Self-study

Computational Molecular Biology Program
University of Washington
Seattle, WA

Official title: Computational Molecular Biology Graduate Certificate Program
Year of program inception: 2008
Year of last review: N/A
Name of Director: William Noble
Name of self-study coordinator/author: William Noble
Date submitted: December 1, 2013

Contents

1 Required information for review committee

1.1 Program Mission

The mission of the Computational Molecular Biology Program is three-fold: to train graduate students in the field of computational molecular biology, to foster interactions among the relevant disciplines and between the UW and the Fred Hutchinson Cancer Research Center, and to attract to the University of Washington graduate students who are interested in studying computational molecular biology.

1.2 Program Oversight

The CMB program was founded in 1999, with Phil Green as Director. Joe Felsenstein took over the leadership in 2001, and CMB became an Individual Program Committee in 2002. Mary Kuhner led the program starting in 2006, and the program received official certificate status in 2008. Martin Tompa took over as Director in 2009, and was succeeded by Bill Noble in June, 2013.

Starting in June, 2013, Bob Waterston, Chair of the Department of Genome Sciences, has agreed to dedicate a portion of Brian Giebel's time to help administer the program. Brian is responsible for maintaining the CMB web page, tracking student enrollment in the program, helping to organize the spring symposium, and gathering feedback in an annual survey of currently enrolled students. Larry Ruzzo manages the CMB Journal Club, and Phil Green manages the CMB weekly seminar.

1.3 Student learning goals and outcomes

1.3.1 What are the student learning goals?

Students will establish proficiency in both molecular biological problems, including familiarity with data in the domain and how it is gathered, as well as computational approaches. CMB students will learn to do science rigorously in a computational context, via modeling and simulation with potential feedback loops to wet lab experimentation. As an interdisciplinary program, CMB students come from divergent backgrounds, with most better prepared in one area and less well prepared in the other.

See `http://cmb.washington.edu/program_requirements` for details of student requirements.

1.3.2 Describe the manner in which student learning is evaluated (e.g., capstone experience).

The capstone is a research project capped by a presentation at the spring symposium. This presentation is evaluated by the PhD supervisory committee. Evaluations also include publications in peer reviewed journals and conferences, participation in national and international conferences, participation in local seminars, placement into postdoctoral positions (short term), faculty or industry positions (longer term). These evaluations all measure how successful the program is in its learning environment.

1.3.3 What methods are used to assess student satisfaction? What efforts are made to gauge the satisfaction of students from under-represented minority groups?

Student satisfaction has been assessed as part of this self-study (see Appendix D).

1.3.4 What are the findings of student learning assessment?

The detailed findings are listed in Appendix D. Some key points include the following:

- Communicate more frequently with current students in the CMB program.
- Design some methods for encouraging collaborative research among CMB students or with industry partners.
- Expand the CMB curriculum to include more courses.
- Increase faculty involvement in the journal club, and organize the presentations more thematically.
- Advertise the program more effectively.

1.3.5 How has the program faculty used student assessment to make improvements to the program?

The assessment was only recently completed, so no changes have yet been implemented.

1.3.6 What specific strategy has the program employed to conduct outreach and recruit traditionally under-represented minority students to the program?

Brian Giebel manages outreach activities for the Department of Genome Sciences, and in that context he often tells prospective students about the CMB program. In particular, he attends two URM-oriented conferences each year, the Annual Biomedical Research Conference for Minority Students and the annual SACNAS conference. Brian tells the prospective students with computational interests about the CMB program and how it works with the GS grad program.

Also, URM students participate in the summer Genome Sciences research program. Two of these students have worked in the Noble lab (in 2010 and 2013). One of these two subsequently joined the department, and the other is still finishing his undergraduate studies.

1.4 Future Directions

1.4.1 What is the future direction of the program?

We aim to expand the definition of CMB to include new and emerging areas of molecular engineering and data science.

Also, as per the assessment question above, we plan to institute an annual survey, in June of each year, to assess the satisfaction of currently enrolled students with the program. This survey will be collected by Brian Giebel, discussed at an end-of-year faculty meeting, and a response will then be sent to the students.

1.4.2 What opportunities does the program wish to pursue and what goals does it wish to reach?

The Moore and Sloan Foundations have recently funded a major Data Science Initiative at the University of Washington. CMB will explore the possibility of creating a formal partnership with this initiative.

There is also a growing and strong Molecular Engineering Program that would benefit CMB students.

1.4.3 How does the program intend to seize these opportunities and reach these goals?

Bill Noble and Tom Daniel will coordinate with Ed Lazowska regarding both the Data Science Initiative and the Molecular Engineering Program.

1.4.4 Describe the program's current benefit and impact to students—academically and professionally, and to academic units?

The impact to students, as reflected in the survey results given in Appendix D, is in exposure to the broader field of Computational Molecular Biology. The impact to academic units is in graduate student recruiting, attracting students who would go elsewhere to a university with dedicated bioinformatics program or degree.

2 Program defined questions

2.1 What are the goals of this program, and how effectively are we meeting them?

The goals of the program are (1) training students in the interdisciplinary scince of Computational Molecular Biology, (2) fostering interactions among the relevant disciplines and between the UW and the Fred Hutchinson Cancer Research Center, and (3) recruiting graduate students to the University of Washington. The training is effective, though the degree of effectiveness is variable as it depends on individual mentorship styles.

2.2 How broad is the impact of our program, in terms of numbers of students, departments and interdisciplinary programs involved? What are areas for improvement?

Seven department at the UW and three at the FHCRC are involved in CMB (see `http://cmb.washington.edu/participating_departments`). There are plenty of faculty involved on paper (see `http://cmb.washington.edu/faculty` for a complete list), but we would like to increase the number who are actively participating. We also aim to increase the number of students enrolled in the program, particularly in departments other than Genome Sciences and Computer Science and Enginering.

2.3 How can the program best serve students in diverse departments?

- Encourage students to interact beyond departmental boundaries.
- Partner computationally proficient students with those more focused on data generation.
- Partner computationally proficient students with undergraduates in various programs seeking to build such skills in CMB.

2.4 How well is this program helping to recruit students to the university, and how can this be improved?

Just the existence of the program is helping, but we could do much more. Probably the first thing is to step up the number and visibility of CMB activities. The existing group of students is missing a sense of cohesiveness. This would go a long way toward improving recruitment, particularly when candidates come in contact with existing CMB members.

Advertising the successes of the people who go through this program is one of the best recruitment tools.

2.5 How valuable and effective is the training that the program provides?

The coursework, seminars and research training are valuable and effective. Student feedback indicates that the journal club and the second of the two core courses could be better structured.

2.6 What is the quality of our courses and our training program, and where is the need or room for improvement?

More collaboration and interdisciplinary activity would add much value to the existing program. We could also establish some mentoring of CMB grads with undergrads (e.g. in the ACMS program, Bio, BioE, CSE, etc.).

2.7 What is the relationship between the goals of the CMB program and other degree programs within the university (e.g., Genome Sciences)?

Achieving the CMB goals is certainly of great value to all the participating departments, who all have a vested interest in computational biology.

2.8 How can we go about obtaining resources for the program? If we had resources, what would we do with them?

Training grants are a traditional way of getting resources. We plan to apply for additional training slots via the existing Genome Training Grant housed in the Department of Genome Sciences. Supporting students with competitive and noncompetitive fellowships will help attract people with the right aptitude to work in this field.

We can also explore partnering more effectively with other training programs (the Data Science Initiative, the computational neurology training grant, etc.).

2.9 What is/could be the value of the certificate itself? Is the certificate the right degree at this time?

Many graduate students value the label, as it gives concrete evidence of their expertise within this interdisciplinary field. The certificate might help job placement in the biotech sector.

2.10 How can we build and improve this program within the next five years?

In addition to the various suggestions above, increasing faculty participation seems like a key goal. Also, coordinating more strongly with Biophysics, Bioengineering, Molecular Engineering, Data Science (eScience) and Applied Mathematics could increase the effectiveness of the program.

A Students

Table 1 lists all CMB students affiliated with the program since its inception. To date, 16 students have completed the certificate since 2008. Currently, 10 students are enrolled in the program.

B Budget summary

The CMB Program has no budget.

We plan to apply to the NIH for additional training slots for the existing Genome Training Grant, housed in the Department of Genome Sciences. The NIH has indicated their willingness to consider increasing the number of slots allocated to the training grant because adding CMB would increase the number of departments and faculty who can access the grant.

C Information about faculty

The following members of the CMB steering committee provide program oversight.

- William Noble, Professor, Department of Genome Sciences, `http://noble.gs.washington.edu/~wnoble/cv/cv.pdf`
- Martin Tompa, Professor, Department of Computer Science and Engineering, `http://homes.cs.washington.edu/~tompa/papers/cv.pdf`
- Valerie Daggett, Professor, Department of Bioengineering, `http://depts.washington.edu/daglab/downloads/Daggett_cv.pdf`
- Tom Daniel, Professor and Chair, Department of Biology, CV attached
- Su-In Lee, Assistant Professor, Department of Computer Science, Department of Genome Sciences, CV attached
- Hong Qian, Professor, Department of Applied Mathematics, `http://faculty.washington.edu/hqian/CV.pdf`
- Ram Samudrala, Associate Professor, Department of Microbiology, `http://compbio.washington.edu/cv.html`

D Feedback from CMB students

An email was sent to current and former CMB students soliciting feedback about (1) whether they found the CMB program useful, and (2) what improvements they might suggest. The responses are listed below.

