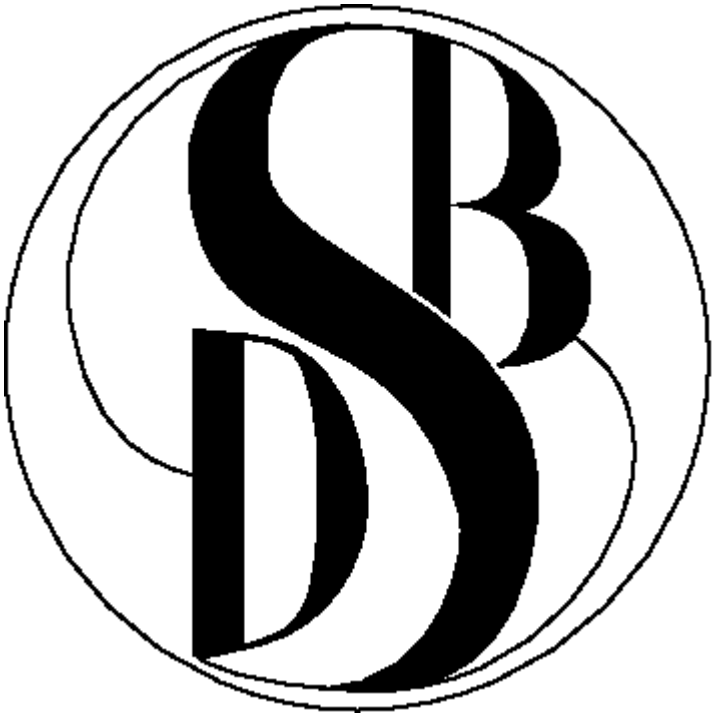

SDB 59th Annual Meeting

June 7th – 11th 2000
University of Colorado, Boulder

Program Chair: ***Chris Wylie***
Local Organizers: ***Bill Wood and Lois Abbott***

Program

Numbers in ***italics*** indicate Program Abstract number.

WEDNESDAY – June 7

Meeting Registration
1:00 P.M.-5:00 P.M. MCDB Lobby

Education Symposium: Improving Science Teaching
2:00 P.M.-5:00 P.M. Muenzinger Auditorium
Chair: Richard Nuccitelli (SDB Education Committee Chair)
2:00 The Science Squad: University Scientists in K-12 Classrooms. J. Graf., S. Messier, D. McDonough, A. Monterossa. Hughes Initiative, Univ. of Colorado, Boulder.
2:35 Placing undergraduate science majors in K-12 classrooms: teaching to learn and learning to teach. R. Nuccitelli. UC Davis.
3:00 Break
3:20 Research experiences for K-12 teachers and classroom implementation. S. Oppenheimer. Cal. State Northridge.
3:50 Improving undergraduate science education. Y. Cruz and S. Singer. Oberlin Col., Carleton Col. and Natl. Sci. Fndn.
4:20 Discussion groups: How these changes can be accomplished at your institution

Opening Reception
5:30 P.M.-7 P.M. Balch Field House

THURSDAY – June 8 *The Origins of Embryonic Patterning*

Meeting Registration
8:00 A.M.-5:00 P.M. MCDB Lobby

Funding Opportunities in Developmental Biology
8:00 A.M.-8:50 A.M. TBA
Moderator: Ida Chow (SDB)
Presentations by representatives of Federal and private funding gencies: NSF, NIH, NASA, March of Dimes Birth Defects Foundation

Plenary Session I The Origins of Embryonic Patterning
9:00 A.M.-11:00 A.M. Macky Auditorium
1 9:00 Is there a germ line determinant? Ruth Lehmann. HHMI and Skirball Inst., NYU Med. Ctr.
2 9:30 Development of polarity in the oocyte. Allan C. Spradling. Carnegie Inst. of Washington, Baltimore.
3 10:00 TGFβ signaling pathways controlling polarity of the early mouse embryo. Elizabeth J. Robertson. Harvard Univ.
10:30 Origins of pattern in plants. Kathy Barton. Univ. of Wisconsin, Madison.

11 A.M.-11:30 A.M. **Break at Parallel Symposia site**

Parallel Symposia 1-3
11:30 A.M.-4:00 P.M Talks by invited speakers (30 min) and selections from contributed abstracts (15 min), with lunch break 12:30-2 P.M.
* - Presenting author of contributed abstracts

Symposium 1: Maternal Determinants
11:30 A.M.-4:00 P.M. Muenzinger Auditorium
Chair: Ruth Lehmann
4 11:30 Mitotic spindle orientation during asymmetric cell divisions in the early *C. elegans* embryo. Bruce

Bowerman. Univ. of Oregon.

5 12:00 Establishment of *Drosophila* embryonic polarity by RNA localization and translational control. Anne Ephrussi. EMBL, Heidelberg, Germany.

12:30 **Lunch at Kittredge**

6 2:00 The *C. elegans* gene nos-2, required for germline development, encodes a P granule associated mRNA that may be regulated at the translational level. Kuppuswamy Subramaniam* and G. Seydoux. Johns Hopkins Univ. Sch. of Med.

7 2:15 Zebrafish vasa RNA but not its protein is a component of the germ plasm and segregates asymmetrically prior to germ-line specification. Holger. Knaut*, F. Pelegri, K. Bohmann, H. Schwarz and C. Nüsslein-Volhard,. Max-Planck Institut für Entwicklungsbiologie, Tübingen, Germany.

2:30 Maternal cytoplasmic information and cell specification in the ascidian embryo. N. Satoh. Kyoto Univ., Japan.

8 3:00 Germ plasm components XDAZL, XCAT2, and DEADSouth are required for primordial germ cell formation in *Xenopus*. Mary Lou King*, D.W. Houston and M. Mora. Univ. Miami Sch. of Med.

9 3:15 The putative Wnt receptor *Xenopus* frizzled-7 is required for vertebrate axis induction. Saulius Sumanas*, P. Strege, J. Heasman and S.C. Ekker. Univ. of Minnesota.

3:30 Patterning by Nodal signals. A. Schier. New York Univ.

Symposium 2 **Oocyte and Egg Polarity**

11:30 A.M.-4:00 P.M. Ramaley Auditorium

Chair: Allan Spradling

11:30 Polarity and patterning in early embryogenesis of *Arabidopsis*. Gerd Jürgens. Tübingen Univ., Germany.

10 12:00 DWnt-4 provides two functions during *Drosophila* ovarian development and oogenesis. Elizabeth L. Wilder* and R.H. Wallace. Univ. of Pennsylvania Sch. of Med.

11 12:15 The αBβC integrin is expressed on the surface of the sea urchin egg and removed at fertilization. Robert D. Burke*, G. Murray, C. Reed, M. Marsden, M. Rise and D. Wang. Univ. of Victoria, Canada.

12:30 **Lunch at Kittredge**

12 2:00 Distal tip cell control of germline stem cells in *C. elegans.* Judith Kimble. Univ. of Wisconsin, Madison.

13 2:30 Embryonic polarity and asymmetric division in *C. elegans.* Bob Goldstein. Univ. of North Carolina-Chapel Hill.

14 3:00 A genetic pathway for control of embryonic polarity in *C. elegans*. Craig P. Hunter* and A. Kay. Harvard Univ.

15 3:15 A role for microtubules in the establishment of anterior/posterior polarity in *C. elegans*. Matthew R. Wallenfang* and G. Seydoux. Johns Hopkins Univ. Sch. of Med.

