

Curriculum Vitae

Timothy L. Karr

Academic Appointments:

- 2011- Affiliate Professor (joint appointment with ASU)
Center for Proteomics
The Translational Genomics Research Institute (TGen)
Phoenix, AZ
- 2008 - Associate Professor Research
The Biodesign Institute
Centers for Infectious Diseases and Vaccinology and
Evolutionary Medicine and Informatics
Arizona State University
Tempe, AZ
- 2002-08 Reader in Biology
Department of Biology & Biochemistry
University of Bath Bath, England
- 2000-01 Visiting Professor, Kyoto Institute of Technology
Drosophila Genetics Resource Center
- 1996-03 Assistant Professor
Department of Organismal Biology and Anatomy
The University of Chicago
Chicago, IL 60637
- 1994-96 Research Associate (Assistant Professor)
Department of Organismal Biology and Anatomy
University of Chicago
Chicago, IL 60637
- 1987-94 Assistant Professor
Department of Biochemistry
University of Illinois
Urbana, IL 61801

Education:

- 1971-74 Associate of Arts
De Anza Junior College
De Anza, California
- 1974-76 Bachelor of Arts (Biochemistry and Molecular Biology)
University of California, Santa Barbara
- 1977-81 Doctor of Philosophy Chemistry
UC Santa Barbara (with Professor Daniel L. Purich)

Postdoctoral Training:

- 1981-84 Jane Coffin Childs Research Fellow
Department of Biochemistry and Biophysics
UC San Francisco (with Professor Bruce Alberts)
- 1985-87 Weingart Fellow
Department of Biochemistry and Biophysics,
UC San Francisco (with Professor Thomas Kornberg)

Honors and Awards:

- 2002-07 Wolfson-Royal Society Merit Awardee, University of Bath (*total award, £475,000*).
- 1997-98 Louis Block Fund, Principal Investigator. University of Chicago. "Acquisition and Operation of a light microscopy and digital Imaging Facility" (*total award, \$251,699 USD*).
- 1999-00 Academic Technology Innovation. Principal Investigator. Project title, "Application and Development of a Biological Database for the CAVE" (*total award, \$251,699 USD*).
- 1990-94 Appointed Faculty Fellow, Neuronal Pattern Analysis, Beckman Institute for Advanced science and Technology, University of Illinois, Urbana, IL.
- 1991-94 IBM Research Board Award, Beckman Institute, University of Illinois, Urbana, IL.
- 1986-87 American Cancer Society Senior Fellowship, with Thomas Kornberg, University of California, San Francisco.
- 1984-86 Weingart Fellowship, with Thomas Kornberg, University of California, San Francisco.
- 1981-84 Jane Coffin Childs Memorial Fund for Medical Research Fellowship, with Bruce Alberts, University of California, San Francisco.
- 1980-81 Earl C. Anthony Graduate Research Fellow, with Daniel Purich, University of California Santa Barbara.

Invited Talks (selected):

Plenary/Keynote/International Symposia (and Organizer) .

- 2011 Invited Speaker, University of Oslo, Natural History Museum, Oslo, Norway.
- 2011 Invited Speaker, Humboldt University Berlin, Institute of Theoretical Biology, Berlin, Germany
- 2010 Plenary Speaker, National Japanese Drosophila Genetics Resource Center, Kyoto, Japan.
- 2010 Invited Speaker, 11th International Symposium on Spermatology, Okinawa, Japan
- 2009 Invited Speaker, Molecular Andrology International Workshop, Giessen, Germany
- 2006 Plenary Speaker, Royal Entomological Society annual meetings, London, UK.
- 2007 Society for Integrative and Comparative Biology, Tempe, AZ. **Organizer** (S. Pitnick, co-Organizer) society-wide symposium entitled, "Evolutionary and Functional Genomics of Sperm, Sperm Storage and Fertilization".
- 2006 Plenary Speaker, 10th International Symposium on Spermatology, Madrid, Spain.
- 2006 Society for Molecular Biology and Evolution, Arizona State University. **Organizer**, "Evolution of Spermatogenesis".
- 2005 Keynote Speaker, International Workshop, "Sperm and seminal fluid: what males produce and how females respond". Monte Verita, Switzerland.
- 2003 Plenary Speaker, 44th Annual Drosophila Research Conference, Chicago, IL.
- 2003 Invited speaker, Insect and Symbiosis Symposium, Tokyo, Japan.
- 2003 Invited speaker, 18th Annual European Drosophila Research Conference, Goettingen, Germany.
- 2003 Invited speaker, Gordon Conference on Fertilization and Activation of Development.

