FROM THE DIRECTOR

The FUTURE - Fostering Undergraduate Talent – Uniting Research and Education - in Biomedicine Program of the UI Carver College of Medicine seeks to foster a network of scientist-educators throughout the state of Iowa in order to enhance preparation of students for biomedically related careers in research or clinical practice, and to share the unique resources of the UI Carver College of Medicine with our colleagues at primarily undergraduate institutions. Dr. Bob and Cherie Shreck of Des Moines share our commitment to expanding biomedical training opportunities in Iowa. We would like to thank them for their generous gift that has been critical to the continued success of the FUTURE in Biomedicine Program.

In our 7th year, 13 participating Faculty Fellows came from Coe College, Cornell College, Drake University, Graceland University, Grinnell College, Hawkeye Community College, Mount Mercy University, and Waldorf College. To promote education and research, Fellows may select an undergraduate student to participate in the experimental studies conducted during the summer. Ten undergraduate student researchers accompanied their faculty mentors as well as 2 first-time Student Affiliates from

2009-2015 PARTICIPATING SCHOOLS
Kirkwood Community College/LSAMP-IINSPIRE Program and St. Mary-of-the-Woods College. The departments of Anatomy and Cell Biology, Biochemistry, Internal Medicine, Microbiology, and Radiation Oncology hosted participants.

The following pages capture major activities of the program, beginning with orientation in late May. During the summer, we held a program of weekly seminars or panels, closing with the Summer Undergraduate Research Conference and Research Symposium in late July. In the fall, in collaboration with the Office of Graduate and Postdoctoral Studies, we hosted a Biomedical Pre-Graduate School Conference, timed to coincide with the Pre-Medical School Conference. To our mutual benefit, alumni Faculty Fellows participate in these events, building stronger intercollegiate ties among primarily undergraduate institutions in Iowa.

We offered Better Futures for Iowans grants to support faculty in Iowa to use UI research core facilities as part of a classroom or research experiment that involved undergraduate students. Eight awards were made for the Central Microscopy Facility, Genomics for sequencing, Nuclear Magnetic Resonance Facility and High Resolution Mass Spectrometry. Students participated in sample preparation and the analysis of results—gaining a perspective for the nature of true research, where the answers are not known in advance.

Several Faculty Fellows have developed ongoing collaborations with UI Carver College of Medicine faculty. Past Fellows have conducted subsequent sabbatical research in Iowa City, published scientific papers with UI faculty, presented their studies at national or international conferences, participate in successful grant applications, and even apply for patents. Faculty Fellows use UI libraries and core research facilities, and recommend our training programs to their students.

The 2015 Faculty Fellows and students had varied interests at the start of the summer. As they describe in their reflections, their experiences on our campus changed their view of their own future and created stronger ties with the University of Iowa. Several students from past classes have pursued PhD or MD degrees, or became research assistants, clinical technicians or science instructors. We are eager to learn about the next steps of the Class of 2015!

We thank all of the individuals who applied to the FUTURE in BiomedicineSM Program and appreciate the commitment of their academic colleagues who nominated them. We look forward to new opportunities to foster scientific and educational interactions among academic institutions throughout Iowa.

Sincerely,

Madeline A. Shea, Ph.D.
Director, FUTURE in BiomedicineSM Program
Professor of Biochemistry

Since 2009, FUTURE in BiomedicineSM has now connected 33 fellows at 18 Iowa institutions, more than 52 undergraduate students and continues to expand each year.

For more information about past participants, events, and programs of the FUTURE in BiomedicineSM Program beyond this annual report, visit online at www.medicine.uiowa.edu/future.
Above: Carver College of Medicine Dean Debra Schwinn, MD (left) with the Class of 2015 Fellows and Students

**COE COLLEGE**

**FUTURE in Biomedicine**

Senior Fellow:
Ugur Akgun, PhD
Assistant Professor of Physics

Student Researcher:
Collin Wilkinson

UI Faculty Host:
Dongxu Wang, PhD
Assistant Professor of Radiation Oncology

**CORNELL COLLEGE**

**FUTURE in Biomedicine**

Senior Fellow:
Barbara Christie-Pope, PhD
Professor of Biology

Student Researcher:
Shashanna Moll

UI Faculty Host:
Robert Cornell, PhD
Associate Professor of Anatomy and Cell Biology

**CORNELL COLLEGE**

**FUTURE in Biomedicine**

Visiting Fellow:
Melinda Green, PhD
Associate Professor and Department Chair of Psychology
Ringer Distinguished Professor

**DRAKE UNIVERSITY**

**FUTURE in Biomedicine**

Senior Fellow:
Adina Kilpatrick, PhD
Assistant Professor of Physics

UI Faculty Host:
Madeline Shea, PhD
Professor of Biochemistry
DRAKE UNIVERSITY
FUTURE in Biomedicine℠
Visiting Fellow:
Jerry Honts, PhD
Associate Professor of Biology

Student Researcher:
Alexandra Howland-Lopez

UI Faculty Host:
Madeline Shea, PhD
Professor of Biochemistry

DRAKE UNIVERSITY
FUTURE in Biomedicine℠
Visiting Fellow:
Abebe Mengesha, PhD
Assistant Professor of Pharmaceutics

Student Researcher:
Dillon Krotz

DRAKE UNIVERSITY
FUTURE in Biomedicine℠
Visiting Fellow:
Heidi Sleister, PhD
Associate Professor of Biology

GRACELAND UNIVERSITY
FUTURE in Biomedicine℠
Visiting Fellow:
Mary Shawgo, PhD
Associate Professor of Biology

UI Faculty Host:
John Kirby, PhD
Professor of Microbiology

GRINNELL COLLEGE
FUTURE in Biomedicine℠
Fellow:
Heriberto Hernandez, PhD
Assistant Professor of Chemistry

Student Researchers:
Julia Rumley and Alitza Shutt

UI Faculty Host:
Michael Schnieders, PhD
Assistant Professor of Biochemistry and Biomedical Engineering

HAWKEYE COMMUNITY COLLEGE
FUTURE in Biomedicine℠
Senior Fellow:
D. Randy Mercer, PhD
Instructor of Natural Sciences

Student Researcher:
John Reed, NSF REU in Microbiology

UI Faculty Host:
Wendy Maury, PhD
Professor of Microbiology
David Weiss, PhD
Associate Professor of Microbiology
MOUNT MERCY UNIVERSITY
FUTURE in Biomedicine
Senior Fellow:
Ryan Bezy, PhD
Assistant Professor of Biology
Student Researcher:
Monica Steffen
UI Faculty Host:
David Weiss, PhD
Associate Professor of Microbiology

MOUNT MERCY UNIVERSITY
FUTURE in Biomedicine
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Research Assistant Professor of Microbiology

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FUTURE in Biomedicine
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Gary Coombs, PhD
Assistant Professor of Cell and Molecular Biology
Student Researcher:
Maria Valdes
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Lori Wallrath, PhD
Professor of Biochemistry

KIRKWOOD COMMUNITY COLLEGE/LSAMP-INSPIRE PROGRAM
FUTURE in Biomedicine
Student Affiliate:
Adam Page, PhD
UI Faculty Host:
E. Dale Abel, MD, PhD
John B. Stokes III Chair in Diabetes Research and Director, Fraternal Order of Eagles Diabetes Research Center

ST. MARY-OF-THE-WOODS COLLEGE/ THERESA L. GIOANNINI WOMEN-IN-SCIENCE FELLOW
FUTURE in Biomedicine
Student Affiliate:
Dulce Chavez
UI Faculty Host:
Jerrold Weiss, PhD
Professor of Internal Medicine and Microbiology
THE FUTURE IN BIOMEDICINE℠ PROGRAM WOULD LIKE TO THANK DR. BOB AND CHERIE SHRECK FOR THEIR GENEROUS SUPPORT!
## SUMMER 2015 FUTURE IN BIOMEDICINE EVENTS & MEETINGS

### MAY 27
**Orientation Day for the Class of 2015**
Welcome and Tours of Research Core Facilities, followed by photos with Host Faculty
Lunch with Deans, Host PI's, lab members, Alumni Fellows & Hosts

### JUNE 1
**Mini-Symposium by Returning FUTURE in Biomedicine Faculty Fellows**
Talks by current Senior Fellows describe projects that are underway with UI laboratories

### JUNE 3
**Survival Skills Workshop for Young Researchers**

### JUNE 6
**Iowa Biochemistry Workshop**
Organized by Associate Professor Ernie Fuentes. Presented in part by FUTURE Fellows Heriberto Hernandez (Grinnell) and Adina Kilpatrick (Drake).

