SDB 61st Annual Meeting
July 21-25, 2002
University of Wisconsin-Madison
Madison, WI

President - Sean Carroll
Local Organizing Committee - John Fallon, Mary Halloran, John Doebly, Judith Kimble, Rick Amasino, Grace Panganiban, Allen Laughon, Seth Blair, Karen Downs, John White, and Jeff Hardin

PROGRAM

Numbers in ***Italics*** indicate Program Abstract Number.
For multiple-authors abstracts, underlined name indicates speaker.

Sunday July 21st

Meeting Registration Union Theater Foyer
9am-5pm

Education Symposium I
9:00 AM - 12:00 PM

Plenary I Union Theater
Chair: Karen Crawford
9:00 Introductory remarks. S. Carroll. Univ. of Wisconsin.
1 9:05 Evolutionary developmental biology: a new way of teaching evolution. S. Gilbert. Swarthmore College, Swarthmore, PA

Workshop 1 Play Circle
2 10:00 Getting the point: using PowerPoint for teaching and research. R. Beach and K. Crawford. Hollins Univ., Roanoke, VA; and St. Mary's Col. of Maryland, St. Mary's City, MD.

Workshop 2 Union Theater
10:00 Laboratories for Developmental Biology—Two different approaches. S. Singer, E. Cole and M. Montgomery. Carleton College, St. Olaf College and Macalester College.

Noon **Lunch at Lakefront Café**

Education Symposium II
1:00 - 5:00 PM

Workshop 3 Union Theater
3 1:00 Career opportunities in developmental biology and related fields. I. Chow. Soc. for Dev. Biol., Bethesda, MD. ***Co-sponsored by NIGMS***
Chair: Ida Chow
Panelists: Hans-Georg Simon (Northwestern – Academia vs. Industry)

Melissa Carpenter (Geron Corp. – Biotechnology)
Toby Horn (District of Columbia Public Schools – K-12 Education)
Larry Kerr (Office of Science and Technology Policy – Policy and Legislation)
Tyl Hewitt (NICHD – Grants and Program Administration)
Jennifer Weller (Virginia Tech – Bioinformatics).

Plenary II Union Theater

2:30 The role of developmental biology in the 21st century curriculum. J. Hardin. Univ. of Wisconsin-Madison, WI

Education Posters and Resource Booth
3:30-5:00pm Great Hall

Education Resource Booth
Organizer: Diana Darnell. Lake Forest College, Lake Forest, IL

Education Posters
Numbers in ***Italics*** indicate program Abstract Number.
B numbers indicates poster Board Number.
These posters will remain through Poster Session I. Authors are present during this Education session.

4 B1 Science and mathematics in an urban school system from a developmental biology perspective. T. Horn. DC ACTS, District of Columbia Public Schools, Washington, DC.

5 B2 Lending a hand, axolotls generate excitement for science. K. Crawford. St. Mary's Col. of Maryland, St. Mary's City, MD.

6 B3 Developing an integrated scientific understanding through identifying tradeoffs in the genetically modified food controversy. S. Seethaler and M. Linn. Univ. of California, Berkeley, CA.

7 B4 Alphatome: a letter-based sectioning simulation. E.E. LeClair. DePaul Univ., Chicago, IL.

8 B5 Use of *Dictyostelium* in an introductory level, investigative laboratory course. M.K. Nelson. Allegheny Col., Meadville, PA.

9 B6 Kidney organogenesis in *Xenopus* embryos: *in vivo* observations and modulation by retinoic acid. B. Lom, W. Christian, S. Hooper and R. Zsoldos. Davidson Col., Davidson, NC.

10 B7 Using human adult mesenchymal stem cells in an undergraduate teaching laboratory. J.S. Doctor. Duquesne Univ., Pittsburgh, PA.

11 B8 Stem cell research: a case study for undergraduates. E.R. McCain. Muhlenberg Col., Allentown, PA.

12 B9 Incorporating group projects into developmental biology courses. J.J. Fernandes and A. Robinson. Miami Univ., Oxford, OH.

13 B10 Collaborative research with undergraduate students: an assembly line model. M.K. Montgomery. Macalester Col., St. Paul, MN.

14 B11 Four dimensional views of frog gastrulation: a teaching resource for the SDB. A.J. Ewald, J.B. Wallingford, J.M. Tyszka, R.M. Harland and S.E. Fraser. Beckman Inst. and Caltech, Pasadena, CA; and Univ. of California, Berkeley, CA.

15 B12 CAMBIO: computational algorithms for multidimensional biological image organization. K.W. Eliceiri, C. Thomas, C. Rueden, N. Stefansson, L. Peterson, F-M. Lu, V. Chu, A. Ron and J.G. White. Univ. of Wisconsin-Madison, Madison, WI.

16 B13 Journeys: great experiments in developmental biology, as told by those who performed them. M.S. Tyler, R.N. Kozlowski and S.F. Gilbert. Univ. of Maine, Orono, ME; Swarthmore Col., Swarthmore, PA.

17 B14 A more inclusive course in development? J.E. Heady. Univ. of Michigan-Dearborn, Dearborn, MI.

18 B15 Recovering the classical tradition in comparative embryology. J. Wells and P.A. Nelson. The Discovery Inst., Seattle, WA.

19 B16 Role of learning and teaching centers in transforming and sustaining excellence in teaching. S.R. Singer. Carleton Col., Northfield, MN.

5:30 **Dinner at Lakefront Café**

Presidential Symposium
7:00 - 9:00 PM Union Theatre

Chair: Sean Carroll

7:00 Introductory remarks. S. Carroll. Univ. of Wisconsin-Madison, WI

7:05 Fishing for the secrets of vertebrate evolution. D. Kingsley. Stanford Univ., CA

7:40 Decoding cis-regulatory information in metazoan genomes. M. Levine. Univ. of California, Berkeley, CA

20 8:15 An extraordinary dinosaur nesting site from Patagonia: understanding the reproductive behavior and early development of the largest land animals. L.M. Chiappe. Natural History Museum of Los Angeles County, Los Angeles, CA.

Poster Session I and Opening Reception
9:00 - 11:00 PM Great Hall and Tripp Commons
Numbers in ***Italics*** indicate program Abstract Number.
B numbers indicates poster Board Number
Odd number boards: Authors at posters 9:00-10:00pm
Even number boards: Authors at posters 10:00-11:00pm

Development and Evolution

21 B17 Evolution of developmental novelty: the proliferative phase of polyembryonic development. M. Grbic, T. Terzin, V. Zhurov and P. Dearden. Univ. of Western Ontario, London, Ontario, Canada.

22 B18 How conserved is polyembryony? Development of independently evolved polyembryonic wasp Macrocentrus grandii. K. Vandenberghe, C-C. Chang and M. Grbic. Univ. of Western Ontario, London, Ontario, Canada.

23 B19 Proliferation during polyembryonic development. L.S. Corley, C.K. Rubio and M.R. Strand. Washington State Univ., Pullman, WA; and Univ. of Georgia, Athens, GA.

24 B20 How cellularization affects patterning? Pattern formation in related syncytial and total cleaving wasps. V. Zhurov, K. Martin and M. Grbic. Univ. of Western Ontario, London, Ontario, Canada.

25 B21 Axillary meristem development in the branchless Zu-0 ecotype of *Arabidopsis thaliana*. V. Grbic, A. Kalinina, N. Mihajlovic and E. Hidber. Univ. of Western Ontario, London, Ontario, Canada.

26 B22 Analysis of Limburg; an *Arabidopsis* late-flowering aerial rosette-bearing ecotype. B. Poduska, T.W. Yeo, T. Humphrey and V. Grbic. Univ. of Western Ontario, London, Ontario, Canada.

27 B23 The role of LEAFY in determination of the primordia initiation rate and activation of axillary meristems. A. Kalinina, N. Mihajlovic and V. Grbic. Univ. of Western Ontario, London, Ontario, Canada.

28 B24 Unraveling the flower with pea developmental mutants - homologies and hidden potentials. J.D. Sollinger and S.R. Singer. Southern Oregon Univ., Ashland, OR; and Carleton Col., Northfield, MN.

29 B25 Molecular characterization of a deficiency in the homeotic complex of the red flour beetle *Tribolium castaneum*. E.A. Richardson and S.J. Brown. Kansas State Univ., Manhattan, KS.

30 B26 Axial patterning in polyembryonic development: pattern formation in the polyembryonic wasp Copidosoma floridanum. T. Terzin, V. Zhurov and M. Grbic. Univ. of Western Ontario, London, Ontario, Canada.

31 B27 Hoxc13 orthologs in zebrafish. R. Thummel, L. Li, M.P. Sarras, Jr. and A.R. Godwin. Univ. of Kansas Med. Ctr., Kansas City, KS.

32 B28 Dorsalventral axis of polyembryonic wasy *Copidosoma* is zygotically regulated. G. Chen and M.R. Strand. Univ. of Georgia, Athens, GA.

33 B29 Development of the stylet mouthparts of a hemipteran insect, *Oncopeltus fasciatus*, the large milkweed bug. D.R. Angelini and T.C. Kaufman. HHMI and Indiana Univ., Bloomington, IN.

34 B30 Ectopic expression of *maxillopedia* in *Tribolium*. K.M. Ruyle, T.D. Shippy and R.E. Denell. Kansas State Univ., Manhattan, KS.

35 B31 Muscle formation in dendrobranchiate shrimp embryos and larvae. P.L. Hertzler and D.A. Kiernan. Central Michigan Univ., Mt. Pleasant, MI.

36 B32 Bat wings and the diversity of vertebrate limb development. S.D. Weatherbee, C.J. Cretekos, R.R. Behringer, J.J. Rasweiler IV and L.A. Niswander. Mem. Sloan Kettering Cancer Ctr., New York, NY; and M.D. Anderson Cancer Ctr., Houston, TX.

37 B33 On the molecular hierarchy regulating cartilage and bone formation. B.F. Eames, P.T. Sharpe and J.A. Helms. Univ. of California, San Francisco, CA; and Guy's Hosp., London, UK.

38 B34 Growth properties of the deutocerebral cells of the silkworm *Bombyx mori*. H.H. Park, S.Y. Na, K.M. Kim and B.H. Lee. Korea Univ., Seoul, South Korea.

39 B35 Identification and characterisation of novel zebrafish brain development mutants by large-scale mutagenesis screening. C. Klisa, P. Bayley, D.A. Lyons, Tübingen 2000 screen consortium, C. Nüsslein-Volhard, J.D.W. Clarke, M. Brand and S.W. Wilson. Max Planck Inst.-CBG, Dresden, Germany; Univ. Col. London, London, UK; Max Planck Inst. for Devel. Biol., Tübingen, Germany; and Artemis Pharmaceut., Tübingen, Germany.

40 B36 Cell adhesion molecule, neuroglian, directs axon guidance, in concert with Sema 1a in mushroom body development in *Drosophila* brain. Y.Y. Kang, R. Hiesinger, S. Natasha and P. Callaerts. Univ. of Houston, Houston, TX; and HHMI/Baylor Col. of Med., Houston, TX.

41 B37 Tracing the ancient history of animal signaling and adhesion proteins. N. King and S.B. Carroll. HHMI and Univ. of Wisconsin, Madison, WI.

42 B38 GXD: the gene expression database for mouse development. I. McCright, D. Begley, D. Hill, T. Hayamizu, C. Smith, J.T. Eppig, J. Kadin, J. Richardson and M. Ringwald. The Jackson Lab., Bar Harbor, ME.

43 B39 Evolution of developmental mechanisms in Chelicerata: genomic of spider mite *Tetranychus urticae*. P. Dearden, C. Donly and M. Grbic. Univ. of Western Ontario, London, Ontario, Canada; and Agriculture and Agri-Food Canada, London, Ontario, Canada.

44 B40 Multiple regulatory changes contribute to the evolution of the *Caenorhabditis lin-48 ovo* gene. X. Wang and H.M. Chamberlin. Ohio State Univ., Columbus, OH.

45 B41 Developmental plasticity in the sex determination mechanism of *C. elegans*. V. Prahlad, D. Pilgrim and E.B. Goodwin. Univ. of Wisconsin, Madison, WI; and Univ. of Alberta, Edmonton, Alberta, Canada.

46 B42 Doublesex-related genes regulate vertebrate sexual development. S. Kim, C. Raymond, J. Kettlewell, V. Bardwell and D. Zarkower. Univ. of Minnesota, Minneapolis, MN.

47 B43 *In vitro* fertilization to hatching, a novel culture method for embryos of the long-finned squid, *Loligo pealei*. K. Crawford. St. Mary's Col. of Maryland, St. Mary's City, MD.