Departmental invited seminars (last 5 years)

- May 2012. "Sperm Systems Biology". Department of Integrative Biology, University of Colorado, Denver, CO. USA.
- Dec. 2011. "Why Sperm? A critical examination of paternal effects and the evolution of sex". Department of Biology, Emory University, Atlanta, GA. USA.
- Nov. 2011. "New frontiers in and new surprises from the sperm proteome". Natural History Museum, University of Oslo, Oslo, Norway.
- Nov. 2011. "Transkingdom sex and other tales of 'viral' infections, bacteria and the spermatozoa". Institute of Theoretical Biology, Humboldt Universitaat, Berlin, GDR.
- Oct. 2011. "Beyond fertilization: Sperm as conduits for rapid protein evolution" Department of Molecular Cell & Developmental Biology, UC Santa Cruz., Santa Cruz, CA.
- Nov. 2010. "Transkingdom sex and other tales of viral infections, bacteria and the spermatozoa". Department of Microbiology and Molecular Genetics, Michigan State University, East Lansing, MI.
- Oct. 2010. "Unraveling sperm function and evolution one sperm proteome at a time". Department of Molecular Biosciences, University of Kansas, Lawrence, KS.
- Dec 2009. "The 3 Kingdoms of Sperm". Molecular & Cellular Biology Colloquium, Arizona State University, Tempe, AZ.
- Feb 2007. "Functional genomics and evolution of the sperm proteome" Department of Molecular and Cellular Biology, University of Arizona, Tucson, AZ.
- Mar 2007. "Sperm- the ultimate Trojan Horse" New Mexico State University, USA.
- April 2007. "*Wolbachia*, sperm and fertilization- the ultimate symbiosis?" UC Merced, USA.

Outreach and Public Discourse:

Work from the laboratory has been published in the popular press including Discover Magazine, Science Digest, Royal Society Magazine and the American Naturalist. Published data has also appeared in all editions of "Developmental Biology, Gilbert, S., Sinauer Press, including the cover photo in the 2nd Edition), "The Molecular Biology of the Cell, Alberts, et al., Academic Press) text books, among others. Recent results and discoveries have been covered by both the popular and scientific press including:

- Gene evolution: How to teach an old gene a new trick, Nature Reviews Genetics 6, 166-166 (01 Mar 2005).
- Parasite infiltrates fruitfly research **Nature 436**, 8 (7 July 2005)
- Cell biology: The secret life of sperm **Nature 436**, 770-771.
- Parsch J, 2009 X Chromosome: Expression and Escape. **PLoS Genet 5(11)**: e1000724. doi:10.1371/journal.pgen.1000724. A "Perspectives" piece written to highlight recent report in PLoS Genetics from our laboratories (see Vibranovski MD, Lopes HF, Karr TL, Long M (2009) Stage-Specific Expression Profiling of Drosophila Spermatogenesis Suggests that Meiotic Sex Chromosome Inactivation Drives Genomic Relocation of Testis-Expressed Genes. **PLoS Genet 5(11)**: e1000731. doi:10.1371/journal.pgen.1000731).

Administrative:

- **Guest Editor**, Proceedings of the National Academy of Sciences 2010-12.
- **Editor**, *Faculty 1000*, Faculty Member (2007- present)
- **Associate Editor**, BMC Genomics (2012 - present)

Publications

Primary Literature

1. Karr, T. L. & Purich, D. L. Examination of tubulin-nucleotide interactions by protein fluorescence quenching measurements. *Biochem Biophys Res Commun* **84**, 957-961 (1978).
2. Karr, T. L., White, H. D. & Purich, D. L. Characterization of brain microtubule proteins prepared by selective removal of mitochondrial and synaptosomal components. *J Biol Chem* **254**, 6107-6111 (1979).
3. Karr, T. L. & Purich, D. L. A microtubule assembly/disassembly model based on drug effects and depolymerization kinetics after rapid dilution. *J Biol Chem* **254**, 10885-10888 (1979).
4. Karr, T. L., Podrasky, A. E. & Purich, D. L. Participation of guanine nucleotides in nucleation and elongation steps of microtubule assembly. *Proc Natl Acad Sci U S A* **76**, 5475-5479 (1979).
5. Karr, T. L. & Purich, D. L. A rapid dilution cuvette for kinetic studies of microtubule disassembly. *Anal Biochem* **104**, 311-314 (1980).
6. Karr, T. L. & Purich, D. L. Rings are not microtubule assembly intermediates: an analysis of the lag phase in GTP-dependent self-assembly of bovine brain tubulin. *Biochem Biophys Res Commun* **95**, 1885-1889 (1980).
7. Karr, T. L., Kristofferson, D. & Purich, D. L. Mechanism of microtubule depolymerization. Correlation of rapid induced disassembly experiments with a kinetic model for endwise depolymerization. *J Biol Chem* **255**, 8560-8566 (1980).
8. Kristofferson, D., Karr, T. L. & Purich, D. L. Dynamics of linear protein polymer disassembly. *J Biol Chem* **255**, 8567-8572 (1980).
9. Karr, T. L., Kristofferson, D. & Purich, D. L. Calcium ion induces endwise depolymerization of bovine brain microtubules. *J Biol Chem* **255**, 11853-11856 (1980).
10. Karr, T. L., White, H. D., Coughlin, B. A. & Purich, D. L. A brain microtubule protein preparation depleted of mitochondrial and synaptosomal components. *Methods Cell Biol* **24**, 51-60 (1982).
11. Kristofferson, D., Karr, T. L., Malefyt, T. R. & Purich, D. L. An automated method for defining microtubule length distributions. *Methods Cell Biol* **24**, 133-144 (1982).
12. Purich, D. L., Terry, B. J., MacNeal, R. K. & Karr, T. L. Characterization of tubulin and microtubule-associated protein interactions with guanine nucleotides and their nonhydrolyzable analogs. *Methods Enzymol* **85 Pt B**, 416-433 (1982).
13. Purich, D. L., Karr, T. L. & Kristofferson, D. Microtubule disassembly: a quantitative kinetic approach for defining endwise linear depolymerization. *Methods Enzymol* **85 Pt B**, 439-450 (1982).
14. Karr, T. L., Ali, Z., Drees, B. & Kornberg, T. The *engrailed* locus of *D. melanogaster* provides an essential zygotic function in precellular embryos. *Cell* **43**, 591-601 (1985).
15. Miller, K. G., Karr, T. L., Kellogg, D. R., Mohr, I. J., *et al.* Studies on the cytoplasmic organization of early *Drosophila* embryos. *Cold Spring Harb Symp Quant Biol* **50**, 79-90 (1985).
16. Ali, Z., Drees, B., Coleman, K. G., Gustavson, E., *et al.* The *engrailed* locus of *Drosophila melanogaster*: genetic, developmental, and molecular studies. *Cold Spring Harb Symp Quant Biol* **50**, 229-233 (1985).
17. Karr, T. L. & Alberts, B. M. Organization of the cytoskeleton in early *Drosophila* embryos. *J Cell Biol* **102**, 1494-1509 (1986).
18. Karr, T. L., Weir, M. P., Ali, Z. & Kornberg, T. Patterns of *engrailed* protein in early *Drosophila* embryos. *Development* **105**, 605-612 (1989).
19. Karr, T. L. & Kornberg, T. B. *fushi tarazu* protein expression in the cellular blastoderm of *Drosophila* detected using a novel imaging technique. *Development* **106**, 95-103 (1989).