Joined	Name	Dept	Advisor	Status	C	Email	R
2000	Jochen Jaeger	CSE	Ruzzo/Sengupta	M 2001			
2000	Tim Robertson	BChem	Varani	G			
2000	Chris Saunders	GS	Green	G 2007			
2001	Guy Shefner	AMath	—	WU			
2001	Chul Joo Kang	GS	Felsenstein	G 2007			
2002	Zasha Weinberg	CSE	Russo	G 2005		zasha.weinberg@yale.edu	✓
2002	Charla Lambert	GS	Olson	G 2008	✓	clambert@cshl.edu	
2002	Tobias Mann	GS	Noble	G 2007		tobiaspmann@gmail.com	
2002	Kai Wang	Micro	Samudrala	G 2005		kaiwang@usc.edu	✓
2003	Cindy Desmarais	GS	Nickerson	G 2010	✓	cindy@cindydemarais.com	
2003	Greg Finney	GS	MacCoss	G 2012	✓		
2003	Joanna Kelley	GS	Swanson	G 2008	✓	joanna.l.kelley@wsu.edu	
2003	Aaron Klammer	GS	Noble/MacCoss	G 2008	✓	aklammer@pacificbiosciences.com	✓
2003	Lincoln Ritter	CSE	Ruzzo	WP			
2004	Alex Scouras	BChem	Daggett	G 2010	✓		
2004	Divya Bhat	GS	Baker	WU			
2004	James Ronald	GS	Akey	G 2007		james.s.c.ronald@gmail.com	✓
2004	Ross Centers	GS	Fields	WU			
2004	Brigham Mecham	GS	Nelson	G 2010	✓	brig@trialomics.com	✓
2004	Yuhan Cai	CSE	Levy	WP			
2004	Jonathan Carlson	CSE	Ruzzo	G 2009	✓	carlson@microsoft.com	✓
2004	Rosalia Tungaraza	CSE	Shapiro	WP			
2005	Thomas Greene	AMath	—	WU			
2005	Richard Meraz	GS	—	WU			
2005	Amol Prakash	CSE	Tompa/Schwikowski	G 2006		amol.prakash@thermofisher.com	✓
2005	Imran Rashid	CSE	Ruzzo	WU			
2005	James Thompson	GS	Baker	G 2011	✓	james.michael.thompson@gmail.com	
2005	Huei-Hun Elizabeth Tseng	CSE	Ruzzo	G 2012	✓	lachesis@cs.washington.edu	✓
2005	Will Sheffler	GS	Baker	G 2009	✓	willsheffler@gmail.com	
2006	Mingyuan Zhong	AMath	Todorov	E		zhongmy@uw.edu	
2006	Joshua Jacobs	AMath	LeVeque	G 2012	✓	joshicola@gmail.com	
2006	Xiaoyu Chen	CSE	Tompa/Noble	G 2011	✓	xiaoyu.xy.chen@gmail.com	
2006	Cam Thach Nguyen	CSE	Karlin	WP			
2006	Bao Nguyen Nguyen	CSE	Tompa	M 2008	✓		
2006	Daniel Blick	GS	Waterston	WP			
2007	Rupali Patwardhan	GS	Shendure	WP			
2007	Benjamin Diament	CSE	Noble	G 2011	✓	bdiament@gmail.com	
2008	Peter Sudmant	GS	Eichler	E		psudmant@gmail.com	
2009	Sharon Greenblum	GS	Borenstein	E		greensi@uw.edu	
2010	Jeff Staples	GS	Nickerson	E		grapas2@uw.edu	
2011	Maxwell Libbrecht	CSE	Noble	E		maxwl@cs.washington.edu	
2012	Maxim Grechkin	CSE	Lee	E		grechkin@cs.washington.edu	✓
2012	Alex Hu	GS	Noble	E		alexhu@uw.edu	✓
2012	Jeremy Hyrkas	CSE	Lee	WP			
2012	Aaron McKenna	GS	Shendure	E		aaronmck@uw.edu	✓
2012	Patricio Velez	CSE	Lee	E		pjvelez@uw.edu	
2012	Paul Vines	CSE	—	WP			
2013	Cecilia Noecker	GS		E		cnoecker@uw.edu	✓

Table 1: **CMB Program enrollment and completion.** Abbrevations under "Status": M = completed a masters and left, WU = withdrew from the university, WP = withdrew from the CMB Program, G = graduated, E = currently enrolled. Column "C" indicates whether the student completed the certificate (i.e., if they finished after 2008). Column "R" indicates whether the student responded to the survey. Surveys were only sent to individuals with email addresses listed in the table.

D.1 Former students

1. Yes, the CMB program was definitely useful for my PhD work. Obviously genomics is a field that relies heavily on computational work, so having extra course work in that area and also extra exposure to the field through journal clubs was good. I was not a computer science major as an undergrad, so a lot of the programming skills that I used throughout my PhD work and in my work currently were developed as a result of the CMB courses.

   No specific suggestions for improvement. I thought all of the faculty teaching was great. In particular Phil Green's and Joe Felsenstein's classes were excellent and the rigorous weekly computer programming assigments were worth the effort I put into them.

2. The CMB program was very useful. It exposed me the many applied fields under bioinformatics. Some of these were areas I got to know through talks, some from other students, some by trying out myself and some through collaboration. My advisor was kind enough to let me pick the research projects that I liked, but the exposure was key in this.

   I have two suggestions:

   - More student collaborations. As part of my current job, I realize a multi-faceted team is so much stronger in CMB projects. We should enable something like this for small research projects (which could become larger singly-owned projects/thesis). May be this could be small course projects or part-Masters projects. This will also give a chance to the CS students to validate their predictions in a wet lab.
   - More industry collaborations. This may or may not related to everyone (especially folks looking for an academic career). But knowing what is relevant, what are the big CS-related challenges that biotech/biopharma/hospitals, etc. are facing would be very good exposure. This will also tell students how does a team with different academic backgrounds (cs/math/physics/bio/chem/genetics/etc.) work in a real world setting.

3. I found the CMB program very useful, especially in making it easier for me to gain exposure to disciplines other than CS, e.g., by making it easier to take the Genetics 550 course, do a wet-lab rotation in Stan Fieldss lab, and go to the Genetics and Microbiology department retreats. My attendance of the retreats was especially something for which it was helpful to be able to point out that I was in the CMB program. I also found the COMBI series and seminar with student/faculty speakers (I think CSE590cb) very useful, along with the computational biology course that Martin Tompa taught, which encouraged computation-oriented and biology-oriented students to collaborate on a project.

   Unfortunately, or fortunately, I can't think of anything I would have wanted to improve. Indeed the only aspect of my U.W. experience I could think to complain about is the counter-productive dissertation formatting and style requirements—obviously a minor issue, and not one related to CMB.

4. Yes, the CMB program was useful to me. I believe the exposure to the courses outside of UW CSE (biostat, genome sciences) helped expand my compbio knowledge of different areas. The core required class 540/541 was a very good spread of lecture and hands-on assignment that definitely helped in both developing my own thesis topics and now at work (I'm now a bioinformatics scientist at Pacific Biosciences, a third-generation sequencing tech company). While other classes are not yet immediately relevant I still feel they are valuable for having a good feel of all compbio fields. Encouragement to go to seminars (GS-seminar, CSE 590C) and annual CMB symposiums were also useful.

If anything I think there should be more CMB core classes with more subdivisions. I don't have any clear idea off the top of my head, but like in CS, where we were required to do 1-2 classes in each field (theory, applications, programming languages), I also think the same should be for CMB. Perhaps divided into more knowledge (genetics, biology), bioinformatics (algorithms), and stats. I also think the CMB symposium could be a little more organized...last few years always felt like it comes together at the last minute and there is not always a theme to the talks...not that I think there should always be a theme. But perhaps have morning sections focused on biology/results/discovery, afternoon sections focused on algorithmic development? Something like that. And more obvious opportunities to have students present, though I think 590C is good it's limited often to CS only students and a few GS faculty.

5. I believe the CMB program was useful to me, though I'm not sure it's something I could quantify. Certainly I remember the courses that Phil Green and Joe Felsenstein taught as being instructive and useful later. Though I think they presupposed a level of probabilistic reasoning that was lacking in most of us at the time. As a young graduate student, the journal club was a great forum for getting to know others outside my department, engaging in interesting papers, and getting an opportunity to present and dive deeper. As I got into my own research projects, this was less useful (or at least, I made less use of it). Spring symposium was always a good chance to present my work outside of my committee, which is always great.

   Overall, I always saw the main value as lying in the flexibility to choose advisors from outside our home department, and to break down barriers for more temporary stints in external labs. I never personally made use of that, but it was a major draw for me in choosing UW and in the abstract it still seems very useful.

   Regarding suggestions for improvement, I fear I am too far removed to make useful comments. I am curious about the rotation you mentioned. Did we have that when I was there (or at least, when I was an early grad student, which I guess is 9 years ago now?) I think it would have been great as a first year student to rotate through a couple labs. From the standpoint of courses, I always advocate for more probabilistic training. We sort of got that in the two required courses, though as I said, it felt to me as though it were presupposed. I don't think many of us really got it till later.

6. The CMB Program was very helpful to me, in terms of offering graduate-level courses in the field of bioinformatics and genomics, and in terms of bringing together a group of people who have common interests. Back then, it is a somewhat loose program, but I am sure it offers a lot more today.

   Better advertise of the program so that more people know about it, to recruit better students. Also 3 rotations should be required like most other graduate programs. One thing that I feel important is that the CMB should try to involve more people from departments outside of Genome Science, rather than being treated as a program for "genome science." In fact, you may want to set up a CMB-specific seminar series or symposium. But I left quite long ago so I guess things have changed a lot in the recent a few years.

7. Yes I did find the CMB program useful, particularly the COMBI seminars and in the scientific presentations by students at monthly CMB journal club / research reports. I think the journal club started strong during my enrollment but the frequency dwindled towards the end of my time at UW.

My one suggestion would be to ensure that the frequency of the CMB journal club is maintained with the same attention from the faculty that the Genome Sciences Department journal club and research reports received.

8. I did find it useful while I was there. It was useful to have a dedicated group focused on computational biology. Since I left I've only had brief interactions with faculty / other students.

   I think introducing non-academics into the group (like local biotech companies or startups) would be useful to help students understand their options post graduation.

D.2 Current students

1. The CMB program seems useful so far. The seminar (when I sign up) is great, though it's still a little ad-hoc. It would be nice to have more of a theme and storyline connecting the papers / work in a semester. Say for instance picking genome alignment and going soup-to-nuts, from the original CS papers / BLAST paper, through more modern approaches (BWA,etc), to what people are doing today for RNA-Seq and 3D gen seq. A little more contiguity would be better than what the professors want to read but don't have time to.

   Outside of that it would be great if students had a CMB advisor. Stat gen does this for their certificate students, and it seems to work. I don't think it's a ton of work on the prof, but would provide an initial checkpoint on the fit with CMB, plus a bit more motivation / planning towards the capstone project.

2. I expressed interest in the CMB program when I applied but actually had no idea I was actually affiliated with it and I don't think I've really participated in it other than attending COMBI seminars and registering for Phil Greens CMB class next quarter. So I guess that is an answer to both questions (in particular for #2: more visibility/communication).

