



*Pathways for Undergraduates to
Discover Biomedical Research*

*Patricia Hand, PhD
Principal Investigator*

ME-INBRE: Comparative Functional Genomics

Research Institutions

MDI Biological Laboratory (Lead)
The Jackson Laboratory (Research)
The University of Maine
(Research/Graduate)

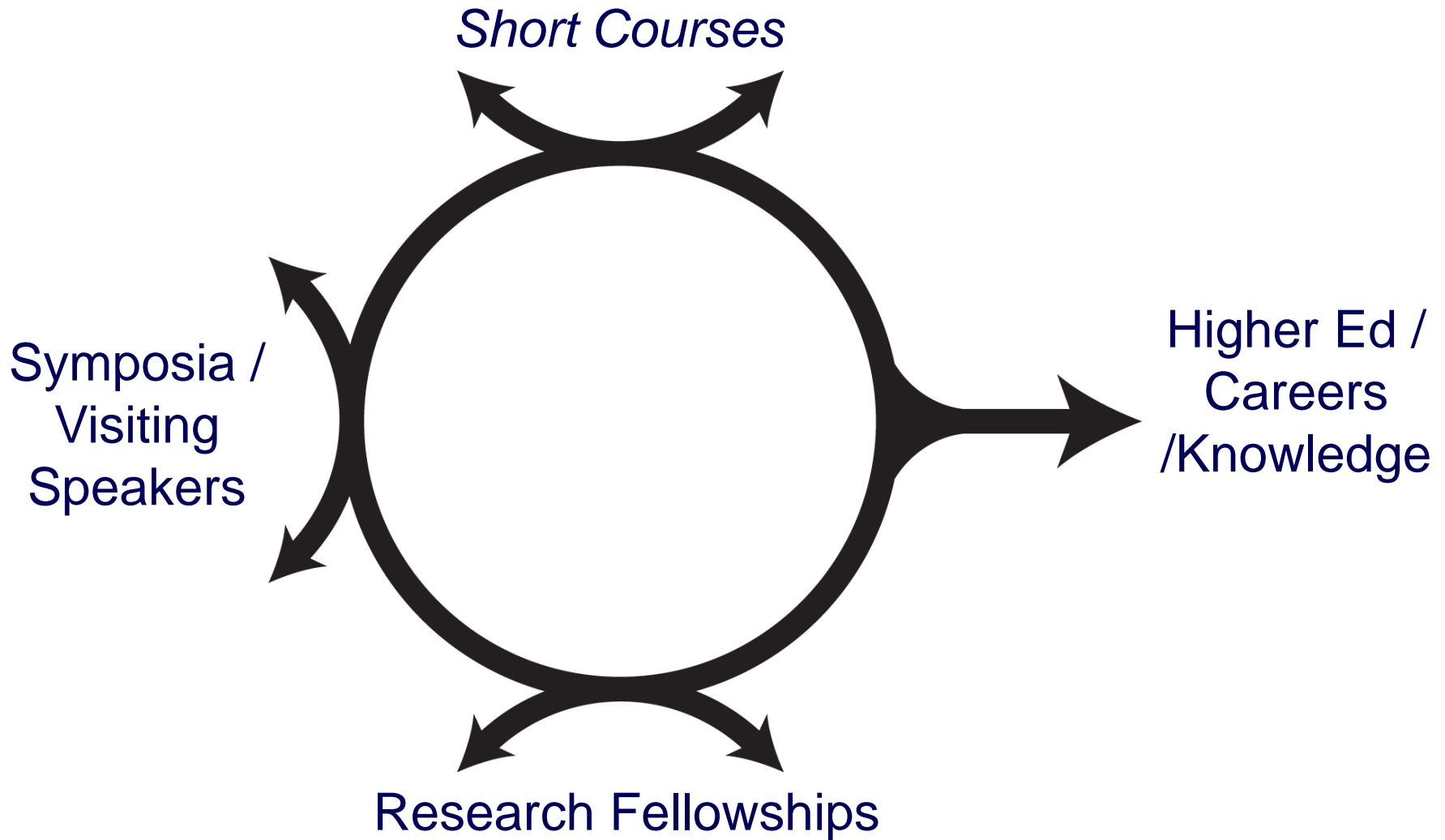
Undergraduate Institutions

Bates College
Bowdoin College
Colby College
College of the Atlantic
Southern Maine Community College
University of Maine - Honors College
University of Maine at Farmington
University of Maine at Fort Kent
University of Maine at Machias
University of Maine at Presque Isle

Outreach to Maine High Schools



Pathways to Biomedical Research





Mount Desert Island Biological Laboratory

Maine INBRE Short Courses - 2011

Course	Institution
Molecular mechanisms of human disease	UMaine Honors College
Molecular mechanisms of human disease	Dartmouth/UVM/UNE School of Medicine
Neuroethology	Bowdoin College
Ecological Developmental Biology	College of the Atlantic
Experimental Neuroscience	Colby College
Experimental Toxicogenomics	Bates College
Molecular Biology Research Techniques	Southern Maine Community College
Molecular Biology Research Techniques	UMaine Farmington / UMaine Machias
Molecular Biology and Bioinformatics	UMaine Presque Isle / UMaine Fort Kent
Summer Academy in Genomics	Students from 17 Maine High Schools