20. Glover, D. M., Raff, J., Karr, T. L., O'Neill, S., Lin, H. & Wolfner, M. F. Parasites in *Drosophila* embryos., in *Nature*
21. O'Neill, S. L. & Karr, T. L. Bidirectional incompatibility between conspecific populations of *Drosophila simulans*. *Nature* **348**, 178-180 (1990).
22. Karr, T. L. Intracellular sperm/egg interactions in *Drosophila*: a three-dimensional structural analysis of a paternal product in the developing egg. *Mech Dev* **34**, 101-111 (1991).
23. Williams, B. C., Karr, T. L., Montgomery, J. M. & Goldberg, M. L. The *Drosophila l(1)zw10* gene product, required for accurate mitotic chromosome segregation, is redistributed at anaphase onset. *J Cell Biol* **118**, 759-773 (1992).
24. O'Neill, S. L., Giordano, R., Colbert, A. M., Karr, T. L. & Robertson, H. M. 16S rRNA phylogenetic analysis of the bacterial endosymbionts associated with cytoplasmic incompatibility in insects. *Proc Natl Acad Sci U S A* **89**, 2699-2702 (1992).
25. Zackson, S. L., Graner, M. W. & Karr, T. L. Detection of electrophoretic variants of Notch, PS integrin, and DROP-1 proteins in *Drosophila* following extraction in guanidine hydrochloride. *Biochem Biophys Res Commun* **194**, 490-495 (1993).
26. Boyle, L., O'Neill, S. L., Robertson, H. M. & Karr, T. L. Interspecific and intraspecific horizontal transfer of *Wolbachia* in *Drosophila*. *Science* **260**, 1796-1799 (1993).
27. Karr, T. L. Cytoplasmic incompatibility. Giant steps sideways. *Curr Biol* **4**, 537-540 (1994).
28. Graner, M., Stupka, K. & Karr, T. L. Biochemical and cytological characterization of DROP-1: a widely distributed proteoglycan in *Drosophila*. *Insect Biochem Mol Biol* **24**, 557-567 (1994).
29. Snook, R. R., Markow, T. A. & Karr, T. L. Functional nonequivalence of sperm in *Drosophila pseudoobscura*. *Proc Natl Acad Sci U S A* **91**, 11222-11226 (1994).
30. Srinivasan, S. & Karr, T. L. Biochemical characterization of related microtubule proteins in *Drosophila melanogaster* and adult rat brain. *Brain Res* **701**, 39-46 (1995).
31. Alcantara, A. A., Srinivasan, S., Reilein, A. R. & Karr, T. L. Antibodies directed against microtubule proteins from *Drosophila melanogaster* cross react with similar proteins in the rat brain. *Brain Res* **701**, 47-54 (1995).
32. Werner, D., Hawrylak, N., Comery, T. A., Karr, T. L. & Greenough, W. T. Expression of DMAP-45R in the rat visual cortex is modulated by visual experience. *Brain Res* **701**, 55-60 (1995).
33. Kose, H. & Karr, T. L. Organization of *Wolbachia pipientis* in the *Drosophila* fertilized egg and embryo revealed by an anti-*Wolbachia* monoclonal antibody. *Mech Dev* **51**, 275-288 (1995).
34. Karr, T. L. Paternal investment and intracellular sperm-egg interactions during and following fertilization in *Drosophila*. *Curr Top Dev Biol* **34**, 89-115 (1996).
35. Ballard, J. W., Hatzidakis, J., Karr, T. L. & Kreitman, M. Reduced variation in *Drosophila simulans* mitochondrial DNA. *Genetics* **144**, 1519-1528 (1996).
36. Lassy, C. W. & Karr, T. L. Cytological analysis of fertilization and early embryonic development in incompatible crosses of *Drosophila simulans*. *Mech Dev* **57**, 47-58 (1996).
37. Karr T. L. and Pitnick, S. The ins and outs of fertilization. *Nature* **379**, 405-6 (1996).
38. Snook, R. R. & Karr, T. L. Only long sperm are fertilization-competent in six sperm-heteromorphic *Drosophila* species. *Curr Biol* **8**, 291-294 (1998).
39. Karr, T. L., Yang, W. & Feder, M. E. Overcoming cytoplasmic incompatibility in *Drosophila*. *Proc Biol Sci* **265**, 391-395 (1998).
40. Pitnick, S. & Karr, T. L. Paternal products and by-products in *Drosophila* development. *Proc Biol Sci* **265**, 821-826 (1998).
41. Karr, T. L. & Pitnick, S. Sperm competition: defining the rules of engagement. *Curr Biol* **9**, R787-R790 (1999).
42. Yue, L., Karr, T. L., Nathan, D. F., Swift, H., *et al.* Genetic analysis of viable Hsp90 alleles reveals a critical role in *Drosophila* spermatogenesis. *Genetics* **151**, 1065-1079 (1999).

