

Curriculum Vitae

Name: Kenneth D. Irvine

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Education & Training:

1981-1985 B.A., magna cum laude with Highest Honors in Chemistry
Williams College, Williamstown MA
Summer Research and Undergraduate Thesis: "Site-specific mutagenesis of sequences implicated in splicing of the *Tetrahymena thermophila* large rRNA precursor", John M. Burke, Advisor

1985-1991 Ph.D. in Biochemistry, Stanford University, Stanford CA
Graduate Thesis: "Regulation of expression of the *Drosophila* homeotic gene *Ultrabithorax*", David S. Hogness, Advisor

1991-1995 Post-doctoral Fellow, Princeton University, Princeton NJ
Research on positional information and morphogenesis during germband extension and wing disc development in *Drosophila*, Eric Wieschaus, Advisor

Positions:

1995 - 2001 Assistant Professor,
2001 - 2006 Associate Professor.
2006 - 2012 Professor,
2012 - Distinguished Professor, Waksman Institute, Department of Molecular Biology and Biochemistry, Rutgers University, Piscataway NJ. Member of the Graduate Faculty, the Child Health Institute of NJ and the Cancer Institute of NJ

2000-2004 Assistant Investigator,
2005- Investigator, Howard Hughes Medical Institute

Honors and Awards:

1984-1985 John Sabian Adriance Prize in Chemistry
American Chemical Society Award
Elected to Sigma Xi & Phi Beta Kappa

1986-1989 NSF Graduate Fellowship

1991-1994 Helen Hay Whitney Foundation Postdoctoral Fellowship

1994-1995 New Jersey Commission on Cancer Research Postdoctoral Fellowship

1996-1997 American Cancer Society Junior Faculty Research Award

2000 Appointed as an Assistant Investigator of the Howard Hughes Medical Institute

2001 Rutgers Board of Trustees Research Fellowship for Scholarly Excellence

Professional Activities:

Grant Review

1997-2003,2013 Ad hoc reviewer for grants submitted to NSF

2000 Reviewer for special emphasis panel of NIH *Genetics* study section

2001 Reviewer for US Civilian Research & Development Foundation Cooperative Grants

2001 Reviewer for MRC Programme grants

2003 NIGMS Review of Exploratory Centers for Human Embryonic Stem cell research

2003-2009 NIH Study Section Member, DEV-1

2004 ACS Development, Differentiation, and Cancer Study Section

2005 Reviewer for Biotechnology and Biological Sciences Research Council

2008-2009 Chair, NIH DEV-1 Study Section

2011 NIH Study Section ad hoc, DEV-2

2011 Reviewer for Wellcome Trust Senior Fellows

2013 NIH, NCI Special Emphasis Panel

2014 NIH CB-C special emphasis panel
NIH, NICHD UCC site visit panel

Editorial

Ongoing Review 25-30 manuscripts per year for various journals
2002-present Member, Faculty of 1000
2004-2005 Editorial board, *Developmental Dynamics*
2009 co-Editor, *Current Opinion in Genetics and Development* August issue
2011 co-Editor, *Developmental Dynamics* Special Issue on *Drosophila* as a model system
2005-2013 Associate Editor, *Developmental Dynamics*

Other

2012 Larry Sandler Award Committee
2013 Chair, Larry Sandler Award Committee
2013 President Elect, *Drosophila* Board
2014 President, *Drosophila* Board

Publications:

- 1) Burke, J.M., Irvine, K.D., Kaneko, K.J., Kerker, B.J., Oettgen, A.B., Tierney, W.M., Williamson, C.L., Zaug, A.J. and Cech. T.R. 1986. Role of conserved sequence elements 9L and 2 in self-splicing of the Tetrahymena ribosomal RNA precursor. **Cell** 45: 167-176.
- 2) Irvine, K.D., Helfand, S.L. and Hogness, D.S. 1991. The large upstream control region of the *Drosophila* homeotic gene *Ultrabithorax*. **Development** 111: 407-424.
- 3) Irvine, K.D., Botas, J., Jha, S., Mann, R., and Hogness, D.S. 1993. Negative autoregulation by *Ultrabithorax* controls the level and pattern of its expression. **Development** 117: 387-399.
- 4) Irvine, K.D. and Wieschaus, E. 1994. Cell intercalation during *Drosophila* germband extension and its regulation by pair-rule segmentation genes. **Development** 120: 827-841.
- 5) Irvine, K.D. and Wieschaus, E. 1994. *fringe*, a boundary-specific signaling molecule, mediates interactions between dorsal and ventral cells during *Drosophila* wing development. **Cell** 79: 595-606.
- 6) Kim, J., Irvine, K.D., and Carroll, S.B. 1995. Cell recognition, signal induction, and symmetrical gene activation at the dorsal/ventral boundary of the developing *Drosophila* wing. **Cell** 82: 795-802.
- 7) Johnston, S.H., Rauskolb, C., Wilson, R., Prabhakaran, B., Irvine, K.D., Vogt, T.F. 1997. A family of mammalian Fringe genes implicated in boundary determination and the Notch pathway, **Development** 124, 2245-2254.
- 8) Panin, V.M., Papayannopoulos, V., Wilson, R., and Irvine, K.D. 1997. Fringe modulates Notch-ligand interactions. **Nature** 387, 908-913.
- 9) Irvine, K.D. and Vogt, T.F. 1997. Dorsal-ventral signaling in limb development. **Curr Opin Cell Biol.** 9, 867-876.
- 10) Papayannopoulos, V. P., Tomlinson, A., Panin, V. M., Rauskolb, C. and Irvine, K. D. 1998. Dorsal-ventral signaling in the *Drosophila* eye. **Science** 281, 2031-2034.
- 11) Panin, V.M. and Irvine, K. D. 1998. Modulators of Notch signaling. **Sem. Cell & Dev. Biol.** 9, 609-617.

- 12) Simmonds, A. J., Liu, X., Soanes, K.H., Krause, H.M., Irvine, K.D. and Bell, J.B. 1998. Molecular interactions between Vestigial and Scalloped promote wing formation in *Drosophila*. **Genes Dev.** *12*, 3815-3820.
- 13) Rauskolb, C. and Irvine, K.D. 1999. Notch-mediated segmentation and growth control of the *Drosophila* leg. **Dev. Biol.** *210*, 339-350.
- 14) Irvine, K. D. 1999. Fringe, Notch, and making developmental boundaries **Curr Opin Genet & Dev.** *9*, 434-441.
- 15) Rauskolb, C., Correia, T. and Irvine, K.D. 1999. Fringe-dependent separation of dorsal and ventral cells in the *Drosophila* wing. **Nature**, *401*, 476-480.
- 16) Moloney, D. J., Panin, V. M., Johnston, S. H., Chen, J., Shao, L., Wilson, R., Wang, Y., Stanley, P., Irvine, K. D. Haltiwanger, R. S. and Vogt, T. F. 2000. Fringe is a glycosyltransferase that modifies Notch. **Nature**, *406*, 369-375.
- 17) Liu, X., Grammont, M. and Irvine, K. D. 2000. Roles for *scalloped* and *vestigial* in regulating cell affinity and interactions between the wing blade and the wing hinge. **Developmental Biology**, *228*, 287-303.
- 18) Grammont, M. and Irvine, K. D. 2001. *fringe* and *Notch* specify polar cell fate during *Drosophila* oogenesis, **Development**, *128*, 2243-2253.
- 19) Irvine, K. D. and Rauskolb, C. R. 2001. Boundaries in development: formation and function. 2001. **Ann Reviews Cell & Dev. Biol.**, *17*, 189-214.
- 20) Panin, V.M., Shao, L., Lei, L., Moloney, D.J., Irvine, K.D., and Haltiwanger, R.S. 2002. Notch ligands are substrates for Protein O-fucosyltransferase-1 and Fringe. **J. Biol. Chem.**, *277*, 29945-29952.
- 21) Grammont, M. and Irvine, K.D. 2002. Organizer activity of the polar cells during *Drosophila* oogenesis. **Development**, *129*, 5131-5140.
- 22) Nakamura, Y., Haines, N., Chen, J., Okajima, T., Furukawa, K., Urano, T., Stanley, P., Irvine, K.D., and Furukawa, K. 2002. Identification of a *Drosophila* gene encoding xylosylprotein β 4-galactosyltransferase that is essential for the synthesis of glycosaminoglycans and for morphogenesis. **J. Biol. Chem.**, *277*, 46280-46288.
- 23) Okajima, T. and Irvine, K.D. 2002. Regulation of Notch signaling by O-linked fucose. **Cell**, *111*, 893-904.
- 24) Li, Y. Lei, L., Irvine, K.D. and Baker, N.E. 2003. Notch activity in neural cells triggered by a mutant allele with altered glycosylation. **Development**, *130*, 2829-2840.
- 25) Correia, T., Papayannopoulos, V., Panin, V., Woronoff, P., Jiang, J., Vogt T.F. and Irvine, K.D. 2003. Molecular genetic analysis of the glycosyltransferase Fringe in *Drosophila*. **Proc. Nat. Acad. Sci. USA**, *100*, 6404-6409.
- 26) Okajima, T., Xu, A. and Irvine, K.D. 2003. Modulation of Notch-ligand binding by Protein O-fucosyltransferase 1 and Fringe. **J. Biol. Chem.**, *278* 42340-42345.
- 27) Haines, N. and Irvine, K.D. 2003. Glycosylation regulates the Notch signaling pathway. **Nature Rev. Mole. Cell Biol.**, *4*, 786-797.
- 28) Lei, L., Xu, A., Panin, V. and Irvine, K. D. 2003. An O-fucose site in the ligand binding domain inhibits Notch activation. **Development**, *130*, 6411-6421.