3. I've been in it for a little more than a year, and I've found it useful to the extent that the course CSE 590C is useful, as this is the only requirement that is outside of my own department's offerings for the past year. It has given me survey-level understanding of fields I wouldn't have otherwise been exposed to as well as a few opportunities to practice preparing and presenting talks. A few of the papers have been helpful for me to understand my own fields of research.

   GS 540 was extremely useful to me, as it gave me a firm understanding of the basics of hidden markov-models; their implementation, the probabilistic inferences they facilitate, and the basic algorithms associated with them. It also was a good exercise in C++ coding.

   GS 541 was useful, but less so. Because only 1-2 weeks was allowed for each topic, some of the lectures and exercises were shallow and not too useful. Whether a lecture or exercise is useful probably depends on the background of the student, so it isn't clear if there's a better way to structure the class. I do think some of the assignments and lectures conveyed some concepts that I think are fundamental and useful: shuffling data to create a null distribution for hypothesis testing (Elhanan's assignment), dynamic programming to compute exact null distributions (your assignment), and expectation maximization (although what was covered was pretty shallow. Su-in and Martin's segments briefly touched it). I remember less about the other portions of the class, but I do remember thinking about the protein structure lectures that I'd be interested in the physical and computational theory behind modeling and predicting protein structures. Simulated annealing on physical equations, for instance. Jesse Bloom's assignment also seemed to be aimed at applications rather than theory. It involved preparing datasets to be put through pre-existing pipelines and then interpretting the results.

I personally would be more interested in the theory behind the methods, but since this is a survey course, what's currently done is probably the most appropriate. There are more in-depth classes that could be taken on any of these topics that are listed as electives on the CMB website. The class succeeded at exposing me to what computational techniques are available so that I could investigate them further.

Regarding potential improvements, I think it's hard to make a computational biology program like this much better than it is because it encompasses so many fields, and the students in it have diverse backgrounds and interests. I do think that perhaps a core class in probability and statistics should be required because so much of the topics in GS 540 and 541 depend on it. I think that having such a course would allow the lectures and assignments in 541 to go a little deeper and that students get get more out of it.

4. Yes, I think the CMB program is is somewhat useful. For example, the requirement of doing a one lab-rotation gives CS compbio students an excuse to try out wet lab stuff. Also in the end, having a certificate sounds is certainly not worse than not having it.

   Maybe this is just an experience from a perspective of a CSE student, but CMB program is almost invisible: some students who where doing CompBio at CSE have never heard about CMB program before someone mentioned it in one of our meetings last spring. (although we don't have that many CompBio students at CSE...).

CURRICULUM VITAE 2013, THOMAS L. DANIEL
KOMEN ENDOWED PROFESSOR
DEPARTMENT OF BIOLOGY, UNIVERSITY OF WASHINGTON

PROFESSIONAL PREPARATION

University of Wisconsin	B.S./M.S.	1976, 1978
Polymer drag reduction in animal locomotion		
Duke University	Ph.D. (Biology)	1982
Unsteady fluid dynamic mechanisms in animal locomotion		
California Institute of Technology	Postdoc (Engineering)	1982-1984

CURRENT RESEARCH AREAS

Control and dynamics of animal locomotion
Molecular mechanisms of force generation in human and animal movement
Sensorimotor Neural Engineering

APPOINTMENTS

2011- 2013	Interim Director, NSF Center for Sensorimotor Neural Engineering
2012-present	Professor, Department of Computer Science & Engineering, UW (joint)
2011-2012	Deputy Director, NSF Center for Sensorimotor Neural Engineering
2010- 2011	Interim Associate Vice Provost for Research, University of Washington
2009-2010	Interim Dean of Research, Infrastructure, and Technology, UW
2002-2008	Chair, Department of Biology, University of Washington
2003-present	Adjunct Professor, Department of Bioengineering, University of Washington
1999-present	Komen Endowed Chair, University of Washington
1997-present	Professor, Neurobiology and Behavior Faculty, University of Washington
1992-present	Professor, Department of Biology (prior Zoology), University of Washington
1988-1992	Associate Professor, Department of Zoology, University of Washington
1984-1988	Assistant Professor, Department of Zoology, University of Washington
1982-1984	Myron A. Bantrell Postdoctoral Fellow, Engineering Sciences, Caltech

AWARDS, HONORS, AND BOARDS

2013	Guggenheim Fellow
2012-	Fellow, AAAS
2012 -	Member, Washington Academy of Sciences.
2011-	Board of Directors, Allen Institute of Brain Science (AIBS)
2010	University of Washington Freshman Convocation Address
2010-	Scientific Advisory Board, NSF Mathematical Biosciences Institute
2010-	Board of Reviewing Editors, *Science*
2009	Editorial Board, *PLoS Computational Biology*
2009	Faculty Invited Lecture to UW Board of Regents.
2006- 2012	Editorial Board, *Biology Letters*, Royal Society for Sciences
2006-	Scientific Advisory Board, Allen Institute of Brain Science (AIBS).
2001	Universityof Washington Distinguished Graduate Mentor Award
2001-2003	Editorial Board, *J. Theoretical Biology*

2000-2001	The Alan T. Waterman Award Committee, National Science Foundation
1998-2004	Editorial Board, J. Comparative and Integrative Biology
1996-2001	MacArthur Fellow, John D. and Catharine T. MacArthur Foundation
1993-1999	co-Director of the NSF Graduate Training Grant in Mathematical Biology, UW
1991	University of Washington Special Merit Award for Outstanding Teaching
1989	University of Washington Distinguished Teaching Award

PROFESSIONAL SOCIETIES

- American Association for the Advancement of Science
- Society for Neuroscience
- International Society for Neuroethology
- Society for Integrative and Comparative Biology
- Washington State Academy of Sciences

PEER REVIEWED JOURNAL AND CONFERENCE PUBLICATIONS

1. Sponberg A, Daniel T, Fairhall A (2013) Decoding synergistic and independent motor features in insect flight. J.Neurosci (*in review*).
2. Hinterwirth A, Sane S, Daniel T (2013) Driven by vision: optic control of antennal muscles in *Manduca sexta*. Biology Letters (*in review*)
3. Campos EO, Bradshaw HD, Daniel T. (2013) Shape matters: corolla curvature affects nectar discovery ability in a nocturnal hawkmoth. Functional Ecology (*submitted*)
4. Dickerson B, Aldworth Z, Daniel T. (2013) Insect wings provide gyroscopic information. J. Exp. Biol. (*in review*).
5. Hinson B, Rombokas E, Dyhr J, Daniel T, and Morgansen K. Sensing from control: airframe deformation for simultaneous actuation and state estimation. (2013) Control and Decision Conference, Florence (*in press*).
6. Dieudonne A, Daniel T, Sane S. (2013) Encoding properties of the mechanosensory neurons in the Johnston's organ of the hawk moth *Manduca sexta*. J. Exp. Biology (*in review*)
7. Williams CD, Salcedo MK, Irving TC, Regnier M, Daniel TL (2013) The slope of the length tension curve in muscle depends on lattice spacing. Proc. Roy. Soc. B (in press)
8. George, NT, Irving TC, Williams CD, and Daniel TL. (2013). The cross-bridge spring: cool muscles store elastic energy. Science 340:1217-1220.
9. Hinterwirth A, Medina B, Lockey J, Otten D, Voldman J, Lang J, Hildebrand J, Daniel TL (2012) Wireless stimulation of antennal muscles in freely flying hawkmoths lead to flight changes. PLoS ONE 7(12): e52725. doi:10.1371/journal.pone.0052725
10. Dyhr JD, Morgansen KA, Daniel TL and Cowan NJ (2013) Flexible strategies for flight control: an active role for the abdomen. J. Exp. Biol 216:1523-1536.
11. Demir A, Ankarali MM, Dyhr JP, Morgansen K, Daniel TL, Cowan NJ. (2012) Inertial redirection of thrust forces for flight stabilization. In Proceedings of the 15th International Conference on Climbing and Walking Robots and the Support Technologies for Mobile Machines (CLAWAR)
12. Williams CD, Regnier M, Daniel TL (2012) Elastic energy storage and radial forces in the myofilament lattice depend on sarcomere length. PLoS Computational 8(11): e1002770. doi:10.1371/journal.pcbi.1002770
13. Dyhr J, Cowan N, Colmenares D, Morgansesn K, Daniel TL (2012) Autostabilizing airframe articulations: animal inspired air vehicle control. IEEE Conference on Decision and Control, Maui

