The Road from Undergraduate Research to a Career as a Researcher

David Dausey, Ph.D.
Provost, Duquesne University
Thank You for Participating!

Biola University
Birmingham-Southern College
Boston University
Case Western Reserve University
Chatham University
City Colleges of Chicago
Depauw University
Dickinson College
Duquesne University
Franciscan University of Steubenville
Franklin Regional High School
Freeport High School
Grove City College
Harvard University
Harvey Mudd College
Lebanon Valley College
Lincoln University
Lipscomb University
Marlboro University
Mt. Lebanon High School
Ohio University
Otterbein University
Pittsburgh Sci-Tech Academy
Rice University
Rutgers University
Saginaw Valley State University
San Francisco State University
Seton Hill University
Skidmore College
Slippery Rock University
Taylor Allderice High School
The George Washington University
The Ohio State University
University of Central Oklahoma
University of Dayton
University of Massachusetts – Lowell
University of Minnesota, Morris
University of North Carolina
University of Notre Dame
University of Pittsburgh
University of Puerto Rico - Mayaguez
University of Puerto Rico-Rio Piedras
University of Rochester
University of South Carolina
Vassar College
Washington & Jefferson College
Waynesburg University
Western Michigan University
Westminster College
Grant Supported Research Groups

- **Dr. Joseph Ayoob** (TecBio REU) Computational Biology, University of Pittsburgh
- **Drs. Taryn Bayles and Joseph McCarthy** (PFM) Chemical and Petroleum Engineering, University of Pittsburgh
- **Dr. David Boone** (Hillman Academy) University of Pittsburgh Cancer Institute
- **Dr. Russell Clark** Physics and Astronomy, University of Pittsburgh
- **Dr. Jeffrey Evansek** (NSF-REU) Chemistry and Biochemistry, Duquesne University
- **Dr. Robbie Iuliucci** Chemistry, Washington & Jefferson College.
- **Drs. Ben Kolber, Kevin Tidgewell, Rita Mihaiescu and Michael Cascio** (PURE and NURE NIH) Biological Sciences, Chemistry and Biochemistry, and Pharmaceutical Sciences
Applause for Faculty Mentors!

- Allyson O'Donnell
- Jeffrey Beckstead
- Fatiha Benmohktar
- Michael Cascio
- Jane Cavanaugh
- Theodore Corcovilos
- James Drennen
- Jeffrey Evanseck
- Ellen Gawalt
- Benjamin Goldschmidt
- Robert Iuliucci
- Jan Janecka
- David Kahler
- Wook Kim
- Howard "Skip" Kingston
- Benedict Kolber
- Matthew Kostek
- Lauren O'Donnell
- David Lampe
- Rehana Leak
- Joseph MacNeil
- Devika Manickam
- Joseph McCormick
- Menon Gopalakrishna
- Rita Mihailescu
- Rebecca Morrow
- Rachael Neilan
- Jana Patton-Vogt
- John Pollock
- Brady Porter
- Michael Seaman
- Kyle Selcer
- David Seybert
- John Stolz
- Melikhan Tanyeri
- Kevin Tidgewell
- Michael Van Stipdonk
- John Viator
- Stephanie Wetzel
Generating Forbidden 10-Fold Symmetry Quasicrystals using an Optical System
Mittal, Jahnavee; Corcovilos, Theodore A.
Department of Physics
Duquesne University

Determining the External Loop Conformations of the Rat Serotonin Transporter through Single Cysteine Point Mutations and Cross-Linking Mass Spectrometry (CX-MS).
Gargano, Adam1,2 ; Castellano, Elizabeth1,2 ; Tomcho, Kayce1,2 ; Cascio, Michael1,2
1Department of Chemistry and Biochemistry, Duquesne University.
2Chronic Pain Consortium, Duquesne University

Does resveratrol prevent sarcopenia and preserve oxidative capacity with aging?
Martinez, Wenceslao1, Omstead, Kailey2, Kostek, Matthew2
1Undergraduate Program of Exercise Science, Western Michigan University, 2Rangos School of Health Sciences, Duquesne University

Exploring the Fragmentation of Copper (II) Cationized, N-terminally Modified Peptides using Tandem Mass Spectrometry and Density Functional Theory Calculations
Kline, Susan; Bubas, Amanda; Metzler, Luke J.; Van Stipdonk, Michael J.
Department of Chemistry and Biochemistry
Duquesne University

Method Development for Remote Sensing of River Flow with Limited Ground-Based Measurements
Martin, Mackenzie L.; Glancey, Kathleen M.; Krebs, Nicholas C.; and Kahler, David M.
Center for Environmental Research and Education
Duquesne University