### JUNE 8
**Panel Discussion by FUTURE Faculty Fellows - Introducing Schools**

### JUNE 15
**Panel on Training to be a Researcher, Physician, Physician Assistant, or Physical Therapist**
PhD - Dan Weeks, Professor of Biochemistry and Director of Graduate Studies
MD - Ms. Kathlene Huebner, Director of Admissions for MD program of the Carver College of Medicine
PA - Tony Brenneman, Director of the Physician Assistant Program
PT - Byron Bork, Faculty in the Physical Therapy and Rehabilitative Science Program

### JUNE 22
**Developing Experience as an Undergraduate Educator - “Teaching Postdocs” and Other Avenues**
Casey Andrews, Biochemistry PhD and Assistant Professor of Chemistry Adam Moser (Loras College)
Lynne Dieckman, Biochemistry PhD (University of Iowa)
Rebecca Laird, Chemistry PhD (Coe College and University of Iowa)

### JULY 29
**Overview of Medical Scientist Training Program (MSTP)**
UI MD/PhD program funded by the National Institutes of Health. [http://www.medicine.uiowa.edu/mstp/](http://www.medicine.uiowa.edu/mstp/)
Program Administrator Leslie Harrington, and MSTP Student representatives
Followed by a FUTURE in Biomedicine℠ dinner in downtown Iowa City.

### JULY 6 & 13
**FUTURE Faculty Fellows - Midsummer Research Progress and Alumni Talks**
Talks by current Fellows will concentrate on background material and preliminary findings.

### JULY 20
**3-D Printing in Education and Research**
Presented by Jerry Honts (Drake) and Assistant Professor Miles Pufall (University of Iowa).

### JULY 27
**Student Presentations for Research Symposium**
Students present draft SURC/FUTURE posters as a talk.

### JULY 30
**Summer Undergraduate Research Conference (SURC) Iowa Memorial Union**
Students present posters at this event organized by the University of Iowa Graduate College

### JULY 31
**Luncheon and Certificates for FUTURE in Biomedicine℠ Fellows and Students**
**FUTURE in Biomedicine℠ Research Symposium**
Faculty Fellows talks, and students present posters. FUTURE in Biomedicine Alumni, their current students and recipients of Better Futures for Iowans awards are invited to present.
### Summer 2015 Biosciences Program

#### Undergraduate Seminar Series

<table>
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<tr>
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<th>Speaker/Title</th>
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<td><strong>MAY 28</strong></td>
<td><strong>Welcome Reception</strong></td>
<td>All students participating in biomedical summer research programs attend</td>
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<td><strong>JUNE 4</strong></td>
<td><strong>Tina Tootle, PhD</strong></td>
<td>Using Fruit Flies to Understand Human Disease</td>
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<td></td>
<td><strong>Assistant Professor of Anatomy and Cell Biology</strong></td>
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<td><strong>JUNE 11</strong></td>
<td><strong>Janice Robertson, PhD</strong></td>
<td>Folding Proteins in Oil</td>
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<tr>
<td></td>
<td><strong>Assistant Professor of Molecular Physiology and Biophysics</strong></td>
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<td><strong>JUNE 18</strong></td>
<td><strong>Veena Prahlad, PhD</strong></td>
<td>Organismal Regulation of Cellular Stress Responses</td>
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<td><strong>Assistant Professor of Biology</strong></td>
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<tr>
<td><strong>JUNE 25</strong></td>
<td><strong>Fang Lin, MD, PhD</strong></td>
<td>Genetic Regulation of Heart Development</td>
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<td><strong>Assistant Professor of Anatomy and Cell Biology</strong></td>
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<tr>
<td><strong>JULY 9</strong></td>
<td><strong>Emma Morrison</strong></td>
<td>The Role of Structural Biology in Biomedical Research</td>
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<tr>
<td></td>
<td><strong>Postdoctoral Research Scholar in Biochemistry</strong></td>
<td></td>
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<tr>
<td><strong>JULY 16</strong></td>
<td><strong>Deborah Dawson, PhD</strong></td>
<td>Elements of Design: How Statistics Can Help You Optimize Your Research Efforts</td>
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<td></td>
<td><strong>Professor of Pediatric Dentistry</strong></td>
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<tr>
<td><strong>JULY 23</strong></td>
<td><strong>Justin Grobe, PhD</strong></td>
<td>Vasopressin and Preeclampsia</td>
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<td><strong>Assistant Professor of Pharmacology</strong></td>
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<td><strong>JULY 30</strong></td>
<td><strong>Farewell Reception</strong></td>
<td>All students participating in biomedical summer research programs attend</td>
</tr>
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<td><strong>JULY 30</strong></td>
<td><strong>John Kirby, PhD</strong></td>
<td>Xenobiotic Disruption of the Microbiome and Metabolic Consequences</td>
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<td></td>
<td><strong>Professor of Microbiology</strong></td>
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### Fall 2015 Events

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<tr>
<td><strong>SEPTEMBER 25</strong></td>
<td><strong>Annual Conference for Pre-PT Students</strong></td>
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<td><strong>OCTOBER 2</strong></td>
<td><strong>68th Annual Pre-Medical School Conference</strong></td>
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<tr>
<td></td>
<td><strong>7th Annual Biomedical Pre-Graduate School Conference</strong></td>
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<td><strong>OCTOBER 16</strong></td>
<td><strong>Iowa Microscopy Society Meeting</strong></td>
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ORIENTATION DAY
Wednesday, May 27, 2015

PANEL DISCUSSION BY FUTURE FACULTY FELLOWS
Monday, June 08, 2015

Fellows highlighted the science curriculum and academic programs at their institutions for leaders of graduate and clinical programs at the University of Iowa.
PANEL ON TRAINING TO BE A RESEARCHER, PHYSICIAN, PHYSICIAN ASSISTANT, OR PHYSICAL THERAPIST
Monday, June 15, 2015
Presented by Dan Weeks, representing PhD graduate programs; Kathlene Huebner, Director of Admissions for the MD program of the Carver College of Medicine; Tony Brenneman, Director for the Physician Assistant Program; Byron Bork, representing the Physical Therapy and Rehabilitation Science Program.

DEVELOPING EXPERIENCE AS AN UNDERGRADUATE EDUCATOR
Monday, June 22, 2015
Presented by Casey Andrews, UI Biochemistry PhD teaching at Loras College; Adam Moser, Assistant Professor Chemistry at Loras College; Lynne Dieckman, Biochemistry PhD teaching at the University of Iowa; Rebecca Laird, Chemistry PhD teaching at Coe College and the University of Iowa
OVERVIEW OF MEDICAL SCIENTIST TRAINING PROGRAM (MSTP)
Monday, July 29, 2015
Presented by Program Administrator Leslie Harrington, and MSTP student representatives

DINNER AT LINN STREET CAFE
Monday, July 6, 2015
Participants enjoyed an evening out with collegiate leadership, staff and MSTP students.
3-D PRINTING IN EDUCATION AND RESEARCH

Monday, July 20, 2015

Presented by Jerry Honts (Drake University) and Miles Pufall (University of Iowa).
## Future in Biomedicine Students

<table>
<thead>
<tr>
<th>College</th>
<th>Student Name</th>
<th>Senior Fellow</th>
<th>UI Faculty Host</th>
<th>Presentation Title</th>
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ST MARY-OF-THE-WOODS COLLEGE

Dulce Chavez, Theresa L. Gioannini Women-in-Science Fellow
UI Faculty Host: Jerrold Weiss, PhD, Professor of Internal Medicine

Improving Detection of Bioactive Endotoxin in Organic Dust

WALDORF COLLEGE

Maria Valdes
FUTURE in Biomedicine Senior Fellow: Gary Coombs, PhD
UI Faculty Host: Lori Wallrath, PhD, Professor of Biochemistry

Manipulating Metabolic Pathways to Suppress Muscular Dystrophy
<table>
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<tr>
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<th>Speaker(s)</th>
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<th>Title</th>
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<td>1:00PM</td>
<td>Introductory Remarks - Madeline A. Shea, PhD, Director</td>
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<tr>
<td>1:15PM</td>
<td>Melinda Green, PhD, Associate Professor, Department Chair of Psychology and Ringer Distinguished Professor</td>
<td>Cornell College, Mt Vernon, IA</td>
<td>Cardiac Risk and Disordered Eating: Decreased Mean R Wave Amplitude</td>
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<tr>
<td>1:35PM</td>
<td>Heriberto Hernandez, PhD, Ruth Ann Henriksen Fellow, Assistant Professor of Chemistry, Grinnell College, Grinnell, IA</td>
<td>UI Faculty Host: Michael Schnieders, Assistant Professor of Biochemistry and Biomedical Engineering</td>
<td>The Role of Thermodynamics in the Formulation of Pharmaceuticals</td>
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<tr>
<td>1:55PM</td>
<td>Break</td>
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<tr>
<td>2:05PM</td>
<td>Gary Coombs, PhD, Assistant Professor of Cell and Molecular Biology</td>
<td>Waldorf College, Forrest City, IA</td>
<td>The Role of Lamins in Regulating Muscle Function and Metabolism</td>
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<tr>
<td>2:25PM</td>
<td>Heidi Sleister, PhD, Associate Professor of Biology</td>
<td>Drake University, Des Moines, IA</td>
<td>Engaging the Next Generation in Hands-on Inquiry</td>
<td></td>
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<tr>
<td>2:45PM</td>
<td>Poster Presentations - Undergraduate Researchers and Better Futures for Iowans Awardees</td>
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<tr>
<td>3:00PM</td>
<td>Break</td>
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<tr>
<td>3:20PM</td>
<td>Adina Kilpatrick, PhD, Assistant Professor of Physics</td>
<td>Drake University, Des Moines, IA</td>
<td>NMR Structural Studies of Calcium-Binding Regulatory Proteins</td>
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<td>3:40PM</td>
<td>Joseph Nguyen, PhD, Assistant Professor of Chemistry</td>
<td>Mount mercy University, Cedar Rapids, IA</td>
<td>Utilizing Transmission Electron Microscopy to Characterize MDV Infections in a Live Host</td>
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<tr>
<td>4:00PM</td>
<td>Break</td>
<td></td>
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<tr>
<td>4:10PM</td>
<td>Barbara Christie-Pope, PhD, Professor of Biology</td>
<td>Cornell College, Mt Vernon, IA</td>
<td>Testing Whether Skin Pigmentation Levels Affect the Severity of Parkinson's Disease Symptoms</td>
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<tr>
<td>4:30PM</td>
<td>Abebe Mengesha, PhD, Assistant Professor of Pharmaceutics</td>
<td>Drake University, Des Moines, IA</td>
<td>Triggerable Lipid-Based Local Delivery of Chemotherapy: Smart Medical System</td>
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<tr>
<td>4:50PM</td>
<td>Closing Remarks - Madeline A. Shea, PhD, Director</td>
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## EVENTS

