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### Education

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University of California, Berkeley    Ph.D. Molecular and Cell Biology, May 1995  
Stanford University                    B.S. Biological Sciences, 1982

### Professional Experience

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2022-present Research Fellow, Biocomplexity Institute, Luddy School of Informatics, Computing, and Engineering, Indiana University, Bloomington

- Simulation study of cell biomechanics in the development and maintenance of organismal form. (Fellowship sponsor: James Glazier.)

2009-2019 Software engineer at the following companies/projects:

- Medium (web publishing platform)
- TiVo, Rovi (TV & movie aggregation / discovery / streaming)
- GREE International (mobile games)
- Kachingle (micropayments startup)
- Career transition project: Camera control module for  $\mu$ Manager open source microscopy image acquisition software.

Main technologies: Native iOS development in Swift, Objective C, and Haxe • C++ • web development with JavaScript/jQuery, HTML5, CSS3 animations, PHP, MySQL • browser extensions • version control with git, perforce.

(Details in my industry-style resume, available at <http://sharonminsuk.com/>)

2004-2006 Postdoctoral Fellow, Konrad Lorenz Institute for Evolution and Cognition Research, Altenberg, Austria

- A computational cell model for the evolution of multicellularity and development (in C).

1997-2003 Postdoctoral Fellow, Dept. of Biology, Indiana University

(and Visiting Scholar, School of Biological Sciences, University of Sydney, Australia; and affiliate of NSF Integrative Graduate Education and Research Traineeship (IGERT) Program in Evolution, Development, and Genomics)

- Evolution of body plan development in larval and adult echinoderms. (Postdoctoral fellowship sponsor: Rudolf Raff.)

1989-1997 University of California, Berkeley, Dept. of Molecular and Cell Biology  
(PhD Student, 1989-1995; and Visiting Scholar, Jun 1996 – Feb 1997)

- Computer simulation of biomechanical cell interactions during notochord development (in C). (Project advisor: George Oster.)

- Gastrulation mechanisms and evolution in Pipid frogs (*Xenopus* and *Hymenochirus*). (PhD thesis advisor: Ray Keller.)

1980-1989 Software engineer at the following institutions:

- Areca Science Corporation (physiological data collection and analysis software)
- Teaching Tools Software (pre-school & K-6 educational software)
- Stanford University Mathematics Dept. (calculus tutorial software)
- Indianapolis Children's Museum (physics simulation games)
- Beckman Instruments, Bioproducts Dept. (database for pharmaceutical research results)

Main technologies: 6502 Assembly language, Pascal, BASIC.

(Details in my industry-style resume, available at <http://sharonminsuk.com/>)

### Teaching

2008 Adjunct Professor, Merritt College, Oakland, CA

- Microscopy practicum, as part of the Merritt Microscopy Program • Guest lecturer, Theory and Practice of Microscopy.

2007-2008 Adjunct Professor, Saint Mary's College, Moraga, CA

- intro cell/molecular/genetics (lab) • intro organisms and evolution (lab) • upper division molecular biology (lecture and lab) • biology of women (lab).

2002 Adjunct Professor, Indiana University, Bloomington

- Biological Mechanisms (large introductory cell/molecular/genetics course; 250 students; supervised 10 undergraduate and 2 graduate teaching assistants).

1990-1991 Graduate Teaching Assistant / Lab Instructor, University of California, Berkeley

- Introductory Biology • Developmental Biology.

1980-1982 Undergraduate Teaching Assistant / Lab Instructor, Stanford University

- Evolutionary Biology • Experimental Biology.

### Awards and Honors

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#### Grants

Postdoctoral Fellowship, Konrad Lorenz Institute for Evolution and Cognition Research, Altenberg, Austria, 2004-2006 (€55,900 [~\$67,000] over 2 years, plus travel support).

NIH, NRSA Postdoctoral Fellowship, 1997-2000 (\$90,228 over 3 years).

University of California Regents Fellowship, 1990 (full coverage of 1 year stipend and tuition).

#### Other honors

Reviewed research grant applications (undergraduate institutions) for the Murdock Trust and have received reviewing inquiries from *Development* and Wadsworth (textbook publisher).