3:30 Par-1 and polarity in *Drosophila*. Daniel St. Johnson. Univ. of Cambridge, UK.

Symposium 3 Origin of Polarity in Mouse and Other Non-Polar Systems

11:30 A.M.-4:00 P.M. MCDB Auditorium

Chair: Elizabeth J. Robertson

16 11:30 Early asymmetry and development of polarity in the mouse embryo. Magdalena Zernicka-Goetz. Univ. of Cambridge, U.K.

17 12:00 The mesoderm development gene is essential for establishing A/P polarity and maintaining early patterning in the mouse embryo. M. Wines, C. DeRossi, K. Brown, S. Wefer and Bernadette Holdener*. SUNY at Stony Brook.

18 12:15 Induction of the mammalian node and derivative tissues requires the function of the novel RING domain gene Arkadia. Vasso Episkopou*, R. Arkell, P. Timmons, J. Walsh and D. Swan. MRC Clin. Sci. Ctr., London, MRC, Harwell and Univ. of Edinburgh, U.K.

12:30 **Lunch at Kittredge**

19 2:00 Symmetry breaking in the chick embryo. Claudio D. Stern. Columbia Univ.

20 2:30 Multiple pathways in the midline regulate concordant brain, heart and gut left-right asymmetry. Brent W. Bisgrove*, J.J. Essner and H.J. Yost. Univ. of Utah.

21 2:45 The oak ridge polycystic kidney disease gene is required for left-right axis determination. Noel S. Murcia*, W.G. Richards, B.K. Yoder, M.L. Mucenski, J.R. Dunlap and R.P. Woychik. Case Western Reserve Univ., Amgen, Inc., Univ. of Alabama, Birmingham, Children's Hosp. Med. Ctr., Cincinnati, Univ. of Tennessee and Parke-Davis Lab. for Molec. Genet.

22 3:00 Identifying genes involved in pattern formation using Arabidopsis genetraps. Andrew T. Groover* and R.M. Martienssen. Cold Spring Harbor Lab.

23 3:15 The cloning of a novel candidate gene for the *Amnionless* mutation. Sundeep Kalantry*, S. Manning, C. Tomihara-Newberger, O. Haub, H-G. Lee, K. Manova and E. Lacy. Mem. Sloan-Kettering Cancer Ctr.
24 3:30 Embryonic polarity, asymmetric division, and cell fate determination in *Volvox.* David L. Kirk. Washington Univ., St. Louis.

4:00-4:30 P.M. **Break at Poster Session**

Poster Session I
4:00 P.M.-5:30 P.M. Balch Field House
All posters on display both poster sessions. See abstract list at the end of program.
Odd number boards: Authors present at posters – 4:00-5:30 P.M.

5:30 P.M.-7:00 P.M. **Dinner at Kittredge**

Workshops 1-2
7:00 P.M.-9:00 P.M.

Workshop 1 Career Options for the Ph.D. Biologist
7:00 P.M.-9:00 P.M. MCDB Auditorium
Chair: Richard Nuccitelli
7:00 Teaching AND research at a liberal arts college?! Y. Cruz. Oberlin Col.
7:30 From codons to concepts: science writing and editing. P. Hines. AAAS/Science.
8:00 Life outside academia: biology in the business world. R. Lundquist. Law Firm of Fish & Richardson, P.C.
8:30 High school teaching as a rewarding career option. A. Monterrosa. Manual High School

Workshop 2 Advanced Technologies in Biology
7:00 P.M.-9:00 P.M. Muenzinger Auditorium
Chair: Lee Niswander
25 7:00 *In vivo* applications of electroporation. L. Niswander. HHMI and Sloan-Kettering Inst., NY.
26 7:20 Developing a neurovascular relationship. Damien Bates*, D.F. Newgreen and G.I. Taylor. Royal Children's Hosp., Parkville, Australia and Jack Brockhoff Inst., RMH, Melbourne, Australia.
27 7:40 Two lineage boundaries and *En1* coordinate AER formation. Alexandra L. Joyner. HHMI, Skirball Inst., New York Univ. Sch. of Med.
28 8:00 withdrawn
29 8:15 Too much interference: injection of double stranded RNA does not have specific effects in the zebrafish embryo. Robert K. Ho. Princeton Univ.
8:30 Open forum on RNA interference in vertebrates and invertebrates -- successes, problems and controversies

Poster Session I (cont.)
9:00 P.M.-11:00 P.M. Balch Field House
Refreshments
All posters on display both poster sessions. See abstract list at the end of program.

FRIDAY – June 9 *Downstream Effectors of Early Patterning Events*

Meeting Registration
8:00 A.M.-5:00 P.M. MCDB Lobby

Plenary Session II Downstream Effectors of Early Patterning Events
9:00 A.M.-11:00 A.M. Macky Auditorium
9:00 Transcriptional control of *Drosophila* and *Ciona* embryogenesis. Mike Levine. UC Berkeley.
9:30 Multiple roles of FGF signaling in vertebrate development. Gail Martin. UCSF.
30 10:00 Steroid hormones in plant development. Joanne Chory. The Salk Inst.
10:30 Cell motility and guidance. Corey Goodman. UC Berkeley.

11 A.M.-11:30 A.M. **Break at Parallel Symposia site**

Parallel Symposia 4-6

11:30 A.M.-4:00 P.M Talks by invited speakers (30 min) and selections from contributed abstracts (15 min), with lunch break 12:30-2 P.M.

* - Presenting author of contributed abstracts

Symposium 4 Transcriptional Regulation

11:30 A.M.-4:00 P.M. MCDB Auditorium

Chair: Mike Levine

31 11:30 RNA-based information superhighway in plants. Bill J. Lucas. UC Davis.

12:00 Encoding regulatory information processing in development. Eric Davidson. Caltech.

12:30 **Lunch at Kittredge**

2:00 Ordered assembly of the MSL dosage compensation complex at roX RNA genes and subsequent spreading into flanking chromatin. Rick Kelley. Baylor Col. of Med.

32 2:25 Creating endoderm and mesoderm in *C. elegans.* Joel H. Rothman. UC Santa Barbara.

33 2:50 The TBP-like factor CeTLF is required to activate RNA polymerase II transcription during *C. elegans* embryogenesis. Linda S. Kaltenbach*, M.A. Horner and S.E. Mango. Univ. of Utah.

34 3:05 Initial transcriptional regulators of cell fates in the sea urchin embryo. E.W. Howard, A.P. Kenny, L.A. Newman, D.J. Oleksyn, R.C. Angerer and Lynne M. Angerer*. Univ. Rochester.

35 3:20 Hey genes form a novel family of Notch target genes with Hey2 as an independent component of the somitogenesis clock. Manfred Gessler*, M. Maier, C. Steidl, A. Fischer, K. Dale, O. Pourquié and C. Leimeister. Univ. of Wurzburg, Germany.

3:35 Signaling and transcriptional control of pituitary development. Geoff Rosenfeld. UCSD.

Symposium 5 Cell Signaling

11:30 A.M.-4:00 P.M. Muenzinger Auditorium

Chair: Gail Martin

11:30 Signaling pathway establishing left-right asymmetry. Hiroshi Hamada. Osaka Univ., Japan.

36 12:00 Casein kinase I transduces Wnt signals. John Peters*, R. McKay, J. McKay and J. Graff. Univ. of Texas Southwestern Med. Ctr.

37 12:15 Fgf8 is required for patterning of the cranial neural crest. Henry Roehl* and C. Nüsslein-Volhard. Max-Planck-Inst., Tübingen.

