

SGP Traveling Scholar Report

Overview of Dr. Strange's visit to St. Olaf College

1. We invited Kevin Strange to St. Olaf College for a variety of reasons: to share his research program with students and faculty in the biology, chemistry, mathematics and psychology departments, to help us think about our new academic concentration in Biomathematics and understand better the relationship between systems biology and physiology and other interdisciplinary facets of biology and finally to engage with students in our Neuroscience and Biomolecular Science concentrations through a dinner hosted by our local ASBMB chapter.
2. The audience included faculty and undergraduate students from the departments of Biology, Chemistry and Mathematics.
3. Seminar Title: "Protecting your proteome: the upside of folding under stress"
4. Enrichment activities:
 - a) Systems Biology working group luncheon.
 - b) Dinner/Discussion with the students concentration in Neuroscience and/or Biomolecular Science
5. List of meetings (see attached schedule of events).
6. Social Activities (see #4 above) and a dinner with three members of the biology and physics departments.

Newsletter Summary of Visit

Dr. Kevin Strange, Director of the Mount Desert Island Biological Laboratory, had a whirlwind visit to St. Olaf College in Northfield Minnesota in early December. From the time he arrived on Sunday afternoon, Kevin was engaged in conversations about science both broadly and specifically, research and teaching, the challenges of building infrastructure with a particular eye towards the future. At his first dinner we had time to catch up on friends we had in common and Kevin shared wisdom with St. Olaf's newest faculty member in Physics and Biology, Jay Demas, who is setting up a research team to study melanopsin in retinal ganglion cells. Monday was busy with meetings starting with our Associate Dean for Natural Science and Mathematics. All the conversations were valuable in different ways. For example, we were just completing a proposal for an innovative biology undergraduate curriculum and directly or indirectly in conversations that wandered into what students need to know to be successful in future post baccalaureate programs, Kevin affirmed again and again our proposal to introduce students to modern genetics, bioinformatics, evolution and biodiversity in our first course. Kevin shared with us his research model *C. elegans* and the genetic screen used to identify critical proteins: this screen fit perfectly into our Genetics course (now using *C. elegans* as a model organism) and the osmoregulatory responses mean it will be an ideal addition to the menagerie we study in Comparative Animal Physiology. Our physical biochemist, Jeff Schweinefus, was particularly glad to chat about the biological relevance of co-solutes, something he and his students have been studying in the context of nucleic acid structural stability. Kevin's seminar was at the end of a very busy day and he spoke to an audience of about 75 students (56 students) and faculty members from multiple science departments. The seminar clicked as he was peppered with good questions from our undergraduates as well as from faculty.

We also had some time to share what we are doing here. Bob Hanson showed Kevin what he is doing in the area of protein visualization, including some innovative interactive systems. We had an interesting exchange about our new Mathematical Biology concentration, how systems biology and computational training fit into today's science as well as some of the very practical ways we teach applied mathematics outside of formal courses through a statistical and computational center. We shared several key features of our LEED Platinum science facility including the practical considerations of achieving resource savings in an intensive laboratory building. Finally Kevin had the chance to really "share" our students concentrating in biomolecular science and neuroscience by

joining them for their weekly dinner meeting. Again, Kevin connected well with these ambitious young scientists clearly listening and giving good advice.

--- Anne Walter, Professor of Biology, St. Olaf College

Comments from faculty and students who participated in Dr. Strange's visit:

A few comments from **faculty** who met with Kevin include responses in **reference to our program initiatives**:

- "I learned that his view of biology today aligns perfectly with our new Bio 150 intro."
- "It was nice to hear about Innovation Engineering and the prevalence of language barriers in interdisciplinary undertakings."
- "It was also nice to get the impression that we've been dealing with the right issues in our efforts to increase collaboration and coordination between biology and mathematics, and that we aren't as far behind the curve as we may have thought."
- "I also enjoyed talking with about evolutionary medicine specifically, and how to communicate to students about evolutionary frameworks for biology in general."
- "I shared with Kevin the details regarding the Mathematical Biology concentration that was recently passed at St. Olaf."
- "Also, I have heard systems biology mentioned in various conversations in the past and I never completely understood how this field differed from physiology. It was very informative to hear the history of systems biology, how it has evolved, and how the definition of systems biology is almost identical to how the field of physiology is described."

Several faculty members were excited to **expand our use of *C. elegans*** – genetic screen, as a test subject for osmotic stress and as a model for animal physiology and genetics classes.

- "Next time I teach Intermediate Genetics, I plan to have students read about his genetic screen in *C. elegans* to detect genes involved in the organism's response to osmotic stress. It's a great story and really illustrates many points that we cover in Genetics such as forward and reverse genetic screens, RNAi, and good model organisms, etc. Now that we've met in person, I hope to be able to have an in-class skype conversation with him after we read his paper."
- "We discussed how *C. elegans* are a fantastic model for genetics, which is something I brought up in Bio125."
- "I'm imagining adding *C. elegans* and their volume regulation to the repertoire of osmoregulation projects for animal physiology lab, especially since we have cultures and students will have met them in Genetics."

A number of other faculty members discussed **research and career** aspects or just picked up on new-to-them technologies.

- "Our visit revolved around Dr. Strange's research and the influence of the cosolute glycerol in *C. elegans*. I appreciated learning more about the biological relevance of this cosolute."
- "I had a pleasant conversation Kevin. I've been out of the preconditioning field for a while, but it was good for me to hear about the overlap of his understanding of cell stress with the oxidative stress that I have been interested in. It was also quite interesting for me to hear about his present position."
- "I learned that there are robots that help crystallographers determine the right conditions to get crystals. I had no idea that such technology exists, and I think it would be fantastic to one day collaborate with a crystallographer to elucidate the structure of my protein of interest. We also discussed global warming and how ridiculous skeptics are."