Best Student Paper Award, American Society of Zoologists, 1994, for platform presentation at annual meeting (see below).  
 Hughes Foundation Predoctoral Fellowship, honorable mention, 1990.  
 NSF Predoctoral Fellowship, honorable mention, 1989, 1990.  
 Outstanding Software of the Year Award, *Learning Magazine*, 1983 (for "Square Pairs", a memory game I developed while at Teaching Tools Software).

## Publications

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- Minsuk, S. B., F. R. Turner, E. C. Raff, and R. A. Raff. Restoration of ancestral cell signaling pathways in chimaeric larvae. (In preparation.)
- Minsuk, S. B., F. R. Turner, M. E. Andrews, and R. A. Raff. (2009). Axial patterning of the pentaradial adult echinoderm body plan. *Dev. Genes Evol.* 219:89-101.
- Minsuk, S. B. (2005). Toward an open-ended and mechanically realistic model of biological cells. In: Workshop on Artificial Chemistry and Its Applications. The 8th European Conference on Artificial Life (ECAL) Workshop Proceedings. Mathieu Capcarrere (ed). [http://sharonminsuk.com/Software/Minsuk\\_05\\_ECAL.pdf](http://sharonminsuk.com/Software/Minsuk_05_ECAL.pdf).
- Minsuk, S. B., M. E. Andrews, and R. A. Raff (2005). From larval bodies to adult body plans: patterning the development of the presumptive adult ectoderm in the sea urchin larva. *Dev. Genes Evol.* 215:383-392.
- Minsuk, S. B. and R. A. Raff (2005). Co-option of an oral-aboral patterning mechanism to control left-right differentiation: the direct-developing sea urchin *Heliocidaris erythrogramma* is sinistralized, not ventralized, by  $\text{NiCl}_2$ . *Evol. Dev.* 7:289-300.
- Nielsen, M. G., E. Popodi, S. Minsuk, and R. A. Raff (2003). Evolutionary convergence in *Otx* expression in the pentameral adult rudiment in direct-developing sea urchins. *Dev. Genes Evol.* 213:73-82.
- Minsuk, S. B. and R. A. Raff (2002). Pattern formation in a pentameral animal: induction of early adult rudiment development in sea urchins. *Dev. Biol.* 247:335-350.
- Minsuk, S. B. and R. E. Keller (1997). Surface mesoderm in *Xenopus*: a revision of the stage 10 fate map. *Dev. Genes Evol.* 207:389-401.
- Poznanski, A., S. Minsuk, D. Stathopoulos, and R. Keller (1997). Epithelial cell wedging and neural trough formation are induced planarly in *Xenopus*, without persistent vertical interactions with mesoderm. *Dev. Biol.* 189:256-269.
- Minsuk, S. B. and R. E. Keller (1996). Dorsal mesoderm has a dual origin and forms by a novel mechanism in *Hymenochirus*, a relative of *Xenopus*. *Dev. Biol.* 174:92-103. [cover article]
- Minsuk, S. B. (1995). A Comparative Study of Gastrulation and Mesoderm Formation in Pipid Frogs. Ph.D. thesis, University of California, Berkeley.
- Weliky, M., S. Minsuk, R. Keller and G. Oster (1991). Notochord morphogenesis in *Xenopus laevis*: simulation of cell behavior underlying tissue convergence and extension. *Development* 113:1231-1244.
- Oster, G., M. Weliky, and S. Minsuk (1990). Morphogenesis by cell intercalation. In: 1989 Lectures in Complex Systems. Santa Fe Institute Studies in the Sciences of Complexity Series, Lect. Vol. II. 501-512. Erica Jen (ed). Reading, MA: Addison-Wesley.