Signaling

48 B44 Molecular mechanisms of micromere induction in the mud snail, *Ilyanassa obsoleta*. J. Wandelt and L.M. Nagy. Univ. of Arizona, Tucson, AZ.

49 B45 Receptor for activated C kinase (RACK1) required for *Drosophila* dorsal closure. J.A. Chapin and R.A. Holmgren. Northwestern Univ., Evanston, IL.

50 B46 The role of TAK1 in mouse developmental cell death. J. Jadrich, M. Danos, M. O'Connor and E. Coucouvanis. Univ. of Minnesota, Minneapolis, MN.

51 B47 Identification of downstream effectors of EphA4 signaling using a *Xenopus* embryo assay system. R.S. Winning. Eastern Michigan Univ., Ypsilanti, MI.

52 B48 A segmentation specific role of small GTPases Rac 1 in mesenchymal-epithelial transition. Y. Takahashi, S. Kuroda, K. Kaibuchi, K. Yasuda and Y. Nakaya. Nara Inst. of Sci. and Technol., Nara, Japan; Univ. of Tokyo, Tokyo, Japan; Nagoya Univ., Nagoya, Japan; and RIKEN, Saitama, Japan.

53 B49 Signaling via phosphoinositide-dependent pathways in fetal mouse submandibular glands. M. Kashimata, N. Koyama and E.W. Gresik. Asahi Univ., Gifu, Japan; and CUNY Med. Sch., New York, NY.

54 B50 Transcriptional coactivation of C/EBPα by a β-catenin/TCF-4N complex. J.A. Kennell, E.E. O'Leary, F. Schaufele and O.A. MacDougald. Univ. of Michigan, Ann Arbor, MI; and Univ. of California, San Francisco, CA.

55 B51 Regulation of Wnt signaling during adipogenesis. C.N. Bennett, S.E. Ross, K.A. Longo, L. Bajnok, N. Hemati, K.W. Johnson, S.D. Harris and O.A. MacDougald. Univ. of Michigan, Ann Arbor, MI; and Chiron Corp., Emeryville, CA.

56 B52 The Sys pathway synergizes with Wnt signaling to set up the proximal-distal axes of the gonad in *C. elegans*. K.R. Siegfried, T. Kidd and J. Kimble. HHMI/Univ. of Wisconsin, Madison, WI.

57 B53 Regulation of Wnt signaling by Dishevelled and Frodo. J. Gloy, K. Itoh, H. Hikasa, B. Brott, M. Ratcliffe and S.Y. Sokol. Harvard Med. Sch. and Beth Israel Deaconess Med. Ctr., Boston, MA.

58 B54 Analysis of the distribution and activity of ectopically expressed Wnt-3a in chick. L.M. Galli, M.J. Skalak, W. Denetclaw and L.W. Burrus. San Francisco State Univ., San Francisco, CA.

59 B55 Analysis of the role of Wnt-3a in chick myogenesis. L.W. Burrus and L.M. Galli. San Francisco State Univ., San Francisco, CA.

60 B56 Investigating the domains critical for MBC function in myoblast fusion in *Drosophila*. L. Balagopalan, B. Galleta and S.M. Abmayr. Pennsylvania State Univ., University Park, PA.

61 B57 Investigating the role of the cytoplasmic domain of sticks and stones in myoblast fusion in *Drosophila*. R. Banerjee and S.M. Abmayr. Pennsylvania State Univ., University Park, PA.

62 B58 Identification of proteins that interact with the cytoplasmic domain of Sticks-and-stones. S.J. Hong, K.E. Smith and S.M. Abmayr. Pennsylvania State Univ., University Park, PA.

63 B59 SpADAM is required for cell fate determination in early sea urchin development. R.D. Burke, G. Murray and M. Rise. Univ. of Victoria, Victoria, BC, Canada.

64 B60 A deficiency screen for genetic regulators of *Drosophila* imaginal leg imaginal disc morphogenesis. L. von Kalm, T. Camarata and A. Leppert. Univ. of Central Florida, Orlando, FL.

65 B61 Molecular and functional characterization of a dominant modifier of *Drosophila hedgehog*. C. Jones, R. Reifegerste and K. Moses. Emory Univ., Atlanta, GA.

66 B62 Functional variation of novel immune-type receptors (NITRs) is predicted by structural diversity and developmentally regulated expression. J.A. Yoder and G.W. Litman. Univ. of South Florida, St. Petersburg, FL; All Children's Hosp., St. Petersburg, FL; and H. Lee Moffitt Cancer Ctr. and Res. Inst., Tampa, FL.

67 B63 aph-1 in Notch signaling pathways of *C. elegans*. N. Sullivan and C. Goutte. Amherst Col., Amherst, MA.

68 B64 A novel role of the Notch signaling pathway in dauer maintenance in *C. elegans*. J. Ouellet and R. Roy. McGill Univ., Montreal, Canada.

69 B65 A suppressor screen of *egl-38* egg-laying defect to study the vulva to uterus signalling pathway in *Caenorhabditis elegans*. V. Rajakumar and H.M. Chamberlin. Ohio State Univ., Columbus, OH.

70 B66 MAB21L2 relocalizes to the nucleus in response to the Msx genes. R.L.Y. Wong, G.T.C. Lau and K.L. Chow. Hong Kong Univ. of Sci. and Technol., Clear Water Bay, Hong Kong.

71 B67 Yeast two-hybrid screen to identify potential interactors with the *Drosophila* gene crossveinless 2. D.J. Olson and S.S. Blair. Univ. of Wisconsin, Madison, WI.

72 B68 Growth and differentiation factor-8 induces dorsal mesoderm formation in *Xenopus* explants and stimulates erythroid differentiation of K562 human myelogenous leukemia cells. E. Carter, R. Hao, E. Etter, H. Lellman, M. Tsang and M. Breitenfeldt. R&D Systems, Inc., Minneapolis, MN.

73 B69 Tob proteins enhance inhibitory Smad-receptor interactions to repress BMP signaling. Y. Yoshida, A. von Bubnoff, N. Ikematsu, I.L. Blitz, E. Yoshida-Hosoda, H. Umemori, K. Miyazono, T. Yamamoto and K.W.Y. Cho. Univ. of Tokyo, Tokyo, Japan; Univ. of Californina, Irvine, CA; and Cancer Inst., Tokyo, Japan.

74 B70 Embryonic erythropoiesis is dependent on a SMAD-mediated signaling pathway in the ventral blood islands. M. Schmerer and T.R. Evans. Albert Einstein Col. of Med., Bronx, NY.

75 B71 Expression of Timeless in mouse lung development. J. Xiao. USC Sch. of Med., Los Angeles, CA.

76 B72 Dual roles of Cripto as a ligand and co-receptor in the Nodal signaling pathway. Y-T. Yan, J-J. Liu, Y. Luo, E. Chaosu, R.S. Haltiwanger, C. Abate-Shen and M.M. Shen. UMDNJ-Robert Wood Johnson Med. Sch., Piscataway, NJ; and SUNY-Stony Brook, Stony Brook, NY.

77 B73 Mechanisms of calcium signaling in zebrafish development. D.C. Slusarski, B. Hjertos and J. Humbert. Univ. of Iowa, Iowa City, IA.

78 B74 Exogenous amino acids regulate trophoblast cell differentiation through a mTOR dependent pathway. P.M. Martin and A.E. Sutherland. Univ. of Virginia, Charlottesville, VA.

Gene Regulation

79 B75 MicroRNAs in *Arabidopsis thaliana*. B. Reinhart, E. Weinstein, B. Bartel and D. Bartel. Whitehead Inst., Cambridge, MA; and Rice Univ., Houston, TX.

80 B76 Molting in free-living and parasitic nematodes: a role for nuclear receptors? P. Gandotra, M. Luschini, K. Kraus, S. Joyce and K. Crossgrove. Loyola Col. in Maryland, Baltimore, MD.

81 B77 Hormonal regulation of a *Manduca sexta* cuticular protein gene, MSCP14.6. D. Petibone and J. Rebers. Northern Michigan Univ., Marquette, MI.

82 B78 mRNA controlled gene expression in development, the epigene. M. Niu. Temple Univ., Philadelphia, PA; and Academia Sinica, Beijing, China.

83 B79 Sequence and expression of BET family genes in zebrafish. K.J. Bee, J.J. Andahazy and A.J. DiBenedetto. Villanova Univ., Villanova, PA.

84 B80 Genetic analysis of hypoxia signaling and response. C. Shen and J.A. Powell-Coffman. Iowa State Univ., Ames. IA.

85 B81 An essential role for bHLH-PAS proteins in *C. elegans*. H. Jiang, S. Wu and J.A. Powell-Coffman. Iowa State Univ., Ames, IA.

86 B82 A pharyngeal muscle specific enhancer from ceh-22 is targeted by PHA-4 and other factors. T. Vilimas, A. Abraham and P.G. Okkema. Univ. of Illinois at Chicago, Chicago, IL.

87 B83 Mab-21 gene expression is regulated by forkhead and homeodomain containing transcription factors. S.S.H. Ho and K.L. Chow. Hong Kong Univ. of Sci. and Technol., Clear Water Bay, Hong Kong.

88 B84 A genetic screen identifies osa as a dominant interacter with the *Drosophila* Pax-6 homolog Eyeless. M. Meziou and P. Callaerts. Univ. of Houston, Houston, TX.

89 B85 Molecular screen identifies fasciclin II as a transcriptional target of Eyeless. B. Gafford, H. Sun and P. Callaerts. Univ. of Houston, Houston, TX.

90 B86 Analysis of histone methyltransferases in *Drosophila*. C.S. Ketel, J. Fang, C.M. Hart, E.L. Miller, Y. Zhang and J.A. Simon. Univ. of Minnesota, Minneapolis, MN; and Univ. of North Carolina, Chapel Hill, NC.

91 B87 Targeted disruption of a mouse homolog of the *Drosophila* Asx gene leads to bidirectional axial skeleton transformations and spermatocyte defects. C. Fisher, C. Helgason, C. Bodner, K. Humphries and H. Brock. Univ. of British Columbia, Vancouver, BC, Canada; and BC Cancer Res. Ctr., Vancouver, BC, Canada.

92 B88 Generating single-copy transgenic mouse embryos by tetraploid embryo complementation. W.D. Garrison, R.P. Misra, S.K. Bronson, Q. Xiao, J. Li, R. Zhao and S.A. Duncan. Med. Col. of Wisconsin, Milwaukee, WI; and Pennsylvania State Col. of Med., Milton S. Hershey Med. Ctr., Hershey, PA.

93 B89 Identification of differentially regulated novel genes during embryo development. I-T. Hwang, Y-J. Kim and J-Y. Chun. Seegene Life Sci. Lab., Seoul, South Korea.

94 B90 A role for a mouse polycomb group gene in imprinting. J.C. Mager, N.D. Montgomery, F. Pardo-Manuel de Villena and T. Magnuson. Univ. of North Carolina-Chapel Hill, Chapel Hill, NC.

95 B91 Functional analysis of CREB binding protein in mice using an ENU-based mutagenesis approach in embryonic stem cells. M.K. Bunger and T.R. Magnuson. Univ. of North Carolina, Chapel Hill, NC.

96 B92 Transcription factor AP-2 - a gatekeeper at the checkpoint proliferation/differentiation? U. Werling, R. Jäger, P. Pfisterer, J. Ehlermann and H. Schorle. Univ. of Bonn Med. Sch., Bonn, Germany.

97 B93 Abnormal function of astroglia and vestibular dysgenesis in mice lacking Abr and Bcr Cdc42/RacGAPs. V. Kaartinen, I. Gonzalez-Gomez, J.W. Voncken, A. Nagy, L. Haataja, J. Groffen and N. Heisterkamp. Children's Hosp., Los Angeles, CA.

98 B94 Dissecting the regulatory regions of the mouse Fgf3 gene and the requirement for sonic hedgehog signalling for some domains of expression. N. Powles, H. Marshall, A. Economou, C. Chang, A. Murakami, C. Dickson, R. Krumlauf and M. Maconochie. Med. Res. Council, Oxfordshire, UK; Stowers Inst. for Med. Res., Kansas City, MO; Natl. Inst. for Med. Res., London, UK; Vanderbilt Univ., Nashville, TN; Kyoto Univ., Kyoto, Japan; and Imperial Cancer Res. Fund, London, UK.

99 B95 Regulation of chordin transcription by FGFR1. D. Watrous-McCabe, L. Abler and M.D. Sheets. Univ. of Wisconsin-Madison, Madison, WI.

100 B96 Translation and polyadenylation of BMP7 mRNA are regulated by novel mechanisms in *Xenopus* embryos. B.R. Fritz and M.D. Sheets. Univ. of Wisconsin-Madison, Madison, WI.