14. Tanner BCW, Daniel T and Regnier (2012) Filament compliance influences cooperative activation of thin filaments and the dynamics of force production in skeletal muscle. PLoS Computational Biology. 8(5):e1002506. doi:10.1371/journal.pcbi.1002506
15. Sponberg S and Daniel T (2012) Abdicating power for control: precision timing strategies for a control function of power muscles. Proc. Roy. Society. B. 279:3958-3966.
16. *George NT, Sponberg S. and Daniel TL (2012) Temperature gradients drive mechanical energy gradients in the flight muscle of Man*duca sexta*. Journal of Experimental Biology 215:471-479. (* *named the best paper of J. Exp. Biol in 2012*)
17. Daniel TL, Aldworth Z, Hinterwirth A, Fox J. (2012) Insect inertial measurement units: Gyroscopic sensing of body rotation. pp. 286-297. In: Barth F, Srinavasan MV (eds) Frontiers in Sensing: Biology and Engineering. Springer-Verlag**.** Springer, Wien-New York,.
18. George NT and Daniel TL (2011) Temperature gradients in the flight muscles of *Manduca sexta* imply a spatial gradient in muscle force and energy output Journal of Experimental Biology 214, 894-900.
19. Tsang WM, Stone AL, Otten D, Aldworth ZN, Daniel TL, Hildebrand JG, Levine RD, Voldman, J (2011) Insect-machine interface: a carbon nanotube-enhanced flexible neural probe. J. Neurosci. Methods. http://www.ncbi.nlm.nih.gov/pubmed/22155384.
20. Mountcastle, AM and Daniel TL (2010) Vortexlet models of flapping flexible wings show tuning for force production and control Bioinspiration & Biomimetics. 5(4): 045005. .
21. Williams CD, Regnier M, Daniel TL, 2010 Axial and Radial Forces of Cross-Bridges Depend on Lattice Spacing. PLoS Comput Biol 6(12): e1001018. doi:10.1371/journal.pcbi.1001018
22. Tsang, WM, Stone, A, Aldworth, Z, Hildebrand, JG, Daniel, T, Akinwande, AI, Voldman, J (2010) Flexible Split-Ring Electrode for Insect Flight Biasing using Multisite Neural Stimulation. IEEE Transactions in Biomedical Engineering 57:1757 - 1764.
23. Fox, JL, Fairhall, AL, and Daniel, TL. (2010) Encoding properties of halteres enable motion feature detection in a biological gyroscope. PNAS. 107(8):3840-3845.
24. Hinterwirth A and Daniel, TL. (2010) Antennae in the hawkmoth *Manduca sexta* (Lepidoptera, Sphingidae) mediate abdominal flexion in response to mechanical stimuli. J. Comp. Physiology 196:947-956.
25. Biewener AA and Daniel, TL. (2010) A moving topic: control and dynamics of animal locomotion Biology Letters 3 387-388.
26. Daly, DC, Mercier, PP, Bhardwaj, M, Stone, AL, Aldworth, ZN, Daniel, TL, Voldman, J, Hildebrand, JG, Chandrakasan, AP (2010) A Pulsed UWB Receiver SoC for Insect Motion Control. IEEE Journal of Solid-State Circuits 45:153 - 166.
27. Yaeger D, Zhang F, Zarrasvand A, George N, Daniel TL, Otis B. (2010) A 9 uA addressable gen2 sensor tag for biosignal acqisition . IEEE J. of Solid State Circuits. 45:2198-2209.
28. Sprayberry, J.D.H. (2009). Responses of descending visually-sensitive neurons in the hawkmoth, *Manduca sexta*, to three-dimensional flower-like stimuli. J. Insect Science. 9:1-16.
29. Mountcastle, A. and Daniel, T.L. (2009) Aerodynamic and functional consequences of wing compliance. Experiments in Fluids .DOI 10.1007/s00348-008-0607-0
30. Daniel, T.L., Dieudonne, A., Fox, J.L., Myhrvold, C.A., Sane, S.P., and Wark,B. (2008). Inertial guidance systems in insects: from the neurobiology to the structural of biologocial gyroscopes. J. Inst. Navigation. 55:235-240.
31. Fox, J.L. and Daniel, T.L. (2008). A neural basis for gyroscopic encoding in the halteres of *Holorusia*. Journal of Comparative Physiology A 194: 887-897.
32. Tanner, B.C.W, Regnier, M., and Daniel, T.L.(2008). A spatially-explicit model of muscle contraction explains a relationship[betwen activation phase, power, and ATP utilization in insect flight. J. Exp. Biol. 211:180-186.

33. Tanner, B.C.W, Daniel, T.L. and Regnier, M.. (2007) Sarcomere lattice geometry influences cooperative myosin binding in muscle. PLOS Computational Biology 3:
34. Sprayberry, J. and Daniel, T.L. (2007). Flower tracking in hawkmoths: behavior and energetics. J. Exp. Biol. 210:37-45.
35. Nishikawa, K, Biewener, A.A., Aerts, P., Ahn, A.N., Chiel, H.J., Daley, M.A., Daniel,T.L., Full, R.J., Hale, M.E., Hedrick, T.L., Koditschek, D.E., Lappin, A.K., Nichols, T.R., Quinn, R.D., Ritzman, R.E., Satterlie, R.A., Szymik, B. (2007) Neuromechanics: an integrative approach for understanding motor control. Integrative and Comparative Biology. 41:16-54.
36. Sane, S.P., Dieudonne, A, Willis, M.A., and Daniel, T.L. (2007) Antennal mechanical sensors mediate flight control in Lepidoptera. Science. 315:863-866
37. Alexander, R.McN. Antennae as gryoscopes. (2007). Science 315:771-772.
38. Kataoka A, Tanner BCW, Macpherson JM, Xu X, Wang Q, Regnier M, Daniel TL and Chase PB. 2007. Spatially explicit, nano-mechanical models of the muscle half-sarcomere: Implications for biomechanical tuning in atrophy and fatigue. Acta Astronautica 60:111-118.
39. Hedrick, T.L. and Daniel, T.L. (2006). Flight control in the hawkmoth Manduca sexta: the inverse problem of hovering. J. Exp. Biol. 209:31143130.
40. Combes, S. and Daniel, T.L. (2005). Flexural stiffness in insect wings: effects of wing venation and stiffness distribution on passive bending. American Entomotologist. 42-45.
41. Tu, M.S. and Daniel, T.L. (2004). Submaximal power output from the dorsolongitudinal flight muscles of the hawkmoth Manduca sexta. J. Exp. Biol. 207:4651-4662
42. Mavoori, J., Millard, B., Longnion, J., Danielt, T.L., and Diorio, C. (2004). A miniature implantable computer for functional electrical stimulation and recording of neuromuscular activity. IEEE (in press).
43. Chase, P.B., MacPherson, J.M, and Daniel, T.L. (2004). A spatially explicit model of the half sarcomere: myofilament compliance affects Ca2+ regulation. Ann. Biomed. Eng. 32,1559-1568.
44. Tu, M.S. and Daniel, T.L. (2004). Cardiac like behavior in insect flight muscle. J. Exp. Biol. 207,2455-2464.
45. Daniel, T.L.. (2003). Flying with Animals, II: Interfacing Computer Electronics with Biology. The Bridge, National Academy of Engineering. 33:16-18
46. Combes, S.A. and Daniel, T.L. (2003). Flexural stiffness in insect wings. I. Scaling and the influence of wing venation. J. Exp. Biol. 206(17), 2979-2987.
47. Combes, S.A. and Daniel, T.L. (2003). Flexural stiffness in insect wings. II. Spatial distribution and dynamic wing bending. J. Exp. Biol. 206(17), 2989-2997.
48. Combes, S.A. and Daniel, T.L. (2003). Into thin air: Contributions of aerodynamic and inertial-elastic forces to wing bending in the hawkmoth Manduca sexta. J. Exp. Biol. 206(17), 2999-3006.
49. Daniel, T.L. and Combes, S.A. (2002). Flexing wings and fins: bending by inertial or fluid-dynamic forces? Int. Comp. Biol. 42(5), 1044-1049.
50. Combes, SA and Daniel, TL (2001). Shape, flapping and flexion: Wing and fin design for forward flight. J. Exp. Biol. 204(12), 2073- 2085.
51. Hanein Y, Lang, J. Theobald, R. Wyeth, K. F. Böhringer, T. Daniel, D.D. Denton and A. O. D. Willows. (2001) . Intracellular Recording with High Aspect Ratio, MEMS Neuronal Probes. In Transducers 2001 - The 11th International Conference on Solid-State Sensors and Actuators, Munich, Germany, June 10-14,. pp 386-389.
52. Chase, P.B., Y. Chen, K.L. Kuhlin and T.L. Daniel. (2000). Viscosity and solute dependence of F-actin translocation by rabbit skeletal heavy meromyosin. Am. J. Physiol. Cell Physiol. 278, C1088-C1098.
53. Daniel, T.L. and Tu, M.S. (1999). Animal movement, mechanical tuning and coupled

systems. J.Exp.Biol. 202, 3415-3421
54. Daniel, T.L., Trimble, A.C. and Chase, P.B. (1998). Compliant realignment of binding sites in muscle: transient behavior and mechanical tuning. Biophysical Journal 74:1611-1621.
55. Denny, M., Gaylord, B., Helmuth, B., and Daniel, T. (1998). The menace of momentum: dynamical forces on flexible organisms. Limnol. Oceanogr. 43:955-968.
56. Helmuth BS, Sebens KP, and Daniel TL (1997) . Morphological variation in coral aggregations: branch spacing and mass flux to coral tissues. J. Exp. Mar. Biol. Ecol. 209: 233-259.
57. Daniel, TL, Helmuth BS, Saunders WB and Ward PD. (1997). Septal complexity in ammonoid cephalopods increased mechanical risk and limited depth. Paleobiology 23:470-481.
58. Kingsolver JG and Daniel TL (1995) Mechanics of food handling by fluid feeding insects. In Regulator Mechanisms in Insect Feeding pp.32-73. Ed. RF Chapman and G deBoer. Chapman and Hall, New York.
59. Daniel TL. (1995) Invertebrate swimming: integrating internal and external mechanics. Soc. Experimental Biol. 49:61-89.
60. Daniel, T.L., C.E. Jordan, and D. Grünbaum (1992) The mechanics of aquatic locomotion. In: Comparative and Environmental Physiology. Vol. 11, Mechanics and Energetics of Animal Locomotion (ed. R. McNeill Alexander). Springer-Verlag.
61. Meyhofer E and Daniel TL (1990) Dynamic mechanical properties of extensor muscle cells of the shrimp Pandalus danae: cell design for escape locomotion. J. Experimental Biology 151:435-452.
62. Daniel TL, Kingsolver JG, and Meyhofer E (1989). Mechanical determinants of nectar feeding energetics in butterflies: muscle mechanics, feeding geometry, and functional significance. Oecologia 79:66-75
63. Daniel TL and Meyhofer E(1989) Size limits in escape locomotion of shrimp. J. Experimental Bio. 143:245-265.
64. Daniel TL (1988) Forward flapping flight from flexible fins. Can J Zool. 66:630-638.
65. Tidball JG and Daniel TL (1986). Elastic energy storage in rigored skeletal muscle cells under physiological loading conditions. Amer. J. Physiology. 250:R56-R64.
66. Tidball JG and Daniel TL (1986) Myotendinous junctions of tonic muscle cells: structure and loading. Cell and Tissue Res. 245:315-322.
67. Denny MW, Daniel TL and Koehl MAR (1985) Mechanical limits to size in wave-swept organisms. Ecol. Monogr. 55:69-102.
68. Daniel TL (1985) Cost of locomotion: unsteady medusan swimming. J. Exp. Biol. 119:149-164.
69. Daniel TL (1984) Unsteady aspects of aquatic locomotion. J. Integrative and Comparative Biology (formerly Am. Zool.) 24:121-134.
70. Daniel TL (1983) Mechanics and energetics of medusan jet proposulsion. Can. J. Zool. 61:1406-1420.
71. Daniel TL and Kingsolver JG (1983). Feeding strategy and the mechanics of blood sucking in insects. J. Theoretical Biol. 105:661-672.
72. Kingsolver JG and Daniel TL (1983) Mechanical determinants of nectar feeding strategy in hummingbirds: energetics, tongue morphology and licking behavior. Oecologia 60:214-226.
73. Daniel TL (1981) Fish mucus: in situ measurements of polymer drag reduction. Biol. Bulletin 160:376-382.
74. Kingsolver JG and Daniel TL (1979). On the mechanics and energetics of nectar feeding in butterflies. J. Theoretical Biol. 76:167-179.