12:30 **Lunch at Kittredge**

2:00 Bioactive lipid signaling and cell migration during vertebrate development. Didier Stainier. UCSF.

38 2:30 Does T (Brachyury) play a role in limb development? Chunqiao Liu*, S. Hunter, V. Knezevic, K. Thompson and S. Mackem. NCI, NIH.

39 2:45 SHH is necessary for cell survival in both the neural tube and paraxial mesoderm in the early avian embryo. Jean-Baptiste Charrier*, M-A. Teillet and N.M. Le Douarin. CNRS FRE, France.

3:00 Cell architecture in Drosophila: signalling, polarity, and tumor supressors. David Bilder. Harvard Med. Sch.

3:30 Molecular aspects of cell signaling by chordin. Eddy de Robertis. UCLA.

Symposium 6 Cell Motility and Guidance

11:30 A.M.-4:00 P.M. Ramaley Auditorium

Chair: Corey Goodman

11:30 Developmental regulation of cell motility. Denise Montell. Johns Hopkins Univ.

41 12:00 Differentiation-induced changes in trophoblast cell motility and cytoskeleton. Sean Aeder*, M. Parast and A. Sutherland. Univ. of Virginia.

42 12:15 *One-eyed pinhead* dependent cell motility in the zebrafish blastula. Rachel M. Warga* and D.A. Kane. Univ. of Rochester.

12:30 **Lunch at Kittredge**

43 2:00 Eph receptor activation triggers the assembly of actin structures via Rho family GTPases. Catherine D. Nobes. Univ. College London, U.K.

2:30 Molecular mechanisms of axon guidance in *C. elegans.* Joe Culotti. SLRI, Canada.

44 3:00 Axon guidance in the periphery. J. Eberhart, M. Swartz, M. Ekong, S.A. Koblar, E.B. Pasquale and Catherine E. Krull*. Univ. of Missouri-Columbia, Univ. of Adelaide, and The Burnham Inst.

45 3:15 Roles of the leech rPTP HmLAR2 in growth cone collapse and self-avoidance. Eduardo R. Macagno* and M.W. Baker. Columbia Univ.

46 3:30 Shot coordinates actin and microtubule dynamics during neuronal and tracheal morphogenesis. S.

Lee and Peter Kolodziej*. HHMI and Vanderbilt Univ. Med. Ctr.
47 3:45 Study the function of mouse slit genes. Wenlin Yuan* and D.M. Ornitz. Washington Univ.

4:00-4:30 P.M. **Break at Poster Session**

Poster Session II
4:00 P.M.-5:30 P.M. Balch Field House
All posters on display both poster sessions. See abstract list at the end of program.
Even number boards: Authors present at posters – 4:00-5:30 P.M.

5:30P.M.-7:00 P.M. **Dinner at Kittredge**

Workshops 3-4
7:00 P.M.-9:00 P.M.

Workshop 3 Genomics/Proteomics/Informatics
7:00 P.M.-9:00 P.M. Muenzinger Auditorium
Co-chairs: Stuart Kim and Joe Ecker
7:00 Genes blossom from a weed: the *Arabidopsis* genome initiative. Joe Ecker. Univ. of Pennsylvania.
48 7:30 *C. elegans* functional genomics: profiling gene expression patterns with DNA microarrays. Stuart K. Kim. Stanford Univ.
8:00 Protein interaction mapping in *C. elegans*. Marc Vidal. Harvard Univ.
8:20 Functional genomics: from David to Goliath. Julie Baker. Stanford Univ.
8:40 Probing the expressed genome of *Arabidopsis* for protein localization information in a live, multicellular context. David Ehrhardt. Stanford Univ.

Workshop 4 Regeneration
7:00 P.M.-9:00 P.M. MCDB Auditorium
Co-chairs: Alejandro Sanchez Alvarado and Brigitte Galliot
49 7:00 Early genetic regulations during hydra regeneration. Brigitte Galliot. Univ. of Geneva, Switzerland.
50 7:25 Planarian regeneration: revisiting a classic problem using modern methodologies. Phillip A. Newmark*, S. Saha, R. Juste and A. Sánchez Alvarado. Carnegie Inst. of Washington, Baltimore.
51 7:40 A serum activity that induces cell cycle re-entry from the differentiated state. Elly M. Tanaka. Max Planck Inst. for Molec. Cell Biol, Germany.
52 8:05 Plasticity of postmitotic myotubes in adult regeneration. Anoop Kumar*, C.P. Velloso and J.P. Brockes. Univ. Col. London, U.K.
53 8:20 Molecular mechanisms of zebrafish fin regeneration. Alexei Nechiporuk, K. Poss, S. Johnson and M. Keating. Univ. of Utah and HHMI and Washington Univ. Sch. of Med.
54 8:35 Metazoan regeneration. Alejandro Sanchez Alvarado. Carnegie Inst. of Washington, Baltimore.

Poster Session II (cont.)
9:00 P.M.-11:00 P.M. Balch Field House
Refreshments
All posters on display both poster sessions. See abstract list at the end of program.

SATURDAY – June 10 *Development of Organs and the Whole Organism*

Meeting Registration
8:00 A.M.-5:00 P.M. MCDB Lobby

Plenary Session III The Academic Press Annual Symposium in Developmental Biology
9:00 A.M.-11:00 A.M. Macky Auditorium
55 9:00 Signaling in flower development Detlef Weigel. The Salk Inst.
9:30 A genetic approach to development of the mesodermal organs in zebrafish. Mark Fishman. Harvard Univ.
10:00 Patterning the nervous system. Tom Jessell. Columbia Univ.
10:30 The development of the vertebrate pancreas. Doug Melton. Harvard Univ.

11 A.M.-11:30 A.M. **Break at Parallel Symposia site**

Parallel Symposia 7-9

11:30 A.M.-4:00 P.M Talks by invited speakers (30 min) and selections from contributed abstracts (15 min), with lunch break 12:30-2 P.M.

* - Presenting author of contributed abstracts

Symposium 7 Ectodermal Organs

11:30 A.M.-4:00 P.M. Muenzinger Auditorium

Chair: Thomas Jessell

11:30 Genetic control of developmental timing in *C. elegans.* Victor Ambros. Dartmouth Univ.

12:00 Compartments, boundaries, and signaling in the wing of *Drosophila.* Seth Blair. Univ. of Wisconsin, Madison.

12:30 **Lunch at Kittredge**

56 2:00 Genetic analysis of forebrain patterning in zebrafish. Steve W. Wilson. Univ. Col. London, U.K.

57 2:30 Formation of the zona limitans intrathalamica: a putative diencephalic organizer. Lori M. Zeltser*, C.W. Larsen, A. Hornbruch and A.G.S. Lumsden. Columbia Univ. and King's Col. London, U.K.

58 2:45 Notch activation instructs rapid glial differentiation by multipotent neural crest stem cells. Sean J. Morrison*, S.E. Perez, J.M. Verdi, C. Hicks, G. Weinmaster and D.J. Anderson. Univ. of Michigan, Caltech, UCLA and Univ. of Western Ontario, Canada.

3:00 Characterization of neural stem cells in the adult mammalian brain. Jonas Frisen. Karolinska Inst., Sweden.

3:30 Beauty is skin deep: mechanisms of growth and differentiation in the skin. Elaine Fuchs. Univ. of Chicago.

Symposium 8 Mesodermal Organs

11:30 A.M.-4:00 P.M. MCDB Auditorium

Chair: Mark Fishman

11:30 Dissecting ventral mesoderm and hematopoietic development using the Zebrafish. Leonard Zon. Harvard Univ.