101 B97 Inducible control of tissue-specific transgene expression in *Xenopus tropicalis* transgenic lines. J. Chae, L.B. Zimmerman and R.M. Grainger. Univ. of Virginia, Charlottesville, VA; and Natl. Inst. for Med. Res., The Ridgeway, London, UK.

102 B98 Modulation of Smad-induced collagen gene expression by p53 in skin fibroblasts. A. Ghosh and J. Varga. Univ. of Illinois at Chicago Col. of Med., Chicago, IL.

103 B99 Twist, Sp1, USF1 and USF2 regulate the human GLI1 promoter. E. Villavicencio, J.W. Yoon, D. Frank, E-M. Füchtbauer, D. Walterhouse and P. Iannaccone. Northwestern Univ. and the Children's Mem. Inst. for Edu. and Res., Chicago, IL; and Aarhus Univ., Aarhus, Denmark.

104 B100 Functional characterization of EPS, a novel lineage-specific transcription factor. Y. Xu, E.D. Smith, B. Kennedy, Y. Fujiwara, S.H. Orkin and J.D. Crispino. Univ. of Chicago, Chicago, IL; and Harvard Med. Sch., Boston, MA.

105 B101 Initial localization of a neurogenic response element in the promoter of the human Zfhep transcription factor gene. K.L. Hapney, R.P. Stearman and D.S. Darling. Univ. of Louisville, Louisville, KY.

106 B102 Unique roles for E2F1 in the mouse ocular lens. R.K. Hyde and A.E. Griep. Univ. of Wisconsin, Madison, WI.

107 B103 Mechanisms underlying region-specific expression of the δ-crystallin gene in chick lens development. N. Shimada, T. Murata-Aya and K. Yasuda. Nara Inst. of Sci. and Technol., Ikoma, Japan.

108 B104 Understanding the regulation of hedgehog genes during eye development. A.R. Morris and K. Moses. Emory Univ. Sch. of Med., Atlanta, GA.

109 B105 Identification and characterization of male-specific sexual regulators and TRA-1 target gene. K. Thoemke, W. Yi, V. Reinke, M. Sohrmann and D. Zarkower. Univ. of Minnesota, Minneapolis, MN; Yale Med. Sch., New Haven, CT; and The Wellcome Trust Sanger Inst., Cambridge, UK.

110 B106 Molecular control of testis development by Dmrt1. U. Fahrioglu, C. Raymond, D. Zarkower and V. Bardwell. Univ. of Minnesota, Minneapolis, MN.

111 B107 Analysis of muscle and tissue-specific expression of MRP in *Drosophila*. J. Daley, M. Gentile, W. Sunday, D.M. Standiford and C.P. Emerson, Jr. Univ. of Pennsylvania Sch. of Med., Philadelphia, PA.

112 B108 Analysis of myosin heavy chain expression in tadpole hindlimb and tail muscle during spontaneous metamorphosis. K.D. Martin, B.G. Atkinson and P.A. Merrifield. Univ. of Western Ontario, London, Ontario, Canada.

113 B109 Structure and regulation of an amphibian muscle-specific creatine kinase gene. L.F. Petersen and B.G. Atkinson. Univ. of Western Ontario, London, Ontario, Canada.

Functional Genomics

114 B110 A transcriptional profile of development in wild type and in mutant *Dictyostelium discoideum* cells. N. Van Driessche, C. Shaw, M. Ibarra, A. Kuspa and G. Shaulsky. Baylor Col. of Med., Houston, TX.

115 B111 A search for targets of the *Drosophila* neuroblast temporal network. T. Brody, C. Stivers and W.F. Odenwald. NINDS, NIH, Bethesda, MD.

116 B112 Insertional mutagenesis in *Xenopus* using retroviruses and transposons. E. Kuliyev, A.M. Proctor, J.R. Doherty, H. Zhu, M.J. Hamlet and P.E. Mead. St. Jude Children's Res. Hosp., Memphis, TN.

117 B113 An ENU-induced hypomorphic allele of Smad2 identifies novel functions in murine embryonic development. J.L. Vivian, Y. Chen and T. Magnuson. Univ. of North Carolina at Chapel Hill, Chapel Hill, NC.

118 B114 Identifying novel relationships among RNA expression patterns in microarray data. F.D. Oakley. Iowa State Univ., Ames, IA.

119 B115 DNA microarray optimizations: increasing spot accuracy and automated identification of true microarray signals using *Xenopus laevis* as a model system. D. Peiffer, Y. Shin, A. von Bubnoff, P. Tran, M. Mochii, A. Kitayama, N. Ueno and K.W.Y. Cho. Univ. of California, Irvine, CA; and Natl. Inst. for Basic Biol., Okazaki, Japan.

120 B116 Microarray gene expression profiling reveals novel tissue relationships and coordinately-regulated genes in mouse development. M.D. Bates, L.C. Schatzman, M.A. Betzel and B.J. Aronow. Children's Hosp. Med. Ctr., Cincinnati, OH.

Early Embryo Patterning

121 B117 Centrosome rotation and tubulin in the early *C. elegans* embryo. A.J. Wright and C.P. Hunter. Harvard Univ., Cambridge, MA.

122 B118 A microtubule array precedes the formation of the cleavage furrow during the first two cell division cycles in zebrafish embryos. K.W. Lee, S.E. Webb, S.M. Ho, C.H. Wong and A.L. Miller. Hong Kong Univ. of Sci. and Technol., Clear Water Bay, Hong Kong.

123 B119 A twist in a tail: a conserved mechanism by which the tailbud controls brain, heart and gut left-right organogenesis? H.J. Yost, J.J. Essner and M.K. Wagner. Univ. of Utah, Salt Lake City, UT.

124 B120 Wnt3a is required for establishment of L-R asymmetry. T.P. Yamaguchi, K. Biris and J. Greear. NCI-Frederick, NIH, Frederick, MD.

125 B121 BMP signaling through ALK2 plays a role as tight determinant in the establishment of left-right asymmetry in mouse embryos. S. Kishigami, C. Trisha and Y. Mishina. NIEHS, NIH, Res. Triangle Pk., NC.

126 B122 Morphological landmarks of anteroposterior development in pre-streak mouse embryos. J.A. Rivera-Perez, J. Mager and T. Magnuson. Univ. of North Carolina, Chapel Hill, NC.

127 B123 The role of *bruno-like* in early zebrafish development. S.M. Byrd and R.K. Ho. Univ. of Chicago, Chicago, IL.

128 B124 Axis duplication and neural specification in *Xenopus* embryos overexpressing the novel gene *Ashwin*. T.B. Alexander, S.S. Patil, J.A. Uzman and A.K. Sater. Univ. of Houston, and Univ. of Houston Downtown, Houston, TX.

129 B125 Chordin mediates pronephros induction by the trunk organizer. T.S. Mitchell and M.D. Sheets. Univ. of Wisconsin-Madison, Madison, WI.

130 B126 Stabismus and the planar polarity pathway in convergent extension. R.S. Darken, A.M. Scola, A.S. Rakeman, G. Das, M. Mlodzik and P.A. Wilson. Weill Med. Col., New York, NY; and Mount Sinai Sch. of Med., New York, NY.

131 B127 Reinterpretation of the extant fate maps in *Xenopus* supports revision of the embryonic axes. M.C. Lane and M.D. Sheets. Univ. of Wisconsin, Madison, WI.

132 B128 LvTbx2/3, a T-box family transcription factor that patterns the dorsal/ventral axis of the sea urchin embryo. J.M. Gross, R.E. Peterson and D.R. McClay. Duke Univ., Durham, NC.

133 B129 Spatial regulation of proteolysis in patterning the *Drosophila* embryonic D/V axis. E.K. LeMosy. Med. Col. of Georgia, Augusta, GA.

134 B130 LvGroucho represses beta-catenin mediated endomesoderm specification in the sea urchin *Lytechinus variegatus*. R.C. Range, J.M. Venuti and D.R. McClay. Duke Univ., Durham, NC; and LSU Hlth. Sci. Ctr., New Orleans, LA.

135 B131 Withdrawn

136 B132 Inadequate differentiation of endoderm/mesoderm derived cells in mouse 17Rn3 mutant embryos. H. Nakamura and M.J. Justice. Baylor Col. of Med., Houston, TX.

137 B133 *Eomesodermin* antagonizes Nodals to pattern the organizer. A.E.E. Bruce, C. Howley and R.K. Ho. Univ. of Chicago, Chicago, IL.

138 B134 Analysis of Wnt pathway function in *Tribolium* segmentation. L. Farzana, L. Peterson and S. Brown. Kansas State Univ., Manhattan, KS.

139 B135 Regulation of WG-signaling by *Drosophila* sulfated. M. Lai, X. Ai, W. Sunday, C. Emerson, Jr. and D.M. Standiford. Univ. of Pennsylvania Sch. of Med., Philadelphia, PA.

140 B136 Basal repression of Wnt target genes by hdl and tcf3b helps define the low end of a Wnt activity gradient in the neurectoderm. M. Itoh, R.I. Dorsky, R.T. Moon and A. Chitnis. NICHD, NIH, Bethesda, MD; Univ. of Utah, Salt Lake City, UT; and HHMI/Univ. of Washington, Seattle, WA.

141 B137 The RNA-binding protein hermes is essential for embryonic development. M.E. George, L-J. Duan and T.A. Drysdale. Univ. of Western Ontario, London, Ontario, Canada; and Univ. of Connecticut Hlth. Ctr., Farmington, CT.

142 B138 Identification of an organizer-specific Lim1 regulatory element in the mouse. W. Shawlot and I. Leaf. Univ. of Minnesota, Minneapolis, MN.

143 B139 Defective forebrain patterning in embryos of diabetic mice. D.M. Liao, Y.K. Ng, S.S.W. Tay, E.A. Ling and S.T. Dheen. Fac. of Med., Natl. Univ. of Singapore.

144 B140 Analysis of postaxial limb malformations in mice induced by gestational ethanol exposure. D.P. Gardner, L. Suchocki, T. Thal and Y.G. Yueh. Midwestern Univ., Glendale, AZ.

145 B141 The differentiation of dopaminergic neurons is inhibited by estrogen. J. Roffers and R.D. Heathcote. Univ. of Wisconsin-Milwaukee, Milwaukee, WI.

146 B142 Central and peripheral pattern formation of primary sensory neurons. S. Wieczorek and R.D. Heathcote. Univ. of Wisconsin-Milwaukee, Milwaukee, WI.

147 B143 Signal synergy of the Dpp and Scw pathways occurs at the level of the type I receptors. D.G. Stathakis, S. Park and K. Arora. Univ. of California, Irvine, CA.

148 B144 The putative RNA-binding proteins MEX-5, MEX-6, and SPN-4 regulate MEX-3 localization and activity to control PAL-1 spatial patterning. N.N. Huang and C.P. Hunter. Harvard Univ., Cambridge, MA.

149 B145 Gene expression profiles in early human development. J. Cai, D. Ash, D. Massina, N. Fukushima, R. Tidwell, C. Helms, R. Veile, Y. Korshunova, M. Lovett, T. Attie-Bitach, S. Audollent, J. Auge, M. Vekemans and E.W. Jabs. Johns Hopkins Univ., Baltimore, MD; Washington Univ., St. Louis, MO; and Hosp. Necker Enfants Melades, Paris, France.

Morphogenesis

150 B146 Do morphogen gradients arise by diffusion? A.D. Lander, Q. Nie and F.Y.M. Wan. Univ. of California, Irvine, CA.

151 B147 Computational analysis of cell communication *Drosophila* oogenesis. S.Y. Shvartsman and C.B. Muratov. Princeton Univ., Princeton, NJ.

152 B148 Remodeling of motor neuronal contacts into functional synapses at developing adult neuromuscular junctions in *Drosophila*. S. Hebbar and J. Fernandes. Miami Univ., Oxford, OH.

153 B149 VAB-9 is a claudin-like adherens junction protein that regulates epithelial morphology and adhesion in *C. elegans.* J.S. Simske and J. Hardin. Rammelkamp Ctr., Cleveland, OH; and Univ. of Wisconsin, Madison, WI.

154 B150 Two ram genes interact with genes guiding axonal migration and matrix formation during sensory ray morphogenesis. J.C.N. Tam, Y.M. Lam and K.L. Chow. Hong Kong Univ. of Sci. and Technol., Clear Water Bay, Hong Kong.

155 B151 A novel secretory protein MAB-7 is involved in sensory ray morphogenesis of *C. elegans*. H.S.W. Tsang and K.L. Chow. Hong Kong Univ. of Sci. and Technol., Clear Water Bay, Hong Kong.

156 B152 Synthesis of specific cuticular collagen in *C. elegans* male tail modulates sensory organ morphogenesis. R.Y.L. Yu, D.W.S. Hui and K.L. Chow. Univ. of Sci. and Technol., Clear Water Bay, Hong Kong.