PUBLISHED ABSTRACTS FOR RECENT SCIENTIFIC MEETINGS

(5 YEARS, AUTHORS ARE A MIX OF COLLEAGUES, GRADUATE STUDENTS, POSTDOCS, UNDERGRADS AND HIGHSCHOOL STUDENTS)

2013

1. Munk Y, Wilkinson S, Daniel TL. Hawkmoths of Endor: navigational decision policies for obstacle navigation in *Manduca sexta*. Soc. Integ. Comp. Biology, San Francisco 01/13
2. Zamore S, LaMarca E, Daniel TL. Mosquitoes do not track warm plumes in the absence of CO2. Soc. Integ. Comp. Biology, San Francisco 01/13
3. Campos EO, Bradshaw HD, Daniel TL. Exploring plant-pollinator interactions using 3D printed flowers. Soc. Integ. Comp. Biology, San Francisco 01/13
4. Eberle AL, Reinhall, PG, Mountcastle AM, Daniel TL. Fluid-solid coupled model of flapping flexing insect wings reveals multiple maxima for flight forces. Soc. Integ. Comp. Biology, San Francisco 01/13
5. Howell DB, Dickerson BH, Dyhr JP, Sponberg SN, Daniel TL. Extracellular recordings of wing campaniform sensilla of *Manduca sexta* demonstrate encoding properties similar to intracellular recordings of haltere neurons. Soc. Integ. Comp. Biology, San Francisco 01/13
6. Dickerson BH, Howell DB, Daniel TL. Moths respond to inertial yaw rotations with lateral abdominal motions. Soc. Integ. Comp. Biology, San Francisco 01/13
7. Dyhr JP, Cowan NJ, Morgansen KA, Daniel TL. Agile airframes I: maneuverability from abdominal actuation. Soc. Integ. Comp. Biology, San Francisco 01/13 Soc. Integ. Comp. Biology, San Francisco 01/13
8. Colmenares DJ, Dyhr JP, Morgansen KA, Daniel TL. Agile airframes II: closing the loop on abdominal motion. Soc. Integ. Comp. Biology, San Francisco 01/13
9. Sponberg SN, Dyhr JP, Hall R, Salcedo M, Daniel TL. Background luminance alters tracking performance of freely flying hawkmoths revealing variable delays in optomotor processing. Soc. Integ. Comp. Biology, San Francisco 01/13
10. Daniel TL, George NT, Williams CD, and Irving TC *In vivo* time resolved x-ray diffraction reveals radial motions of myofilaments in insect flight muscle. Biophysical Society

2012

1. Daniel TL, Williams CD, Salcedo M, George NT, Irving TC. Radial myofilament motion in *Manduca* muscle modulates mechanics. Society of Experimental Biology, Salzburg Austria
2. Daniel TL, George, NT, Williams CD, Salcedo M, and Irving TC. *In vivo* time resolved x-ray diffraction reveals radial motions of myofilaments in insect flight muscle. Canadian Society of Biomechanics, Vancouver BChttp://ocs.sfu.ca/csb-scb/index.php/csb-scb/2012/paper/viewFile/363/263
3. Sponberg S, Fairhall AL, Daniel TL. Decoding the independent and synergistic roles of flight muscle for control of turning in the hawkmoth *Manduca sexta*. International Society of Neuroethology, Maryland
4. Colmenares DJ, Dyhr JP, Morgansen KA, Cowan NJ, Daniel TL. Abdominal stabilization of vertical image velocity during tethered flight. International Society of Neuroethology, Maryland.
5. Zamore, S, Daniel TL and Fairhall AL. Modeling decision rules to optimize host localization in flying insects. . International Society of Neuroethology, Maryland.
6. Sponberg S, Daniel TL, Fairhall AL. Using dimensionality reduction to explore muscle synergies and torque encoding during insect flight. Computational and Systems Neuroscience (CoSyNe). Salt Lake City, UT
7. Dyhr JP, Cowan NJ, Hinterwirth AJ, Morgansen KA, Daniel TL. Flexible frames for fligt. *SICB*, Charleston SC.

8. George NT, Salcedo MK, Williams CD, Irving TC, Daniel TL. Myofilament lattice spacing increases as muscles shorten. *SICB*, Charleston, SC
9. Williams CD, Salcedo, MK, Regnier M, Irving TC, Daniel TL. Pulling apart lattice spacing: interfilament distance regulates force. *SICB*, Charleston, SC
10. Fechko AS, Hinterwirth AJ, Daniel TL. Gaining insight: visual feedback control in the hawkmoth *Manduca sexta. SICB*, Charleston, SC
11. Dickerson BH, Daniel TL, Riffell JA. Shaken, not static: multimodal processing in the antenna of the hawkmoth *Manduca sexta. SICB*, Charleston, SC
12. Daniel TL, Williams CD. Modeling many molecular motors mostly motivated by moth movement. *SICB*, Charleston, SC

2011

1. Mountcastle AM, Daniel TL. Vortexlet models of flapping flexible wings show tuning for force production and control. *SICB,* Salt Lake City UT
2. Williams CD, Regnier M, Daniel TL. Myosin's big radial force: axial and radial tensions are similar in contracting muscle. *SICB,* Salt Lake City UT
3. George NT, Hsu HM, Irving TC, Daniel TL. Molecular and structural evidence for temperature dependent elastic energy storage in *Manduca sexta*. *SICB,* Salt Lake City UT
4. Sponberg S, Fechko AS, Daniel TL. The control potential of power muscles in a flying insect. *SICB,* Salt Lake City UT

2010

1. Hinterwrith AJ, Daniel TL. Visual rotation stimuli drive activity of intrinsic antennal muscles in *Manduca sexta*. *SICB* Seattle WA
2. Fox JL, Daniel TL. Motion feature detection in a biological gyroscope. *SICB* Seattle WA
3. George NT, Daniel TL. Mechancial energy gradients arise as a consequence of temperature gradients in the flight muscles of *Manduca sexta*. *SICB* Seattle WA
4. Aldworth Z, Lockey J, Otten D, Lang J, Voldman J, Daniel TL. Radio controlled stimulation of abdominal flexion in *Manduca sexta* affects the flight path. *SICB* Seattle WA
5. Mountcastle AM, Daniel TL. Unsteady forces occur at the ventral stroke reversal in the hawkmoth *Manduca sexta*. *SICB* Seattle WA
6. Sponberg S. Daniel TL. Phase modulation and control of flight power muscles during visually induced turning responses in the hawkmoth *Manduca sexta*. *SICB* Seattle WA
7. Zamore S, Fox JL, Daniel, TL. Locating flight stabilizing mechanosensors in the Eastern bumblebee (*Bombus impatiens*). International Society for Neuroethology. Salamanca, Spain.
8. Aldworth Z, Danielt TL. Dynamic encoding of wing bending by mechanoreceptors in the hawkmoth *Manduca sexta.* International Society for Neuroethology. Salamanca, Spain.
9. Fox JL and Daniel TL. Predicting haltere neuron spike trains in freely flying dipterans. International Society for Neuroethology. Salamanca, Spain.
10. George NT, Liu J, Simons L, Daniel TL, Irving TC. Structural and functional gradients with temperature in flight muscle of Manduca sexta. Annual Meeting of the Biophysical Society. San Francisco, CA.

2009

1. Mountcastle, A.M., Daniel, T.L. (2009). Wing stiffness affects mean advective flows of *Manduca sexta*, with wing overlap a potential contributor. *SICB*, Boston, MA.

2. Williams,C David; Regnier, Mike and Daniel,T.L. 1427-Pos Simulating The Effect Of Lattice Spacing On The Frank-Starling Mechanism *Biophys. J.* 2008 94: 1427.
3. George, N.T., Daniel, T.L. (2009). Temperature gradients in the dorsolongitudinal flight muscles of *Manduca sexta* may yield functional gradients. *SICB, Boston, MA.*
4. Fox, JL and Daniel, TL. (2009). Estimation of information transfer rates in highly precise sensory afferents. *SICB, Boston, MA.*
5. Fox, JL and Daniel, TL. (2008). Information processing in a biological gyroscope. Annual meeting of the *Society for Neuroscience, Washington, DC.*
6. Hinterwirth, AJ and Daniel, TL. (2009). Antennae mediate an abdominal flexion response to body rotations in the hawkmoth Manduca sexta *SICB, Boston, MA.*
7. Tse J, Jong P, Hinterwirth AJ, and Daniel TL (2009). Stimulating antennal muscles leads to path changes in a moth's flight trajectory. *SICB, Boston, MA.*
8. Loudon, S., Aldworth, Z., and Daniel TL (2009). Perturbing flight paths in Lepidoptera by inducing abdominal flexion.. *SICB, Boston, MA.*
9. Aldworth,Z. and Daniel TL (2009). Wing mechanosensors can transmit bending information at high bit rates. *SICB, Boston, MA.*

Grants

NSF (PI T. Daniel) ~ $ 280 K 9/1/10 – 8/31/13
(T. Irving Co-PI)
Molecular determinants of power inputs and power outputs of synchronous flight muscle in *Manduca sexta*.

NSF (PI T.Daniel) ~ $18.5MM 06/15/2011-7/31/2016
(co-PIs J. Voldman MIT; K. Moon SDSU)
ERC proposal: Sensorimotor Neural Engineering. The NSF ERC for Sensorimotor Neural Engineering (ERC/SNE) will offer a global hub for building transformational neural-assistive technologies.

AFOSR (PI T. Daniel) $990K 07/01/2011 – 06/30/2013
(K. Morgansen co-PI)
Flight control via wing strain sensors. This proposal seeks to understand information processing by distributed strain sensing cells.

ONR MURI (PI Kristi Morgansen) ~ $ 7.5 M 08/01/2010 – 07/31/2013
(T. Daniel Co-PI)
AIRFOILS: Animal Inspired Robust Flight with Outer and Inner Loop Strategies.