The serotonin transporter (SERT) is a transmembrane protein in neurons. It is responsible for the re-uptake of serotonin from the synapse to the pre-synaptic neuron, and is central to the pathophysiology of several psychological disorders such as depression and anxiety. Dysfunction of SERT could lead to better design of medications for these disorders. The conformation of SERT and its cationization are equally important in understanding the allosteric and structure of the external loops of the SERT. A group of small model peptides were used to establish general fragmentation patterns using the N-terminal modification and Cu²⁺ cationization. For each peptide, losses of 44 mass units (loss of CO₂) and 46 mass units (loss of H₂O and CO) were observed, and sequence of fragmentation pathways for the two dissociation channels were investigated. A range of sequence ions and non-sequence ions were observed and therefore probe the local environment of the protein. The results provide for an improved river flow record (given by flow rate) through Single Cysteine Point Mutations and Cross-Linking Mass Spectrometry (CX-MS).
I Had to Google Some of Your Topics

Interesting Themes Emerged...
Fast and Furious

Daniel Gray, Riley Workman, Dr. Matthew Srnec and Dr. Jeffrey Evanseck

Mercedes-Benz

Monte Carlo
Breaking Bad

Illicit Drugs

Correctional Facilities

Erica Maney, Logan Miller, Sean Fischer, Dr. Stephanie Wetzel and Dr. Jeffrey Beckstead
Star Wars?

Jahnavee Mittal and Dr. Theodore Corcovilos

Forbidden 10-Fold Symmetry Quasicrystals
But Seriously…

Never doubt the capacity of any research project to change lives and change the world.
I, too, Participated in a URP...
How Did I Get From There to Here?
How Much Time Do You Have?
My 13 Year Old Son’s Advice

Stick to the time-lapsed YouTube version of the story...
My Talk is Already Uploaded to YouTube. Enjoy the Rest of Your Day.

Best Keynote Address Ever Award
Five Steps to Get From Point A to B

1. Decide where you are going
2. Find a reliable map, choose a path and take it
3. Expect unplanned traffic and deviations
4. If lost, stop and ask for directions
5. Follow open doors; avoid closed ones
Five Steps to Get From Point A to B

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2. Find a reliable map, choose a path and take it
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4. If lost, stop and ask for directions
5. Follow open doors; avoid closed ones
What Motivates You?

- Solving Problems
- Helping People
- Being Creative
What Interests You?

Health and Disease  Math and Science  Social Problems
Solve for Y

\[ y = \beta_0 + \beta_1 X + \beta_2 Z + e \]

Where:
- \( y \) = Dependent variable = Point B = field(s) you should pursue
- \( X = \sum (X_1 - X_i) \) = Predictor variable = Sum of key motivations
- \( Z = \sum (Z_1 - Z_i) \) = Predictor variable = Sum of key interests
- \( e \) = Error term = How sure you are about \( X \) and \( Z \)
Don’t Assume a Linear Equation*

*This talk offers no guarantees. Mathematical models are for illustrative purposes only. You may need a quadratic variable in your model. You may have collinear variables. Etc. Worse--you may be entirely non-linear (*think Divergent*) and require non-parametric model. Consult your mentor for help before settling on any model.
For Me “Y” Solved for Epidemiology

Greek word meaning:

- “upon”
- “study”
- “people”

Diagram showing a study of people with statistical data.
Five Steps to Get From Point A to B

1. Decide where you are going
2. **Find a reliable map, choose a path and take it**
3. Expect unplanned traffic and deviations
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Maps and Paths

1. **Get a lay of the land**—carefully study what you think your are interested in.

2. **Take a few road trips**—kick the tires on the car and make sure you are ready for the journey—this URP is a good example.

3. **Chart a course**—talk to people who have already traveled on the path you want to take (e.g. faculty mentors, graduate students, others).
Lay of the Land for Epidemiology
Road Trips (Literally & Figuratively)

Psychiatric Epidemiology

MOVIES Study

Outcomes Research

Altruism and Bone Marrow Transplants

Cancer Epidemiology

Pain Management for Cancer Patients
I Charted a Course to Yale
Five Steps to Get From Point A to B

1. Decide where you are going
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3. **Expect unplanned traffic and deviations**
4. If lost, stop and ask for directions
5. Follow open doors; avoid closed ones
To Degree or Not to Degree

MD
MD, MPH
MD, PhD
PhD
PhD, MPH
JD, PhD

Which Path is the Right One?

Initially I wanted to pursue a PhD and MD
Life Events Can Change Your Plans

Marriages, births, deaths and other life events can cause you to change course.
Chance Favors the Prepared Mind
Five Steps to Get From Point A to B

1. Decide where you are going
2. Find a reliable map, choose a path and take it
3. Expect unplanned traffic and deviations
4. **If lost, stop and ask for directions**
5. Follow open doors; avoid closed ones
You Need Mentors at Every Stage
Listen to Good Advice

The Whale that Spouts Gets the Harpoon

Duck Your Head Down and Do Good Work
Five Steps to Get From Point A to B

1. Decide where you are going
2. Find a reliable map, choose a path and take it
3. Expect unplanned traffic and deviations
4. If lost, stop and ask for directions
5. Follow open doors; avoid closed ones
Land Ho!
I expect to pass through this world but once. Any good therefore that I can do, or any kindness or abilities that I can show to any fellow human being, let me do it now. Let me not defer or neglect it, for I shall not pass this way again.

--William Penn
Thank You!

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