### UNDERGRADUATE RESEARCHERS, CLASS OF 2014 AND BETTER FUTURES FOR IOWANS Awardees

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<td>Seth Steenwyk, Hannah Van Maanen, Jeff Ploegstra, PhD</td>
<td>2014 Better Futures for Iowans Awardee</td>
<td>Genetic Variability of the 5-enolpyruvylshikimate-3-phosphate (EPSP) Synthase Gene in Round-up Resistant Soil Bacteria</td>
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<td>ST MARY-OF-THE-WOODS COLLEGE</td>
<td><strong>Dulce Chavez</strong>, Theresa L. Gioannini Women-in-Science Fellow</td>
<td>UI Faculty Host: Jerrold Weiss, PhD, Professor of Internal Medicine</td>
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<td><strong>Improving Detection of Bioactive Endotoxin in Organic Dust</strong></td>
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<td>WALDORF COLLEGE</td>
<td><strong>Maria Valdes</strong></td>
<td>FUTURE in Biomedicine℠ Senior Fellow: Gary Coombs, PhD</td>
<td>UI Faculty Host: Lori Wallrath, PhD, Professor of Biochemistry</td>
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<td><strong>Manipulating Metabolic Pathways to Suppress Muscular Dystrophy</strong></td>
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Each year, University of Iowa PhD training programs seek out the most highly qualified and diverse individuals to join their programs. The Biomedical Pre-Graduate School Conference, co-organized with the Office of Graduate and Postdoctoral Studies, is a free, one-day event for academic advisors and their advisees. The conference is offered as an opportunity to interact with faculty and current graduate students to learn more about training programs including research areas, admissions, student life and research environment. The events are specifically designed for maximum opportunities to meet one-on-one with faculty and socialize with current graduate students.

PARTICIPATING TRAINING PROGRAMS

- Biochemistry
- Free Radical and Radiation Biology
- Genetics
- Immunology
- Medical Scientist Training Program (MSTP)
- Microbiology
- Molecular and Cellular Biology
- Molecular Physiology and Biophysics
- Neuroscience
- Pharmacology
<table>
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<tr>
<th>Time</th>
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<tr>
<td>9:00AM</td>
<td>Registration, and Continental Breakfast - Information Tables with Literature and/or Liaisons from PhD Training Programs</td>
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<tr>
<td>9:30AM</td>
<td>Welcome - Dan Tranel, PhD, Associate Dean for Graduate and Postdoctoral Studies, Professor of Neurology and Psychology</td>
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<tr>
<td>9:45AM</td>
<td>Unique Research Opportunities at The University of Iowa - Amy Lee, PhD, Assistant Dean for Scientific Affairs and Professor of Molecular Physiology and Biophysics, Neurology and Otolaryngology</td>
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<td>10:15AM</td>
<td>Inclusive Excellence in Graduate Biomedical Education - Denise Martinez, MD, Assistant Dean for Cultural Affairs and Diversity Initiatives</td>
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<tr>
<td>10:30AM</td>
<td>Break</td>
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<tr>
<td>10:45AM</td>
<td>Admissions Procedures from A-Z - Jodi Graff, MA, Biomedical Programs Administrator, Assistant to the Associate Dean for Graduate and Postdoctoral Studies</td>
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<tr>
<td>11:15AM</td>
<td>I Got an Interview for Grad School: What Do I Do? - Madeline Shea, PhD, Director, FUTURE in Biomedicine℠ Program, Professor of Biochemistry</td>
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<td>Mock Interview with Peter Rubenstein, PhD, Professor of Biochemistry</td>
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<td>11:55AM</td>
<td>Closing Remarks</td>
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<tr>
<td>12:00PM</td>
<td>Lunch with UI Graduate Students</td>
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<tr>
<td>1:15PM</td>
<td>Informal Q&amp;A with Admissions Committee Members</td>
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<td>1:40PM</td>
<td>Informal Q&amp;A with Admissions Committee Members</td>
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<tr>
<td>2:00PM</td>
<td>Research Core Facility Tour or Laboratory Tour with a Graduate Student</td>
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<td>2:30PM</td>
<td>Additional Opportunity - Research Core Facility Tour or Laboratory Tour with Graduate Student</td>
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<td>3:00PM</td>
<td>Event concludes</td>
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"This was my second year in the FUTURE in Biomedicine℠ program. I am an experimental high-energy physicist, and my main research focus is to develop novel glass detectors for various applications such as particle physics, homeland security, and medical applications. My research group has been working on a novel detector design for proton imaging systems for a while. The FUTURE in Biomedicine℠ program gave me an amazing opportunity to include Dr. Dongxu Wang from Radiation Oncology Department of the University of Iowa Carver College of Medicine, into our project. Our proton imaging detector design requires a high-density, scintillating glass, which is being made at state-of-the-art glass laboratories of the Coe College Physics Department. In the last two years, through the FUTURE in Biomedicine℠ program and Coe College's NSF REU and RUI grants, 11 undergraduate students from Coe College, and a M.S. student from the University of Iowa Physics department, had the opportunity to participate in this research endeavor.

As one team worked on inventing the novel high density scintillating glasses, the other team created a simulation model of a prototype and developed image reconstruction codes. Without Dr. Dongxu Wang’s expertise in radiation oncology we would never have made the image reconstruction part of the project. Currently, we have a candidate glass, and working simulation model, as well an efficient image reconstruction method. We will soon start production runs, which will utilize the University of Iowa High Performance Computing resources, as well as all of the local Linux cluster in the Physics Department of Coe College. We hope to get our first results, write a scientific paper, and most importantly submit an NIH grant proposal this coming year. All of these would not have happened this fast without the support of the FUTURE in Biomedicine℠ Program.

I would also like to mention that the FUTURE program helped me to meet faculty from other Liberal Arts College science departments, and learn about their research interests, which might help me to initiate new collaborations.

Finally, I cannot thank enough Professor Madeline Shea for accommodating everything for my students, and me. Her gracious support helped us to improve our medical imaging knowledge tremendously. I am very excited to continue my collaboration with Dr. Dongxu Wang in years to come.”

Ugur Akgun, PhD
Assistant Professor of Physics
FUTURE in Biomedicine℠ Senior Fellow

“FUTURE in Biomedicine℠ program has been an amazing opportunity to expand my knowledge in a variety of fields and methods. Coming from a physics background, my knowledge of biology has been minimal and coming to the FUTURE events has truly broadened my horizons. Not only has the program itself been extremely helpful, but also the resources at University of Iowa have been indispensable to my project. I couldn’t imagine being able to continue my project without them. In short the FUTURE Program has been an expansive force in many aspects of my academic life.”

Collin Wilkinson
Student Researcher
CORNELL COLLEGE - MOUNT VERNON, IA

UI Faculty Host: Robert Cornell, PhD, Associate Professor of Anatomy and Cell Biology
Project: Functional Zebrafish of Genes Implicated in Epilepsy and Parkinson's Disease

“This is the third summer I have spent as a FUTURE Fellow and each experience has surpassed the previous one. The FUTURE program allows faculty from small colleges to become totally immersed in research and to return to the reason we became scientists in the first place: our passion for and desire to understand the natural world. Although we may love teaching, faculty from small institutions often become isolated from the broader scientific community, and the FUTURE program permits reengagement with that community, allowing us to invigorate not only ourselves, but our teaching as well.

Through my involvement with the FUTURE program I now have a zebrafish facility at my college that is used in laboratories associated with courses and in student-designed research projects. However, the biggest reasons I have returned for the third time are personal. I have had the opportunity to work with graduate students who remind me of that passion for science. I have had engaging discussions with Rob Cornell about ideas and new avenues of research. I have had a wonderful time working with my own student who has reminded me of the frustrations and joys inherent in ‘doing science.’ Altogether, a very rewarding experience.”

Barbara Christie-Pope, PhD
Professor of Biology
FUTURE in BiomedicineSM Senior Fellow

“Participating in the FUTURE in BiomedicineSM program gave me the opportunity to work firsthand in a research environment. I was able to interact with graduate students, lab technicians and my principal investigator, which gave me a sense of what graduate school would be like.