Vulcan, Inc.
(T. Daniel, PI) $35,000
Living Buildings for Living Sciences: A Charrette to Plan Modern Multifunctional Buildings
The aim of this project is to produce a twenty-first century lab that will change the way people think about future, sustainable building design.

NIH 2 R01 HL65497-06 04/01/01 – 05/31/13
NIH/NHLBI (PI: M. Regnier) Total Direct Costs, $1M
T. Daniel, Co-Investigator)
Cooperative Filament Activation in Striated Muscle
The goal of this project is to determine how interactions between neighboring regulatory units on thin filaments influence the cooperative activation of contraction in cardiac and skeletal muscle.

FA8650-07-C-7704 11/02/06 – 04/01/12
DARPA (Flow-through from MIT) $293,924
(T. Daniel, PI)
Cyborg Moths: Melding Microelectromechanical Systems with Neurons for Motion Control in Freely Flying Insects
This research is aimed at identifying the most promising venues of flight control in freely flying insects.

UW Komen Endowed Chair $50K/year

RECENT PROFESSIONAL SERVICE (NON-UW, PAST 5 YEARS)

2013
- Steering Committee, NSF Workshop on "Animals on the edge of stability"
- External Departmental Reviewer: University of North Carolina, Chapel Hill
- Advisor, P.G. Allen Family Foundation (Science Programs)
- Scientific Advisory Board, Allen Institute of Brain Science
- Board of Editors, Science Magazine

2012
- External Departmental Reviewer: Duke University
- Advisor, P.G. Allen Family Foundation (Science Programs)
- Board of Editors, Science Magazine
- Board of Editors, Royal Society Biology Letters

2011
- NSF Panel (Integrated Organism Systems (2011)
- External Review Committee, Department of Biology, University of South Carolina
- External Review Committee, Department of Biology Case Western University
- External Review Committee, Interdepartmental Program in Physiology, UCLA
- Advisor, P.G. Allen Family Foundation
- Board of Editors, Science Magazine
- Board of Editors, Royal Society Biology Letters

2010
- Society of Integrative Biology, Development Committee Chair
- Board of Editors, Science Magazine

- Board of Editors, Royal Society Biology Letters
-

2009

- NIH Study Section (MABS: Mathematical Analysis of Biological Systems study section)

RECENT PROFESSIONAL SERVICE (UW, PAST 5 YEARS)

2013

- UW IT Strategy Board.
- e-Science Advisory Committee
- Neurobiology and Behavior Steering Committee
- Neurobiology Undergraduate Major Steering Committee
- Chair, Search Committee for the Director of the Center for Sensorimotor Neural Engineering
- Steering Committee, Cardiovascular Biology Training Grant

2012

- Committee for Assessing Interdisciplinary Graduate Education (Chair).
- e-Science Advisory Committee
- Neurobiology and Behavior Steering Committee
- Neurobiology Undergraduate Major Steering Committee
- Chair, Search Committee for the Director of the Center for Sensorimotor Neural Engineering
- Steering Committee, Cardiovascular Biology Training Grant

2011

- Interim Associate Vice Provost for Research, UW.
- Research Advisory Board, UW
- e-Science Advisory Committee
- Neurobiology and Behavior Steering Committee
- Neurobiology Undergraduate Major Steering Committee
- Steering Committee, Cardiovascular Biology Training Grant

2010

- Interim Associate Dean for Infrastructure Research and Technology, College of Arts and Sciences.
- Research Advisory Board, UW
- e-Science Advisory Committee
- Neurobiology and Behavior Steering Committee
- Neurobiology Undergraduate Major Steering Committee
- Featured speaker: 2010 UW President's retreat.
- Steering Committee, Cardiovascular Biology Training Grant

2009

- Royalty Research Fund Review Committee (chair)
- Research Advisory Board Member (for the vice Provost of Research).
- Development Committee: Neurobiology and Behavior
- Honors Curriculum Committee

- E-science faculty search committee
- Landolt Distinguished Graduate Mentor Award Selection Committee
- Department of Biology Graduate Program Committee
- e-Science Advisory Committee
- Neurobiology and Behavior Steering Committee
- Neurobiology Undergraduate Major Steering Committee

INVITED LECTURES (PAST 5 YEARS)

2013

- Modeling and measuring myriad molecular motors in moth muscle. Marine Biological Laboratories.
- Control and dynamics of animal motion: sensing and actuation. Research Collaboration Network, Tulane University.
- Plenary Speaker: Joint Scientific Symposium of the Hong Kong University of Science and Technology and the Shanghai Jiao Tong University and Chiba University: Advances in Bioninspired and Biomedical Engineering. Hong Kong. http://jsshsc2013.com
- Modeling and measuring myriad molecular motors in moth muscle. Cell and Molecular Biology & Systems Biology joint lecture. Harvard University
- Radial dynamics in muscle contraction. Royal Veterinary College. London.

2012

- Keynote Lecture: Intel Science and Technology Conference on Pervasive Computing, Bremerton, WA.
- The NSF center for sensorimotor neural engineering: an overview. Carnegie Mellon University.
- Inertial sensing in insect flight. Air Force Research Labs, Eglin Air Force Base, FL
- The NSF center for sensorimotor neural engineering: an overview .University of Tokyo
- Flapping flight from flexing wings: sensing and actuation. Chiba University, Tokyo
- From sensing to actuation: closed loop control in movement systems. GEM4 Summer School Invited Lecture. University of Illinois, Urbana.
- The NSF center for sensorimotor neural engineering: an overview. University of Freiburg, BrainLinks-BrainTools Inaugural Lecture.
- Mentoring, mathematics and moths – undergraduates integrated into our research enterprise. AAAS Annual Meeting, Vancouver BC.
- Flying and sensing with compliant wings. Civil Engineering, MIT
- Modeling many molecular motors mostly motivated by moths. Soc. Integrative Comparative Biology, Symposium on Mathematics and Biology. Charleston South Carolina.
- Sensu-ators: the confluence of sensing and actuation in single structures. NSF/ARL Locomotion Systems Science Workshop.
- The NSF center for sensorimotor neural engineering: research at the interface of technology and neuroscience. University of Puget Sound.

2011.

- TUBITAK-NSF-ESF Workshop on Transworld Forum on Next Generation Complex Engineering Systems: Learning from Nature. Istanbul
- Microsoft Research: 20 year celebration Sept. 2011

- Sensorimotor control of movement: even small brains accomplish amazing tasks. 2nd Annual Allen Institute Symposium.
- Sensory information processing in biology: US-China NSF sponsored workshop on Advanced Sensors and Bioinspoired Technologies. Shanghai (November 2011)
- How should universities respond to Broader Impacts? A view from the trenches. CISE meeting of the NSF. (January 2011)
- Dynamics of Living Networks – future issues for research and education in biology. NSF division of Integrated Organism Systems.
- Keynote: State-of-the-art review of mechanosensory information processing in insect flight. US/UK Joint Workshop on Animal Inspired Micro-Air Vehicles. Chilworth, UK.
- Plenary Lecture SICB: Integrative biology is complex computational and collaborative (January 2011)
- Driven by vision – why do the eyes control antennal movements. Imperial College London (April 2011)

2010

- AFOSR Annual Review: State of the Art Review of Insect flight (June 2010), Atlanta.
- World Congress of Biomechanics (co-organizer, animal mechanics) Flapping flight from flexing wings – a vortexlet analysis (with A. Mountcaslte) (July 2010)
- The dynamics of insect flight muscle: insigh from time-resolved x-rays. Cambridge University – Symposium in honor of Charles Ellington (September 2010)
- Sensory information processing in biology: US-China NSF sponsored workshop on Advanced Sensors and Bioinspoired Technologies. Shanghai (November 2011)

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2009

- Grass Foundation Lecture. East Coast Nerve Net. Woodshole Mass
- Keynote Lecture at the GEM4 Summer Institute, Ill. Inst. Tech. The physics and biology of sensors and actuators.
- Howard Hughes Medical Institute Janelia Farm. Gyroscopic information encoding in insect flight control
- Keynote: Sensing and mechanics in biological systems. Dalian China, NSF-China Workshop on Bio-inspired design.
- Keynote: Sensing and actuation in biological systems. Shanghai China, NSF-China Workshop on Bio-sensors and Bio-actuators.
- Control and dynamics of insect flight . UC Berkeley.
- Control and dynamics of insect flight. UC San Diego
- Keynote. Biology: collaborative, connected, data dense and dynamic.Leadership Coalition Faculty Conference. Washington DC.
- Control and dynamics of insect flight, UC Riverside
- Shanghai China: NSF-China organizational workshop on Bio-sensors and Bio-Actuators.
- Keynote lecture: Sensing and actuation in natural systems. US-Taiwan NSF/NSC workshop on Biosensors and Bioactuators, Taipei. April 2009

2008

- Keynote lecture: Biologically Inspired Design and Lessons for Buildings. American Institute of Architecture.
- The integration of computers and neural systems. Hybrid Insect MEMS conference. Vail Colorado
- Keynote lecture: Microsoft Research Conference on Neural Engineering.
- Control and dynamics of insect flight: where computers meet neural systems. Google, Inc.
- Control and dynamics of insect flight: the role of antennal gyroscopes. Wageningen University, The Netherlands
- Keynote lecture: Control and dynamics of insect flight: biological gyroscopes. International Conference on Sensors in Biology and Engineering, Cetraro Italy.

CURRENT COLLABORATORS (NON-UW).

NSF ERC (with Yoky Mastuoka) Center for Sensorimotor Neural Engineering

MIT: Jeffery Lang, Russ Tedrake, Joel Voldman, Dana Weinstein.

SDSU: Sam Kassenge, Kee Moon,

ONR MURI (with Morgansen) Animal Inspired Robust Flight with Inner and Outer Loop Systems

Boston University: John Ballieul

University of Maryland: Sean Humbert

University of North Carolina: Ty Hedrick.