43. Snook, R. R., Cleland, S. Y., Wolfner, M. F. & Karr, T. L. Offsetting effects of Wolbachia infection and heat shock on sperm production in *Drosophila simulans*: analyses of fecundity, fertility and accessory gland proteins. *Genetics* **155**, 167-178 (2000).
44. Karr, T. L. & Brady, R. Virtual biology in the CAVE. *Trends Genet* **16**, 231-232 (2000).
45. Anderson, C. L. & Karr, T. L. *Wolbachia*: evolutionary novelty in a rickettsial bacteria. *BMC Evol Biol* **1**, 10 (2001).
46. Karr, T. L. Centrosome inheritance: a central 'in-egg-ma' solved? *Curr Biol* **11**, R21-R24 (2001).
47. Alipaz, J. A., Wu, C. I. & Karr, T. L. Gametic incompatibilities between races of *Drosophila melanogaster*. *Proc Biol Sci* **268**, 789-795 (2001).
48. Zchori-Fein, E., Gottlieb, Y., Kelly, S. E., Brown, J. K., *et al.* A newly discovered bacterium associated with parthenogenesis and a change in host selection behavior in parasitoid wasps. *Proc Natl Acad Sci U S A* **98**, 12555-12560 (2001).
49. Isaenko, O. A., Karr, T. L. & Feder, M. E. Hsp70 and thermal pretreatment mitigate developmental damage caused by mitotic poisons in *Drosophila*. *Cell Stress Chaperones* **7**, 297-308 (2002).
50. Gottlieb, Y., Zchori-Fein, E., Werren, J. H. & Karr, T. L. Diploidy restoration in Wolbachia-infected *Muscidifurax uniraptor* (Hymenoptera: Pteromalidae). *J Invertebr Pathol* **81**, 166-174 (2002).
51. Clark, M. E., Veneti, Z., Bourtzis, K. & Karr, T. L. The distribution and proliferation of the intracellular bacteria *Wolbachia* during spermatogenesis in *Drosophila*. *Mech Dev* **111**, 3-15 (2002).
52. Veneti, Z., Clark, M. E., Zabalou, S., Karr, T. L., *et al.* Cytoplasmic incompatibility and sperm cyst infection in different *Drosophila*-*Wolbachia* associations. *Genetics* **164**, 545-552 (2003).
53. Clark, M. E., Veneti, Z., Bourtzis, K. & Karr, T. L. *Wolbachia* distribution and cytoplasmic incompatibility during sperm development: the cyst as the basic cellular unit of CI expression. *Mech Dev* **120**, 185-198 (2003).
54. Veneti, Z., Clark, M. E., Karr, T. L., Savakis, C. & Bourtzis, K. Heads or tails: host-parasite interactions in the *Drosophila*-*Wolbachia* system. *Appl Environ Microbiol* **70**, 5366-5372 (2004).
55. Sawamura, K., Karr, T. L. & Yamamoto, M. T. Genetics of hybrid inviability and sterility in *Drosophila*: dissection of introgression of *D. simulans* genes in *D. melanogaster* genome. *Genetica* **120**, 253-260 (2004).
56. Alipaz, J. A., Karr, T. L. & Wu, C. I. Evolution of sexual isolation in laboratory populations: fitness differences between mating types and the associated hybrid incompatibilities. *Am Nat* **165**, 429-438 (2005).
57. Loppin, B., Lepetit, D., Dorus, S., Couble, P. & Karr, T. L. Origin and neofunctionalization of a *Drosophila* paternal effect gene essential for zygote viability. *Curr Biol* **15**, 87-93 (2005).
58. Clark, M. E., Anderson, C. L., Cande, J. & Karr, T. L. Widespread prevalence of wolbachia in laboratory stocks and the implications for *Drosophila* research. *Genetics* **170**, 1667-1675 (2005).
59. Loppin, B., Bonnefoy, E., Anselme, C., Laurençon, A., *et al.* The histone H3.3 chaperone HIRA is essential for chromatin assembly in the male pronucleus. *Nature* **437**, 1386-1390 (2005).
60. Clark, M. E., Heath, B. D., Anderson, C. L. & Karr, T. L. Induced paternal effects mimic cytoplasmic incompatibility in *Drosophila*. *Genetics* **173**, 727-734 (2006).
61. Dorus, S., Busby, S. A., Gerike, U., Shabanowitz, J., *et al.* Genomic and functional evolution of the *Drosophila melanogaster* sperm proteome. *Nat Genet* **38**, 1440-1445 (2006).