I have learned a tremendous amount throughout the last nine weeks, not only in the specific area of my research but also overall research methods. I know this will benefit me greatly as I continue my education in the sciences and work in other labs. I really enjoyed the weekly FUTURE meetings, which gave me the chance to become familiar with the research my fellow participants were involved in. Overall, I am extremely grateful to have taken part in this program and I am thrilled with the amount of knowledge I have gained.”

Shashanna Moll
Student Researcher

CORNELL COLLEGE - MOUNT VERNON, IA

Research Area: The biological, psychological, and sociocultural correlates of body dissatisfaction and eating disorder symptomatology.

“The FUTURE program helped me to become much more knowledgeable about the Medical Scientist Training Program (MSTP) at the University of Iowa. I am definitely in a better position to recommend this program to my top students.

The FUTURE program helped me to network with other scientist-educators around the state of Iowa. This has been beneficial to my professional development. I look forward to the continued opportunities for collaboration it will provide in the future.

Thanks again for the great opportunity!”

Melinda Green, PhD
Associate Professor and Department Chair of Psychology
Ringer Distinguished Professor
FUTURE in BiomedicineSM Visiting Fellow
**REFLECTIONS FROM PARTICIPANTS**

**DRAKE UNIVERSITY - DES MOINES, IA**

*UI Faculty Host: Madeline Shea, PhD, Professor of Biochemistry*

*Research Area: The structure, function, and evolution of cytoskeletal proteins in eukaryotes*

“The FUTURE program provided the impetus for expanding my research program at a critical juncture. Through work initiated in the first summer of the FUTURE in BiomedicineSM program in 2009, I have been able to make progress toward realizing many long-term research objectives, and in some cases, gone much further than I would have imagined. Assistance from University of Iowa Carver College of Medicine faculty and facilities have been critical to my success to date, and will be in the future. On this basis, I have recommended the FUTURE program to our faculty at Drake, and to date we have had five participants.

In addition to fostering collaborations between faculty and Iowa’s private colleges and the University of Iowa, the program has provided high-impact summer undergraduate research experiences that have enabled our students to compete effectively in gaining admission to post-baccalaureate programs in the life sciences.

I have participated as a Senior Fellow over the last six years because I strongly support the mission of the FUTURE program. Returning FUTURE faculty provide inspiration for new participants, since they can see progress made through participation in the program over the seven years of its existence.”

**Jerry Honts, PhD**

*Associate Professor of Biology*

*FUTURE in BiomedicineSM Visiting Fellow*

“My first semester of research at Drake University was amazing; I was doing things in the lab that I never considered would be available to me without a degree so I was exhilarated when Dr. Honts said there was an opportunity for me to continue our research at the University of Iowa during the summer and learn some new techniques. My first week at the University of Iowa completely blew my mind. I was not expecting the labs to be so big and efficient and collaborative; but mostly I was so surprised to see how much research was being done, both within and outside the FUTURE program.

Academic research was never mentioned in my family growing up so I didn’t really know that it was even an option until I began applying to college and started to see it mentioned in degree program profiles.

The FUTURE program as allowed me to encounter different research projects from the surrounding schools, specific research projects within my host lab, diverse topics that are in an offered lecture series and such a vast amount of different types of research that now I cannot even fathom how I didn’t realize that this was out there before. I no longer see publications and papers as obscure scientists in secret labs secluded from the world, but rather as colleagues and professors and actual people who are trying to solve a puzzle.

The resources at the University of Iowa, are certainly phenomenal but what I found most humbling were the people who talked to each other about the their projects and shared ideas with one another, asking questions and taking suggestions. It felt like I was part of a real scientific community.

This summer has opened my eyes to so many possibilities and I am extremely grateful for the opportunity to be part of the program and I highly recommend anyone with the same opportunity to take it. Ten out of ten would do again.

Thank you, Dr. Shea and Sonya, for putting this together and for all your help throughout the process!”

**Alexandra Howland-Lopez**

*Student Researcher*
DRAKE UNIVERSITY - DES MOINES, IA
UI Faculty Host: Madeline Shea, PhD, Professor of Biochemistry
Project: Calcium-Binding Regulatory Proteins - Structure and Energetics

“I very much appreciate the opportunity to return to Madeline Shea’s lab as a FUTURE in BiomedicineSM Senior Fellow. I participated in the program for a third year in a row, and I was able to make significant progress on two projects related to structural studies of calcium-binding regulatory proteins.

In one project, I continued my collaboration with Professor Shea on the interaction between calmodulin and the ryanodine receptor, two proteins involved in muscle contraction. To complement the thermodynamics analysis undertaken over the last two summers, we used NMR spectroscopy to investigate the molecular details of the complex between the two biomolecules and obtain residue-specific information of the binding interface. We were also able to isotopically label a co-expressed calmodulin-ryanodine receptor peptide complex, which will enable us to probe for the first time the conformational dynamics of the ryanodine receptor calmodulin-binding domain.

In a second project that is part of a collaboration with fellow Drake University faculty, I used NMR spectroscopy to investigate the structure of the C-terminal domain of TCB2, a putative calcium sensor from the ciliated protozoan Tetrahymena thermophila. I acquired three-dimensional NMR experiments and determined the sequential assignment of backbone and side-chain resonances of the domain, both in the absence and the presence of calcium. Structure determination using distance and dihedral angle constraints is ongoing for calcium-free TCB2, and will be initiated in the near future for the calcium-bound protein. Comparison of the solution structures of the domain at low versus high calcium levels will enable us to probe its calcium binding properties and gain insights into the molecular basis of calcium sensing in Tetrahymena.

Returning to the FUTURE program this year has enabled me to focus again exclusively on research for nine weeks, in a way that is sometimes difficult at a primarily undergraduate institution. It also allowed me to use the state-of-art facilities and instrumentation in the Carver College of Medicine, including the CCOM Protein Crystallography Core and the CCOM High Field NMR Core. I have received invaluable help with the NMR spectroscopy projects, and increased my expertise in solving protein structures by NMR.

Having access to the highly specialized knowledge and instrumentation available at the University of Iowa proved essential for making significant progress in my structural work. I am very grateful for the support and help of my collaborator, Madeline Shea, and all the members of her lab. The FUTURE in Biomedicine program allowed me to do cutting-edge biophysical research for the past three years, and I look forward to continued collaborations.”

Adina Kilpatrick, PhD
Assistant Professor of Physics
FUTURE in BiomedicineSM Senior Fellow
DRAKE UNIVERSITY - DES MOINES, IA

Research Area: Host-viral interactions and chromosome transmission

“I was excited to participate in the FUTURE in BiomedicineSM program after hearing about my colleagues’ fantastic experiences as Faculty Fellows. I am thankful to Madeline Shea for piloting the Visiting Fellows program for faculty like me who cannot commit to the full-time summer research program.

Participation in several of the weekly meetings as a Visiting Fellow will help me as a researcher and advisor. For example, while touring the IIHG Genomics Core Facility, I discovered equipment, services, and expertise available at Iowa that I can use in my research projects at Drake. I also learned more about the graduate and professional programs at the University of Iowa. This is information I can share with my undergraduate advisees. I enjoyed connecting with faculty from the University of Iowa and primarily undergraduate institutions in Iowa and sharing information about our academic and research programs. I’m grateful for the opportunity to join the FUTURE program as a Visiting Fellow and encourage others to participate.”

Heidi Sleister, PhD
Associate Professor of Biology
FUTURE in BiomedicineSM Visiting Fellow

DRAKE UNIVERSITY - DES MOINES, IA

Research Area: Pharmaceutical technology and its applications to drug development and administration

“The FUTURE in BiomedicineSM program has been very helpful to create collaborations, and use the core research facilities in the Carver College of Medicine. The scanning electron microscope (SEM) is one of the most powerful and versatile instruments used in research, development and manufacturing of drug delivery systems. The SEM has the ability to image a wide variety of sample types and sizes, often with minimal sample preparation, and is capable of generating multiple analysis signals, providing high-resolution information about the composition of the samples. The opportunity to use this powerful technique has greatly enhanced the quality of our research project. Otherwise, it would be difficult to carry out those evaluations. I am very grateful for the support and help of Dr. Randy Nessler and Dr. Jianqiang Shao at the Central Microscopy Research Facilities.

In addition, I appreciated the many discussions with other Fellows, participating in the weekly FUTURE in BiomedicineSM meetings and workshops, as well as interacting with peers and students from other undergraduate institutions in Iowa.”

Abebe Mengesha, PhD
Assistant Professor of Pharmaceutics
FUTURE in BiomedicineSM Visiting Fellow

“Participating in the FUTURE in BiomedicineSM program gave me the chance to spend a lot more quality time with my mentor Dr. Mengesha. I was able to develop much better research habits and greater love for research in general.

It certainly got me a more personal connection with the University of Iowa. I am planning on applying to attend medical school there.