157 B153 The para-Hox gene caudal is required for tail formation in zebrafish. I. Skromne, Y. Kikuchi, D. Stainier and R.K. Ho. Chicago Univ., Chicago, IL; and Univ. of California, San Francisco, CA.

158 B154 Analysis of the cellular behaviors driving cardiac fusion in zebrafish. N.S. Glickman and D. Yelon. Skirball Inst., NYU Sch. of Med., New York, NY.

159 B155 Pronephric duct morphogenesis in *Ambystoma mexicanum* and *Xenopus laevis* compared. R. Lumpkins, C. Meighan, M.E. Kite and J. Drawbridge. Rider Univ., Lawrenceville, NJ; and Princeton Univ., Princeton, NJ.

160 B156 The role of the Rho family of GTPases in gastrulation cell movements. R. Habas, Y. Kato, I. Dawid and X. He. Children's Hosp., Harvard Med. Sch., Boston, MA; and NICHD/NIH, Bethesda, MD.

161 B157 Membrane protrusive activity and cleavage furrow closure in *Xenopus* embryos. M. Danilchik, E. Brown and K. Ray. Oregon Hlth. and Sci. Univ., Portland, OR.

162 B158 Control of tension across the chorioamniotic membrane. R. Pulver, Y. Evrard, P. Tilkens and B. Holton. Univ. of Wisconsin, Oshkosh, WI.

163 B159 Arterial blood vessel-specific expression of the ALK1 gene. T. Seki, J. Yun, C. Hughes and S.P. Oh. Univ. of Florida, Gainesville, FL; and Univ. of California, Irvine, CA.

164 B160 Defective placental and yolk sac vascularization in mice lacking LBP-1a, a member of the NTF family of transcription factors. V. Parekh, A. McEwen, V. Barbour, Y. Takahashi, S.M. Jane and J.M. Cunningham. St. Jude Children's Res. Hosp., Memphis, TN; and Royal Melbourne Hosp. Res. Fndn., Victoria, Australia.

165 B161 Role of Nope and DCC in otic development. L. Francis and S.L. Mansour. Univ. of Utah, Salt Lake City, UT.

166 B162 Mesenchyme-epithelial transformation during corneal endothelial morphogenesis. T. Mgwebi and S.H. Kidson. Univ. of Cape Town, Cape Town, South Africa.

167 B163 A mouse mutant with double anterior zeugopod and D/V autopod duplication. C. Schreiner, S. Bell, O. Krebs and W. Scott. Children's Hosp. Res. Fndn., Cincinnati, OH; and Inst. of Molec. Animal Breeding, Munich, Germany.

168 B164 Asymmetric limb malformations induced by transgene integration into a novel gene. S.M. Bell, C.M. Schreiner, B. Aronow and W.J. Scott. Children's Hosp. Med. Ctr., Cincinnati, OH.

169 B165 BMPR1A signaling is required to establish limb patterning. M. Lewandoski, C. Wilson, R. Anderson, Y. Mishina, D. Nelson and T. Williams. NCI-Frederick, NIH, Frederick, MD; NIES, NIH; Yale Univ., New Haven, CT; and Univ. of Colorado, Denver, CO.

170 B166 Wnt3 is necessary for proper limb development. B. Arenkiel, K. Thomas and M. Capecchi. Univ. of Utah, Salt Lake City, UT.

171 B167 Spatial and temporal aspects of SHH signaling during limb patterning. L. Panman, P. te Welscher, G. Soete, O. Michos, R. Zeller and A. Zuniga. Univ. of Utrecht, Utrecht, The Netherlands.

172 B168 Retroviral expression of a constitutively-active epidermal growth factor receptor leads to alterations of limb patterning in developing chick embryos. M. Omi, N. Maihle and C.N. Dealy. Univ. of Connecticut Hlth. Ctr., Farmington, CT; and Mayo Clin. Fndn., Rochester, MN.

173 B169 The role of delta-like 3 in maintaining the Notch pathway somite clock. M.S. Mimoto, K.L. Covello, S.A. Stevens and K. Kusumi. Children's Hosp. of Philadelphia and Univ. of Pennsylvania Sch. of Med., Philadelphia, PA.

174 B170 Consequences of the lack of aggrecan in epiphyseal growth plate signaling. M.S. Domowicz, M.M. Mueller, S.M. Ferguson, J.G. Henry, L.E. Schwartz and N.B. Schwartz. Univ. of Chicago, Chicago, IL.

175 B171 Differentiation and patterning of vertebrate tendons. T. Riordan, N. Murchison and R. Schweitzer. Shriners Hosp. for Children, Portland, OR.

176 B172 Epimorphin promotes cartilage condensation/sorting during vertebral skeletogenesis. Y. Oka, Y. Sato, Y. Hirai, H. Tsuda and Y. Takahashi. Sumitomo Electric Industries, LTD, Yokahama, Japan; Nara Inst. of Sci. and Technol., Nara, Japan; and RIKEN, Saitama, Japan.

177 B173 Changes in gap junction communication between human mesenchymal stem cells during differentiation and senescence. R.A. Meyer. Creighton Univ., Omaha, NE.

Cell Proliferation

178 B174 Downstream gene targets of GLI1 by gene expression profiling. J.W. Yoon, Y. Kita, D. Frank, R.R. Majewski, B.A. Konicek, M.A. Nobrega, H. Jacob, D. Walterhouse and P. Iannaccone. Northwestern

Univ. and Children's Mem. Inst. for Edu. and Res., Chicago, IL; Med. Col. of Wisconsin, Milwaukee, WI; and Fujisawa Pharmaceut. Co., Ltd., Japan.

179 B175 G1 regulation in *C. elegans*. J. Cerón and S. van den Heuvel. Massachusetts Gen. Hosp. Cancer Ctr., Harvard Med. Sch., Charlestown, MA.

180 B176 Role of the hedgehog gene in myoblast proliferation. K. Badrinath and J. Fernandes. Miami Univ., Oxford, OH.

181 B177 Possible role for PDZ domain containing proteins in lens development. M.M. Nguyen and A.E. Griep. Univ. of Wisconsin-Madison, Madison, WI.

182 B178 Inhibition of cell division is required during vertebrate gastrulation. W.F. Leise and P.R. Mueller. Univ. of Chicago, Chicago, IL.

Molecular Medicine and Development

183 B179 Specificity assay for cell binding to derivatized beads. A. Razi, M.R. Khurrum, D. Khatibi, S. Gipson, M.S. Khadiv, P. Parsa, E.S. Soriano, E. Garcia, K. Keyvanjah, K. Abedi, T. Clark, M. Sidhu, S. Meshkinfam, M. Khoddami, O. Badali and S.B. Oppenheimer. California State Univ., Northridge, CA.

184 B180 Sonic hedgehog signaling activates stromal *Gli1* expression and accelerates prostate cancer xenograft tumor growth. L. Fan, M. Lamm, C. Hebner, W. Catbagan, R. Laciak, D. Barnett and W. Bushman. Northwestern Univ. Med. Sch., Chicago, IL.

Monday July 22nd

Meeting Registration
8am-5pm Union Theater Foyer

Funding Opportunities in Developmental Biology
8-9am Humanities 2650
Moderator – Ida Chow. Society for Developmental Biology, Bethesda, MD
Representatives from NSF, NIH, American Cancer Society, March of Dimes and other agencies.

Concurrent Symposia
9 AM - 12:15 PM Each symposium has talks by invited speakers (30 min) and by authors selected from contributed abstracts (15 min), with coffee break at 10:30am.

Symposium 1 -- Regulation of Morphogenetic Signaling Humanities 2650

Chair: Arthur Lander

185 9:00 Interplay of receptors, co-receptors, and molecular diffusion in the regulation of developmental signaling. A.D. Lander, K. Ding, E. Kanakubo, A. Kumbasar, Q. Nie, L. Pham, J.A. Sanchez and F.Y.M. Wan. Univ. of California, Irvine, CA.

186 9:30 FGF signaling is governed by distinct heparan sulfate domains during mouse development. B.L. Allen and A.C. Rapraeger. Univ. of Wisconsin-Madison, Madison, WI.

187 9:45 Syndecan 2 is asymmetrically regulated by PKC during early *Xenopus* left-right development. K.L. Kramer and H.J. Yost. Univ. of Utah, Salt Lake City, UT.

188 10:00 Regulation of cell polarity during zebrafish gastrulation. L. Solnica-Krezel, F. Marlow, J. Topczewski, J. Jessen and D. Sepich. Vanderbilt Univ., Nashville, TN.

10:30 Break.

189 10:45 Xlefty antagonizes both Nodal and Wnt signaling during gastrulation. W.W. Branford and H.J. Yost. Univ. of Utah, Salt Lake City, UT.

190 11:00 Regulation of extracellular signaling by cell surface sulfatases. X. Ai, D. Spillmann, U. Lindahl and C.P. Emerson, Jr. Univ. of Pennsylvania Sch. of Med., Philadelphia, PA; and Uppsala Univ., Uppsala, Sweden.

191 11:15 β-catenin is differentially degraded along the animal-vegetal axis of early sea urchin embryos in a GSK-3β-dependent manner. H.E. Weitzel and C.A. Ettensohn. Carnegie Mellon Univ., Pittsburgh, PA.

192 11:30 Characterization of the *in vivo* substrate activities of the mammalian BMP-1/Tolloid-related metalloproteinases: analysis of the Bmp1/Tll1 double knockout. W.N. Pappano and D.S. Greenspan. Univ. of Wisconsin Med. Sch., Madison, WI.

193 11:45 Functional genomic analysis of cellular morphology using high-throughput RNAi screens. A. Kiger, B. Baum, S. Armknecht, M. Chang, M. Jones, A. Coulson, S. Jones, B. Sönnichsen, C. Echeverri and N. Perrimon. HHMI/Harvard Med. Sch., Boston, MA; Wellcome Trust Sanger Inst., Cambridge, UK; and Cenix BioScience GmbH, Dresden, Germany

Symposium 2: Making and Connecting the Brain Humanities 3650

Chair: Mary Halloran. Univ. of Wisconsin-Madison. WI

194 9:00 Genetic analysis of the roles of BMPs and FGFs in forebrain patterning. S.K. McConnell and J. Hébert. Stanford Univ., Stanford, CA.

195 9:30 Dual roles for FGF signaling in promoting zebrafish hindbrain development. L. Maves and C.B. Kimmel. Univ. of Oregon, Eugene, OR.

196 9:45 Generating the mammalian neocortical area map. E.A. Grove. Univ. of Chicago, Chicago, IL.

197 10:15 Coordinate regulation of neuronal fate by homeodomain factors Exex, dNk6, and Ddbx. H. Broihier, A. Kuzin, Y. Zhu, W. Odenwald and J. Skeath. Washington Univ. Sch. of Med., St. Louis, MO; and NINDS, NIH, Bethesda, MD.

10:30 Break.

198 10:45 Genetic analysis of axonal guidance in the zebrafish embryo. J. Zhang, S. Zhao and M. Granato. Univ. of Pennsylvania Sch. of Med., Philadelphia, PA.

199 11:15 EphA4-ephrin interactions in axon pathfinding. C.E. Krull, J. Eberhart, M.E. Swartz and E.B. Pasquale. Univ. of Missouri, Columbia, MO; and Burnham Inst., La Jolla, CA.

200 11:30 Identification of a cell autonomous neuronal function for Commissureless in axon guidance. V.L. McGovern and M.A. Seeger. Ohio State Univ., Columbus, OH.

11:45 Axon guidance and synaptogenesis in *Drosophila*. Kai Zinn. Caltech, Pasadena, CA

12:15 **Lunch at Lakefront Café**

NIGMS 40th Anniversary Symposium -- Dealing with Complexity
1:00 - 3:30 PM Union Theatre

Chair: Stuart Kim

201 1:00 Global analysis of gene expression in *C. elegans*. S.K. Kim. Stanford Univ., Stanford, CA.

202 1:30 Unraveling the genetic hierarchy of muscle development using genetics and genomics. E.E.M. Furlong, R.D. Artero, M.K. Baylies and M.P. Scott. HHMI/Stanford Univ. Med. Sch., Stanford, CA; and Memorial Sloan-Kettering Cancer Ctr., New York, NY.

2:00 Genome regulatory networks in living cells. R. Young. MIT, Cambridge, MA

2:30 A functional genomics approach to the discovery of cis-regulatory DNA. D. Keys. Univ. of California, Berkeley, CA

3:00 Genome wide RNAi screening in *C. elegans* and its application to studying early cell polarity. J. Ahringer. Univ. of Cambridge, U.K.