62. Karr, T. L. Fruit flies and the sperm proteome. *Hum Mol Genet* **16 Spec No. 2**, R124-R133 (2007).
63. Karr, T. L. Application of proteomics to ecology and population biology. *Heredity* **100**, 200-206 (2008).
64. Dorus, S., Freeman, Z. N., Parker, E. R., Heath, B. D. & Karr, T. L. Recent origins of sperm genes in *Drosophila*. *Mol Biol Evol* **25**, 2157-2166 (2008).
65. Marco, A., Konikoff, C., Karr, T. L. & Kumar, S. Relationship between gene co-expression and sharing of transcription factor binding sites in *Drosophila melanogaster*. *Bioinformatics* **25**, 2473-2477 (2009).
66. Vibranovski, M. D., Lopes, H. F., Karr, T. L. & Long, M. Stage-Specific Expression Profiling of *Drosophila* Spermatogenesis Suggests that Meiotic Sex Chromosome Inactivation Drives Genomic Relocation of Testis-Expressed Genes. *PLoS Genet* **5**, e1000731 (2009).
67. Vibranovski, M. D., Chalopin, D. S., Lopes, H. F., Long, M. & Karr, T. L. Direct evidence for postmeiotic transcription during *Drosophila melanogaster* spermatogenesis. *Genetics* **186**, 431-433 (2010).
68. Wasbrough, E. R., Dorus, S., Hester, S., Howard-Murkin, J., *et al.* The *Drosophila melanogaster* sperm proteome-II (DmSP-II). *J Proteomics* **73**, 2171-2185 (2010).
69. Dorus, S., Wasbrough, E. R., Busby, J., Wilkins, E. C. & Karr, T. L. Sperm Proteomics Reveals Intensified Selection on Mouse Sperm Membrane and Acrosome Genes. *Mol Biol Evol* **27**, 1235-1246 (2010).
70. Dorus, S., Wilkin, E. C. and Karr, T. L. (2011). Expansion and functional diversification of a leucyl aminopeptidase family that encodes the major protein constituents of *Drosophila* sperm. **BMC Genomics**, **12**, 177).
71. Snook, R.R., Hosken, D.J., and Karr, T.L. (2011). The biology and evolution of polyspermy: insights from cellular and functional studies of sperm and centrosomal behavior in the fertilized egg. **Reproduction** **142**, 779-792.
72. Kumar, S., Konikoff, C., Van Emden, B., Busick, C., *et al.* (2011). FlyExpress: visual mining of spatiotemporal patterns for genes and publications in *Drosophila* embryogenesis. *Bioinformatics* **27**, 3319-3320.
73. Konikoff, C. E., Karr, T. L., McCutchan, M., Newfeld, S. J. & Kumar, S. (2012). Comparison of embryonic expression within multigene families using the FlyExpress discovery platform reveals more spatial than temporal divergence. *Dev Dyn* **241**, 150-160.
74. Fischer, B.E., Wasbrough, E., Meadows, L.A., Randlet, O., Dorus, S., Karr, T.L., and Russell, S. (2012). Conserved Properties of *Drosophila* and Human Spermatozoal MRNA Repertoires. **ePub- Proc Royal Soc Biol B**. doi:10.1098/rspb.2012.0153.
75. Vibranovski, M. D., Zhang, Y. E., Kemkemer, C., Lopes H. F., Betrán, E., Karr, T. L., Long, M. *Drosophila* Spermatogenesis Expression: Lessons to Learn for Genomic Analyses of Gene Evolution(**BMC Genomics**, in press).
76. Maria D. Vibranovski, M., Zhang, Y. E., Kemkemer, C., Lopes, H. F., Karr, T. L., Long, M. (2012). Segmental dataset and whole body expression data do not support the hypothesis that non-random movement is an intrinsic property of *Drosophila* retrogenes. (**BMC Evolutionary Biology**, in press).

Papers in progress:

77. Skerget, S., Dorus, S., Polpitiya, A., Petritis, K. and Karr, T.L. The macaque sperm proteome (in preparation).
78. Vibranovski, M., Dorus, S., Long, M. and Karr, T. L. The footprint of the *Drosophila* sperm proteome on the transcriptional landscape of spermatogenesis (in preparation).
79. Heath, B. and Karr, T. L. A new viral life cycle associated with diploid sex. (in preparation).