59 12:00 Notch signalling and the synchronisation of the somite segmentation clock. Yun-Jin Jiang*, L. Smithers, B. Aerne, C. Haddon, D. Ish-Horowicz and J. Lewis. Imperial Cancer Res. Fund, U.K.

60 12:15 Mutation of the Tg737 gene reveals an important role in the development and patterning of the mammalian embryo. Bradley K. Yoder*, P.D. Taulman, C.J. Haycraft, S.M. Krum, N.S. Murcia, W.G. Richards and R.P. Woychik. Univ. of Alabama at Birmingham, Case Western Reserve Univ., Amgen and Parke-Davis Lab. for Molec. Genet.

12:30 **Lunch at Kittredge**

2:00 The early steps of development of the hemopoietic and vascular systems in the avian embryo. Nicole Le Douarin. CNRS, France.

61 2:30 Co-ordination of early kidney development by Wnt signaling. SeppoVainio. Univ. of Oulu, Finland.

62 3:00 Murine Hox11 paralogs are required for metanephric kidney development. Deenen M. Wellik* and M.R. Capecchi. Univ. of Utah.

63 3:15 Notch and serrate specify cell fates in the *Xenopus* heart field. Melissa S. Rones*, K.A. McLaughlin and M. Mercola. Harvard Med Sch.

3:30 Control of heart and limb development by dHAND. Eric Olson. Univ. Texas Southwestern Med. Ctr.

Symposium 9 Endodermal Organs

11:30 A.M.-4:00 P.M. Ramaley Auditorium

Chair: Doug Melton

64 11:30 Development of the *C. elegans* intestine. Jim D. McGhee. Univ. of Calgary.

65 12:00 Zygotic functions of *pal-1*, the *C. elegans* caudal homolog, in posterior embryonic patterning. LoisG. Edgar* and W.B. Wood. Univ. of Colorado.

66 12:15 Coordinate signaling by two BMPs in the regional specification of the *Drosophila* endoderm. Kristi A. Wharton*, C. Savery and R.P. Ray. Brown Univ.

12:30 **Lunch at Kittredge**

67 2:00 From simple to complex: endoderm formation and embryonic patterning in *Xenopus.* Janet Heasman. Univ. of Minnesota.

2:30 Hedgehog signaling in morphogenesis of the gut and a gut derivative. Andy McMahon. Harvard U

68 3:00 Anterior endoderm specification and the development of taste buds. Linda A. Barlow*. Univ. of Denver.
69 3:15 Controlled differentiation of human embryonic stem cells. Meri T. Firpo*, J.J. Meneses, J. Wu and R.A. Pedersen. UCSF.

Edwin Conklin Award Lecture
4:30 P.M.-5:30 P.M. Muenzinger Auditorium
Patterning the zebrafish head skeleton. Charles Kimmel. U Oregon

Awards Reception and Picnic
6 :00 P.M. Observatory Field and Fiske Planetarium

SUNDAY – June 11 ***Departure***

POSTER SESSIONS I and II Balch Field House

Session I: 6/8 – 4:00-5:30 P.M. and 9:00-11:00 P.M.
Session II: 6/9 – 4:00-5:30 P.M. and 9:00-11:00 P.M.
All posters are displayed at both sessions.

The authors should be present at respective boards according to the following schedule:
Odd # Boards: Session I (6/8) - 4:00-5:30 pm.
Even # Boards: Session II (6/9) - 4:00-5:30 pm.

Italic numbers – Program Abstract number
B numbers – Board number

Education
70 B1 Breaking out of the model paradigm: using the comparative approach in undergraduate investigative labs. M.K. Montgomery. Macalester Col.
71 B2 Investigating genes and development in the biology curriculum. J.T. Warren, Jr., M.A. Campbell, P.E. Barney, L. Eckroat, D.M. McKinstry, J. Patel, K. Wellejus and R.L. Gill, Jr. Pennsylvania State Univ., The Behrend Col.
72 B3 Undergradutate laboratory exercises in axis specification. J.A. Emerson, St. Louis Univ.
73 B4 Teaching undergraduates the fundamentals of amphibian mesoderm induction through class discussion and laboratory experimentation. E.R. McCain. Muhlenberg Col.
74 B5 A method for teaching controls. D.S. Adams. Smith Col.
75 B6 K-12 science teaching internship program. R. Nuccitelli, T. Rost and G. Lusebrink. UC Davis.

Genomics/Informatics
76 B7 The gene expression database: a different kind of computer mouse. D.P. Hill, D.A. Begley, J.P. Corradi, J.T. Eppig, J.A. Kadin, R.P. Pazola, J.E. Richardson and M. Ringwald. The Jackson Lab.
77 B8 Genomic, transcriptional, and mutational analysis of the mouse microphthalmia locus. J.H. Hallsson, J. Favor, G.J. Gunnarsson, N.G. Copeland, N.A. Jenkins and E. Steingrimsson. Univ. of Iceland, NCI-FCRF, and GSF-Inst. of Mammalian Genet., Germany.

Medicine and Development
78 B9 Aberrant craniofacial development in endothelian-1 knockout mice: emergence of bilateral mandibular protrusions and ectopic maxillo-mandibular fusion. Y. Taya, Y. Soeno, Y. Kurihara, H. Kurihara and T. Aoba. Nippon Dent. Univ. and Univ. of Tokyo, Japan.

Developmental Timing
79 B10 The *C. elegans* developmental timing protein LIN-42: a link to circadian rhythms. H.F. Gardner, M. Jeon, J.E. Abrahante and A.E. Rougvie. Univ. of Minnesota.

Animal Models

80 B11 Pax3/FKHR fusion affects development of the mouse heart. I. Lagutina, J. Sublett, C. McPherson, S. Conway and G. Grosveld. St. Jude Children's Res. Hosp. and Med. Col. of Georgia.

81 B12 Identification of a genetic interaction between *LMX1B* and *PITX2*. C.L. Pressman, J. Martin and R.L. Johnson. M.D. Anderson Cancer Ctr., Univ. of Texas and Texas A&M Univ.

Development and Evolution

82 B13 Jellyfish striated muscle: a model for the evolutionary origin of myogenic factors? P. Müller, M. Stierwald, N. Yanze, J. Spring and V. Schmid. Univ. of Basel, Switzerland

83 B14 The D-quadrant organizer in spiralian development. E. Edsinger-Gonzales, W.J.A.G. Dictus and J.A.M. van den Biggelaar. Smithsonian Marine Sta., Ft. Pierce, FL and Univ. Utrecht, The Netherlands.

84 B15 Evidence for the conservation of mesodermal determinaltion in molluscs. S.M. Moshel-Lynch, D.R. Lindberg and J.R. Collier. UC Berkeley and Effie Lab., LA.

85 B16 Mechanisms of sex determination evolution in *Caenorhabditis*. E. Haag, T.Schedl and J.Kimble. Univ. of Wisconsin and Washington Univ. Sch. of Med.

86 B17 Using RNAi to study SKN-1 and other homologs governing early nematode development. J. Norman and M.K. Montgomery. Macalester Col.

87 B18 Mechanisms of segment formation in polychaete annelids. E.C. Seaver and S.D. Hill. Univ. of Hawaii and Michigan State Univ.

88 B19 Evolution of anteroposterior axis formation in insects: the role of *hunchback* and *nanos* in the grasshopper. S. Lall, M.Z. Ludwig and N.H. Patel. Univ. of Chicago.