## Professional Presentations and Abstracts

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### Talks (\* invited)

- \* Biology 101 (informal discussion of biology, mostly cell and molecular, for a diverse computer-tech-oriented audience). Grey Thumb Silicon Valley, Menlo Park, CA, October 2008
- \* Simulating cell behavior: towards modeling the evolution of development. Grey Thumb Silicon Valley, San Francisco, CA, June 2008.
- \* Simulating cell behavior: towards modeling the evolution of development. Old Dominion University, Norfolk, VA, April 2006.
- Toward an open-ended and mechanically realistic model of biological cells. The 8th European Conference on Artificial Life (ECAL), Sep. 2005. (Minsuk, S. B. (2005). In: Capcarrere, M. (ed.): The 8th European Conference on Artificial Life (ECAL) Workshop Proceedings.)
- Patterning the pentaradial adult sea urchin body plan. Society for Integrative and Comparative Biology, Jan. 2005. (Minsuk, S. B. and R. A. Raff (2004). Integr. Comp. Biol. 44(6):607.)
- Hen's teeth and sea urchin's toes. Society for Integrative and Comparative Biology, Jan. 2004. (Minsuk, S. B., E. C. Raff, and R. A. Raff (2003). Integr. Comp. Biol. 43(6):835.)
- \* Simulating the evolution of multicellularity and development. Santa Fe Institute, Santa Fe, NM, Mar. 2003.
- \* Simulating the evolution of multicellularity and development. Konrad Lorenz Institute for Evolution and Cognition Research, Vienna, Austria, Feb. 2003.
- A new angle on axial patterning: co-option of a dorsal-ventral patterning mechanism to control left-right differentiation in a direct-developing sea urchin. Society for Integrative and Comparative Biology, Jan. 2003. (Minsuk, S. B. and R. A. Raff (2002). Integr. Comp. Biol. 42(6):1280.)
- Inductive signals initiating adult body plan development in echinoderms. Society for Integrative and Comparative Biology, Jan. 2002. (Minsuk, S. B. and R. A. Raff (2001). Am. Zool. 41(6):1528.)
- Inductive signals in rudiment development in the direct-developing sea urchin *Heliocidaris erythrogramma*. Fourth North American Echinoderm Conference, Aug. 2001. (Minsuk, S. B. and R. A. Raff (2001). Gulf of Mexico Science 19(2):179.)
- Mechanisms of early adult development in a pentameral animal. Evolution 2000 (Society for the Study of Evolution).
- Induction and fate specification during early development of the adult sea urchin. Developmental Biology of the Sea Urchin XII, May 1999.
- "Surface mesoderm" in Pipid frogs. — Winner of Best Student Paper Award. American Society of Zoologists. (Minsuk, S. B. and R. E. Keller (1994). Am. Zool. 34(5):49A)

### Posters

- First steps toward a generalized model cell for evo-devo computer simulations. Society for Integrative and Comparative Biology, Jan. 2005. (Minsuk, S. B. (2004). Integr. Comp. Biol. 44(6):729.) (View entire poster, with QuickTime movies of simulations, at <http://sharonminsuk.com/Software/kli-sicb2005/>.)

- A proposal for an artificial life simulation of evolving multicellular ontogeny. Artificial Life VIII (8th International Conference on the Simulation and Synthesis of Living Systems), Dec. 2002. (Abstract)
- Inductive signals initiating adult body plan development in echinoderms. Developmental Basis for Evolutionary Change (U. Chicago special symposium, 2001).
- Inductive interactions during development of the sea urchin adult pentameral body plan. Society for Developmental Biology. (Minsuk, S. and R. Raff (1998). Dev. Biol. 198:199.)
- Xenopus* retains a latent ancestral program of mesoderm morphogenesis still expressed during normal development in its close relative *Hymenochirus*. Bodega Marine Lab, Bodega Bay, CA, "Evolution of Development: Molecules, Mechanisms, Phylogenetics", 1995.
- Epithelial participation in mesoderm formation in a relative of *Xenopus laevis*, by a novel morphogenetic mechanism. American Society for Cell Biology. (Minsuk, S. B. and R. E. Keller (1994). Molecular Biology of the Cell 5:100a.)
- Gastrulation in the frog *Hymenochirus*. American Society of Zoologists, 1992. (Minsuk, S. B. (1992). Am. Zool. 32(5):84A.)
- A computer simulation of notochord formation in *Xenopus laevis*: testing proposed rules of morphogenesis. Society for Developmental Biology, 1990.

#### Professional Societies

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International Society for Artificial Life. 2002-2008, 2020-present.