Publications in books, journals and periodicals:

Invited Reviews and Book Chapters

80. Dorus, S., Skerget, S. and Karr, T.L. (2012). Proteomic discovery of diverse immunity molecules in mammalian spermatozoa. In *Proteomics and Reproduction*, special issue to appear in *Systems Biology in Reproductive Medicine*, R. Oliva, ed.
81. Karr, T. L. and Dorus, S. (2012). Evolutionary genomics of the sperm proteome. In *Evolution in the fast lane: Rapidly evolving genes and genetic systems* (Singh, R., Xu, J., and Kulathinal, R. J., eds.). Oxford University Press, London.
82. Karr, T. L. and Dorus, S. (2009). Evolution of sperm proteomes. In *Sperm Biology: an Evolutionary Perspective*. In *Sperm Biology: an Evolutionary Perspective* (T.R. Birkhead, D.J. Hosken and S. Pitnick, eds.). Elsevier Press, pp 435-469.
83. Karr, T. L., Snook, R.R. and Swanson, W. (2009). Evolution of Sperm-Egg Interactions. In *Sperm Biology: an Evolutionary Perspective* (T.R. Birkhead, D.J. Hosken and S. Pitnick, eds.) Elsevier Press, pp 305-365.
84. Karr, T. L. and Ballard, J.W.O. (2005). *Wolbachia* and speciation. *Encyclopedia of Life Sciences* (Nature Publishing Group).
85. Karr, T. L. and Loppin, B. (2005). Molecular Genetics of Insect Fertilization. In *Comprehensive Molecular Insect Science*, (Gilbert, L. and Iatrou, K. eds.) Elsevier.
86. K. Bourtzis, H.R. Braig and T. L. Karr (2003). Cytoplasmic Incompatibility. In *Insect Symbiosis*. K. Bourtzis, T. Miller, eds. CRC Press, Florida, USA, pp. 217-246.
87. Karr, T. L. (2001). A central "in-egg-ma" solved? *Curr Biol* **11**: R21-24.
88. Karr, T. L. and Pitnick, S. (1999). Sperm competition: defining the rules of engagement. *Curr Biol* **9**: 787-790.
89. Pitnick, S. and Karr, T. L. (1996) Sperm caucus. *Trends Ecol Evol* **11**: 148-151.
90. Karr, T. L. Paternal investment and intracellular sperm-egg interactions during and following fertilization in *Drosophila*. In *Current Topics in Developmental Biology* **34**: 89-115.
91. Karr T. L. (1996). Paternal investment and intracellular sperm-egg interactions during and following fertilization in *Drosophila*. *Curr Top Dev Biol* **34**: 89-115.
92. Karr, T. L. (1994). Giant steps sideways. *Curr Biol* **4**: 537-540.
93. Karr, T. L. (1992). Mechanisms that accelerate embryonic development in *Drosophila*. In *The Organization of Organisms* (A. Baskin and J. Mittenthal, eds.) Santa Fe Institute, Santa Fe.
94. Karr, T. L. (1989). Early zygotic gene action and pattern formation in *Drosophila*. In *The Molecular Basis of Pattern Formation*. (D. Stocum and T. L. Karr, eds.). Oxford University Press, Oxford.
95. Ali, Z. Drees, B., Coleman, K.G., Gustavson, E., Karr, T. L., Kuavar, L., Poole, S.J., Soeller, W., Weir, M.P. and Kornberg, T. (1985). The *engrailed* locus of *Drosophila melanogaster*. Genetic, Developmental and Molecular Studies. *Cold Spring Harbor Symp Quant Biol* **50**: 229-233.
96. Miller, K.G., Karr, T. L., Kellogg, D.R., Morh, I.J., Walter, M. and Alberts, B.M. (1985). Studies on the cytoplasmic organization of early *Drosophila* embryos. *Cold Spring Harbor Symp Quant Biol* Vol 50: 498-513.

97. Purich, D.L., MacNeal, R.K., Terry, B.J. and Karr, T. L. (1982). Methods for examining tubulin interactions with GTP, GDP and non-hydrolyzable analogues. *Methods in Enzymology* 85: 416-432.
98. Purich, D.L., Karr, T. L. and Kristofferson, D. (1982). Microtubule disassembly: a quantitative kinetic approach for defining endwise linear depolymerization. *Methods in Enzymology* 85: 439-449.
99. Karr, T. L., White, H.D., Coughlin, B.A. and Purich, D.L. (1982). A brain microtubule protein preparation depleted of mitochondrial and synaptosomal components. *Methods in Cell Biology* 24: 51-60 (L. Wilson, ed), Academic Press, New York.
100. Kristofferson, D., Karr, T. L., Malefyt, T.R. and Purich, D.L. (1982). An automated method for defining microtubule length distributions. *Methods in Cell Biology* 24: 133-144 (L. Wilson, ed.), Academic Press, New York.
101. Purich, D.L., Terry, B.J., White, H.D., Coughlin, B.A., Karr, T. L. and Kristofferson, D. (1981). Microtubule associated protein phosphorylation and calcium ion regulation of bovine brain. *Cold Spring Harbor Symp Quant Biol* 50: 1494-1501.