Dillon Krotz
Student Researcher
GRACELAND UNIVERSITY - LAMONI, IA

UI Faculty Host: John Kirby, PhD, Professor of Microbiology
Research Area: Protection mechanism of Bacillus subtilis from Myxococcus xanthus

“The FUTURE in BiomedicineSM program has meant a lot to me, to my students, and to Graceland University. We have learned new laboratory techniques from the best scientists in these fields, and I have strengthened my scientific knowledge in the classes that I teach. These relationships are invaluable and inspiring. In my third visit to the Kirby Lab, I have gained information that can’t be acquired by reading a journal article. Rather, it is the knowledge obtained from a personal interaction - attending a seminar, listening to colleague presenting and troubleshooting data, or talking over coffee.

During these few years, my participation in the FUTURE program has grown. At first, I brought back projects for my students to work on at Graceland. This has brightened the outlook for 11 students who have worked with me already.

The impact extends beyond my campus. The Kirby Lab and I are working on a manuscript from our collaborations and hope to write a small grant application together in the future. I look forward to our continued collaboration.”

Mary Shawgo, PhD
Associate Professor of Biology
FUTURE in BiomedicineSM Visiting Fellow

GRINNELL COLLEGE - GRINNELL, IA

UI Faculty Host: Michael Schnieders, PhD, Assistant Professor of Biochemistry and Biomedical Engineering
Project: The Role of Thermodynamics in the Formulation of Pharmaceuticals

“I am really grateful for this opportunity that Dr. Madeline Shea and the FUTURE program have granted me and my students. We were able to work with a great person and scientist, Assistant Professor Mike Schnieders. I definitely will recommend this program to my colleagues and friends. Being part of this program has had many advantages. I was able to use and have access to scientific computational resources that I do not have at my current college. It also gave my students a sense of what it is like to be at a large research institution. I definitely will come back as a Senior Faculty Fellow.”

Heriberto Hernandez, PhD
Assistant Professor of Chemistry
FUTURE in BiomedicineSM Ruth Ann Henriksen Fellow

“The FUTURE in Biomedicine program helped me in the pursuit of my own future. With the support of this program, I feel that I have assured myself that I am truly passionate in science given the opportunity to work hands-on in a lab. It has been a blessing to meet new people through the connections the FUTURE program fosters. I would recommend any of my friends to the program who are interested in research and want to see what its all about. Thank you so much everything.”

Alitza Shutt
Student Researcher

“The FUTURE in BiomedicineSM program allowed us to broaden our understanding of scientific research. By taking advantage of the excellent research facilities offered by the University of Iowa and collaborating with professors, undergraduate students, and graduate students in different fields, we became very familiar with the processes essential in analyzing data. Overall, the program enabled us to develop techniques taught in our undergraduate courses and apply them in new environments. We enjoyed a wonderfully enriching experience!”

Julia Rumley
Student Researcher
“This was my third opportunity to participate in the FUTURE In BiomedicineSM Program. Each summer has been a bit different and I have learned and advanced my scientific understanding with each opportunity. The project I was involved with is locating and characterizing Wolbachia pipientis in Iowa mosquitoes. This obligate endoparasitic bacterium is widespread among terrestrial arthropods and may play a significant role in the reproductive success, competitive capabilities or vector potential of infected hosts. After having spent the first two FUTURE summers researching my ‘favorite treehole mosquito’ from my dissertation research in California, I decided that my student, John Reed, and I should serve more local interests by investigating Iowa mosquitoes.

Community college faculty generally do not have opportunity for research; this is even more true for community college students. Dr. Wendy Maury and her graduate students graciously provided research space, materials, advice and encouragement during our research. Dr. Madeline Shea and Ms. Sonya Housholder provided exceptional liaison with the FUTURE Program. And through the FUTURE Program, we gained access to essential software capabilities and sequencing that were integral to our success.

I hope to continue my collaboration with the Maury lab and would be grateful for future opportunities in affiliation with the FUTURE Program. For faculty interested in taking their research to a new level, please consider this Program.”

D. Randy Mercer, PhD
Instructor of Natural Sciences
FUTURE in BiomedicineSM Senior Fellow

“I have just completed my first semester at Hawkeye Community College. The FUTURE program has allowed me to be involved with many new projects and people. Thus, it has given me a greater outlook on scientific studies in general. I learned about the work going on in many laboratories at our weekly meetings. With their interesting and diverse topics, it was a pleasure to come and be a part of it as well.”

John Reed
Student Researcher
"I have had the pleasure of participating as a Faculty Fellow in the FUTURE of BiomedicineSM program at the University of Iowa for the past three years. This is an outstanding program that allows faculty from schools across Iowa to expand their research, build collaborations, get undergraduate students valuable research experience, and interact with admissions staff from professional programs. This program has been particular valuable to me in helping to carry out a robust research program that integrates undergraduate students from Mount Mercy in an immersive project that has not failed to generate results every summer, as well as establish a productive collaboration between Dr. David Weiss (Microbiology) and me that has persisted now over multiple years.

This program has also allowed me to interact with peers in my field to help improve my courses at Mount Mercy through talks about teaching practices, classroom activities, and new laboratory exercises. Summers participating in the FUTURE program have gone by fast - an exciting experience. I would strongly urge other faculty in Iowa to take advantage of the FUTURE program.

As I have participated in this program, I have also seen it grow and change, from the inclusion of Senior Fellows who have come back to participate in this experience two or more times and the expansion of the program to include graduate students and post-docs from the University of Iowa getting teaching experience at some of the institutions that are home to the FUTURE Fellows. I look forward to seeing how this program will continue to evolve over time."

Ryan Bezy, PhD
Assistant Professor of Biology
FUTURE in BiomedicineSM Senior Fellow

“This summer has been a wonderful opportunity for me to experience lab work in a whole new way. Working on a project, and being able to collaborate with other members of the lab has been an insightful experience into how a real lab works.

Being able to do hands-on work was probably the best part this summer; I was the one handling the pipette and doing the spot assays, and that was a great experience. I learned a lot about how scientists approach different problems, and how resilient and patient they are when an experiment doesn't turn out the first time. Thanks to the FUTURE program I have had these opportunities, and I am very grateful for everyone involved in making this program available. I would definitely recommend this program to anyone who is interested in research.

I would like to thank Dr. Bezy, Dr. Weiss, Dr. Eric Ransom, and Dr. Atsushi Yahashiri for helping me with procedures, and for answering questions that I have had. Thank you for making this opportunity available to me.”

Monica Steffen
Student Researcher
“Participating in the FUTURE in Biomedicine℠ Program as a Senior Fellow has been yet another tremendous experience. Firstly, the experience for my undergraduate student is invaluable. The undergraduate students learn a lot about the various professional and graduate programs at the University of Iowa. They also see the wealth of resources available at Iowa, including but not limited to the research facilities, the groundbreaking research taking place, and the tremendous researchers and educators available.

The FUTURE program has allowed me to perform research that cannot solely be accomplished at Mount Mercy University. The collaboration with Professor Keith Jarosinski has been great because it allows me to utilize my chemical experience in a new field for me. Besides working on a novel area of research, the collaborative research project gives my undergraduate students an opportunity to experience research in electron microscopy, which is extremely rare for most undergraduate students. The experience provides an excellent experience with research because they understand how difficult it is to obtain the images they see in their textbooks.

As an educator and pre-professional adviser at a small institution, the FUTURE in Biomedicine℠ program helps me to stay up-to-date with important information regarding the admissions process for the professional and graduate programs. This information is essential for me because it allows me to give my students the best information and advice possible.

I highly recommend the FUTURE in Biomedicine℠ for all professors in primarily undergraduate institutions because it provides invaluable opportunities, collaborations, resources, and access to tremendous research facilities. I look forward to my continued participation in the future!”

Joseph Nguyen, PhD
Assistant Professor of Chemistry
FUTURE in Biomedicine℠ Senior Fellow

“The experience I have gained within the FUTURE in Biomedicine℠ Program has been one-of-a-kind. It has opened my eyes to the importance of collaboration between researchers and various departments as a way to improve techniques and provide valuable insight for different perspectives on a project. I appreciated the many seminars to showcase the different programs offered at University of Iowa and the priceless time from guests to talk about their programs.

The intimate setting of dinner, which included the FUTURE of Biomedicine℠ Program participants, MD/PhD students, Dean Schwinn, and Associate Dean Sherree Wilson, allowed priceless advice and insight. It provided a deeper conversation and informal setting to ask personalized questions.

It would be wise for many looking to further their education by continuing in a graduate program (PhD or Medicine) at the University of Iowa to invest time in the FUTURE in Biomedicine℠ Program as confirmation regarding the program they would like to join. This has given me the opportunity to confirm my passion and future goal in medicine.

Thank you again for the opportunity of being part of this program.”

Amanda Dolley
Student Researcher
WALDORF COLLEGE - FOREST CITY, IA
UI Faculty Hosts: Lori Wallrath, PhD, Professor of Biochemistry
Project: The Role of Lamins in Regulating Muscle Function and Metabolism

“I genuinely appreciate the opportunity to return and participate in the FUTURE in BiomedicineSM program a second time. Both this year’s experience, and my initial experience in 2011 have helped me to establish connections to UI faculty who have been very supportive of my efforts to conduct research at Waldorf College and provide my students with more meaningful lab experiences and insights into careers in the biomedical sciences. Madeline Shea went the extra mile this year to help me find funding for a student stipend so that I could bring a student along. The experience has been very enlightening for my student, Maria Valdes, and fortunately, has increased, rather than decreased her enthusiasm for a career in genetic research.

