

**Seeds: "You Choose" Awards**

**"Biophysics, a male-dominated scientific discipline: a woman's perspective"**

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## Abstract

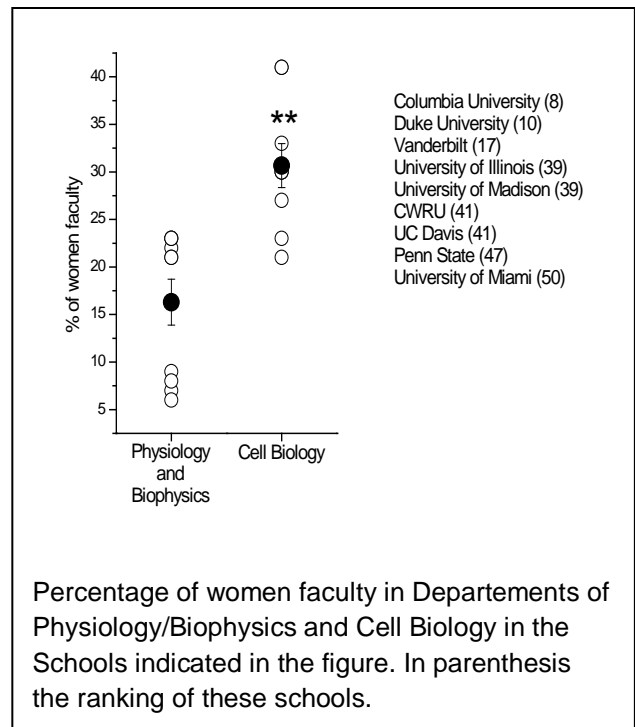
Women faculty are under-represented in Academia especially at the higher ranks. The under-representation of women in Academia is striking in disciplines that are historically male-dominated. In Biomedical science, the discipline with the fewest women faculty is Physiology/Biophysics. Junior women faculty in this heavily male-dominated discipline have to learn, even more than their peers, to effectively negotiate with men in order to advance their career. I propose here to invite established, successful women in Physiology/Biophysics for forums. Each forum will include a seminar on their science and a separate Q/A session with emphasis on strategies to maximize women's impact in science.

## Goals

The American Association of Medical Colleges reports that in 2008 only 17.6% of full professors, 29.3% of associate professors and 40.6% of assistant professors are women throughout biomedical departments. Interestingly, the percentage of women is much higher at the lower instructor rank (51.4%), suggesting that there is a dearth of trained, capable women within these disciplines.

(<http://www.aamc.org/data/facultyroster/usmsf08/usmsf08.htm>).

The percentage of women faculty in historically male-dominated disciplines is even lower than across biomedical science as a whole. I randomly selected 9 Medical Schools across the country, that are ranked higher than the University of Miami. I then obtained primary faculty demographics from the websites of Departments of Cell Biology (or equivalent) and Physiology and Biophysics (or equivalent). I found that the percentage of women faculty in Physiology and Biophysics is significantly lower than in Cell Biology (Fig.1). According to the American Association of Medical Colleges, Pharmacology Departments also see very poor women representation (% of women faculty: Pathology>Anatomy>Microbiology>Biochemistry>Pharmacology>Physiology and Biophysics). *Clearly, the picture is not rosy for any biomedical discipline. But it is particularly dire for my particular discipline.*



Because the percentage of women faculty in Physiology and Biophysics is so low, junior women in these disciplines have little opportunities to be mentored by women. In a male-dominated environment, mentoring by women is important not only because some issues are more relevant to women (family/career balance for example), but perhaps more significantly, because of existing social structures and fundamental differences of approach. The goal of this proposal is expose young women (junior faculty, postdocs and students) to successful women faculty in Physiology/Biophysics. More specifically:

- 1) Seminars will be organized over the span of 1.5 years, inviting three successful women in the field of Physiology and Biophysics. The seminar presentation will expose young women in these fields to cutting edge research conducted by women.
- 2) The Q/A session that will follow each seminar will have a mentoring goal. Junior faculty, postdocs and students will have the opportunity to ask the speaker what were her major challenges in developing her career in a male-dominated environment and what skills she developed to successfully negotiate with men.

3) Another goal for these forums is for junior researchers to establish a long-term relationship with women in Physiology/Biophysics. These relationships will likely be valuable sources of mentoring.

4) The forums will be advertised across the three campuses at UM and the mentoring Q/A sessions will be emphasized, so that junior women at UM in other disciplines will have the opportunity to interact with successful and established women scientists. For example, women in the Biochemistry Department at UM could also benefit from the Q/A sessions: this is another department with low number of women faculty (21 faculty, only 3 women).

Eunji Lim (Industrial Engineering) was awarded the "You choose award" in 2009 to invite speakers for departmental seminars. My proposal is fundamentally different from hers in three ways: 1) only women speakers will be invited, 2) the speakers will be Physiologist/Biophysicists, 3) seminars will be followed by mentoring Q/A sessions.