3:30 Break

Imaging Cells and Molecules Workshop
3:45 - 5:30 PM Union Theatre

Chair: John White

203 3:45 Common mechanisms underlying growth cone guidance and axon branching. K. Kalil, F. Tang and E.W. Dent. Univ. of Wisconsin, Madison, WI.

204 4:10 Using multiphoton microscopy to explore the dynamics of embryonic development. J.M. Squirrell. Univ. of Wisconsin, Madison, WI.

4:35 Real time observation of the physiology of apoptosis in cells. B. Herman. Univ. of Texas Hlth. Ctr. at San Antonio, TX

205 5:00 Single-molecule physiology under an optical microscope: how molecular machines may work. K. Kinosita, Jr. Okazaki Natl. Res. Inst., Okazaki, Japan.

Meet the SDB Directors – Reception for students and postdocs
5:00 - 6:00 PM Inn Wisconsin

5:30 **Dinner at Lakefront Café**

Plenary I: The Development of Cell, Organ, and Organismal Size
7:00 - 9:00 PM Union Theatre

Chair: Martin Raff

206 7:00 Size control. M. Raff. Univ. Col. London, London, UK.

7:30 Cell-cell communication during *Drosophila* eye development. E. Hafen. Univ. of Zürich, Switzerland

8:00 The roles of functionally overlapping gene families in regulating stem cell identity. S. Clark. Univ. of Michigan, Ann Arbor, MI.

207 8:30 The control of body size in *Manduca sexta*. F. Nijhout. Duke Univ., Durham, NC.

Poster Session I and Mixer
9:00 - 11:00 PM Great Hall and Tripp Commons
Odd number boards: Authors at posters 9:00-10:00pm
Even number boards: Authors at posters 10:00-11:00pm

Tuesday July 23rd

Gene-Tools Breakfast Tutorial Humanities 2650
7:30 - 8:45AM Morpholino antisense: Mechanism & design. P. Morcos and S. Knuth. Gene-Tools, LLC

Meeting Registration
8am-5pm Union Theater Foyer

Set up for Poster Session II
8-11:30am Great Hall and Tripp Commons

Concurrent Symposia
9 AM - 12:15 PM Each symposium has talks by invited speakers (30 min) and by authors selected from contributed abstracts (15 min), with coffee break at 10:30am.

Symposium 3: Signaling into the Cytoskeleton Humanities 2650

Chair: Jeff Axelrod

208 9:00 Regulation of cell migration by Rho GTPases. H. Daub, S. Etienne-Manneville and A. Hall. Univ. Col. London, London, UK.

209 9:30 *Drosophila* inhibitor of apoptosis (DIAP1) affects the actin cytoskeleton and is required for border cell migration. E.R. Geisbrecht and D.J. Montell. Johns Hopkins Sch. of Med., Baltimore, MD.

210 9:45 Cell biological studies of ephrin-B1 signaling in avian neural crest cell migration. A.J. Ewald and S.E. Fraser. Caltech, Pasadena, CA.

211 10:00 Two-component circuitry in *Arabidopsis* cytokinin signal transduction. I. Hwang and J. Sheen. Massachusetts Gen. Hosp., Harvard Med. Sch., Boston, MA.

10:30 Break.

212 10:45 Rac and Rho act in parallel in signaling pathways that ultimately converge to control convergent extension during *Xenopus* gastrulation. E. Tahinci and K. Symes. Boston Univ. Sch. of Med., Boston, MA.

213 11:00 Finding their way - role of PI3K in directional sensing. R.A. Firtel, S. Funamoto and R. Meili. Univ. of California San Diego, La Jolla, CA.

214 11:30 A secreted cell-number counting factor represses intracellular glucose levels to regulate group size in *Dictyostelium*. W. Jang, B. Chiem and R.H. Gomer. HHMI and Rice Univ., Houston, TX.

215 11:45 Feedback loops and gradients determine cortical domains during planar cell polarity signaling. D. Ma, D. Tree, C-H. Yang, M. Simon and J. Axelrod. Stanford Univ. Sch. of Med., Stanford, CA.

Symposium 4: Development of Sensory Systems Humanities 3650

Chair: Connie Cepko

216 9:00 Scents and sensibility: development of chemosensory neurons in *C. elegans.* P. Sengupta. Brandeis Univ., Waltham, MA.

217 9:30 FGF signaling and early ear development in the zebrafish. B.B. Riley, B.T. Phillips, S-J. Kwak and R. Heck. Texas A&M Univ., College Station, TX.

218 10:00 BMP gradient and Tbx genes determine the dorsal-ventral polarity of eye. K. Koshiba-Takeuchi, J. Takeuchi, T. Suzuki and T. Ogura. Nara Inst. of Sci. and Technol., Nara, Japan.

219 10:15 Establishing the pre-placodal region. A. Litsiou, K.W. McLarren and A. Streit. King's Col., Guy's Hosp., London, UK.

10:30 Break.

220 10:45 Lamina selective synapse formation in the visual system. J.R. Sanes, J.A. Weiner and M. Yamagata. Washington Univ. Med. Sch., St. Louis, MO.

221 11:15 Formation of the rod photoreceptor cell mosaic. J.M. Fadool. Florida State Univ., Tallahassee, FL.

222 11:30 Prospero: from inner photoreceptor to R7 cell fate. T. Cook and C. Desplan. New York Univ., New York, NY.

11:45 Genomics approaches to photoreceptor development and disease. C. Cepko. Harvard Med. Sch., Boston, MA.

12:15 **Lunch at Lakefront Café**

SDB Business Meeting – Membership vote on changes to SDB's Articles of Incorporation
1:30 - 2:00 PM Humanities 2650

Poster Session II
2:00--5:30pm Great Hall and Tripp Commons
Numbers in ***Italics*** indicate program Abstract Number.
B numbers indicates poster Board Number
Odd number boards: Authors at posters 9:00-10:00pm
Even number boards: Authors at posters 10:00-11:00pm

Patterning and Transcription Factors

223 B1 Analysis of *Arabidopsis* root pattern formation: tissue-specific ectopic expression on the moving putative transcription factor SHORT-ROOT. G. Sena, K. Nakajima, J. Jung and P.N. Benfey. New York Univ., New York, NY.

224 B2 Structure-function analysis of the putative transcription factor SCARECROW in asymmetric cell division. A.J. Paquette, K. Nakajima and P.N. Benfey. New York Univ., New York, NY; and Nara Inst. of Sci. and Technol., Nara, Japan.

225 B3 Functional consequences of epidermal patterning in *Arabidopsis* leaves. J.L. Croxdale, M.L. Spletter and T.D. Sharkey. Univ. of Wisconsin-Madison, Madison, WI.

226 B4 RNAi of *Lox6*, a *Deformed* orthologue, leads to axonal patterning defects in the nervous system of the leech, *Hirudo medicinalis.* M.E. Mercado-Pimentel and G.O. Aisemberg. Lehman Col. and CUNY, Bronx, NY.

227 B5 A link between developmental timing and circadian rhythms. H. Gardner, M. Jeon and A. Rougvie. Univ. of Minnesota, St. Paul, MN.

228 B6 A screen for factors affecting the expression pattern of *lin-48* in *C. elegans*. R-J. Tseng and H.M. Chamberlin. Ohio State Univ., Columbus, OH.

229 B7 Identification of co-factors that act with EGL-38, a Pax transcription factor, to activate *C. elegans lin-48* gene expression. S.F. Sleiman and H.M. Chamberlin. Ohio State Univ., Columbus, OH.

230 B8 A role for the polycomb group in development of the *C. elegans* male nervous system. J. Ross and D. Zarkower. Univ. of Minnesota, Minneapolis, MN.

231 B9 Temporal control of pattern formation by LIN-57/HBL-1, a *C. elegans* hunchback-like protein. M. Li, A. Daul, M. Volk and A. Rougvie. Univ. of Minnesota, St. Paul, MN.

232 B10 Genetic dissection of the Ci signaling complex. M.A. Lefers, Q.T. Wang and R.A. Holmgren. Northwestern Univ., Evanston, IL.

233 B11 Redox regulation of DNA binding by *Drosophila* Ultrabithorax 1b. S.E. Bondos, S. Mudali, M. Hanson and K.S. Matthews. Rice Univ., Houston, TX.

234 B12 A potential network of proteins interacting with Ultrabithorax. X-X. Tan, S.E. Bondos and K.S. Matthews. Rice Univ., Houston, TX.

235 B13 Transcription control by hunchback in the early *Drosophila* embryo. I. Brun, V. Napolitano, J. Lin and C. Desplan. New York Univ., New York, NY.

236 B14 Patterning of *Drosophila* leg sensory bristles through coordinate function of the Hedgehog, Dpp and EGFR pathways. C. Kwon, R. Hays, J. Fetting and T. Orenic. Univ. of Illinois, Chicago, IL.

237 B15 Involvement of the MADS domain transcription factor Mef2 in vein formation in the *Drosophila* wing. H. Matakatsu, Y.S. Lee, J. Kim and S.S. Blair. Univ. of Wisconsin, Madison, WI; and BMRC, Korea.

238 B16 Klumpfuss, the *Drosophila* Wilm's tumor suppressor 1 ortholog, regulates programmed cell death in the developing retina by modulating activity of the EGFR/Ras pathway. J.C. Rusconi and R.L. Cagan. Washington Univ. Med. Sch., St. Louis, MO.

239 B17 Molecular characterization of seven eyeless alleles with eyeless GAL4 activity in *Drosophila* melanogaster and evidence for tissue-specific regulation of eyeless protein transport into the nucleus. J. Clements and P. Callaerts. Univ. of Houston, Houston, TX.

240 B18 Fibroblast growth factors -3, -8 and -10 in mouse inner ear development. T.J. Wright and S.L. Mansour. Univ. of Utah, Salt Lake City, UT.

241 B19 Conditional inactivation of the Rx homeobox gene results in viable anophthalmic animals. V.A. Voronina, S.V. Kozlov, P.H. Mathers and M. Lewandoski. West Virginia Univ., Morgantown, WV; and Natl. Cancer Inst., Frederick, MD.

242 B20 Analysis of *GBX* genes during neurogenesis. S.T. Waters, C. Wilson, R. Anderson and M. Lewandoski. NCI-Frederick, NIH, Frederick, MD and SAIC, Frederick, MD.

243 B21 Role of GAP-43 in early cerebellar patterning. R. Mishra, L. Donahue, Y. Shen, K. Meiri and S. Mani. Natl. Brain Res. Ctr., Haryana, India; and Tufts Univ. Sch. of Med., Boston, MA.

244 B22 Roof plate formation and function in the brain. A. Lindgren, R. Roberts and K. Millen, Univ. of Chicago, Chicago, IL.

245 B23 Genetic control of dorsal-ventral identity in the telencephalon: co-operative roles for Pax6 and Tailless in the establishment of the pallio-ganglionic boundary. J. Stenman, R. Yu, R. Evans and K. Campbell. Children's Hosp. Med. Ctr., Cincinnati, OH; Lund Univ., Lund, Sweden; and Salk Inst., La Jolla, CA.

246 B24 Incomplete rescue of the Tbx6 mutation generates an allelic series of phenotypes in the mouse. E.E. McFadden, D.R. Hamburger and D.L. Chapman. Univ. of Pittsburgh, Pittsburgh, PA.

247 B25 Foxc1 and Foxc2 are involved in medial-lateral patterning of the non-axial mesoderm in the mouse embryo. B. Wilm and B. Hogan. Vanderbilt Univ. Sch. of Med. and Howard Hughes Med. Inst., Nashville, TN.

248 B26 Expression of mOb1, a novel atypical 73 amino acid K50-homeodomain protein, during mouse development. J. Adu, F.T. Leong and A.J. Mighell. St. James's Univ. Hosp., Leeds, UK.

249 B27 *Prx-Hox* transgenic mice: a model for dissecting the molecular basis for functional dominance of posterior Hox genes. M.E. Williams and J.W. Innis. Univ. of Michigan, Ann Arbor, MI.

250 B28 A role for the polycomb group gene TPD in the regulation of establishment of left-right asymmetry in the chick. S. Wang, X. Yu and Y.P. Chen. Tulane Univ., New Orleans, LA.

251 B29 Tbx genes and the digit identity. T. Suzuki, J. Takeuchi, K. Koshiba-Takeuchi and T. Ogura. Nara Inst. of Sci. and Technol., Nara, Japan.

252 B30 Modulation of BMP activity by heparan sulfate proteoglycans during limb cartilage differentiation *in vitro*. M.C. Fisher, M.R. Seghatoleslami, C.N. Dealy and R.A. Kosher. Univ. of Connecticut Hlth. Ctr., Farmington, CT.