Our research project this summer has been very exciting. We have had the opportunity to use Drosophila as an animal model of muscular dystrophy, and have gained insights into contributing factors at the cell and molecular level that may eventually provide avenues of pharmacological research to pursue. We are hoping to submit our work later this year for publication.

I am also enthusiastic about working with Drosophila because I have been incorporating Drosophila studies into my genetics lab at Waldorf for the past two years, but I have very little prior experience with this animal model. The insights I’ve gained this summer will allow me to make some big changes in how I conduct these lab activities, and hopefully will allow my students to pursue novel questions in lab rather than just learning technical skills.

I am definitely hoping to come back and participate again, and planning to stay involved in the Wallrath lab’s muscular dystrophy work as it moves forward.”

Gary Coombs, PhD
Assistant Professor of Cell and Molecular Biology
FUTURE in BiomedicineSM Senior Fellow

because, as my advisor, he knows I was interested in this field. After this summer I realized that research is something I would like to do full time, and that here at University of Iowa there are great opportunities to continue my education and obtain a Ph.D. This program also taught me a lot, I think that my genetics and biochemistry classes are going to be way easier now. I am really happy with the experiences I had and the people I met this summer. I would like to thank the University of Iowa, my lab host Lori L. Wallrath and all the staff that make this program happen.”

Maria Valdes
Student Researcher
KIRKWOOD COMMUNITY COLLEGE/LSAMP-IINSPIRE PROGRAM - CEDAR RAPIDS, IA

UI Faculty Host: E. Dale Abel, MD, PhD, John B. Stokes III Chair in Diabetes Research and Director, Fraternal Order of Eagles Diabetes Research Center
Project: Diabetes Research

“The experience that I’ve had over the summer as a FUTURE Student Affiliate has been wonderful. Not having a professor from my home institution with me in the laboratory has not been an issue because of how welcome the FUTURE program and my lab has made me feel. Networking with people in the field that I want to go into has given me many chances over the summer to ask questions and find out more about the research and medical area. It’s given me even more motivation to focus in school so my knowledge can continue to be applied to a lab setting. I’ve found something that I truly enjoy doing and it has left me eager for my next research opportunity.

Coming from a community college, the FUTURE in BiomedicineSM program has helped me get a chance to experience a university atmosphere before transferring to one. Also offering weekly seminars and workshops has helped build skills and gain knowledge for either graduate school or professional school.

Having this information so early in my pathway through school has provided an upper hand with guidance and reassurance of my career goals and passion for science.

I would definitely recommend the FUTURE in BiomedicineSM program to other students looking for an amazing opportunity in research or to find out about other career opportunities with science.”

Adam Page
FUTURE in BiomedicineSM Student Affiliate
“First and foremost, I want to thank you Madeline Shea for including me in the FUTURE in Biomedicine Program. Coming to the University of Iowa alone as the first Theresa L. Gioannini Women-in-Science Fellow was a great experience. It exposed me to a level of science that I would have otherwise not witnessed in my undergraduate career. Everyone I worked with here was more than willing to be part of my development as a scientist in this short time.

This is definitely a program that helps undergraduates get a grasp for real research. It is really set up for the student to gain great hands on experience. I do however, think that because a lot of the projects went into so much depth that it would be a great benefit if this program was a couple of weeks longer. Being able to do research at a high level at an institution like the University of Iowa will definitely boost my resume. It was really a great experience!”

Dulce Chavez
FUTURE in Biomedicine™ Student Affiliate
Through the FUTURE in Biomedicine™ Program, the University of Iowa Carver College of Medicine is committed to:

- Fostering closer research collaborations between its faculty and those of primarily undergraduate institutions throughout the state of Iowa.
- Mentoring talented undergraduates who will be our next generation of physicians and biomedical scientists.
- Promoting opportunities to translate biomedical discoveries and methods into educational materials used in Iowa’s college classrooms.
- Making its research facilities available to a statewide network of scientist-educators.

Consistent with these commitments, the goal of the Better Futures for Iowans program is to make state-of-the-art core research facilities at the University of Iowa available to academic classes and research projects conducted primarily by undergraduates at 2-year and 4-year institutions in Iowa.

Faculty throughout the state are eligible to apply for small grants to support laboratory-intensive projects involving undergraduate students in “hands-on” inquiry. Students take responsibility for the preparation of samples and analysis of data obtained. All participants are invited to present a poster about their work at the FUTURE in Biomedicine™ Research Symposium. This activity extends University resources to Iowans and addresses an important goal of the University Strategic Plan—to provide better futures for Iowans.

### 2015-16 Grant Recipients

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<th>Institution</th>
<th>Name</th>
<th>Title</th>
<th>Project Description</th>
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<td>Drake University</td>
<td>Heidi Sleister, PhD</td>
<td>Associate Professor of Biology</td>
<td>Imaging the 3D Structure of Protein Liquid Droplets</td>
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<td>Jerry Honts, PhD</td>
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<td>Adina Kilpatrick, PhD</td>
<td>Assistant Professor of Physics</td>
<td>Characterizing the Stress Response Capacities of <em>Deinococcus maricopensis</em></td>
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<td>Grand View University</td>
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<td>Utilization of NMR for a Generic Versus Name-Brand Naproxen Open-Inquiry Experiment</td>
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<td>Kris Keuseman, PhD</td>
<td>Associate Professor of Chemistry</td>
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<td>Waldorf College</td>
<td>Gary Coombs, PhD</td>
<td>Assistant Professor of Cell and Molecular Biology</td>
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“Imaging the 3D Structure of Protein Liquid Droplets”  
Grant Recipients: Heidi Sleister, PhD and Jerry Honts, PhD  
UI Core Facility: Central Microscopy Research Facility

We have recently discovered that two Tetrahymena cytoskeletal proteins (Epc1 and Fen1) that we are studying form an unusual type of phase-separated liquid droplets. A number of publications this year have described the role of protein droplets formed by association of protein and RNA, such as the P-bodies involved in mRNA storage and turnover. In at least one other case, cytoskeletal proteins have been found to form similar structures. Students working with Dr. Sleister have just completed construction of bacterial expression plasmids for GFP-tagged versions of Fen1. This fall we obtained our first images of liquid droplets formed by GFP-tagged versions of the Epc1 protein, which although similar to others reported in the literature, also appear to have novel structural features. We are also working to construct versions of the mRNAs encoding these proteins with engineered fluorescent RNA aptamers for visualization studies, to see if as in other systems, messenger RNA molecules associate with these liquid droplet structures. We propose to use the Central Microscopy Facility’s new confocal microscope to image the 3D structures of these unusual structures, which are revolutionizing our understanding of organization of the cytoplasm of cells.

“Probing the Conformational Dynamic of the C-domain Tcb2, a Calcium Binding Protein from Tetrahymena thermophila”  
Grant Recipient: Adina Kilpatrick, PhD  
UI Core Facility: Nuclear Magnetic Resonance Facility

Many protist cells use an ATP-independent form of contractile motility, which results from the calcium-triggered contraction of filaments containing novel structure and/or calcium-binding proteins. Several such proteins were previously identified during proteomic analysis of contractile fibers isolated from the membrane-associated cytoskeleton of the ciliated protozoan Tetrahymena thermophila, including the putative calcium-binding protein Tcb2 and the filament-forming structural protein Epc1. The goal of this project is to investigate the structure and dynamics of the two-domain protein Tcb2. The full-length protein and its N-terminal domain are not amenable to high-resolution structure determination, as they tend to aggregate in the presence of calcium and/or upon concentration. However, the C-terminal domain (Tcb2-C) is highly soluble at both low and high calcium concentrations. Solution NMR HSQC spectra of 15N-labeled Tcb2-C indicate that the protein is well folded in the presence and absence of calcium, and undergoes a dramatic conformational change upon calcium addition. We expressed and purified 15N, 13C-labeled Tcb2-C, and assigned the chemical shifts of the main chain and aliphatic and aromatic side chains of the protein at both low and calcium concentrations. NMR structure determination of calcium-free and calcium-bound Tcb2-C is currently underway. For this grant, we propose to acquire additional NMR experiments to quantify the calcium-binding properties of the domain and investigate its conformational dynamics. These studies will establish a structural basis for elucidating the function of Tcb2.
GRAND VIEW UNIVERSITY

“Characterizing the Stress Response Capacities of Deinococcus maricopensis”
Grant Recipient: Michael LaGier, PhD
UI Core Facility: Genomics Division, Iowa Institute for Human Genetics

Funds are requested to support an undergraduate project to characterize a putative catalase and superoxide dismutase from the bacterium Deinococcus maricopensis. D. maricopensis has potential as a bioremediation agent due to its resistance to environmental stressors including oxidative damage. The genome of the bacterium has recently been sequenced as part of the GEBA (Genomic Encyclopedia of Bacteria and Archaea) project headed by the Joint Genome Institute of the Department of Energy. A goal fo GEBA is to better capture the diversity of the microbial world via genomic sequencing. A secondary goal of GEBA is to provide undergraduates an opportunity to contribute to genomics research, through the MGAN (Microbial Genome Annotation Network, supported by the National Science Foundation) network. Grand View is part of MGAN, and as part of this group, has access to bioinformatics tools geared at genome annotations. I am currently working with undergraduate mentees to more closely examine the genomic content of D. maricopensis. In particular, we are collecting the annotating genes believed to be related to stress tolerance phenotypes. The funding requested here will help support these efforts, by providing a means to validate our bioinformatics work via molecular biology techniques. In this project, mentees will clone, sequence, and functionally characterize (in Escherichia coli hosts) putative catalase and superoxide dismutase genes from D. maricopensis.