89 B20 The evolution of Hox function and arthropod morphological diversity. M.R. Ronshaugen and W. McGinnis. UCSD.

90 B21 Evolution of arthropod appendage development. M.W. Giorgianni, N.R. Gleich D. DiPietro, M. Averof and N.H. Patel. Univ. of Chicago and Vassilika Vouton, Greece.

91 B22 Distinct roles for Ubx and Abd-A in the beetle embryonic abdominal appendage development. R.L. Bennett, D.L. Lewis and M.A. Decamillis. Brigham Young Univ. and Univ. of Wisconsin.

92 B23 The role of Pax group III genes in short-germ segmentation. C.A. Jaramillo, G.K. Davis and N.H. Patel. Univ. of Chicago.

93 B24 Fringe benefits in arthropods. A.L. Price, M. Hunter, C. Josefowicz and N.H. Patel. Univ. of Chicago and HHMI.

94 B25 Experimental evolution of development: changes in wing vein phenotypes across compartment boundaries in "hot" and "cold" adapted lab populations of *Drosophila melanogaster*. D.M. Rand, A. Fry and L. DiChiaro. Brown Univ.

95 B26 Phylogenetic analysis and expression of amphioxus *Wnt* genes: a possible ancient function for *Wnt1* during gastrulation. M. Schubert, L.Z. Holland, D.K. Jacobs and N.D. Holland. Scripps Inst. of Oceanography and UCLA.

96 B27 Urochordate cornichon homologue may play a role in metamorphic EGF signalling. B.J. Davidson, W. Moody and B.J. Swalla. Univ. of Washington.

97 B28 Lamprey *Dlx* genes and early vertebrate evolution. J.A. Langeland, A.H. Neidert, V. Virupannavar and G.W. Hooker. Kalamazoo Col.

98 B29 Lens cell death regulates the eyeless phenotype of the cave fish. A.G. Strickler and W.R. Jeffery. Univ. of Maryland.

99 B30 The lens is a regulator of craniofacial development and evolution in the teleost *Astyanax*. W.R. Jeffery and Y. Yamamoto. Univ. of Maryland.

100 B31 Midline signaling in evolutionary regression of vertebrate eye development. Y. Yamamoto, A.G. Strickler, D.W. Stock and W.R. Jeffrey. Univ. of Maryland and Univ. of Colorado, Boulder.

101 B32 Regressive evolution of melanogenesis in the cavefish astyanax *Astyanax*. D.W. McCauley and W.R. Jeffery. CalTech and Univ. of Maryland.

102 B33 The role of the trimolecular complex-MT1-MMP/TIMP2/MMP2 in zebrafish embryogenesis. J. Zhang, S. Bai and M.P. Sarras, Jr. Univ. of Kansas Med. Ctr.

103 B34 Hoxgene patterning and fish evolution. J.M. McClintock, C. Jozefowicz and V.E. Prince. Univ. of Chicago.

104 B35 Hoxgene function and regulation during teleost hindbrain and pharyngeal arch development. M. Hunter, J.L. Scemama, E.J. Stellwag and V.E. Prince. Univ. of Chicago and East Carolina Univ.

105 B36 Toward understanding the evolution of skeletogenesis. B.F. Eames and J.A. Helms. UCSF.

106 B37 A subtractive hybridization identifies chick-cripto, a novel EGF-CFC ortholog expressed during gastrulation, neurulation, and early cardiogenesis. J-F. Colas and G.C. Schoenwolf. Univ. of Utah Sch. of Med.

Plant Development

107 B38 Computational development: two examples in plant development--apical/basal cell differentiation in fern gametophytes; and linking concentration pattern to growth in three dimensions. D.M. Holloway and L.G. Harrison. Univ. of British Columbia, Canada.

108 B39 High throughput analysis of zygote development and putative transformants of the giant unicell acetabularia. L. Krueger and D.F. Mandoli. Univ. of Washington.

109 B40 Possible roles of one-carbon metabolism in the development of Acetabularia acetabulum. C.L. Richmond and D.F. Mandoli. Univ. of Washington.

110 B41 Whorls of variable numbers of parts: trying to correlate experiment and theory for Acetabularia and for conifer somatic embryos. L.G. Harrison. Univ. of British Columbia, Canada.

Gametogenesis and Fertilization

111 B42 Derivatized bead binding to live cells and cells fixed with two fixatives. V.M. Navarro, M.I. Abundis, S.L. Walker, L.L. Ngo, G. Weerasinghe, M. Barajas, O.A. Badali, G. Zem, J.P. Taitz and S.B. Oppenheimer. California State Univ., Northridge.

112 B43 Dissociation of pH and charge effects on sea urchin fertilization. G.R. Weerasinghe, M. Barajas, E.H. Yamoah, M. Grigorian and S.B. Oppenheimer. California State Univ., Northridge.

113 B44 *Strongylocentrotus drobachiensis* oocytes maintain their polarity throughout oogenesis. A.L. Egana, J.A. Boyle and S.G. Ernst. Tufts Univ.

114 B45 The scattershot mutation disrupts germ cell migration in *Drosophila*. C.R. Coffman, D. Przychodzin, R.C. Strohm, F.D. Oakley and R.E. Boswell. Iowa State Univ. and Univ. of Colorado.

115 B46 Using reverse genetics to screen for *glh* mutants E.A. Coberly, R.A. Montgomery, K.A. Kuznicki, A.W.M. Leung-Chiu and K.L. Bennett. Univ. of Missouri.

116 B47 Combinatorial RNA interference indicates P granule components GLH-1 and GLH-4 are critical for fertility in *Caenorhabditis elegans*. K.A. Kuznicki, P.A. Smith, A.W.M. Leung-Chiu and K.L. Bennett. Univ. of Missouri.

117 B48 Designing integrin-binding peptides by secondary structure analysis. J.W. Norris and R.L. Nuccitelli. UC Davis.

118 B49 Fertilization and lipid signaling in *Xenopus laevis.* B.J. Stith, P. Medina, D. Petcoff, W. Holland and K. Savi. Univ. of Colorado, Denver.

119 B50 Nuclear export and modification of An3p, a DEAD-box RNA helicase in *Xenopus laevis.* V.M. Ogniewski, L.B. Sutherland and D.L. Weeks. Univ. of Iowa.

Cell Lineage

120 B51 Erythroid differentiation in vitro is blocked by cyclopamine, an inhibitor of hedgehog signaling. K. Detmer, A.N. Walker, T.M. Jenkins, T.A. Steele and H. Dannawi. Mercer Univ. Sch. of Med., Univ. of Georgia Col. of Agr. and Envrn. Sci. and Med. Ctr. of Central Georgia.

121 B52 FGF signaling in mouse trophoblast stem cells. T. Kunath, S. Tanaka and J. Rossant. Mount Sinai Hosp., Toronto.

122 B53 Characterization of the zebrafish nacre/MiT family of bHLH/ZIP proteins. J.A. Lister, J. Close and D.W. Raible. Univ. of Washington.

123 B54 A role for protein degradation in the asymmetric localization of PIE-1 and other germline factors in *C. elegans* embryos. K.J. Reese, M.A. Dunn and G. Seydoux. Johns Hopkins Univ. Sch. of Med.

124 B55 A new gene required for *C. elegans* tail morphogenesis. T.M. Ratliff and M.A. Herman. Kansas State Univ.

125 B56 MES-1, a protein required for unequal divisions of the germline in early *C. elegans* embryos, resembles receptor tyrosine kinases and is localized to the boundary between the germline and gut cells. L.A. Berkowitz and S. Strome. Indiana Univ.