Molecular Mechanisms of Human Disease



The
Honors
College
AT THE UNIVERSITY OF MAINE

February 2011

Molecular Mechanisms of Human Disease

Faculty

Bruce Stanton, Ph.D., Prof. Physiology, Dartmouth Medical School

Denry Sato, Ph.D., Emeritus faculty, MDI Biological Laboratory

Carol Kim, Ph.D., Assoc. Prof. Biochemistry, Molecular Biology, UMaine

Ben King, M.S., Staff Scientist, Bioinformatician, MDIBL

Keith Hutchison, Ph.D., Prof. Biochemistry, Molecular Biology, UMaine

Students:

15 undergraduate participants

12 from Maine

3 from outside of Maine

8 Sophomores

5 Juniors

2 Seniors

Majors include:

Anthropology

Biochemistry

Biological Engineering

Biology

Chemistry

Computer Science

Ecology / Environmental Science

English

History

Molecular and Cellular Biology

Zoology

Molecular Mechanisms of Human Disease

1. Cystic Fibrosis

Investigate the link between CF and *Pseudomonas* bacteria using zebrafish CFTR morpholinos

- *molecular biology; fluorescence imaging / confocal microscopy*

2. Genetic Screening of Human Disease

Polymorphisms of CYP2C19 – the enzyme known to metabolize omeprazole (Prilosec) and other drugs

- *molecular biology; DNA sequencing; personalized medicine*

3. Deep sequencing technologies in genetics

Microarray gene expression analysis of amputated zebrafish fin

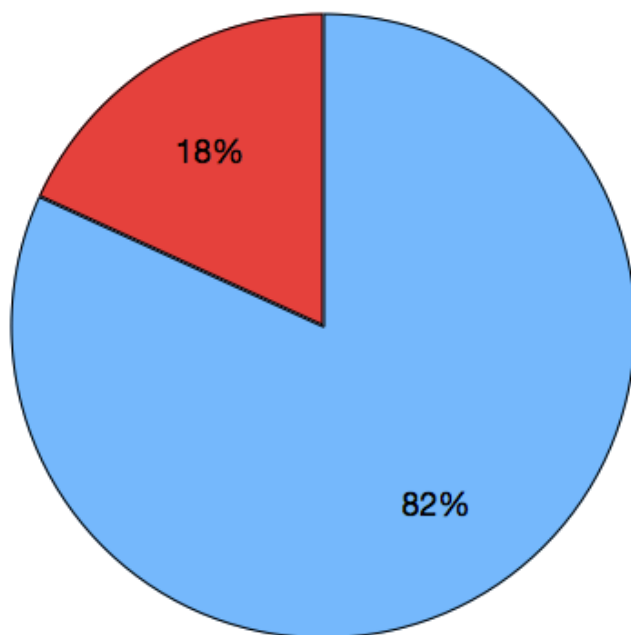
- *statistical analysis using the R computing environment*

- *use of BLAST to compare differential gene expression during regeneration between two species – zebrafish and little skate.*

4. Presentation at Maine Biological and Medical Sciences Symposium

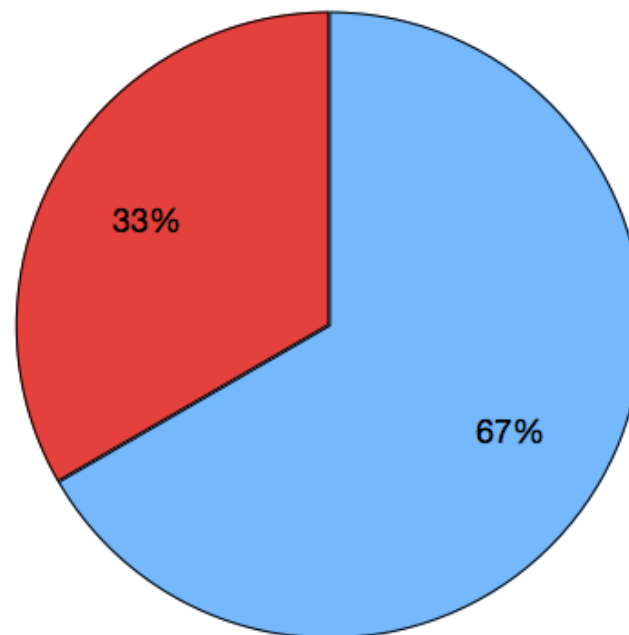
Molecular Mechanisms of Human Disease

The information presented will improve my research capabilities



● Strongly agree
● Agree
● Neutral
● Disagree
● Strongly Disagree

Faculty accommodated for the varying academic backgrounds of all participants



● Strongly agree
● Agree
● Neutral
● Disagree
● Strongly Disagree

*82% reported that the course increased their interest in biomedical research.
“This course offered a realistic idea of a career in research.”*

Short Course Challenges

- **Courses are not ‘one size fits all’** – courses are custom made to meet the needs of the sending institution, students, faculty
- **Courses led by Maine INBRE investigators or other principal investigators** – recruitment sometimes a challenge
- **Courses are one or two weeks long** – time is short – new courses can be overly ambitious
- **Scheduling around institutional calendars**
- **Course credit**

Short Course Advantages

- **Courses are not ‘one size fits all’** – no institution is forced to adopt a course model; these courses retain maximum flexibility.
- **All courses are led by Maine INBRE investigators or other principal investigators** – student / faculty interaction extremely high; a highly rated outcome on all short course evaluations. Coursework relevant to existing research. Publications.
- **Courses are one or two weeks long** – 1-3 credits
- **Location** – ‘power of place’ Faculty and students benefit by being away from home institutions.

Short Courses Lead to New Partnerships

- **HHMI Science Education Alliance**
- **Bioinformatics Training**
- **Catalyst for student research fellowships, additional mentoring by faculty, collaborations between faculty**



Sen. Olympia Snowe

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