MOUNT MERCY UNIVERSITY

“Utilization of NMR for a Generic Versus Name-Brand Naproxen Open-Inquiry Experiment”
Grant Recipient: Joseph Nguyen, PhD
UI Core Facility: Nuclear Magnetic Resonance Facility

The purpose of this class project is for the students to determine whether name-brand (Aleve) and generic (CVS and Equate) sodium naproxen are similar. The students are challenged to find or establish procedures that will help them determine this, including isolating, confirming the presence of, and quantifying the amount of the active species as well as the bioefficacy of the drug using a wide variety of instruments and experiments. At Mount Mercy University, we have a 90 MHz NMR spectrometer, but the power supply had broken, so the students could not determine the presence of the active ingredient. Thus, we have approached the CCOM NMR facilities to help the class accomplish one of their tasks.
MOUNT MERCY UNIVERSITY

“Determination of Glucosamine Serum Levels in Horses”
Grant Recipient: Kris Keuseman, PhD
UI Core Facility: High Resolution Mass Spectrometry Facility

Glucosamine is commonly used by horse owners to improve mobility and decrease pain associated with osteoarthritis. Despite a large amount of anecdotal evidence for positive therapeutic outcomes, the veterinary literature provides no clear evidence for increased blood serum glucosamine levels after oral or IV administration of glucosamine preparations. The proposed study would seek to study how blood serum glucosamine levels change during administration of oral and IV glucosamine preparations. The study will also compare serum glucosamine concentration to qualitative metrics of mobility and pain in the animals participating in the study. To determine serum glucosamine concentrations, whole blood samples will be collected each day for one week prior to treatment with glucosamine. After glucosamine treatment, whole blood samples will be collected each day and qualitative measurements of mobility and pain will be made. Post administration sampling will continue for one week. We intend to use the University of Iowa Mass Spectroscopy facility to identify glucosamine in prepared serum samples. Quantification will be done using High-Performance Liquid Chromatography at Mount Mercy University. This study will be conducted by Mount Mercy University undergraduate student Mikayla Galloway in collaboration with Prof. Kristopher Keuseman.

WALDORF COLLEGE

“Using Drosophila as a Model of Human Muscular Dystrophy Caused by Mutations in the LMNA Gene”
Grant Recipient: Gary Coombs, PhD
UI Core Facility: Central Microscopy Research Facility

During the summer of 2015, as participants in the FUTURE in Biomedicine™ program, Maria Valdes (a Waldorf student) and I conducted studies in Lori Wallrath's lab that demonstrated defects in protein folding and redox homeostasis resulted from expressing lamins in Drosophila with mutations in the head, rod, or Ig-fold domain. We developed a technique using video analysis to quantitate larval locomotion defects, quantitated survival of pupation, and tested several RNAi or overexpression strategies to rescue survival in flies expressing a lamin mutant that normally results in less than 2% survival. Several strategies resulted in up to 30-fold rescue. Another student, Gulnara Novbatova, has taken on the characterization here at Waldorf College of two more mutations known to cause human muscular dystrophy. To date she has quantitated their locomotion defect and determined percent survival to adulthood relative to wild type expressing flies. As a continuation of the project, arrangements have been made for her to spend a week in Iowa City so she can dissect larval muscle, learn to stain for lamin C and possibly for a DNA damage marker, and then perform fluorescence confocal microscopy on the prepared samples with Dr. Wallrath. We hope to be able to publish these results as a follow-up to a manuscript in preparation on the studies performed over the summer. I am requesting support for the microscopy to be performed with Dr. Wallrath's assistance in December.
The FUTURE in Biomedicine™ Program has had outstanding results. The program has hosted 33 Faculty Fellows from 18 Iowa colleges, and more than 52 undergraduate research assistants. It has contributed to the success of grant applications from both UI faculty and FUTURE Fellows throughout the state who have applied for external funding from the NIH, the NSF, NASA and private foundations such as the American Heart Association. The FUTURE in Biomedicine™ Program has sponsored 17 PUI Faculty grants for “hands on” inquiry using the research core facilities of the University of Iowa. Each project involved undergraduate students who created the samples and analyzed the data. Many of the Faculty Fellows and their students have returned to continue their projects with their own independent funding. Our Faculty Fellows and their collaborators have published 8 peer-reviewed papers and abstracts, and made more than 35 conference presentations related to the research projects that they initiated or continued as a result of the FUTURE in Biomedicine™ Program. Thus, the program has had a “Ripple Effect” by training the next generation of scientists and clinicians who ultimately will conduct the cutting-edge research that will provide Iowans with more effective and timely healthcare at a reasonable cost.

AMANDA MARWITZ

“I participated in the FUTURE in Biomedicine™ program in the summer of 2013 working with Dr. Adina Kilpatrick in Dr. Madeline Shea’s lab in the Department of Biochemistry. Our project for the summer was ‘Biophysical Studies of Calmodulin Recognition of the Ryanodine Receptor’. Getting a chance to participate in the FUTURE project was both unexpected and wonderful. I enjoyed research, but was intending to apply to Physical Therapy school and did not see myself as a likely candidate to spend a summer conducting biochemistry research. However, I really enjoyed my time at Iowa, learned more than I ever imagined, and strengthened my ability to think critically and collaborate with a group.

The FUTURE program reinforced my love of science and sharing science with others. Since that summer, my career aspirations have changed. I graduated from Drake University with a B.A. in Biology and am currently working on my Master of Secondary Education degree at DePaul University. In March-June 2016, I will be student teaching honors biology and honors environmental science with the intent to obtain a position as a high school biology teacher after graduation.”

Amanda Marwitz
Master of Secondary Education Student, DePaul University
2013 FUTURE in Biomedicine™ Student Researcher
FUTURE Faculty Mentor: Adina Kilpatrick, PhD  |  UI Faculty Host: Madeline Shea, PhD

DAVID STANEK

“During the summer of 2014, I joined Dr. Ryan Bezy in Dr. David Weiss's lab in the Department of Microbiology to do research on “Genetic Analysis of Bacterial Cell Division”. Through the informative weekly meetings, lab research and interactions with faculty and students at Iowa, I learned a lot. By the end of the 8-week program, we had real results that will contribute to a publication Dr. Bezy is preparing for submission. Following the FUTURE in Biomedicine™ Program, I had additional opportunities to present my work at the Iowa Academy of Science in Iowa City and at the Mount Mercy University Scholarship Festival in Cedar Rapids, both in April 2015.

Prior to participating in FUTURE, I planned to apply to medical school. That plan didn’t change but it was enhanced by my experience. I now envision a future medical career that includes research. I am currently enrolled in the Master of Science in Anatomy program at Des Moines University with plans to apply to medical school in Summer 2016 and hope to return to Iowa in Fall 2017.”

David Stanek
Master of Science in Anatomy Student, Des Moines University
2014 FUTURE in Biomedicine™ Student Researcher
FUTURE Faculty Mentor: Ryan Bezy, PhD  |  UI Faculty Host: David Weiss, PhD
COE COLLEGE - A SCINTILLATING APPROACH TO DETECTING CANCEROUS TUMORS

Early detection of tumors gives patients an edge in beating cancer. Once a cancer has been identified, physicians want to target damage to eliminate only the sick cells, and keep as many of the healthy ones as possible. So, first, they need to pinpoint the location of tumor and get a precise map of its size and shape.

Distinguishing and eliminating tumors within healthy tissue is a difficult challenge. But, going after them is a job that will be made easier by a new tool being developed in a collaboration between Coe College Associate Professor of Physics Ugur Akgun, an experimental high-energy physicist, and University of Iowa Assistant Professor of Radiology Dongxu Wang, a radiation oncologist. They have been working together for the past two years in the FUTURE in Biomedicine Program.

Their collaboration depends on remarkable strengths at each of their institutions. Coe College, located in Cedar Rapids, is a national leader in the development of new formulations of glass, and is one of a handful of liberal arts colleges in the US with funding from the National Science Foundation to support a Research Experience for Undergraduates program. In Iowa City, the UI Carver College of Medicine is a leader in cancer care with research and clinical studies within the Holden Comprehensive Cancer Center.

Working together, Akgun and Wang have developed a proton imaging detector which will allow more precise mapping and delivery of therapy to kill diseased tissue. This will be particular valuable for brain tumors and tumors in smaller people such as children. They are using proton therapy because it has the unique characteristic of depositing most of its energy at the end of its trajectory. Their imager design requires a high-density, scintillating glass, which is being made at state-of-the-art glass laboratories of the Coe College Physics Department.