126 B57 Novel cell-cell interactions determine cleavage plane and eye-forming potential in early *Ilyanassa* embryos. M.B. Goulding. Univ. of Texas at Austin.

Morphogenesis

127 B58 Quantitative analyses of zebrafish morphogenesis. R.J. Adams. Univ. of Bath, UK.

128 B59 Mechanical and geometric determinants of pattern formation during cell rearrangements in embryos. E.M. Munro and G.M. Odell. Univ. of Washington.

129 B60 Analyses of excision mutants near Imp-L1 of *Drosophila*. S. Kedia, J.E. Natzle and L.A. Abbott. Univ. of Colorado, Boulder and UC Davis.

130 B61 Each *C. elegans* laminin a subunit mediates distinct aspects of morphogenesis. C-C. Huang, P.D.

Yurchenco and W.G. Wadsworth. Robert Wood Johnson Med. Sch.

131 B62 SMA-1 spectrin is required for embryonic morphogenesis in *C. elegans*. V. Praitis and J. Austin. Univ. of Chicago.

132 B63 A novel gene, *ram-5*, is required specifically in structural cell of ray for it proper morphogenesis in *Caenorhabditis elegans*. R.Y.L. Yu and K.L. Chow. Hong Kong Univ. of Sci. and Technol., PRC

133 B64 *dpy-11* mutations implicate the requirement of protein modification for normal sensory organ morphogenesis in *C. elegans*. F.C.F. Ko and K.L. Chow. Hong Kong Univ. of Sci. and Technol., PRC

134 B65 Cell commitment in the zebrafish blastula. D.A. Kane and R. M Warga. Univ. of Rochester.

135 B66 Genetic control of convergence and extension movements during zebrafish gastrulation. L. Solnica-Krezel, J. Topczewski, D. Sepich, D. Myers, F. Marlow, A. Amores, C. Walker and J. Postlethwait. Vanderbilt Univ. and Univ. of Oregon.

136 B67 A gradient of BMP activity coordinates the gastrulation movements of convergence and extension. D. Myers, D. Sepich and L. Solnica-Krezel. Vanderbilt Univ.

137 B68 The localization of focal adhesion kinase (FAK) indicates a role for FAK in cellular intercalation and boundary formation. C.A. Henry, M.S. Cooper and M.B. Hille. Univ. of Washington and Univ. of Oregon.

138 B69 Somites in knypek;trilobite zebrafish form without mesenchymal internal cells or compaction of the presomitic mesoderm. C.A. Henry, L.A. Hall, L. Solnica-Krezel and M.S. Cooper. Univ. of Washington and Vanderbilt Univ.

139 B70 Essential role of intact hyaluronan matrix for the elongation of gastrulating mesoderm. G. Lepperdinger and J. Müllegger. Austrian Acad. of Sci., Austria

140 B71 Neural fold formation and morphogenesis in the chick embryo. A. Lawson, H. Anderson and G. Schoenwolf. Univ. of Utah.

141 B72 Bone morphogenetic protein-1 (BMP-1) related metalloproteases regulate cartilage formation and BMP growth factor activity in the embryonic chick limb. S.A. Maas, R.D. Dahn, I.C. Scott, J.F. Fallon and D.S. Greenspan. Univ. of Wisconsin Med. Sch.

142 B73 Hoxa-13 mutant expression downregulates Bapx1 homeodomain gene and leads to hindgut and tail malformations in chicken. P. de Santa Barbara and D.J. Roberts. Massachusetts Gen. Hosp.

143 B74 Delta-Notch signalling in gut epithelium. M. Skipper, A. Morrison, Y. Jiang and J. Lewis. Imperial Cancer Res. Fund, U.K.

144 B75 Sonic hedgehog regulates morphogenesis, cell proliferation and differentiation in developing tooth germs. T. Ohmori, M. Iwamoto, H. Okada, M.J. Tabata, K. Kurisu, M. Pacifici and E. Koyama. Osaka Univ. Fac. of Dent., Japan and Univ. of Pennsylvania Sch. of Dent. Med.

145 B76 Opposing roles of BMP4 and Fgf10 during branching morphogenesis. M. Weaver, N.R. Dunn and B.L.M. Hogan. Vanderbilt Med. Ctr.

146 B77 Segmentor: an activity that induces boundary formation during somite segmentation. Y. Takahashi and Y. Satou. Nara Inst. of Sci. and Technol., Japan.

Organogenesis

147 B78 A subtractive screen for Pax6 target genes. K. Coulter and T. Glaser. Univ. of Michigan Med. Ctr.

148 B79 Molecular mechanism of the chicken Rx/rax underlying neural retina formation. K. Sakagami and K. Yasuda. Natl. Inst. of Sci. Technol., Japan.

149 B80 Tbx12 function in vertebrate development. B.A. Parr and C.T. Carson. Univ. of Colorado.

150 B81 Notch regulates Xath5 function during neural plate and retinal stages. M.L. Schneider, D.L. Turner and M.L. Vetter. Univ. of Utah and Univ. of Michigan.

151 B82 XFz3 promotes ectopic eye formation in *Xenopus*. J.T. Rasmussen, M.A. Deardorff, M.S. Rao, P.S. Klein and M.L. Vetter. Univ. of Utah and Univ. of Pennsylvania.

152 B83 Forkhead gene FoxE3 has an important role in vertebrate lens development. I. Brownell and M. Jamrich. Baylor Col. of Med.

153 B84 Bmp4 is essential for lens induction in the mouse embryo. Y. Furuta. Univ. of Texas, M.D. Anderson Cancer Ctr.

154 B85 Confocal laser scanning microscopy of *Xenopus* inner ear organs during larval development. E.E. Serrano and Q.A. Quick. New Mexico State Univ.

155 B86 Bone morphogenetic proteins regulate morphogenesis of otic membrane, otic capsule chondrogenesis, and their interactions during chicken inner ear development. W. Chang and D. Wu. NIDCD, NIH.

156 B87 The role of Dlx genes in avian inner ear development. S.T. Brown and A.K. Groves. House Ear Inst., Los Angeles.

157 B88 Defining genes involved in mammalian inner ear development. M. Ficker N.S. Powles and M.K. Maconochie. MRC, Harwell, U.K.

158 B89 The developing mouse hearing and balance systems require the orphan nuclear receptor COUP-TFI.

F.A. Pereira, C. Shope, W.E. Brownell, S.Y. Tsai and M. Tsai. Baylor Col. of Med.

159 B90 The consequences of expression of Nkx2.5 truncation mutants on *Xenopus* heart development. L.B. Sutherland, S.J. Kolker, V.M. Ogniewski, U. Tajchman, J.M. Dagle, C. Greaves and D.L. Weeks. Univ. of Iowa.

160 B91 Transcriptional regulation of the BMP-induced chick cardiac homeobox gene, Nkx-2.5. K.-H. Lee and A.B. Lassar. Children's Hosp. and Harvard Med. Sch.

161 B92 Analysis of blood vessel development using transgenic zebrafish. B.M. Weinstein and N.D. Lawson. NICHD, NIH.

162 B93 Sex-specific mechanisms of vascular development in the mouse gonad. J. Brennan and B. Capel. Duke Univ. Med. Ctr.

163 B94 *Sry* and the control of testis organogenesis. B. Capel, J. Karl, C. Tilmann, J. Schmahl, J. Brennan and J. Guille. Duke Univ. Med. Ctr.

164 B95 Cell proliferation is necessary for the induction of the testis pathway in the XY gonad. J.P. Schmahl and B. Capel. Duke Univ.