### **How the funds will further my career and scholarly goals:**

The award will serve to further my academic goals in the following ways:

1) As a junior faculty, I am learning how to navigate the Academic world and how to best use my skills to become a productive faculty member and a recognized scientist. More specifically, I am learning how to balance all my duties (research, teaching and service) to advance my career. In negotiating my duties, I recognize that my approach as a woman is different than a man's approach and that sometimes it does not serve well the goal of advancing my career. Mentoring by established successful women in my discipline is essential for learning negotiation skills. Unfortunately, in my field there are very few women and thus I have little opportunities to receive this type of mentoring. These forums will expose me to women scientists that have become successful and that have impacted science in a significant way. These women developed skills to negotiate and interact successfully with men. My goal is to establish with these women scientist a long term relationship that can serve me well throughout my career.

2) As a woman I recognize that there are issues that impinge on women's more than men' career. One example is family life and how to balance family and career. This issue is relevant regardless of the presence of children, as it is well-recognized that even in this age women carry more than men the weight of family life. These forums will expose me to women scientists that have developed strategies to successfully advance their career while having a family.

3) It is well-recognized that one of the aspects of scholarly activities is to build a network of interactions with scientists in one's scientific area of expertise. Through these forums I will have the opportunity to build relationships with esteemed researchers in Physiology/Biophysics and thus expand my network.

### **Budget**

Travel: Funds are requested to support the visit of three outside speakers to the University of Miami

Estimated airfare	\$500
Two nights hotel @ \$150/ night	\$300
Total per invited speaker	\$800
Total for 3 speakers:	\$2,400

\$ 100 is budgeted for snacks and drinks (non-alcoholic) for the Q/A sessions that will follow the seminars.

INSTITUTION AND LOCATION	DEGREE	YEARS
University of Milan, Italy	BS and MA in Biology	1987-1992
University of Florence, Italy	PhD in Human Physiology	1992-1997
Vanderbilt University, Nashville, TN, USA	Postdoctoral training: Biophysics and Physiology of ion channels	1998-2001

### Appointments

2006-present	Assistant Professor, University of Miami, FL
2001-2006	Research Assistant Professor, Rutgers University, NJ
1998-2001	Postdoctoral Fellow, Vanderbilt University, TN
1997-1998	Postdoctoral Fellow, MetroHealth Medical Center/CWRU, OH
1992-1997	Graduate Student, University of Florence, Italy

### Publications

#### **10 selected publications (31 total)**

- 1) Wang Y. and Bianchi L., (2009) Insights into the molecular determinants of proton inhibition in an acid inactivated DEG/ENaC channel. **Biochemistry**, 48 (42), 10005–10013. PMID: 19769407
- 2) Wang Y., Apicella A. Jr, Lee S-K, Ezcurra M., Slone D., Goldmit M., Schafer W. R., Shaham S., Driscoll M. and Bianchi L. \* (2008) A glial DEG/ENaC channel functions with neuronal channel DEG-1 to mediate specific sensory functions in *C. elegans*. **European Molecular Biology Organization (EMBO) Journal**, 27(18):2388-99. PMID: 18701922. \* *Corresponding author*
- 3) Zhang W.\*, Bianchi L.\*, Lee W.-H., Wang Y., Israel S. and Driscoll M. (2008) Inter-subunit interactions between DEG/ENaCs induce synthetic neurotoxicity. **Cell Death and Differentiation**, Nov;15(11):1794-1803. PMID: 18670436 \**These two authors contributed equally to this work*
- 4) Tsechpenakis G.\*, Bianchi L.\*, Metaxas D. and Driscoll M. (2008) A novel computational approach for simultaneous tracking and feature extraction of *C. elegans* populations in fluid environments. **Institute of Electrical and Electronics Engineers (IEEE) Transactions in Biomedical Engineering**, 55: 1539-1549. PMID: 18440900. \**These two authors contributed equally to this work*
- 5) Bianchi L., (2007) Mechanotransduction: touch and feel at the molecular level as modeled in *Caenorhabditis elegans*. **Molecular Neurobiology**, 2007 Dec;36(3):254-71. PMID: 17955200
- 6) Royal D. C.\*, Bianchi L.\*, Royal M. A., Lizzio M., Mukherjee G., Nunez, Y. O. and Driscoll M. (2005) Temperature-sensitive mutant of the *Caenorhabditis elegans* neurotoxic MEC-4(d) DEG/ENaC channel identifies a site required for trafficking or surface maintenance. **The Journal of Biological Chemistry** 280(51):41976-86. PMID: 16239217. \**These two authors contributed equally to this work*
- 7) Bianchi L., Gerstbrein B., Frøkjær-Jensen C., Royal D. C., Mukherjee G., Royal M. A., Xue J., Schafer W. R. and Driscoll M. (2004) The Neurotoxic MEC-4(d) DEG/ENaC Na<sup>+</sup> channel conducts calcium: implications for necrosis initiation. **Nature Neuroscience**, 7 (12): 1337-1344. PMID: 15543143
- 8) Suzuki H., Kerr R. A., Bianchi L., Frøkjær-Jensen C., Slone D., Xue J., Gerstbrein B., Driscoll M. and Schafer W. R. (2003) *In vivo* functional analysis of *C. elegans* mechanosensory neurons reveals a specific role for MEC-4 channels in the process of gentle touch sensation. **Neuron**, 39(6):1005-1017. PMID: 12971899
- 9) Bianchi L., S-M. Kwok, Driscoll M., and Sesti F. (2003). A potassium channel-MiRP complex controls neurosensory function in *Caenorhabditis elegans*. **The Journal of Biological Chemistry**, 278: 12415 – 12424. PMID: 12533541
- 10) Bianchi L., and Driscoll M., (2002) Protons at the gate: DEG/ENaC ion channels help us feel and remember. Review, **Neuron**, 34: 337-340. PMID: 11988165