Kevin had a chance to learn a bit about at least one project on-going here focused **on protein structure visualization** as well as share his own research

- “Thank you, Anne, for inviting the Chemistry Department to herald this talk as a joint seminar. I hope we can do more of that. I enjoyed meeting Kevin and talking about protein structure visualization, particularly in relation to how we are on the cusp of new understandings in relation to disordered structures and the challenge that poses to our entire concept of "visualization" of binding sites. His seminar was a bit over my head, but it was good to stretch my brain and learn more about RNAi and its possibilities and how hypertonic stress affects cell processes.”

The **students** also had a wonderful time talking with Kevin (and I think *vice versa*). I heard from students that the dinner conversation was very valuable scientifically and full of career advice. Of the approximately 75 people at his seminar, 15 were upper-level chemistry majors attended the seminar and turned in comments and questions.

The **student** comments tell us that Kevin clearly connected well with the audience.

- very good mix of technical and easy to understand information.
- very professional! Interactive and witty.
- great overview and detail.
- good discussion of the methods, important terms.
- several figures had dark colors with dark text; this is difficult to read.
- he was a pretty funny guy.
- clear, interesting.
- good use of slides, good progression from simple ideas to the complex main idea.
- very interesting and well planned out presentation. Even had data put together from last Friday! Even though a bio/chem senior, there was not much chemistry to relate to.
- very well explained.
- very interesting and easy to follow; related in many ways to what I'm currently studying in biochem.

The following “Questions for the speaker” also indicate that his talk helped students think about things beyond just the basic information given....i.e., he connected well to what students know.

- What mammals are possible candidates for this type of study? If you had to change species, what are good candidates?
- Does anybody study aggregation of beta-amyloid protein aggregation and its relations to osmotic and other cellular stress? (In the context of Alzheimers disease?)
- With RNAi do you run into difficulty with shutting down processes that are essential to life? Is this a limitation?
- How do you extract DNA from *C. elegans*?
- Does the suppression of these proteins affect other processes besides [protein synthesis] inhibition?
- Why are there different concentrations of NaCl considered to induce hypertonic stress for different pathway steps tested?
- How would the cell respond to heavier metals such as Ni(II)?
- What does it mean for a molecule to be unstable?
- What would happen under hypotonic stress?
- What is the next step in further understanding such pathways?
- How do you go about finding out how the genes translate gpdh-1
- How about transcription factors? Are there known transcription factors associated with gpdh-1?
- If protein synthesis is being inhibited so vigorously, how is gpdh being produced?
- How did you become interested in kidney diseases?

Dr. Kevin Strange
Director of Mount Desert Island Biological Laboratory
St. Olaf College Visit Itinerary**

Sunday Dec 2:

3:30 pm Pick up from the airport -- Anne Walter and drive to Northfield

6:00 pm Dinner with Jay Demas (Biology & Physics, Neuroscience), Mike Swift (Biology, Environmental Studies), Anne Walter (Biology, Biomolecular Science, Neuroscience) at MS & AW's home.

Stay – at the Archer House

Monday Dec 3:

7:30 am Breakfast – with AW and ride to campus

8:45 am Dr. Matt Richey, Associate Dean for the Faculty of Natural Science and Mathematics (Mathematics), RNS 302A

9:00am Dr. Dave Van Wylene (Biology, physiologist) ischemic responses in cardiac and neural tissue

9:30am Dr. Jeff Schwinefus (Chemistry) physical biochemist who studies organic co-solutes, RNS 368

10:00am Dr. Lisa Lenartz (cell biologist) and Dr, Roberto Zayas (neuroscientist) – visiting faculty in Biology, RNS 386

10:45am Jean Porterfield (Co-Chair of Biology) fish evolutionary biology using molecular approaches, RNS 428

11:15am Anne Walter – lab tour, LEED Platinum features of our facility

11:45am Working Lunch in President's Dining Room with faculty members interested in systems biology— Conversation based on *"The end of naive reductionism: rise of systems biology or renaissance of physiology?"* Becky Vandiver (Mathematics) – biomathematics and physiological modeling; Kevin Crisp (Biology, Neuroscience) neurocomputation, leech swimming; Anne Walter (Biology, Biomolecular Science, Neuroscience) membrane biophysics, comparative physiology; Steve McKelvey (Mathematics & Computer Science)—biomathematics, ecological modeling, practicum director.

1:15pm Dr. Kandler (Chair of Biology, cell biologist) perhaps re: *C. elegans* as a model organism, RNS 382

1:45pm Dr. Lisa Bowers (Biology) microbiology, RNS 384

2:15pm Dr. Gary Muir and Dr. Shelly Dickinson (Psychology & Neuroscience) place cells and alcohol pathways respectively, Shelly is the Director of the Neuroscience program, RNS 222

2:45pm Dr. Greg Muth (Chemistry) Biochemist, ChBi program. RNS 376

3:15pm Dr. Bob Hanson (Chair, Chemistry) organic chemistry, visualizations, innovation, RNS 318

3:30pm preparation for seminar as needed

4:00pm **Biology-Chemistry Seminar: Dr. Strange will present** *"Protecting your proteome: the upside of folding under stress"*, RNS 410

5:30pm St. Olaf StoMols (a student affiliate of ASBMB) & Neuro Clubs will host Dr. Strange at a caf-tray supper and discussion of their research/his research, Buntrock 142

7:00pm AW will take Dr. Strange back to the Archer House (or home for more conversation).

4 Dec – Early morning departure for airport.

** Supported by The Society for General Physiologists