165 B96 Genetics of prepattern formation in the *C. elegans* gonad. K.R. Siegfried and J. Kimble. HHMI and Univ. of Wisconsin, Madison.

166 B97 Upregulation of the GDNF receptors in the ectopic ureteric buds induced by GDNF. M.K. Hytönen, K. Sainio and H. Sariola. Univ. of Helsinki, Finland.

167 B98 Kidney cell lines from Hoxa 11-SV40 Tag transgenic mice identify putative targets of the Hoxa 11 gene. M.T. Valerius, L.T. Patterson and S.S. Potter. Children's Hosp. Med. Ctr., Cincinnati.

168 B99 Leukemia inhibitory factor induces epithelial tubule formation in metanephric mesenchyme through activation of Wnt signaling. A.O. Perantoni, S. Plisov, L.F. Dove, K.G. Higinbotham and K.Yoshino. NCI, NIH.

169 B100 Patterning the pronephros: a role for notch signaling in kidney organogenesis. K.A. McLaughlin, M.S. Rones and M. Mercola. Harvard Med. Sch.

170 B101 Mutations affecting the form and function of the zebrafish pronephros. F.C. Serluca and M.C. Fishman. Massachusetts Gen. Hosp.

171 B102 The role of TNF signaling in the morphogenesis of epithelial appendages: expression and regulation of tabby and downless in mouse teeth. J. Laurikkala, M. Mikkola, T. Mustonen and I. Thesleff. Univ. of Helsinki, Finland

172 B103 Functional analysis of the A33 antigen. H.E. Abud, C.N. Johnstone, N.C. Tebbutt, S.H. Cody, B. Catimel, E.C. Nice and J.K. Heath. Ludwig Inst. for Cancer Res., Royal Melbourne Hosp., Australia.

173 B104 Pituitary gland development and hormone production are sensitive to Pitx2 dosage. H. Suh, S.A. Camper and P.J. Gage. Univ. of Michigan.

174 B105 In vitro development of organogenesis-stage embryos of *Sminthopsis macroura* (*Marsupialia:Dasyuridae*). Y.P. Cruz, D. Hickford and L. Selwood. Oberlin Col. and La Trobe Univ., Australia.

175 B106 Development of the follicle-associated epithelium and bursal secretory dendritic cells in the guinea fowl (*Numida meleagris*). I. Oláh, N. Nagy, A. Magyar, Cs. Dávid and M.K. Gumati. Fac. of Med., Semmelweis Univ., Hungary.

176 B107 SHH signaling is required for feather bud development. V.C. Oropeza, A.A. Ligas and J.A. Cebra-Thomas. Franklin and Marshall Col.

177 B108 Novel monoclonal antibody identifies avian early myogenic and differentiated smooth muscle cells. N. Nagy, A. Magyar, Cs. Dávid and I. Oláh. Fac. of Med., Semmelweis Univ., Hungary.

178 B109 Function of Gdf11 during chick limb development. L. Gamer, K. Cox and V. Rosen. Genet. Inst.

179 B110 A high-throughput method to identify and characterize novel hematopoietic genes. S.D. Marty and S. Lin. Med. Col. of Georgia.

180 B111 A novel transcriptional regulator is a candidate for the zebrafish moonshine gene. D.G. Ransom, N. Bahary, B.A. Barut, W.J. Saganic and L.I. Zon. HHMI, Children's Hosp., Boston.

181 withdrawn

182 B113 A hedgehog homolog regulates gut formation in leech. D. Kang, D. Li, M. Shankland, W. Gaffield and D. Weisblat. UC Berkeley, Univ. of Texas, Austin and ARS, USDA.

183 B114 *Drosophila* salivary gland morphogenesis, a tale of two transcription factors. M.M. Myat and D.J. Andrew. Johns Hopkins Univ. Sch. of Med.

184 B115 Identification and characterization of *failure to fuse*, a novel gene required for muscle formation in *Drosophila*. V. Corbin, J. Rusconi, S. Gordon, P. Bajaj and J. Aracena. Univ. of Kansas, Univ. of Kansas Med. Sch. and Mississippi Univ. for Women.

185 B116 The homeobox gene Pdx1 is sufficient for endoderm cells to initiate pancreas formation. A. Grapin-Botton and D.A. Melton. HHMI and Harvard Univ.

186 B117 Pancreatic islet-like cells derived from mouse ES cells. B.W. Kahan, L.M. Jacobson, D.A. Hullett and J.S. Odorico. Univ. of Wisconsin Med. Sch.

Neural Development

187 B118 *C. elegans* UNC-4 targets ACR-5 and DEL-1: are they determinants of synaptic choice? S.E. Von Stetina and D.M. Miller III. Vanderbilt Univ.

188 B119 Ecdysteroid coordinates optic lobe neurogenesis via a nitric oxide signaling pathway. D.T. Champlin and J.W. Truman. Univ. of Washington.

189 B120 *nerfin-1*, a new Pan-neural Zn-finger gene is required for proper nervous system development in *Drosophila*. C. Stivers, A. Kuzin, T. Brody and W.F. Odenwald. NINDS, NIH.

190 B121 Talin: a conserved cytoskeletal linker protein expressed in a subset of CNS neurons. T. Brody, C. Stivers and W.F. Odenwald. NINDS, NIH.

191 B122 Cell fate determination mechanisms in the insect central nervous system. B.C. Lear, J.B. Skeath and N.H. Patel. Univ. of Chicago and Washington Univ.

192 B123 Migration of cranial motor neurons is eliminated in the zebrafish gastrulation mutant trilobite. A. Chandrasekhar and S. Bingham. Univ. of Missouri.

193 B124 Development of epibranchial placodes in *Ambystoma mexicanum*. J.B. Gross and L.A. Barlow. Univ. of Denver and Univ. of Colorado Hlth. Sci. Ctr.

194 B125 Establishing neuronal identity in vertebrate neurogenic placodes. C.V.H. Baker and M. Bronner-Fraser. Caltech.

195 B126 The *sensory-deprived*^{w15} mutation is required for development of the dorsal root ganglia in zebrafish. J.M. Ungos, T. Linbo and D.W. Raible. Univ. of Washington.

196 B127 Curly fry, a neural crest deficient mutant. A.E. Davidson, J.C. Shaffer, C. Saunders, D. Mohn, P.D. Henion, P.B. Hackett and S.C. Ekker. Univ. of Minnesota and Ohio State Univ.

197 B128 CD44-ERBB receptor interactions facilitate neural crest cell differentiation. L. Sherman, M. Bevers and H. Horn. Univ. of Cincinnati.

198 B129 Concurrent expression of recombination activating genes 1 and 2 in the zebrafish olfactory system. J.R. Jessen, T.N. Jessen and S. Lin. Med. Col. of Georgia.

199 B130 The spatiotemporal expression order limits the potential of Brn-3 factors to promote retinal ganglion cell differentiation. W. Liu, S.L. Khare, X. Liang, X. Liu, M.A. Peters, C.L. Cepko and M. Xiang. UMDNJ-Grad. Sch. of Biomed. Sci.

200 B131 The role of histone deacetylase in the regulation of notch signaling in the mammalian cochlea. P.J. Lanford and M.W. Kelley. NIDCD, NIH.

201 B132 Transcriptional regulators of MATH1. P.J. Ebert and J.E. Johnson. Univ. of Texas Southwestern Med. Ctr.

202 B133 Neuroligin 3 is expressed in a wide range of glia during development. M.M. Gilbert, J. Smith, A. Roskams and V.J. Auld. Univ. of British Columbia, Canada.