- 29) Koles, K. Irvine, K. D., Panin, V. M. 2004. Functional characterization of *Drosophila* Sialyltransferase. **J. Biol. Chem.** 279, 4346-57.
- 30) Cho, E. and Irvine, K.D. 2004. Action of *fat*, *four-jointed*, *dachsous* and *dachs* in distal-to-proximal wing signaling. **Development**, 131, 4489-4500.
- 31) Haines, N. and Irvine, K.D. 2005. Functional analysis of *Drosophila* N-Acetylgalactosaminyltransferases. **Glycobiology**, 15, 335-346.
- 32) Okajima, T., Xu, A., Lei, L. and Irvine, K.D. 2005. Chaperone Activity of Protein O-fucosyltransferase 1 Promotes Notch Receptor Folding. **Science** 30, 1599-1603.
- 33) Major, R. and Irvine, K.D. 2005. Influence of Notch on dorsal-ventral compartmentalization and actin organization in the *Drosophila* wing. **Development**, 132, 3823-3833.
- 34) Xu, A. Lei, L., and Irvine, K.D. 2005. Regions of *Drosophila* Notch that contribute to ligand binding and the modulatory influence of Fringe. **J. Biol. Chem.**, 280, 30158-30165.
- 35) Rogulja, D. and Irvine, K.D. 2005 Regulation of cell proliferation by a morphogen gradient. **Cell**, 123, 449-461.
- 36) Mao, Y., Rauskolb, C., Cho, E., Hu, W.-L., Hayter, H., Minihan, G., Katz, F.N., and Irvine, K.D. 2006. Dachs, an unconventional myosin that functions downstream of Fat to regulate growth, affinity and gene expression in *Drosophila*. **Development** 133, 2539-2551 .
- 37) Cho, E., Feng, Y., Rauskolb, C., Maitra, S., Fehon, R., and Irvine, K.D. 2006. Delineation of a Fat tumor suppressor pathway. **Nature Genetics** 38, 1142-1150.
- 38) Major, R. and Irvine, K.D. 2006. Localization and requirement for Myosin II at the dorsal-ventral compartment boundary of the *Drosophila* wing. **Dev. Dyn.** 235, 3051-3058.
- 39) Xu, A, Haines, N., Dlugosz, M., Rana, N.A., Takeuchi, H. Haltiwanger, R.S., and Irvine, K.D. 2007. In vitro reconstitution of the modulation of *Drosophila* Notch-ligand binding by Fringe. **J. Biol. Chem.** 282, 35153-35162.
- 40) Feng, Y. and Irvine, K.D. 2007. Fat and expanded act in parallel to regulate growth through Warts. **Proc. Nat. Acad. Sci. USA**, 104, 20362-20367.
- 41) Stolz, A., Haines, N., Pich, A., Irvine, K. D., Hokke, C. H., Deelder, A. M., Gerardy-Schahn, R., Wuhler, M. and Bakker, H. 2008. Distinct contributions of β 4GalNAcTA and β 4GalNAcTB to *Drosophila* glycosphingolipid biosynthesis. **Glycoconjugate J**, 25, 167-175.
- 42) Okajima, T., Reddy, B.V.V.G., Matsuda, T. and Irvine, K.D. 2008. Contributions of chaperone and enzyme activities of O-fucosyltransferase 1 to Notch signaling. **BMC Biology**.6, 1.
- 43) Irvine, K.D. 2008. A Notch sweeter. **Cell**, 132, 177-179.
- 44) Oh, H., Irvine, K.D. 2008. in vivo regulation of Yorkie phosphorylation and localization. **Development** 135, 1081-1088.
- 45) Ishikawa, H.O., Takeuchi, H., Haltiwanger, R.S. and Irvine, K.D. 2008. Four-jointed is a Golgi kinase that phosphorylates a subset of cadherin domains. **Science** 321, 401-404.
- 46) Rogulja, D. Rauskolb, C. and Irvine, K.D. 2008 Morphogen control of wing growth through the Fat signaling pathway. **Developmental Cell**, 15, 309-321.