253 B31 Expression of *Xenopus* zinc-finger transcription regulator *sal (Xsal-3)* during limb development and regeneration. M.W. Harty, T. Nguyen, M.W. King, A.L. Mescher, M.C. Muzinich, R.C. Smith and A.W. Neff. Indiana Univ. Sch. of Med., Bloomington, IN; MD Anderson Cancer Ctr., Houston, TX; Indiana Univ. Sch. of Med., Terre Haute, IN; and Eli Lilly and Co., Indianapolis, IN.

254 B32 Developmental functions of XKaiso, a transcriptional repressor associating with the Xp120 catenin in *Xenopus laevis*. S.W. Kim, X. Fang, H. Ji and P.D. McCrea. Univ. of Texas, M.D. Anderson Cancer Ctr., Houston, TX.

255 B33 A double negative: FoxD3 regulation of Nodal in *Xenopus* mesoderm formation. M.E. Engleka, J.L. Lefebvre, A.B. Steiner, J. Walters, S. Yaklichkin, E.J. Craig, P.A. Labosky and D.S. Kessler. Univ. of Pennsylvania, Philadelphia, PA.

256 B34 Detection of myogenic transcription factors in electrocytes lacking sarcomeric proteins in S. macrurus. G.A. Unguez, C.B. Jonsson and J.A. Kim. New Mexico State Univ., Las Cruces, NM.

257 B35 Roles of the *nlz* zinc finger protein in zebrafish development. A.P. Runko and C.G. Sagerstrom. Univ. of Massachusetts Med. Ctr., Worcester, MA.

258 B36 Functions of zebrafish Hox paralogue group 2 and 3 genes in hindbrain and pharyngeal arch development. M. Hunter and V. Prince. Univ. of Chicago, Chicago, IL.

259 B37 Analysis of meis genes expression in zebrafish suggests a role in the development of organs derived from the endoderm. F. Biemar, F. Baraldi, N. Devos, J. Holzschuh, J.A. Martial, W. Driever and B. Peers. Univ. of Liège, Liège, Belgium; and Univ. Freiburg, Freiburg, Germany.

260 B38 Meis proteins are essential for hindbrain development in the zebrafish. S-K. Choe, N. Vlachakis and C.G. Sagerstrom. Univ. of Massachusetts Med. Sch., Worcester, MA.

261 B39 Yeast two-hybrid analysis provides new information about interaction of HOX proteins with Meis-family cofactors. T.M. Williams and J.W. Innis. Univ. of Michigan, Ann Arbor, MI.

262 B40 The roles of LXRα in adipocyte differentiation and metabolism. I. Gerin, S.E. Ross, R.L. Erickson, P.M. DeRose, L. Bajnok, K.A. Longo, D.E. Misek, R. Kuick, S. Hanash, K.B. Atkins, S.M. Andresen, H.I. Nebb and O.A. MacDougald. Univ. of Michigan, Ann Arbor, MI; and Univ. of Oslo, Oslo, Norway.

263 B41 The role of a William-Beuren syndrome associated HLH domain containing transcription factor in activin/nodal signaling. C. Ring, S. Ogata, L. Meek, J. Song, T. Ohta, K. Miyazono and K.W.Y. Cho. Univ. of California, Irvine, CA; and The Cancer Inst. of the Japanese Fndn. for Cancer Res., Tokyo, Japan.

Cell Motility and Guidance

264 B42 The requirement for JAK/STAT signaling in ovarian cell migration. D.L. Silver and D.J. Montell. Johns Hopkins Sch. of Med., Baltimore, MD.

265 B43 AHR-1, the *C. elegans* homolog of the aryl hydrocarbon receptor, regulates neuronal migration. H. Qin and J.A. Powell-Coffman. Iowa State Univ., Ames, IA.

266 B44 A role for semaphorin 3D, a secreted cell-signaling molecule, in zebrafish cranial neural crest cell delamination and migration. J.D. Berndt, A. Isadore and M.C. Halloran. Univ. of Wisconsin, Madison, WI.

267 B45 The zebrafish diwanka gene controls multiple aspects of motor axon migration. V. Schneider, J. Zeller and M. Granato. Univ. of Pennsylvania, Philadelphia, PA.

268 B46 Domains of EPH-A4 mediating dissociation of cadherin adhesion complexes. J. Bonis, J.L. Malcore and J.B. Scales. Univ. of Wisconsin-Eau Claire, Eau Claire, WI.

269 B47 Syndecan-1 mediated cell spreading requires alphavbeta3 integrins. D.M. Beauvais and A.C. Rapraeger. Univ. of Wisconsin-Madison, Madison, WI.

270 B48 Overexpression of syndecan-1 extracellular domain disrupts adhesion and blocks invasion of T47D mammary carcinoma cells. B.J. Burbach and A.C. Rapraeger. Univ. of Wisconsin-Madison, Madison, WI.

Cell Fate Specification

271 B49 Characterization of the dictyostelium protein FbiA, a potential target of ubiquitin-mediated degradation. K.A. McFeaters, S.C. Houwer, E.A. Wilson, C. More, J.A. Christman, T. Abe and M.K. Nelson. Allegheny Col., Meadville, PA; and Wellcome Trust Bioctr., Univ. of Dundee, Dundee, Scotland.

272 B50 Metamorphic remodeling in frog cranial cartilages is specified before neural crest cell migration. C.S. Rose, A.L. Johnson and K.A. Pomeroy. James Madison Univ., Harrisonburg, VA; and Dalhousie Univ., Halifax, Nova Scotia, Canada.

273 B51 FGF10 and SMAD in the chick otic vesicle. B. Alsina, E. Ulloa and F. Giraldez. CEXS-Univ. Pompeu Fabra, Barcelona, Spain.

274 B52 Requirement for *Fgf8* in olfactory neurogenesis. S. Kawauchi, J. Shou and A.L. Calof. Univ. of California, Irvine, CA.

275 B53 In vivo monitoring of neurogenesis in the vertebrate neuroepithelium. D.A. Lyons and J.D.W. Clarke. Univ. Col. London, London, UK.

276 B54 Asymmetric cell division and Numb segregation in the developing mammalian retina. M. Cayouette and M. Raff. Univ. Col. London, London, UK.

277 B55 Ath5 acts in the embryonic mouse retina to specify retinal ganglion cell fate. N.L. Brown, T. Le and E. Wroblewski. Northwestern Univ. Med. Sch. and Children's Mem. Inst. for Edu. and Res., Chicago, IL.

278 B56 Information provided by the extraocular muscle has a role in retinal differentiation. B. Kablar. Dalhousie Univ., Halifax, Canada.

279 B57 LIM domain proteins in ocular development. C. McCollum, D. Ji, C. Sagerstrom and M.E. Lane. Rice Univ., Houston, TX; and Univ. of Massachusetts Med. Ctr., Worcester, MA.

280 B58 Characterization of different populations of motoneurons in regenerating and adult spinal cords of the weakly electric fish S. macrurus. M.N. Viveros, K. White and G.A. Unguez. New Mexico State Univ., Las Cruces, NM.

281 B59 Identification of cells that give rise to slow and fast muscle during post-embryonic growth in zebrafish. J.A. D'Angelo, D. Acquista, M.J.F. Barresi and S.H. Devoto. Wesleyan Univ., Middletown, CT.

282 B60 Wnt7a regulates multiple aspects of limb bud development in the mouse embryo. B.A. Parr, A.P. Nunnally and J.H. Olson. Univ. of Colorado, Boulder, CO.

283 B61 Withdrawn

284 B62 Distalization of the *Drosophila* leg by graded EGF-receptor signaling. G. Campbell. Univ. of Pittsburgh, Pittsburgh, PA.

285 B63 *nerfin-1*, a member of a conserved Zn-finger gene subfamily, is required for proper neuronal cell fate specification. A. Kuzin, C. Stivers, T. Brody and W.F. Odenwald. NINDS, NIH, Bethesda, MD.

286 B64 The cysteine rich domain-containing protein Crossveinless 2 is required for BMP-like signaling in the developing crossveins of *Drosophila*. A. Ralston and S.S. Blair. Univ. of Wisconsin, Madison, WI.

Germ Cells and Gametogenesis

287 B65 Three GLH interactors: a tale of two mutants. Great expectations for the third? A. Orsborn, R. Montgomery, P. Smith, E. Coberly, R. Barnes and K. Bennett. Univ. of Missouri, Columbia, MO.

288 B66 The *scattershot* gene has critical roles in *Drosophila* germ cell migration and programmed cell death. A.R. Mortvedt, F.D. Oakley and C.R. Coffman. Iowa State Univ., Ames, IA.

289 B67 The *outsiders* gene is required for the programmed cell death of *Drosophila melanogaster* germ cells. Y. Yamada, R.C. Strohm and C.R. Coffman. Iowa State Univ., Ames, IA.

290 B68 The JAK pathway ligand unpaired acts as a putative morphogen to determine fates in the follicular epithelium. D. Harrison, R. Xi and J. McGregor. Univ. of Kentucky, Lexington, KY.

291 B69 Oocyte and embryonic cytoskeletal defects caused by mutations in the *Drosophila* swallow gene. J. Meng and E.C. Stephenson. Univ. of Alabama, Tuscaloosa, AL.

292 B70 Anti-apoptotic effects of SCF and IGF-1 on fetal mouse oocytes. F.G. Klinger and M. De Felici. Univ. of Rome Tor Vergata, Rome, Italy.

293 B71 Involvement of Fas/FasL in spermatogenic cell apoptosis induced by Experimental Autoimmune Orchiditis. Z. Nie and B. Liu. Univ. of Pennsylvania, Philadelphia. PA; and Peiking Univ. Med. Ctr., Beijing, China.

294 B72 Rat embryos cloned with cumulus cells and fibroblasts. Y. Zhou, M. Bader, V. Galat and P. Iannaccone. Northwestern Univ., Chicago, IL; and Max Delbrück Ctr. for Molec. Med., Berlin, Germany.

Fertilization

295 B73 Bead analysis of sea urchin sperm. L. Ngo, M. Barajas, G. Weerasinghe, G. Zem and S.B. Oppenheimer. California State Univ., Northridge, CA.

296 B74 Allurin, a *Xenopus* sperm chemoattractant: sequence confirmation and immuno-visualization. A. Kittleson, A. Rawls, D. Chandler and A. Bieber. Arizona State Univ., Tempe, AZ.

297 B75 Expression and purification of recombinant allurin, a 21 kD sperm chemoattractant protein from *Xenopus laevis* egg jelly. H. Sugiyama, A. Rawls, A. Bieber and D. Chandler. Arizona State Univ., Tempe, AZ; and St. Marianna Univ., Kawasaki, Japan.

298 B76 Allurin, a 21 kD sperm chemoattractant from *Xenopus* egg jelly, is expressed in a hormone-dependent manner in the pars recta region of the *Xenopus* oviduct. X. Xiang, A. Rawls and D.E. Chandler. Arizona State Univ., Tempe, AZ.

299 B77 Infertility in mice with oocyte-specific, GPI-anchored protein knockout. J.A. Alfieri, M. Okabe, J. Takeda, G. Kondoh, D.G. Myles and P. Primakoff. Univ. of California, Davis, CA; and Osaka Univ. Med. Sch., Osaka, Japan.

Stem Cells and Tissue Regeneration

300 B78 Isolation and identification of potential dental pulp stems cells from adult rat. S. Gu, Y. Song, Z. Zhang and Y.P. Chen. Tulane Univ., New Orleans, LA.

301 B79 The regulation of the epithelial stem cell compartment in the continuous growing molar of the vole by the notch signalling pathway and fgf10. M. Tummers and I. Thesleff. Inst. of Biotechnol., Univ. of Helsinki, Helsinki, Finland.

302 B80 'Stemness': transcriptional profiling of embryonic and adult stem cells. M. Ramalho-Santos, S. Yoon, R.C. Mulligan and D.A. Melton. HHMI/Harvard Univ., Cambridge, MA.

303 B81 Hedgehog signaling promotes the differentiation of ES cells into neurons. J. Thorne, P. Maye, S. Becker, N. Byrd, H. Siemen, A. Soucy and L. Grabel. Wesleyan Univ., Middletown, CT.

304 B82 Integration and differentiation of human embryonic stem cells transplanted to the chick embryo. R.S. Goldstein, M. Drukker and N. Benvenisty. Bar-Ilan Univ., Ramat-Gan, Israel; and Hebrew Univ., Israel.

305 B83 *In vitro* differentiation of human embryonic stem cell lines: derivation of progenitors and differentiated progeny of pancreatic islet lineages. B.W. Kahan, L.M. Jacobson, K. Lang, J. Ochoada, D.A. Hullett and J.S. Odorico. Univ. of Wisconsin, Madison, WI.