NSF Collaborative Research Program

Tom Irving, Illinois Institute of Technology

2012-2013 STUDENTS AND POSTDOCTORAL TRAINEES

Bingni Brunton (Applied Mathematics/CSNE Postdoctoral Research Associate)
Octavio Campos(Biology, graduate student)
David Colmenares (Bioengineering and CSE, undergraduate)
Brad Dickerson (Biology, graduate student)
Jon Dyhr (NSF Postdoctoral Fellow, co-advised with Kristi Morgansen)
Annika Eberle (graduate student, Mechanical Engineering)
Tom Erez (Sackler Postoctoral Fellow, co-advisor with Emo Todorov)
Robert Hall (Biology, undergraduate)
Darren Howell (Neurobiology, undergraduate)
Samia Kazi (Biology & ACMS, undergraduate)
Yonatan Munk (Postdoctoral Research Associate, co-advised by Kristi Morgansen)
Eric Rombokas (Postdoctoral Research Associate, CSNE)
Simon Sponberg (NSF Postdoctoral Fellow, co-advisor with Adrienne Fairhall)
Camillo Tiejero (Computer Science & Engineering, undergraduate)
Shawn Wilkinson (Computer Science, Morehouse College, Summer 2012 REU)
Sharri Zamore (Neurobiology & Behavior, graduate student)
*Emma LaMarca, Neil Chauhan, Andreas Molbak (High School Summer Interns)

*over 25 prior undergraduates involved in lab research not listed here

PRIOR GRADUATE STUDENTS AND POSTDOCTORAL TRAINEES

Dany Adams, Research Professor, Tufts University (graduate student)
Zane Aldworth, Postdoc, NIH (postdoc)
Stacey Combes, Assistant Professor, Harvard University (graduate student and postdoc)
Alexandre Dieudonne, Postdoc, HHMI Janelia Farms (graduate student)
Michael Dillon, Assistant Professor, University of Wyoming (graduate student)
Kevin Flick, Microsoft (graduate student)
Jessica Fox, Asst. Professor, Case Western University (graduate student)
Mark Frye, Associate Professor, UCLA, (graduate student)
Nicole George, Associate Program Officer, P. G. Allen Family Foundation (graduate stuent)
Erica Goldman, Science Writer, University of Maryland (graduate student)
Daniel Grunbaum, Associate Professor, Oceanography, University of Washington (postdoc)
Robin Harris (Neurobiology & Behavior, graduate student, co-advised with Jim Truman)
Tyson Hedrick, Assistant Professor, University of North Carolina Chapel Hill (postdoc)
Brian Helmuth, Professor, University of South Carolina (grad student)
Chris Jordan, Program Manager, NOAA (grad students)
Edgar Meyhofer, Professor, University of Michigan (graduate student)
Andrew Mountcastle, Postdoc, Harvard (graduate student)
Sanjay Sane, Assistant Professor, National Centre for Biological Science, Bangalore, (postdoc)
Jordanna Sprayberry, Assistant Professor, Muhlenberg College (graduate student)
Bertrand Tanner, Postdoc University of Vermont (graduate student)
Jamie Theobald, Assistant Professor, Florida International University (grad student)
Alan Trimble, Research Scientist, University of Washington (graduate student).
Mike Tu, Financial Analyst, University of Washington (postdoc).
C. David Willams, Postdoc, Harvard University (graduate student)

EXTERNAL EXAMINER FOR DOCTORAL STUDENTS (NON-UW)

David Lentink, Wageningen University, The Netherlands
Florian Muijres, University of Lund, Sweden
Clemens Schaber, University of Vienna, Austria
Jonathan Voise, University of Tours, France

Su-In Lee

CONTACT INFORMATION

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Department of Genome Sciences
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WWW: suinlee.cs.washington.edu

EDUCATION

Stanford University September 2001 to December 2008

Ph.D. in Electrical Engineering, January 2009
Machine Learning Approaches to Understanding the Genetic Basis of Complex Traits
Advisor: Daphne Koller (Computer Science)

M.S. in Electrical Engineering, June 2003

Korea Advanced Institute of Science and Technology March 1997 to February 2001

B.S. in Electrical Engineering, March 2001
Top-Down Selective Attention for Robust Recognition
Summa cum Laude, graduated with top honors

ACADEMIC APPOINTMENTS

University of Washington January 2010 to present

Assistant Professor of Computer Science & Engineering, College of Engineering
Assistant Professor of Genome Sciences, School of Medicine
Adjunct Assistant Professor of Electrical Engineering, College of Engineering

Carnegie Mellon University January 2009 to December 2009

Visiting Assistant Professor of Lane Center for Computational Biology and Machine Learning Department, School of Computer Science

RESEARCH INTERESTS

Computational biology, machine learning, probabilistic graphical models, genetics, genomics, personal genomics, cancer systems biology

HONORS AND AWARDS

Microsoft New Faculty Fellowship Finalist (2013)
Samsung Lee Kun Hee Fellowship (2002-2006)
Stanford Graduate Fellowship (2001-2004)
The President of KAIST Award, awarded to the 1st runner-up for academic excellence in the undergraduate program of KAIST (2001)
Best paper award, Samsung Research Paper Competition (2000)
Merit-based full scholarship from KAIST (1997-2001)

TEACHING

University of Washington

Computational Biology (CSE 527) – Win13, Fall12, Fall11, Fall10
Statistical Methods – Probabilistic Graphical Models (CSE 515) – Spr11
Machine Learning in Biology (CSE 599V) – Spr10
Introduction fo Computational Molecular Biology (GENOME 541) – Spr13, Spr12
Statistics for Genome Scientists (GENOME 560) – Spr12

Carnegie Mellon University

Computational Molecular Biology and Genomics (02-711) – Spr09

Korea Advanced Institute of Science and Technology

Summer School for International Mathematical Olympiad (IMO) participants – Sum97

STUDENT ADVISING

Scott Lundberg (CSE), expected graduation 2018.

Maxim Grechkin (CSE), expected graduation 2017.

Safiye Celik (CSE), expected graduation 2017.

Patricio Velez (CSE), expected graduation 2017.

Ezgi Mercan (CSE) (co-advised with Linda Shapiro), expected graduation 2016.

Danielle Bragg (CSE), a student of James Fogarty, expected graduation 2017.

John Earls (CSE), a student of Nathan Price at ISB, expected graduation 2016.

Mike Chung (CSE), a student of Rajesh Rao, expected graduation 2016.

Tim Wu (BHSI), a student of Peter Tarczy-Hornoch, expected graduation 2014.

Karthik Mohan (EE), a student of Maryam Fazel, expected graduation 2014.

Palma London (EE/Math), an undergraduate student of Maryam Fazel, expected graduation 2014.

Bilge Soran (CSE), a student of Linda Shapiro, expected graduation 2014.

Shulin Yang (CSE), a student of Linda Shapiro, graduated in 2013.

Rupali Patwardhan (GS), a former GS student of Jay Shendure, *Massively parallel functional dissection of regulatory elements*, graduated in 2012, now a postdoctoral fellow.

PROFESSIONAL SERVICE

Department Service: Organizer of the Genome Sciences Departmental Seminars

University Service: Computational Molecular Biology Program Committee

Journal and Conference Reviewing: Journal of Machine Learning Research (JMLR), PLoS Computational Biology, International Conference of Machine Learning (ICML), Uncertainty in Artificial Intelligence (UAI), Frontiers in Statistical Genetics and Methodology, International Society for Computational Biology (ISMB)

Grant Proposal Reviewing: National Science Foundation (NSF), National Institutes of Health (NIH), Israeli Science Foundation (ISF)

PEER-REVIEWED PUBLICATIONS

[1] Maxim Grechkin and **Su-In Lee** (2013). *Identifying Perturbed Genes in the Regulatory Networks from Gene Expression Data*, NIPS Workshop on Machine Learning in Computational Biology. **acceptance rate (oral) 20%**

[2] Safiye Celik, Benjamin Logsdon and **Su-In Lee** (2013). *Sparse Estimation of Module Gaussian Graphical Models with Applications to Cancer Systems Biology*, NIPS Workshop on Machine Learning in Computational Biology. **acceptance rate (oral) 20%**

[3] Ka Yee Yeung, C. Anthony Blau, Vivian Oehler, **Su-In Lee**, Christopher Miller, Sylvia Chien, Timothy Martins, Elihu Estey and Pamela Becker (2013). *Personalized Approach To Treatment of Acute Myeloid Leukemia Using a High-Throughput Chemosensitivity Assay*, American Society of Hematology Annual Meeting. **acceptance rate (oral) 10%**

[4] Min Fang, Scott McElhone, Xin Zhao, Barry Storer, **Su-In Lee**, C. Anthony Blau, Vivian Oehler, Elihu Estey, Frederick Appelbaum and Pamela Becker (2013). *Proof-Of-Concept Study For Precision Medicine With Chromosome Genomic Array Testing (CGAT) For Drug Sensitivity Screening In Acute Myeloid Leukemia*, American Society of Hematology Annual Meeting. **acceptance rate (poster) 20%**

[5] Karthik Mohan, Palma London, Maryam Fazel, Daniela Witten, and **Su-In Lee** (2013). *Node-Based Learning of Multiple Gaussian Graphical Models*, Journal of Machine Learning Research (JMLR). In Press.

[6] Ezgi Mercan, Linda Shapiro, Seth Weinberg and **Su-In Lee** (2013). *The use of pseudo-landmarks for craniofacial analysis: A comparative study with L1-regularized logistic regression*, The 35th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC). **acceptance rate (oral) 40%**, PMID: 24111127

[7] Karthik Mohan, Mike Chung, Seungyeop Han, Daniela Witten, **Su-In Lee** and Maryam Fazel (2012). *Structured Sparse Learning of Multiple Gaussian Graphical Models*, Neural Information Processing Systems (NIPS). **acceptance rate 25%**

[8] Steve Schwartz, Hillel Schwartz, Steven Horvath, Eric Schadt and **Su-In Lee** (2012). *A Systematic Approach to Multifactorial Cardiovascular Disease: Causal Analysis*, Arteriosclerosis, Thrombosis, and Vascular Biology, 32(12):2821-35. **acceptance rate 18%**, **impact factor: 6.338**, PMID: 23087359

[9] Shulin Yang, Linda Shapiro, Michael Cunningham, Matthew Speltz, Craig Birgfeld, Indriyati Atmosukarto and **Su-In Lee** (2012). *Skull Retrieval for Craniosynostosis Using Sparse Logistic Regression Models*, Proceedings of the MICCAI Workshop on Medical Content Based Retrieval for Clinical Decision Support.**Winner of the Best Paper Award**

[10] Bilge Soran, Jenq-Neng Hwangz, **Su-In Lee** and Linda Shapiro (2012). *Tremor Detection Using Motion Filtering and SVM*, International Conference on Pattern Recognition. **acceptance rate 25%**