- 47) Reddy, B.V.V.G. and Irvine, K.D. 2008. The Fat and Warts signaling pathways: new insights into their regulation, mechanism, and conservation. **Development**, *135*, 2827-2838.
- 48) Lin, Y., Reddy, B.V.V.G., and Irvine, K.D. 2008. Requirement for a core 1 galactosyltransferase in the *Drosophila* nervous system. **Dev. Dyn.** *237*, 3703-3714.
- 49) Oh, H., Irvine, K.D. 2009. in vivo analysis of Yorkie phosphorylation sites. **Oncogene**, *28*, 1916-1927.
- 50) Feng, Y. and Irvine, K.D. 2009. Processing and Phosphorylation of the Fat receptor. **Proc. Nat. Acad. Sci. USA**, *106*, 11989-11994.
- 51) Mao, Y., Kucuck, B., Irvine K.D. 2009 *Drosophila lowfat*, a novel modulator of Fat signaling. **Development** *136*, 3223-3233.
- 52) Anderson, K. and Irvine, K. 2009. Developmental biology moves forward in the 21st century. **Curr. Opin. Genet. & Dev.** *19*, 1-3.
- 53) Oh, H., Reddy, B.V.V.G. and Irvine, K.D. 2009. Phosphorylation-independent repression of Yorkie in Fat-Hippo signaling. **Dev. Biol.** *335*, 188-197.
- 54) Simon, M.A., Xu, A., Ishikawa, H.O. and Irvine, K.D. 2010. Modulation of Fat-Dachsous binding by the cadherin domain kinase Four-jointed. **Current Biology** *20*, 811-817.
- 55) Oh, H., Irvine, K.D. 2010. Yorkie: the final destination of Hippo signaling. **TICB** *20*, 410-417.
- 56) Reddy, B.V.V.G., Rauskolb, C., Irvine, K.D. 2010. Influence of Fat-Hippo and Notch signaling on the proliferation and differentiation of *Drosophila* optic neuroepithelia. **Development** *137*, 2397-2408.
- 57) Staley, B.K. and Irvine, K.D. 2010. Warts and Yorkie mediate intestinal regeneration by influencing stem cell proliferation. **Current Biology** *20*, 1580-1587.
- 58) Sun, G. and Irvine, K.D. 2011. Regulation of Hippo signaling by Jun kinase signaling during compensatory cell proliferation and regeneration, and in neoplastic tumors. **Dev. Biol.** *350*, 139-151.
- 59) Oh, H., Irvine, K.D. 2011. Cooperative regulation of growth by Yorkie and Mad through *bantam*. **Dev. Cell**, *20*, 109-122.
- 60) Mao, Y., Mulvaney, J., Zakaria, S., Yu, T., Malanga, K., Allen, S., Basson, M.A., Francis-West, P., and Irvine, K.D. 2011. Characterization of a *Dchs1* mutant mouse reveals requirements for Dchs1-Fat4 signaling during mammalian development. **Development**, *138*, 947-957.
- 61) Rauskolb, C., Pan, G., Reddy, B.V.V.G., Oh, H., and Irvine, K.D. 2011. Zyxin links Fat signaling to the Hippo pathway. **PLoS Biology** *9*, e1000624.
- 62) Reddy, B.V.V.G. and Irvine, K.D. 2011. Regulation of *Drosophila* glial cell proliferation by Merlin-Hippo signaling. **Development** *138*, 5201-5212.
- 63) Staley, B.K. and Irvine, K.D. 2012. Hippo signaling in *Drosophila*: recent advances and insights