## **Synergistic activities**

**Innovation in teaching and training.** I organized the “Hille” club, a weekly meeting among students and postdocs to discuss chapters of the book “Ion channels of excitable membranes” by Bertil Hille, in 2000 at Vanderbilt University and in 2003 at Rutgers University. “Ion channels of excitable membranes” by B. Hille provides an extensive review of what is known about the physiology and biophysics of ion channels. However, this book is usually not adopted in courses because it is very detailed. By organizing this mini-course I gave students and postdocs the opportunity to acquire a much more in depth knowledge and understanding of the mechanisms that regulate the activity and modulation of ion channels.

Between 2003 and 2006, I supervised two undergraduate Honor Thesis students at Rutgers University. These students worked on individual projects that were subsequently presented at conferences. I adopted a similar training strategy at the University of Miami. The undergraduate students in my lab (I have had 3 so far, plus one high school student) are trained to carry on their own projects and to become as independent as possible both in scientific thinking and techniques. Naturally, these students are heavily supervised due to their relative little experience, however this training strategy pushes them to become independent thinkers. In addition, by feeling responsible for their own projects, students become very interested in the subject and eager to learn more.

**Development and/or refinement of research tools.** At Vanderbilt University while I was a postdoc, I was one of the first scientists to implement the use of *C. elegans* cell culture for electrophysiological and pharmacological analyses. I was later asked to write a book chapter in the *Wormbook* detailing the protocols for extraction and culture *in vitro* of *C. elegans* cells. This book is available online and it is an valuable source for researchers that use *C. elegans* as a model organism.

Bianchi L.\* and Driscoll M. (2006) Culture of embryonic *C. elegans* cells for electrophysiological and pharmacological analyses. Book Chapter in ***WormBook***, ed. The *C. elegans* Research Community, (<http://www.wormbook.org>). [http://www.wormbook.org/chapters/www\\_culture/culture.html](http://www.wormbook.org/chapters/www_culture/culture.html) \* *Corresponding author*

I collaborated with G. Tsechpenakis (UM), M. Driscoll (Rutgers) and D. Metaxas (Rutgers) to develop a method using computer vision tools to track *C. elegans* populations in fluid environments for classification of behavioral phenotypes. This tool is capable of detecting subtle phenotypes and can be used in genetic screens. The software we developed is called LocoWorm and remains the only one so far that can track multiple animals at the same time (see publication n.4). Multiple laboratories have already requested this software.

**Service to the scientific and engineering community outside of my immediate organization.** I served as reviewer for the following journals: Biophysical Journal, Journal of Physiology, Nature Neuroscience, Journal of Structural Biology, European Molecular Biology Organization (EMBO) Journal, BioMedical Center (BMC), Structural Biology, Biochimica et Biophysica Acta (BBA), Biomembranes, Journal of Neurophysiology, Current Biology and Journal of Biological Chemistry. I also served as ad hoc reviewer in the NIH study section Biophysics of Neuronal Systems (2008-2009). Finally, as served twice as session chair and twice in the abstract selection committee for the *C. elegans* meeting.

## **Collaborations and other Affiliations**

- (i) Collaborators (last 48 months): Ana Diez-Sampedro, Ass. Professor, University of Miami; Mandayam A. Srinivasan, Senior Research Scientist, MIT; Gavriil Tsechpenakis, Res. Ass. Professor, University of Miami.
- (ii) Graduate advisor, Enzo Wanke, PhD; Postdoc advisor, Al George Jr., PhD
- (iii) Advisor to: Postgraduate: Ying Wang, MD PhD    Graduate: Han Lu

## **Current funding**

American Cancer Society **RGS-09-043-01-DDC** (1/1/2009-12/31/2012) “Molecular dissection of pain signals in *C. elegans*”, Laura Bianchi, PI