[11] Rupali Patwardhan, Joseph Hiatt, Daniela Witten, Mee Kim, Robin Smith, Dalit May, Choli Lee, Jennifer Andrie, **Su-In Lee**, Gregory Cooper, Nadav Ahituv, Len Pennacchio and Jay Shendure (2012). *Massively parallel functional dissection of mammalian enhancers in vivo*, Nature Biotechnology 30(3):265-70. **acceptance rate 8%**, **impact factor 32.438**, PMID: 22371081

[12] Bilge Soran, Zhiyong Xie, Rosalia Tungaraza, **Su-In Lee**, Linda Shapiro and Thomas Grabowski (2012). *Parcellation of Human Inferior Parietal Lobule Based on Diffusion MRI*, The 34th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBS). **acceptance rate (oral) 40%**, PMID: 23366611

[13] Shulin Yang, Linda Shapiro, Michael Cunningham, Matthew Speltz and **Su-In Lee** (2011). *Classification and Feature Selection for Craniosynostosis*, Proceedings of ACM Conference on Bioinformatics, Computational Biology and Biomedicine (ACM BCB). **acceptance rate (oral) 28%**

[14] Iain Dykes, Lynne Tempest, **Su-In Lee** and Eric Turner (2011). *Brn3a and Islet1 act epistatically to regulate the gene expression program of sensory differentiation*, Journal of Neuroscience, 31(27):9789-99. **impact factor 7.115**, PMID: 21734270

[15] Sivaraman Balakrishnan, Hetunandan Kamisetty, Jaime Carbonell, **Su-In Lee** and Christopher Langmead (2011). *Learning Generative Models for Protein Fold Families*, PROTEINS: Structure, Function, and Bioinformatic, 79(4):1061-78. **impact factor 3.337**, PMID: 21268112

[16] Sivaraman Balakrishnan, Hetunandan Kamisetty, Jaime Carbonell, **Su-In Lee** and Christopher Langmead (2010). *Learning Networks of Statistical Couplings in Protein Fold Families using L1-regularization*. Proceedings of 3DSIG Structural Bioinformatics and Computational Biophysics.

[17] Andrew Gentles, Ash Alizadeh, **Su-In Lee**, June Myklebust, Catherine Shachaf, Babak Shahbaba, Ronald Levy, Daphne Koller and Sylvia Plevritis (2009). *A pluripotency signature predicts histologic transformation and influences survival in follicular lymphoma patients*, Blood 114(15):3158-66. **impact factor 9.060**, PMID: 19636063

[18] **Su-In Lee**, Aimee Dudley, David Drubin, Pamela Silver, Nevan Krogan, Dana Pe'er and Daphne Koller (2009). *Learning a Prior on Regulatory Potential from eQTL Data*, PLoS Genetics, 5(1):e1000358. doi: 10.1371/journal.pgen.1000358. **acceptance rate 25%**, **impact factor 8.517**, PMID: 19180192

[19] **Su-In Lee**, Vassil Chatalbashev, David Vickrey and Daphne Koller (2007). *Learning a Meta-Level Prior for Feature Relevance from Multiple Related Tasks*, International Conference on Machine Learning (ICML). **acceptance rate 20%**

[20] **Su-In Lee**, Varun Ganapathi and Daphne Koller (2007). *Efficient Structure Learning of Markov Networks using L1-Regularization*, Neural Information Processing Systems (NIPS). **acceptance rate 24%**

[21] **Su-In Lee**, Dana Pe'er, Aimee Dudley, Georg Church and Daphne Koller. *Identifying Regulatory Mechanisms using Individual Variation Reveals Key Role for Chromatin Modification*, Proceedings of the National Academy of Sciences (PNAS), 103(38):14062-7. **acceptance rate 19%**, **impact factor 9.737**, PMID: 16968785

[22] **Su-In Lee**, Honglak Lee, Pieter Abbeel and Andrew Ng (2006). *Efficient L1 Regularized Logistic Regression*. Proceedings of the 21th National Conference on Artificial Intelligence (AAAI). **acceptance rate 21%**

[23] James Galagan, Sarah Calvo, Christina Cuomo, Li-Jun Ma, Jennifer Wortman, Serafim Batzoglou, **Su-In Lee** et al. (2005). *Sequencing of Aspergillus nidulans and comparative analysis with A. fumigatus and A. oryzae*, Nature, 438(7071), 1105-1115. **impact factor 32.438**, PMID: 16372000

[24] **Su-In Lee** and Serafim Batzoglou (2004). *ICA-based Clustering of Genes from Microarray Expression Data*. Proceedings of Neural Information Processing Systems (NIPS). **acceptance rate 27.6%**

[25] **Su-In Lee** and Serafim Batzoglou (2003). *Application of Independent Component Analysis to Microarrays*, Genome Biology, 4(11), R76. **impact factor 10.3**

[26] **Su-In Lee** and Soo-Young Lee (2000). *Top-Down Attention Control at Feature Selection*, Proceedings of IEEE International Workshop on Biologically Motivated Computer Vision (BMCV).

[27] **Su-In Lee** and Soo-Young Lee (2000). *Biologically Inspired Neural Network Approach using Feature Extraction and Top-Down Selective Attention for Robust Optical Character Recognition*, Proceedings of Humantech Paper Competition held by Samsung Electronics, Inc. **Gold prize (Winner of the Best Paper Award)**

PAPERS UNDER REVIEW

[28] Kean Ming Tan, Palma London, Karthik Mohan, **Su-In Lee**, Maryam Fazel and Daniela Witten. *Learning Graphical Models with Hubs*, submitted to Journal of Machine Learning Research.

[29] Safiye Celik, Benjamin A. Logsdon and **Su-In Lee**. *Module Graphical Lasso*, submitted to AI & Statistics 2014.

PAPERS IN PREPARATION

[30] Maxim Grechkin and **Su-In Lee**. *DISCERN: Identifying Perturbed Genes in the Regulatory Networks from Gene Expression Data*, to be submitted to PLoS Computational Biology.

[31] Benjamin Logsdon, Andrew Gentles, Sofia Alexandrova, C. Anthony Blau, Pamela Becker and **Su-In Lee**. *Identifying Network-based Features Identifies a Novel Marker for a Chemotherapy Drug*

[32] Pamela Becker, Benjamin Logsdon, Vivian Oehler, Christopher Miller, Sylvia Chien, Timothy Martins, C. Antholny Blau, and **Su-In Lee**. *System-level Understanding of Sensitivity to Chemotherapy Drugs in Acute Myeloid Leukemia*

[33] **Su-In Lee**, Sulin Wu, Thomas Drake and Daphne Koller. *PhenoNet: Reconstructing a Transcriptional Basis for Complex Traits*

[34] Safiye Celik, Benjamin Logsdon and **Su-In Lee**. *Identifying Module-Level Gene Interaction in Cancer*

[35] Benjamin Logsdon, Stephanie Battle, Mara Rendi, David Hawkins and **Su-In Lee**. *An Integrative Approach to Identifying Common Mechanisms across Heterogeneous Cancer Types*

[36] Benjamin Logsdon, Richard Muscat, Ray Monnat, David Hawkins, Georg Seelig and **Su-In Lee**. *Chromatin Hubs Identifies Novel Therapeutic Targets of Cancer Metastasis*

ACTIVE PROJECTS

Efficient optimization of graphical lasso, student: Maxim Grechkin (CSE), Palma London (EE), collaborators: Maryam Fazel (EE), Daniela Witten (CSE).

Joint module graphical lasso, student: Safiye Celik (CSE). collaborator:

Patient-specific cancer driver mutation identification, student: Patricio Velez (CSE).

Identifying hub genes in acute myeloid leukemia, postdoc: Benjamin Logsdon (GS), collaborators: Andrew Gentles (Stanford), C. Anthony Blau (Medicine), Pamela Becker (Medicine).

Identification of chromatin hubs, postdoc: Benjamin Logsdon (CSE), student: Scott Lundberg, collaborators: Ray Monnat (Pathology), David Hawkins (Genome Sciences), Georg Seelig (EE).

Identifying novel markers for mesenchymal stem cell in ovarian cancer, postdoc: Benjamin Logsdon, student: Stephanie Battle (GS), collaborators: David Hawkins (GS), Mara Rendi (Medicine).

Systems understanding of yeast evolution, collaborator: Maxim Grechkin (CSE), collaborator: Maitreya Dunham (GS).

Personalized treatment of acute myeloid leukemia, postdoc: Benjamin Logsdon (CSE), collaborators: Pamela Becker (Medicine), C. Anthony Blau (Medicine).

Analysis of tumor images, student: Ezgi Mercan (CSE), collaborators: Linda Shapiro (CSE), Joann Elmore (Medicine).

RESEARCH SUPPORT

NIH T32 HL 007312 *Experimental Pathology of Cardiovascular Disease*, Mentor (PI: Steve Schwartz), Current.

NIH/NHGRI Genome Training Grant, Mentor (Genome Science Department), Current.

Royalty Research Fund, *Structured Graphical Lasso: Models, Optimization, and Applications*, co-PIs: Daniela Witten, Maryam Fazel and Su-In Lee, Current.

NIH/NIGMS R01, *Probabilistic Approach to Integrating Heterogeneous Data for Systems Medicine*, PI: Su-In Lee, Pending.

American Society of Cancer, *Statistical Methods to Integrate Heterogeneous Data for Systems Medicine*, PI: Su-In Lee, Pending.

NSF Advances in Bioinformatics *A Probabilistic Approach to Meta-Analysis of Biological Network Inference*, PI: Su-In Lee, Pending.

eScience/ITHS Small Pilot Grant *Unsupervised Feature Learning from High-dimensional Biological Data for Personalized Medicine*, PI: Su-In Lee, Pending.

eScience/ITHS Small Pilot Grant *Machine Learning in the Operating Room*, co-PIs: Jerry Kim and Su-In Lee, Pending.

NIH/NIDCR FaceBase2 U01 *Feature-Based Integration of Image and Genomic Data for Craniofacial Research*, co-investigator (PI: Linda Shapiro), Pending.

NIH/NCI P01 *Human RECQ Helicases in Biology and Oncology*, co-investigator (PI: Ray Monnat), Completed.

NIH/NHGRI R01 *Cellular Adhesion Molecules: Genes, Phenotypes, and Coronary Atherosclerosis*, co-investigator (PI: Alex Reiner), Completed Completed.