Books edited:

The Molecular Basis of Pattern Formation. (D. Stocum and T. L. Karr, eds.). Oxford University Press, Oxford.

Grant Support

Current:

HHS-National Institutes of Health- R01 LM010730 (Co-I): "Computational Methods for Expression Image Analysis", 2011-2014.

HHS-National Institutes of Health R01- HG002516 (Co-I). "Computational Analysis of Gene Expression Pattern Images" 2007-2014.

Pending:

National Science Foundation- Principal Investigator. The role of paternal products during and following fertilization.

National Science Foundation- Co-Principal Investigator. "Evaluation of the influence of reservoir and vector host diversity on the contamination and propagation of food borne pathogenic bacteria in a complex ecological model".

HHS-National Institutes of Health- (R01) Principal Investigator. "Leveraging the mouse sperm proteome to develop immunocontraceptive vaccines".

HHS-National Institutes of Health- (R01) Principal Investigator. "Linking epididymal transcripts to the dynamics of sperm proteome maturation".

NASA Astrobiology: Exobiology and Evolutionary Biology, Institutional Principal Investigator (ASU/University of Hawaii). Project title, "A proteomic approach to the evolution of novel cell types in basal metazoans".

Past:

HHS-National Institutes of Health, Principal Investigator. "Detection of distribution of new genes in *Drosophila* phylogeny". Total award, \$71,167. Jan 1, 2009 to Apr 30, 2011.

National Institutes of Health, NRSA Fellowship Grant No. RO1 GM47962-01. Project Sponsor for Dr. Stephen Dorus. Project title: "Characterization of the human and mouse sperm proteomes". Funding period, 03/01/06 to 02/28/09. \$50,000/yr direct costs. Total award: \$148,000.

Biotechnology and Biological Sciences Research Council, United Kingdom. Principal Investigator. Project title, "The role of myosin and a tumour suppressor gene in *Wolbachia*

- mediated cytoplasmic incompatibility". Funding period: Jan 15, 2005 – June 14, 2008. Total award, \$525,000 (USD equivalent).
- Royal Society-Wolfson Merit Award.** Principal Investigator. "Molecular analysis of reproductive failure in insects". Funding period: 06/01/02 to 05/31/07. Total award, \$750,000 (USD equivalent).
- National Institutes of Health,** NRSA Fellowship Grant No. 1 F32 HD08172-01/TK. Principal Investigator: **Timothy L. Karr** (for Rhonda Snook NRSA Award). Project title: "Biochemistry of Sperm in a Model System." Funding period, 3/01/97 - 2/28/00 (award terminated 6/30/98-Dr. Snook accepted a tenure-track faculty position at the University of Nevada, Las Vegas). Total award: \$81,920.
- National Institutes of Health,** Grant No. F32GM076913-01. Principal Investigator. Project title: "The molecular basis of cytoplasmic incompatibility in insects." Funding period, 4/01/94 to 7/31/96. \$70,000/yr direct costs. Total award: \$210,000.
- National Science Foundation,** Principal Investigator. Research Experience for Undergraduates Supplement (yrs 1,2). Total award: \$13,000.
- National Science Foundation,** Principal Investigator. Major Research Instrumentation Program. Project title: "Acquisition and Operation of a light microscopy and digital Imaging Facility". Funding period: 11/01/97 to 10/30/01. Total award: \$587,297.
- National Science Foundation,** Principal Investigator. Research Experience for Undergraduates Supplement, yr. 1. Total award: \$10,000.
- National Science Foundation.** Principal Investigator. Biological Infrastructure Program. Project title: "The role of sperm-egg interactions in reproductive isolation in *Drosophila*". Funding period: 06/01/99 to 05/31/2002. Total award: \$200,000
- Binational Science Foundation** (Israeli-U.S.). Co-Principal Investigator. "Sexual functioning of antibiotic-induced males of *Wolbachia*-infected parasitic wasps". Funding period: 09/01/98 to 08/30/01. Total award: \$93,323.
- National Science Foundation,** Principal Investigator. Project title, "Ecophysiology of heat mediated abatement of cytoplasmic incompatibility". Funding period: 5/1/97 to 4/30/01. Total award: \$240,495
- National Science Foundation,** Grant No. DCB-8802152. Principal Investigator. Project title: "Nuclear Migration and Early Zygotic Gene Action in *Drosophila*". Funding period, 6/15/88 to 6/15/91. \$70,000/year, total award: \$210,000.
- National Science Foundation,** (Co-PI with Andrew Belmont, Dept of Cell and Structural Biology, University of Illinois). Project title: "Acquisition of an Optical Sectioning Workstation". Funding period: 6/15/89 to 6/14/90. Total award: \$102,000.
- National Science Foundation.** Research Education for Undergraduates award, 1989. Principal Investigator. Funding period: 6/15/89 to 6/14/90. Total award: \$4,000.
- National Science Foundation.** Minority Opportunity Award, 1990. Principal Investigator. Funding period: 6/15/90 to 6/14/91. Awarded \$5,500. United States Department of Agriculture. Principal Investigator. Project title: "Cytoplasmic Incompatibility in Insects". Funding period: 7/1/91 to 6/30/94. Total award: \$210,000.
- United States Department of Agriculture.** Research grant AG 91-37302-6766, 1991. Project entitled, "Mechanism of Wolbachia-induced Cytoplasmic Incompatibility in *Drosophila*"
- Louis Block Fund,** Principal Investigator. University of Chicago. "Acquisition and Operation of a light microscopy and digital Imaging Facility". Total award: \$251,699.
- Academic Technology Innovation.** Principal Investigator. Project title, "Application and Development of a Biological Database for the CAVE". Funding period: 07/98 to 06/99. Total award: \$33,500.

