conferences
• 5 of 6 completed the program
• All graduated: one going to veterinary school, two to graduate school
• One peer-reviewed manuscript accepted for publication in *Ticks and Tick-Borne Diseases*

Cohort 2 (2012-2014)
• More than 12 presentations at local or national scientific conferences
• 3 of 6 remain in program (1 graduated early, now a Masters student at ODU)

Cohort 3 (2013-2015)
• All completed first summer of research

Other Faculty Involved
• Jin Wang, Mathematics and Statistics
• Norou Diawara, Mathematics and Statistics
• Onur Bilgen, Mechanical & Aerospace Engineering
• Phil L. Langlais, Psychology

Left: RUMS 1 Cohort presented posters at Virginia American Society for Microbiology Meeting in November 2011
Right: RUMS 2 Cohort presented posters at the Natural Areas Conference in November 2012

RUMS 1 student performing necropsy of zebrafish in support of disease challenge studies
RUMS 3 students and graduate student mist-netting for birds, 2013