Dev. Dyn. 241, 3-15.

64) Singh, A. and Irvine, K.D. 2012. *Drosophila* as a model for understanding development and disease. **Dev. Dyn.** 241, 1-2.

65) Irvine, K.D. 2012. Integration of intercellular signaling through the Hippo pathway. **Sem. Cell & Dev. Biol.**, 23, 812-817.

66) Ambegaonkar, A.A., Pan, G., Mani, M., Feng, Y. and Irvine, K.D. Propagation of Dachshous-Fat Planar Cell Polarity. 2012. **Current Biology** 22, 1302-1308.

67) Ishikawa, H.O., Xu, A., Ogura, E., Manning, G., and Irvine, K.D. 2012. The Raine syndrome protein FAM20C is a Golgi kinase that phosphorylates bio-mineralization proteins. **PLoS ONE** 7, p. e42988.

68) Codelia, V.A. and Irvine, K.D. 2012. Hippo signaling goes long range. **Cell** 150, 669-670.

69) Pan, G., Feng, Y., Ambegaonkar, A.A., Sun, G., Huff, M., Rauskolb, C., and Irvine, K.D. 2013. Signal transduction by the Fat cytoplasmic domain. **Development** 140, 831-842.

70) Oh, H., Slattery, M., Ma, L., Crofts, A., White, K., Mann, R., Irvine, K.D. 2013. Genome-wide association of Yorkie with chromatin and chromatin remodeling complexes. **Cell Reports**, 3, 309-318.

71) Reddy, B.V.V.G. and Irvine, K.D. 2013. Regulation of Hippo signaling by EGFR-MAPK signaling through Ajuba family proteins. **Dev. Cell** 24, 459-471.

72) Sun, G. and Irvine, K.D. 2013. Ajuba family proteins link JNK to Hippo signaling. **Science Signaling** 6, ra81.

73) Mani, M., Goyal, S., Irvine, K.D. and Shraiman, B. I. 2013. A collective polarization model for gradient sensing via Dachshous-Fat intercellular signaling. **PNAS** 235, 3051-3058.

74) Sun, G. and Irvine, K.D. 2014. Control of growth during regeneration. **Curr Topics Dev Bio** 108 p.95-120.

75) Xu, A, and Irvine, K.D. 2014. Notch-ligand binding assays in *Drosophila* cells. In *Notch Signaling – Methods and Protocols*, ed. By H Bellen & S Yamamoto, **Methods in Molecular Biology** 1187, in press.

76) Rauskolb, C., Sun, S., Sun, G., Pan, Y. and Irvine, K.D. 2014. Cytoskeletal Tension inhibits Hippo signaling through an Ajuba-Warts complex. **Cell**, in press

77) Zakaria, S., Mao, Y., Kuta, A., Ferreira de Sousa, C., Gaufo, G., McNeill, H., Hindges, R., Guthrie, S., Irvine, K.D., Francis-West, P.H. Regulation of neuronal migration by Dchs1-Fat4 planar cell polarity. **Current Biology**, in press.

78) Oh, H., Slattery, M., Ma, L., White, K.P., Mann, R.S., Irvine, K.D. 2014. Yorkie promotes transcription by recruiting a Histone methyltransferase complex. **Cell Reports**, in press.