Student and postdoctoral associates

Current:

PhD- (ASU)

Sheri Skerget, The Biodesign Institute, Arizona State University. (Expected degree date: Dec., 2013).

Past: Postdoctoral and Graduate Students-

Past Postdoctoral (University of Illinois, University of Chicago, University of Bath, UK)

-*Dr. Ben Heath, Ph.D.*, University of Dundee Scotland. (Current position: Research Officer, Oxford University, Oxford, UK.)

-*Dr. Ursula Gerike, Ph.D.*, University of Bern, Switzerland. (Current position: Research Officer, University of Bath, Bath, UK.)

-*Dr. Steve Dorus, Ph.D.*, The University of Chicago. (Current position: Associate Professor, Syracuse University)

-*Dr. Michael E. Clark*, Postdoctoral Fellow. (Current position: Assistant Professor, University of Rochester).

-*Dr. Cort Anderson* (1999-2001) (current appointment, Associate Professor, University of Idaho).

-*Dr. Olga Isaenko* (1998-1999) postdoctoral Fellow. (Current position: Senior Research Scientist, University of Minnesota).

-*Dr. Kyoichi Sawamura* (1998-99) postdoctoral fellow. (Current position: Assistant Professor, University of Tsukuba, Tsukuba, Japan).

-*Dr. David Hoskens* (summer, 1999) visiting research scientist from the University of Zurich, Switzerland. (Current position: Professor, Exeter University).

-*Dr. Rhonda Snook*, NIH NRSA Fellow 1997-1998. (Current position, Senior Lecturer, University of Sheffield, Sheffield, UK.)

-*Dr. Scott O'Neill*, (1989-1991). Present position, Head of School of Life Sciences The University of Queensland Qld 4072 Australia.

Past Ph.D.

-*Peggy Grott-Delaney* (entered the Ph.D. program, received Master degree, June 1989)

-*Michael Graner* (Ph.D. in Biochemistry, 1993). Present position: Postdoctoral Research Associate, University of Arizona.

-*Lee Boyle* (Ph.D. in Biochemistry, 1992). Present position, Abbott Laboratories.

-*Wanlin Chang* (Ph.D. in Biochemistry, 1994). Present position, Unilever, Inc.

-*Hiroyuki Kose* (Ph.D. in Biochemistry, 1994). Present position, Postdoctoral fellow, Tokyo University.

-*Yuval Gottlieb*, Ph.D. (Visiting from the Hebrew University, Israel).

-*Julie Alipaz* (Ph.D. Committee on Evolutionary Biology)

-*Robin Carlson* (Ph.D. Organismal Biology and Anatomy, graduated June, 2000).

-*Zoe Veneti*, Ph.D. (visiting from the University of Crete, Greece).

-*Craig Lassy* (Ph.D. in Cell and Structural Biology, University of Illinois, Urbana-Champaign). Present position, Manager, Confocal and Digital Imaging Facility, The University of Chicago.

-*Randy Seys*, (entered Ph.D. program, received Master degree, June 1994). Present position, Pharm. D. program, University of Illinois, Chicago.

-*Robin Carlson* (entered Ph.D. program, received Master degree, August, 2000).

-*Julie Alipaz* (joint student with Chung-I Wu, Ph.D. received Jan. 2001). Current position, postdoctoral fellow, Stanford (with S. Palumbi).

-*Marta Babits*, Marie Curie trainee, University of Szeged, Hungary.

-*Elizabeth Wasbrough* (nee Parker). PhD, University of Bath, 2011.

Undergraduate (University of Chicago)

-*Jon Darbro*, Research Technician

-*Dimitry Tetin*, Undergraduate research assistant

- Justin Coffey*, NSF REU research assistant (summer 1999).
- Gregory Gurda*, NSF REU research assistant (summer 1999).
- Will Yang*, (M.D. University of Wisconsin, 2003). Undergraduate research (1996-1998).
- Shikha Garg*, (M.D., Chicago School of Medicine, 2002). Research technician (1997-98).
- Jonathan Darbro*. (Ph.D., UC Riverside, 2003). Undergraduate research (1998-99).
- Joshua Rosenau*, research assistant (summer 1998, REU student).
- Stephanie Hasan*, research assistant (summer 1996, Howard Hughes undergraduate).
- Jessica Cande* (1999-2001). Howard Hughes undergraduate researcher, summer 2000.

References

Roy Curtiss III, Professor (NAS)

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