Their work is so novel that they have filed a patent application for their invention “Apparatus, System and Method for a Proton Beam Imager Using High-Density Glass Scintillator.”

This is an exciting example of the value of collaboration, and synergy between research and education – a cornerstone of FUTURE: Fostering Undergraduate Talent – Uniting Research and Education. The design of the proton imager has benefited from contributions of undergraduate students from both Coe College and the University of Iowa, as well as a graduate student in the Department of Physics of the University of Iowa.

The Coe undergraduates split up into teams – one working on the components of the device and the other working on the computer code that will be needed to take the raw data from the device, and reconstruct an image of the tumor. That final image will be essential in the therapeutic stages of patient treatment.

Dr. Wang’s expertise in radiation oncology provided the medical expertise needed to guide the approaches to image reconstruction. As their collaboration proceeds, they also will use the University of Iowa High Performance Computing resources.

Some Coe undergraduates also participated directly in the FUTURE in Biomedicine program, spending time in Iowa City to learn about our graduate and clinical training programs, and other research programs here,
as well as working on their own project. Other students were supported by awards to Coe College from the National Science Foundation funding Research Experience for Undergraduates (REU) and did most of their research in Cedar Rapids.

The development of the proton imager holds great promise for patients, and is a win-win for the growing partnership between Coe College and the University of Iowa Carver College of Medicine which has been fostered by the FUTURE in Biomedicine program.

WARTBURG COLLEGE - LAUNCHING A CAREER UNITING RESEARCH AND EDUCATION

Doug Brusich first connected with the FUTURE in Biomedicine Program as an undergraduate at St. Ambrose University. One of his instructors at the time, Assistant Professor of Biology Shannon Mackey, had been a FUTURE Faculty Fellow in 2009 - the first year of the program. Dr. Mackey worked in the laboratory of Professor Lori Wallrath, working with Drosophila melanogaster to study nuclear organization, chromatin structure and gene silencing.

Doug matriculated at the University of Iowa and joined the laboratory of C. Andrew Frank in the Department of Anatomy and Cell Biology. His thesis project was “Dual roles for an intracellular calcium-signaling pathway in regulating synaptic homeostasis and neuronal excitability” His studies focused on the role of intracellular calcium-signaling for homeostatic potentiation of neuronal activity following a loss in sensitivity. That pathway also influences neuronal excitability downstream of gain-of-function calcium channels that are similar to gain-of-function channels known to cause migraine.

During Doug’s Ph.D. studies in the Frank laboratory, Assistant Professor Stephanie Toering Peters from Wartburg College was selected as a FUTURE in Biomedicine Faculty Fellow and joined the lab in the summer of 2011 with her student, Islam Qadous. Dr. Toering Peters subsequently returned as a Senior Fellow in the summer of 2014 with another Wartburg student, Jessa Bidwell. At that point, Dr. Toering Peters was an Associate Professor of Biology at Wartburg College, and was contributing to the development of an Interdisciplinary Neuroscience Major on their campus.

Doug’s sights were set on becoming a faculty member at a liberal arts college. Through his connections with Dr. Toering Peters, he received the opportunity to teach a course at Wartburg College. After that experience, he competed successfully for an opening as a Visiting Assistant Professor beginning in the fall of 2015, after sucessfully defending his Ph.D. dissertation. He will be developing an independent research program at Wartburg, and is eager to work with Drosophila melanogaster himself.
LORAS COLLEGE - UI PARTNERSHIP FOR MENTORED TEACHING EXPERIENCE

In 2014, Adam Moser, Assistant Professor of Chemistry at Loras College in Dubuque, Iowa, was selected as a FUTURE in Biomedicine Fellow. Dr. Moser is an inspired and enthusiastic faculty member who brought two Loras students, Alexis Hanson and Jason Derby, to participate in the summer of research and professional development activities in Iowa City. They joined the laboratory of Biochemistry Professor Adrian Elcock to develop computational methods to study how molecules interact within our cells. While Dr. Moser and his students were learning about methods used by the Elcock laboratory and contributing their ideas, the members of the Elcock group were learning from Dr. Moser about his research and his career path.

Dr. Moser’s postdoctoral work at Boston University had given him the chance to develop pedagogical expertise in teaching before joining the faculty of Loras College. These opportunities are rare in the United States, and he is an advocate for similar opportunities for those who wish to become faculty members. He worked with the administration of Loras College to create an opportunity for a mentored teaching experience. Loras College generously offered housing and a laptop computer to support this opportunity.

In January of 2015, Dr. Casey Andrews, a postdoctoral fellow in the Elcock Laboratory, joined Dr. Moser on the Loras College campus to teach classes, mentor undergraduates in research, participate in professional development seminars, attend faculty and division meetings, supervise a laboratory class in general chemistry, and generate new teaching materials for general and biophysical chemistry under the guidance of Dr. Moser. This mentored experience allowed Dr. Andrews to develop a background in teaching pedagogy while getting some real class experience. Additionally, attending faculty and staff meetings provided him a chance to see how a small college functions behind the scenes. The photos show Dr. Andrews participating in didactic instruction and hands-on, side-by-side laboratory work with Loras College students in the classes he was teaching.

This was a win-win opportunity for Loras College and the University of Iowa. Dr. Moser gained an enthusiastic junior colleague who was able to provide a new perspective. In the summer of 2015, both he and Dr. Andrews participated in a Career Workshop as part of the FUTURE in Biomedicine program, describing their experience on navigating steps in the transition from postdoctoral fellow to teaching faculty. Based on his mentored teaching experience at Loras College, Dr. Andrews was selected to be the primary instructor of the University of Iowa Experimental Biochemistry for undergraduate majors in the Spring of 2016. These opportunities will help Dr. Andrews hone his skills as an instructor and make him more competitive on the job market.

Dr. Moser has extended the offer for UI postdoctoral fellows or senior graduate students to train at Loras College with him and other faculty in subsequent academic years. This is a remarkable opportunity for UI trainees and demonstrates the reciprocal partnerships being developed through the FUTURE in Biomedicine program.

Dr. Casey Andrews teaching General Chemistry II class.

During General Chemistry II class:
Aaron Schwarzkopf
Mark Tilkes
Lauren Sutton
Stephanie Harpenau
Dr. Adam Moser

General Chemistry II lab:
Zachary Atzen, Dr. Casey Andrews and Morgan Drew.
Partnerships with the University of Iowa’s FUTURE in BiomedicineSM have included professors of chemistry, biology, and psychology at some of the state’s leading institutions. Since 2009, FUTURE in BiomedicineSM has now connected 33 fellows at 18 Iowa institutions and continues to expand each year.

PAST PARTICIPANTS

2009

Coe College
Randy Christensen, PhD
Brandon Hoffer
Anton McCaffrey, PhD

Drake University
Jerry Honts, PhD
Madeline Shea, PhD

Graceland University
Dan Pratt, PhD
Ryan Sheehy
Ray Hohl, MD, PhD

Loras College
David Speckhard, PhD
Sujan Devbhandari
Rob Piper, PhD

Northwestern College
Karissa Carlson, PhD
Alex Menning
Marc Wold, PhD

St. Ambrose University
Shannon Mackey, PhD
Lori Wallrath, PhD

2010

Drake University
Chinh Dao, PhD
Randi Rumbold
Fred Quelle, PhD

Loras College
K. Mac McLaughlin, PhD
Stephen Brandt
Natalie Denburg, PhD

Morningside College
Rachel Robson, PhD
Johan P. Conradie
Alexander Horswill, PhD

Wartburg College
Shawn Ellerbroek, PhD
Molly Wernli
Kris DeMall, PhD

2011

Buena Vista University
Kristy McClellan, PhD
Caitlin Hof
Pamela Geyer, PhD

Coe College
Maria Dean, PhD
Katelyn Marshall
Sheila Baker, PhD

Cornell College
Barbara Christie-Pope, PhD
Federica O’alora-Roselli
Robert A. Cornell, PhD

Mount Mercy University
Joseph Nguyen, PhD
Molly First
Richard Roller, PhD

Waldorf College
Gary Coombs, PhD
Cody Barnes
Dawn Quelle, PhD

2012

Coe College
Paul Storer, PhD
Molly Schlichenmayer
Andrew Russo, PhD

Dordt College
Kayt Frisch, PhD
Lee Veldkamp
Eric Hoffman, PhD

Hawkeye Community College
D. Randy Mercer, PhD
Quynh Nguyen
Wendy Maury, PhD

Simpson College
Justin Brown, PhD
Emily Magers
Kathleen A. Sluka, PhD, PT

Wartburg College
Stephanie Toering Peters, PhD
Islam Qadous
C. Andrew Frank, PhD
The FUTURE in BiomedicineSM Program encourages all fellows and students to extend the spirit of collaboration beyond the laboratory by sharing accomplishments and successes through the Ongoing Connections Update. Our goal is to foster a community of partnership that continues to benefit everyone involved in the program.

**To Send Us an Update, Visit Us Online At:**
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Learn more about FUTURE of Biomedicine events and programs online at www.medicine.uiowa.edu/future.