306 B84 Evaluating microcarriers for delivering human adult mesenchymal stem cells in bone tissue engineering. J. Doctor, C. Petraglia, A. Loveland, M. Dietz, E. Minich, J. Leung, J. Hollinger and P. Campbell. Duquesne Univ., Pittsburgh, PA; and Carnegie Mellon Univ., Pittsburgh, PA.

Organogenesis

307 B85 Withdrawn

308 B86 Functions of the septins in *C. elegans* development. F.P. Finger, K.R. Kopish and J.G. White. Univ. of Wisconsin, Madison, WI.

309 B87 BMP signaling is important for mesoderm induction and germ layer development in mouse embryogenesis. S. Miura, M.D. Tallquist, P. Soriano and Y. Mishina. NIEHS, NIH, Res. Triangle Pk., NC; Univ. of Texas Southwestern Med. Ctr., Dallas, TX; and Fred Hutchinson Cancer Res. Ctr., Seattle, WA.

310 B88 Two-stage patterning of the avian intermediate mesoderm. R.G. James and T.M. Schultheiss. Beth Israel Deaconess Med. Ctr. and Harvard Med. Sch., Boston, MA.

311 B89 Molecular genetic analysis of the mouse orofacial cleft mutation, Dancer. J.O. Bush and R. Jiang. Univ. of Rochester, Rochester, NY.

312 B90 FGF10 functions as a survival factor during mouse palatogenesis. S. Alappat, Z. Zhang, K. Suzuki, X. Zhang, G. Yamada and Y. Chen. Tulane Univ., New Orleans, LA; and Kumamoto Univ., Kumamoto, Japan.

313 B91 Msx1 controls alveolar bone formation through Bmp4, Dlx5 and Cbfa1. Z. Zhang, Y. Song, X. Zhang and Y.P. Chen. Tulane Univ., New Orleans, LA.

314 B92 Evidence for pre-patterned odontogenic neural crest. Y. Zhang, S. Wang, J. Han, Y. Chai and Y.P. Chen. Col. of Bioengin., Fujian Teachers Univ., Fuzhou, China; Tulane Univ., New Orleans, LA; and Univ. of Southern California, Los Angeles, CA.

315 B93 Fibroblast growth factor receptors-1 and -2(IIIb), and FGF7 and FGF10, regulate branching morphogenesis of developing mouse submandibular glands in organ culture. M.P. Hoffman, B.L. Kidder, Z. Steinberg, M. Larsen and H.K. Kleinman. NIDCR, NIH, Bethesda, MD.

316 B94 Identification of genes preferentially expressed in distal endoderm during lung branching morphogenesis. Y. Liu, H. Jiang and B.L.M. Hogan. HHMI and Vanderbilt Univ. Med. Sch., Nashville, TN.

317 B95 Tissue interactions pattern the mesenchyme of the embryonic mouse lung. M. Weaver, M. Stahlman and B.L.M. Hogan. Vanderbilt Univ., Nashville, TN.

318 B96 Heparan sulfate proteoglycans modulate the epithelial response to fibroblast growth factors during lung morphogenesis. K. Izvolsky, D. Shoykhet, M. Nugent and W. Cardoso. Boston Univ. Sch. of Med., Boston, MA.

319 B97 Gene-dosage sensitive genetic interactions between iv, nodal, and ActRIIB genes in the left-right asymmetric patterning. E. Li and S.P. Oh. Univ. of Florida, Gainesville, FL; and Massachusetts Gen. Hosp., Boston, MA.

320 B98 Inducible mouse models in lung development. L.A. Miller, S.E. Wert and J.A. Whitsett. Children's Hosp. Res. Fndn., Cincinnati, OH.

321 B99 Do cardiac neural crest defects in zebrafish result in loss of cardiomyocytes? M. Sato and H.J. Yost. Huntsman Cancer Inst., Salt Lake City, UT.

322 B100 Isolation of novel heart and cardiac neural crest genes by modified differential display. B.J. Martinsen, N. Groebner and J. Lohr. Univ. of Minnesota, Minneapolis, MN.

323 B101 An ENU mutagenesis screen to isolate cardiovascular and hematopoietic lethal mutations using a mouse balancer chromosome. K. Hentges, Y. Furuta, C. Kaiser, S. Moncrief, Y. Wang, R.L. Johnson, A. Bradley and M.J. Justice. Baylor Col. of Med., Houston, TX; Univ. of Texas M.D. Anderson Cancer Ctr., Houston, TX; and Sanger Ctr., Cambridge, UK.

324 B102 The odd-skipped-related 1 gene is required for cardiovascular development in mice. Y. Lan, E-S. Cho, Q. Wang, K. Maltby and R. Jiang. Univ. of Rochester, Rochester, NY.

325 B103 Effects of TGFβ proteins on left-right signaling and cardiac development. J. Lohr, A. Arndt, S. Wanner and M. Breitenfeldt. Univ. of Minnesota and R&D Systems, Minneapolis, MN.

326 B104 Regulation of the retinoic acid signaling pathway is essential for multiple events in early *Xenopus* cardiogenesis. J.A.S. Broomfield, A.H. Collop, R.A.S. Chandraratna and T.A. Drysdale. Univ. of Western Ontario, London, Ontario, Canada; and Allergan Inc., Irvine, CA.

327 B105 Some new FACS about Nkx2-5 and cardiogenesis. M. Solloway, D. Elliott, O. Prall, C. Biben and R. Harvey. Victor Chang Cardiac Res. Inst., Darlinghurst, NSW, Australia.

328 B106 mRNF4 is necessary for normal heart development. G.E. Lyons, A. Griffin, A. Petrie, E. Lyons, J. Grilley, C. Berrios, L. Bauer, R. Baker and B.K. Micales. Univ. of Wisconsin Med. Sch., Madison, WI.

329 B107 Defective heart and liver development in type III TGFβ receptor-deficient embryos. K.L. Stenvers, N. Kountouri, M. Tursky, S. Amatayakul-Chantler, D. Grail, C. Small, R.A. Weinberg and A. Sizeland. Ludwig Inst. for Cancer Res., Melbourne, Australia; and Whitehead Inst. for Biomed. Res., Boston, MA.

330 B108 Hepatogenesis requires the transcription factor Hnf4a. F. Parviz, J. Li and S.A. Duncan. Med. Col. of Wisconsin., Milwaukee, WI.

331 B109 BMP signaling and patterning of the liver and other endodermal tissues. A.J. Peterson, J.M. Rossi and K.S. Zaret. Fox Chase Cancer Ctr., Philadelphia, PA.

332 B110 Comparative and functional DNA binding analyses of the novel pharyngeal factor PEB-1. L. Beaster-Jones and P. Okkema. Univ. of Illinois at Chicago, Chicago, IL.

333 B111 Lateral plate mesoderm induces the pre-pancreatic domain in a posterior dominant fashion. M.E. Kumar, D.A. Melton and A. Grapin-Botton. Harvard Univ., Cambridge, MA; and Swiss Inst. for Exptl. Cancer Res., Lausanne, Switzerland.

334 B112 Manipulation of pancreas development and endocrine islet formation by Hedgehog signaling components. H. Kawahira, D. Scheel, N. Ma, S. Smith, P.T. Chuang, A.P. McMahon, M. German and M. Hebrok. Univ. of California, San Francisco; and Harvard Univ., Cambridge, MA.

335 B113 Ectopic retinoic acid induces three-dimensional patterning defects in the digestive system. K.J. Lipscomb and N.M. Nascone-Yoder. Eckerd Col., Petersburg, FL.

336 B114 Disruption of Pax2/Pax8 gene function reveals essential role for Pax8, but not for Pax2, in early *Xenopus* pronephric kidney development. H. Ghanbari and A.W. Brändli. Swiss Fed. Inst. of Technol., Zürich, Switzerland.

337 B115 Notch signalling in the developing kidney. S. Kuure, K. Sainio, S. Vainio and H. Sariola. Inst. of Biomed., Univ. of Oulu, Helsinki, Finland.

338 B116 Transcriptional profiling of tubulogenesis using Wnt4 mutant mice. M.T. Valerius and A.P. McMahon. Harvard Univ., Cambridge, MA.

339 B117 Altered cell adhesive mechanisms and signal transduction during kidney development in Bcl-2-/- mice. C.M. Sorenson. Univ. of Wisconsin, Madison, WI.

340 B118 Identification and characterization of male-specific gonad mutants in *C. elegans*. W. Chang, J. Illi and D. Zarkower. Univ. of Minnesota, Minneapolis, MN.

341 B119 The PDGF α receptor is required for differentiation of Leydig cells and proper testis cord organization in the embryonic testis. J. Brennan, C. Tilmann and B. Capel. Duke Univ. Med. Ctr., Durham, NC.

342 B120 *Fgf9* acts downstream of *Sry* to induce proliferation of Sertoli precursor cells. J. Schmahl and B. Capel. Duke Univ. Med. Ctr., Durham, NC.

343 B121 Sonic hedgehog activates mesenchymal *Gli1* expression during prostate ductal bud formation. M.L.G. Lamm, W.S. Catbagan, R.J. Laciak, D.H. Barnett, C.M. Hebner, W. Gaffield, D. Walterhouse, P. Iannaccone and W. Bushman. Northwestern Univ. Med. Sch., Chicago, IL.

344 B122 Expression analysis on genes involved in the development of external genitalia. G. Yamada, K. Suzuki, Y. Ogino, Y. Sato, H. Ogi, H. Katoh, M. Kamikawa and R. Haraguchi. Kumamoto Univ., Kumamoto, Japan.

345 B123 BMP signaling in mammalian neural tube development. R.W. Stottmann, Y. Mishina and J.A. Klingensmith. Duke Univ. Med. Ctr., Durham, NC; and NIEHS, NIH, Research Triangle Pk., NC.

346 B124 Role of ventral midline signals in the formation of the trigeminal ganglion. N. Fedtsova and E.E. Turner. UCSD, La Jolla, CA; and VA Med. Ctr., San Diego, CA.

347 B125 Homeobox gene Prop1 is required for the response to WNT signaling in the pituitary gland. M. Brinkmeier, M. Potok, K. Bromfield, T. Gridley, J. Meeldijk, H. Clevers and S. Camper. Univ. of Michigan, Ann Arbor, MI; The Jackson Lab., Bar Harbor, ME; and Univ. Hosp., Utrecht, The Netherlands.

348 B126 *Lhx4* and *Prop1* are required for cell survival and expansion of the pituitary primordia. L.T. Raetzman, R. Ward and S.A. Camper. Univ. of Michigan, Ann Arbor, MI.

349 B127 Molecular and tissue interactions controlling inner ear induction. A.K. Groves, K. Martin and S.T. Brown. House Ear Inst., Los Angeles, CA.

350 B128 *Drosophila hibris*, a gene related to human *nephrin*, is involved in muscle and eye development. H.A. Dworak, M. Thomas and H. Sink. Skirball Inst. of Biomolec. Med., New York Univ., New York, NY.

351 B129 Network of FGF, Ihh and BMP signaling coordinates chondrocyte proliferation and differentiation. E. Minina, C. Kreschel, M.C. Naski, D. M. Ornitz and A. Vortkamp. Max-Planck Inst. for Molec. Genet., Berlin, Germany; Univ. of Texas Hlth. Sci. Ctr., San Antonio, TX; and Washington Univ. Sch. of Med., St. Louis, MO.

352 B130 Regulation and roles for VEGF in skeletal development. E. Zelzer, W. McLean, Y-S. Ng, P.A. D'Amore and B.R. Olsen. Harvard Med. Sch., Boston, MA; and Schepens Eye Res. Inst., Boston, MA.

353 B131 Functional analysis of GDF6 during skeletogenesis. L. Gamer, K. Cox and V. Rosen. HSDM/Forsyth Inst., Boston, MA; and Wyeth, Cambridge, MA.

354 B132 Gene-dosage sensitive compensatory mechanism of activin type II receptors for mediating GDF11 and nodal signals for anteroposterior and left-right patternings. S.P. Oh, C. Yeo, Y. Lee, H. Schrewe, S. Lee, M. Whitman and E. Li. Univ. of Florida, Gainesville, FL; Harvard Med. Sch., Boston, MA; Max-Planck Inst., Germany; Johns Hopkins Univ., Baltimore, MD; and Massachusetts Gen. Hosp., Boston, MA.

355 B133 Redundancy between components of the segmentation oscillator and the Delta/Notch pathway protects the anterior somites of zebrafish from genetic perturbation. A.C. Oates and R.K. Ho. Univ. of Chicago, Chicago, IL.

356 B134 *Doubleridge*, a new mouse mutant with an atypical apical ectodermal ridge (AER) resulting in postaxial polydactyly and syndactyly. B.T. MacDonald, M. Adamska and M.H. Meisler. Univ. of Michigan, Ann Arbor, MI.

357 B135 Conditional Raldh2 null mice reveal that retinoic acid is needed for limb bud posteriorization and outgrowth through Shh and Hgf/Met myogenic signaling. G. Duester and F.A. Mic. Burnham Inst., La Jolla, CA.

358 B136 Embryonic and regenerative forelimb/hindlimb patterns are controlled by different mechanisms. H-G. Simon, B. Linkhart and P. Khan. Northwestern Univ. Med. Sch., Chicago, IL.

359 B137 Expression patterns of Tbx4 and Tbx5. A. Krause, B. Linkhart, L. Sleiter, P. Khan and H-G. Simon. Northwestern Univ. Med. Sch., Chicago, IL.

360 B138 Influence of genotype and gender on the activities of some enzymes in liver and brain tissues of developing chick embryo. A.K. Pal, B.S. Gehlaut, S.B. Jadhao, H.S. Kushwah and I.C. Datta. Col. of Vet. Sci. and Animal Husb., Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur, India; and Central Inst. of Fisheries Edu., Versova, Mumbai, India.

361 B139 Decreased adipose tissue and altered metabolic function in Wnt-10b transgenic mice. K.A. Longo, S. Kang, W.S. Wright, P.C. Lucas, M.R. Opp and O.A. MacDougald. Univ. of Michigan, Ann Arbor, MI.

362 B140 A unique system to study keratinocyte proliferation and differentiation. W-P. Wang, Y-F. Hsu, Y-T. Chen and D-W. Liu. Tzu Chi Univ., Taiwan, R.O.C.

Concurrent Symposia

2 - 5:15 PM Each symposium has talks by invited speakers (30 min) and by authors selected from contributed abstracts (15 min), with coffee break at 3:30pm.

Symposium 5: Organogenesis Humanities 2650

Chair: John Fallon

363 2:00 Limb development in the absence of *Sonic hedgehog (Shh)* and *Gli3* function. J.F. Fallon, Y. Litingtung, Y. Li, R.D. Dahn and C. Chiang. Univ. of Wisconsin-Madison, Madison, WI; and Vanderbilt Univ., Nashville, TN.

364 2:30 Two linked hairy/enhancer of split-related zebrafish genes, her1 and her7, function together to refine alternating somite boundaries. C.A. Henry, M.K. Urban, K.K. Dill, J.P. Merlie, M.F. Page, C.B. Kimmel and S.L. Amacher. Univ. of California, Berkeley, CA; and Univ. of Oregon, Eugene, OR.

365 2:45 Initiation and elaboration of leaves. S. Hake, A. Hay, H. Smith and M. Tsiantis. Plant Gene Expression Ctr., Albany, CA; and Oxford Univ., Oxford, UK.

366 3:15 Flower development in pea: role of *Proliferating inflorescence meristem,* an *AP1* homolog. S. Singer, S. Maki, J. Sollinger, J. Plotz, K. Fitzgerald, J. Fishbach and H. Mullen. Carleton Col., Northfield, MN; and Southern Oregon Univ., Ashland, OR.

3:30 Break.

367 3:45 Regulation of ectodermal organogenesis by TNF signaling. I. Thesleff. Univ. of Helsinki, Helsinki, Finland.

368 4:15 The ventral midline endoderm constitutes a molecularly distinct population of cells. Y-X. Li, M. Zdanowicz, H. Stadt and M. Kirby. Duke Univ. Med. Ctr., Durham, NC.

4:30 Determining the principles of Hedgehog signaling in patterning the vertebrate embryo. A. McMahon. Harvard Univ.

369 5:00 *STRUBBELIG* and the control of organ size and early organogenesis in plants. D. Chevalier, M. Schellenberg and K. Schneitz. Univ. of Zurich, Zurich, Switzerland; and Tech. Univ. of Münich, Freising, Germany.

Symposium 6: Evolution of Morphological Diversity Humanities 3650

Chair: David Baum. Univ. of Wisconsin, Madison, WI

370 2:00 Evolution of a well-characterized embryonic promotor: the *Endo16 cis*-regulatory system of sea urchins. G.A. Wray. Duke Univ., Durham, NC.

371 2:30 Engrailed expression in 3 polychaete annelids: a possible role in chaetogenesis. E.C. Seaver and M.Q. Martindale. Univ. of Hawaii, Honolulu, HI.

2:45 Axial specification in vertebrates. A. Burke. Wesleyan College.

372 3:15 Antagonism between bone morphogenesis proteins and Noggin in the branching morphogenesis of feathers. M. Yu, P. Wu and C-M. Chuong. USC, Los Angeles, CA.

3:30 Break.

3:45 The molecular evolution of plant shoot architecture. M. Purugganan. North Carolina State Univ.

373 4:15 Activation of FLC by ART1, ART2 and FRI is required for the altered body plan of the Sy-0 ecotype of *Arabidopsis*. B. Poduska, T. Humphrey, A. Redweik and V. Grbic. Univ. of Western Ontario, London, Ontario, Canada.

374 4:30 Evolution of vulva development in nematodes: from genetics and genomics to gene function. R.J. Sommer. Max-Planck Inst. for Devl. Biol., Tuebingen, Germany.

375 5:00 Rapid coevolution of the nematode sex-determining genes *fem-3* and *tra-2*. E.S. Haag, S. Wang, D. Bernstein, M. Wickens and J. Kimble. HHMI/Univ. of Wisconsin, Madison, WI.

5:30 **Dinner at Lakefront Café**

Plenary II: Making Boundaries
7:00 - 9:00 PM Union Theatre

Chair: Seth Blair

376 7:00 Lineage compartments and signaling boundaries in the wing of the fruitfly. S.S. Blair. Univ. of Wisconsin, Madison, WI.

7:30 Positional information in leaf polarity determination. K. Barton. Carnegie Institution of Washington/Stanford Univ., CA

377 8:00 Linking morphogen gradients to morphogenesis. E. Bier, J. Trimble, K. Lunde and O. Cook. Univ. of California San Diego, La Jolla, CA; and Univ. of Freiburg, Freiburg, Germany.

378 8:30 The establishment of crustacean segments. N.H. Patel. Univ. of Chicago/HHMI, Chicago, IL.

Poster Session II and Mixer
9 - 11 PM Great Hall and Tripp Commons
Odd number boards: Authors at posters 9:00-10:00pm
Even number boards: Authors at posters 10:00-11:00pm

Wednesday July 24th

Meeting Registration
8am-5pm Union Theater Foyer

Plenary III: Developmental Timing
9:00 - 11:15 AM Union Theatre

Chair: Rick Amasino. Univ. of Wisconsin-Madison, WI

379 9:00 MicroRNAs and heterochronic genes. V. Ambros, R. Lee, A. Abbott, L. Sempere, A. Lavanway, N. Sokol and D. Jewell. Dartmouth Med. Sch., Hanover, NH.

380 9:30 Genetic regulation of vegetative phase change in plants. S. Poethig. Univ. of Pennsylvania, Philadelphia, PA.

381 10:00 Light control of *Arabidopsis* development, a role of protein degradation. X.W. Deng. Yale Univ., New Haven, CT.

10:30 Break

382 10:45 Does the segmentation clock measure embryonic time? O. Pourquié, K. Dale, M-L. Dequeant, J. Dubrulle, T. Iimura, C. Jouve, M. McGrew, P. Malapert, M. Maroto and S. Millet. CNRS, INSERM-Univ. de la Méditerranée, Marseille, France.

Conklin Award Lecture
11:15 AM - 12:15 PM Union Theater
Gail Martin. Univ. of Calif. San Francisco, CA FGF signaling in vertebrate development.

12:15 **Lunch at Lakefront Café**

Concurrent Symposia
1:30 - 5:00 PM Each symposium has talks by invited speakers (30 min) and by authors selected from contributed abstracts (15 min), with coffee break at 3:00pm.

Symposium 7: Control of Gene Expression Humanities 2650

Chair: Allen Laughon. Univ. of Wisconsin, Madison, WI

1:30 Regulation of stem cell behavior. M. Fuller. Stanford Univ., CA

2:00 The role of genomic imprinting in seed development. U. Grossniklaus. Univ. of Zürich, Switzerland

383 2:30 Transcription factor networks in development: deciphering regulatory links using single cell expression profiles and computational analysis. K. Birnbaum, J. Jung, G. Lambert, D.W. Galbraith and P.N. Benfey. New York Univ., New York, NY.

384 2:45 Nuclear localization of Dishevelled is required for Wnt/beta-catenin signal transduction. K. Itoh, B. Brott, M. Ratcliffe and S. Sokol. Harvard Med. Sch. and Beth Israel Deaconess Med. Ctr., Boston, MA.

3:00 Break.

385 3:15 BMP signals positively regulates Nodal expression during early somite stage in the chick embryo--implications for left-right development. M.E. Piedra and M.A. Ros. Univ. de Cantabria, Santander, Spain.

386 3:30 ENU-induced allelic series of Smad4 mutations in murine ES cells. Y. Chen, J. Vivian, D. Yee, E. Schneider and T. Magnuson. Univ. of North Carolina at Chapel Hill, Chapel Hill, NC.

3:45 How to build an organ: PHA-4 and foregut development in *C. elegans*. Susan Mango. Univ. of Utah, Salt Lake City, UT.

387 4:15 Tracheal branching morphogenesis in *Drosophila* as a model system to analyze cell migration *in vivo.* M. Affolter. Biozentrum, Basel, Switzerland.

Symposium 8: Germ Cells Humanities 3650

Chair: Ruth Lehmann

388 1:30 Exclusion of germ plasm components from somatic lineages by localized protein degradation. C. Derenzo, K. Reese and G. Seydoux. Johns Hopkins Univ. Sch. of Med., Baltimore, MD.

389 2:00 FBF controls germline stem cells in *Caenorhabditis elegans*. S.L. Crittenden, D.S. Bernstein, J.L. Bachorik, B.E. Thompson, G. Moulder, R. Barstead, M. Wickens and J. Kimble. HHMI and Univ. of Wisconsin-Madison, Madison, WI; and Oklahoma Med. Res. Fndn., Oklahoma City, OK.

390 2:15 Separation of the germ line at the 8-cell stage - the invariant cell lineage of the amphipod *Parhyale hawaiensis*. M. Gerberding, W. Browne, S. Lall and N. Patel. HHMI/Univ. of Chicago, Chicago, IL.

391 2:30 Recognition and rejection of self in plant reproduction. J.B. Nasrallah. Cornell Univ., Ithaca, NY.

3:00 Break.

392 3:15 Translational control of maternal mRNA. Q. Cao, I. Groisman, J. Tay and J.D. Richter. Univ. of Massachusetts Med. Sch., Worcester, MA.

393 3:45 Oocyte determination in *Drosophila*. C. Navarro, M. Grunwald and R. Lehmann. HHMI/Skirball Inst., New York Univ. Med. Ctr., New York, NY.

394 4:00 A mutagenesis screen to identify maternal factors required in early zebrafish development. D.S. Wagner, R. Dosch, B.A. Holloway, W.Y. Mei, K.A. Mintzer and M.C. Mullins. Univ. of Pennsylvania Med. Sch., Philadelphia, PA.

395 4:15 Germline development in *Drosophila*. R. Lehmann, L. Gilboa, R. Martinho and J. Stein. Skirball Inst. and HHMI, New York Univ. Sch. of Med., New York, NY.

Awards Ceremony and Banquet
6:00-11:00 PM Lakefront Café

Awards Ceremony

Lifetime Achievement Award – David S. Hogness. Stanford Univ., CA
Viktor Hamburger Outstanding Educator Prize – Scott Gilbert. Swarthmore Coll., PA
Best Poster Competition –Winners to be selected

Awards Banquet and Entertainment

Thursday July 25th

Departure

ACKNOWLEDGMENTS

Photographs used in the poster and cover of the Program/Abstract Booklet were generously provided by:
Phil Benfey
Sean Carroll
Karen Crawford
Brigid Hogan
Sally Moody
Gary Schoenwolf
Chris Wright

Grants National Science Foundation
National Institute of Child Health and Human Development
National Institute of Deafness and Communicative Diseases
National Institute of General Medical Sciences
March of Dimes Birth Defects Foundation

Sponsors Academic Press/Elsevier Science
Carl Zeiss, Inc.
Gene Tools, LLC
Merck Research Laboratories
Promega Corporation

Exhibitors

Blackwell Publishing
Elsevier Science
Fine Science Tools
Intavis, Inc.
John Wiley & Sons
Protech International, Inc.
R & D Systems, Inc.
Rockefeller University Press
Sinauer Associates, Inc.
The Company of Biologists, Ltd.