203 B134 Heparan sulphate plays a role in closure of the neural tube in the mouse embryo. G.W. Yip, P. Ferretti and A.J. Copp. University Col. London, U.K. and Univ. of Singapore, Singapore

204 B135 Metabolism of choline in neurulating mouse embryos. M.C. Fisher, K.M. Denno, M.H. Mar, S.H. Zeisel and T.W. Sadler. Univ. of North Carolina-Chapel Hill.

205 B136 Sonic hedgehog regulation of midbrain pattern formation. S. Agarwala and C.W. Ragsdale. Univ. of Chicago.

206 B137 Ectopic BMPs disrupts chick telencephalic development through the repression of Shh and FGF8 gene expression and the regulation of apoptosis. Y. Ohkubo and J.L.R. Rubenstein. UCSF.

207 B138 Patterning of midbrain and hindbrain by isthmic FGF8. I. Mason, D. Chambers, C. Irving, H. Shamim and J. Walshe. King's Col. London, U.K.

208 B139 Analysis of *Fgf8* function in the development of the mouse midbrain and anterior hindbrain. C.L. Chi, S. Martinez, W. Wurst and G.R. Martin. Sch. of Med., UCSF, Fac. of Med., Univ. Murcia, Spain and GSF-Res. Ctr., Inst. for Mammalian Genet., Germany.

209 B140 zpl4, a zebrafish gene expressed in an fgf8-dependent manner, may play a role in patterning the rostral hindbrain. M.E. Lane, A.P. Runko and C.G. Sagerstrom. Univ. of Massachusetts Med. Ctr.

210 B141 A novel Pbx family member expressed during early zebrafish embryogenesis forms trimeric complexes with Meis3 and Hoxb1b. N. Vlachakis, D.R. Ellstrom and C.G. Sagerstrom. Univ. of Massachusetts Med. Sch.

211 B142 Role of muscle segment homeobox-B in zebrafish neural development. B.B. Riley, B.T. Phillips and A. Fritz. Texas A&M Univ. and Emory Univ.

212 withdrawn

213 B144 Cloning and characterization of GABA transporter genes in *Xenopus* L. August, K.Hoke, D.Solomon, N.Madden and M. Saha. Col. of William and Mary.

214 B145 Xrx1 in neural plate differentiation. M. Andreazzoli. NICHD, NIH and Univ. of Pisa, Italy.

215 B146 XHMG4, a novel *Xenopus* member of the HMG1/2 family, is expressed in the developing nervous

system. C. Prothmann, C. Vorbach and R.A.W. Rupp. Max-Planck Gesellschaft, Tübingen.
216 B147 Identification of XSIP1, a zinc finger/homeodomain transcription factor expressed during early neural development. L. van Grunsven, C. Papin, K. Opdecamp, B. Avalosse, D. Huylenbroeck, J. Smith and E. Bellefroid. Flanders Interuniv. Inst. for Biotechnol., Belgium and NIMR,U.K.
217 B148 The maternal gene product, tumorhead, induces cell proliferation and regulates neural differentiation in *Xenopus* embryos. C. Fen Wu and L.D. Etkin. Univ. of Texas, M.D. Anderson Cancer Ctr.
218 withdrawn
219 B150 *XEbf3* functions as an effector of *XNeuroD* during neurogenesis. O. Pozzoli, A. Bosetti, L. Croci, G.G. Consalez and M.L. Vetter. HSR Sci. Inst., Milan, Italy and Univ. of Utah.

Patterning

220 B151 A role for the Exd/PBC homolog CEH-20 in *C. elegans* embryogenesis? Q.F. Boese and W.B. Wood. Univ. of Colorado.
221 B152 *C. elegans* embryonic axial patterning requires two recently discovered posterior-group Hox genes and a homothorax homolog. K. Van Auken, D.C. Weaver, B. Robertson, U. Elling, L.G. Edgar and W.B. Wood. Univ. of Colorado, Boulder.
222 B153 MEX-3 interacting proteins required to regulate *pal-1* translation. N.N. Huang, A.J. Walhout, M. Vidal and C.P. Hunter. Harvard Univ. and Dana Farber Cancer Inst.
223 B154 Head regeneration of an aquatic oligochaete, *Lumbriculus variegatus*, is precisely regulated and correlated to engrailed gene expression. K. Crawford, D.R. Backof, D.R. Angelini, H. Hatcher and R.L. Beach. St. Mary's Col. of Maryland and Hollins Univ.
224 B155 Sea urchin fringe: identification and preliminary functional analysis. R.E. Peterson and D.R. McClay. Duke Univ.
225 B156 Patterning the *Drosophila* eggshell: a role for *18-wheeler*. S.K. Syed and E.D. Eldon. Univ. of Notre Dame.
226 B157 *dSmurf1*, a ubiquitin-protein ligase that modulates BMP signaling in *Drosophila*. S.D. Podos and E.L. Ferguson. Univ. Chicago.
227 B158 *Drosophila* sulfatase1 regulates developmental signaling during development. D.M. Standiford, W. Tao Sun and C.P. Emerson, Jr. Univ. of Pennsylvania.
228 B159 Localized protein degradation regulates Paired protein expression in *Drosophila* development. P. Vivekanand, L. Raj, M. Fernandes, S.D. Hanes, L.F. Appel and M. Weir. Wesleyan Univ. and SUNY Albany.
229 B160 *arrow* encodes an LDL receptor related protein essential for reception of the wingless signal in *Drosophila*. M. Wehrli, A. Rives and S. DiNardo. Univ. of Pennsylvania Med. Ctr.
230 B161 The effect of the proteoglycan Syndecan on the development of Drosophila. T.R. Heslip and J.L. Marsh. Fac. of Med., Univ. of Calgary and UC Irvine.
231 B162 Identification and analysis of two new genes involved in the control of cell polarity during *C. elegans* development. X. Zhao and M.A. Herman. Kansas State Univ.
232 B163 Determining the function of the planar cell polarity gene strabismus in vertebrate development. M. Park and R.T. Moon. Univ. of Washington Sch. of Med. and Ctr. for Develop. Biol.
233 B164 Patterning the vertebrate gastrointestinal tract. D. Smith, R.C. Grasty, N.M. Nascone-Yoder and C.J. Tabin. Harvard Med. Sch. and Eckerd Col.
234 B165 mRNA localization patterns in zebrafish oocytes. C.E. Howley and R.K. Ho. Princeton Univ.
235 B166 A mutagenesis screen to identify maternal factors specifically required in early development of the zebrafish. D.S. Wagner, K.A. Mintzer, R. Dosch and M.C. Mullins. Univ. of Pennsylvania.
236 B167 Roles of *chameleon* in midline signaling. A. Kawakami, W.S. Talbot and A.F. Schier. NYU Sch. of Med., Stanford Univ. Sch. of Med. and Natl. Inst. of Genet., Mishima, Japan.
237 B168 Delta-Notch mediated regulation of midline cell fate. A.J. Latimer and B. Appel. Vanderbilt Univ.
238 B169 Isolation and characterisation of two *Mab21* gene family members in *Danio rerio*. Y.M. Wong and K.L.Chow. Hong Kong Univ. of Sci. and Technol., PRC
239 B170 The role of one-eyed pinhead and Nodal signaling in left-right axis determination. R.D. Burdine, K. Gritsman, J. Corrales, W.S. Talbot and A.F. Schier. NYU Sch. of Med. and Stanford Univ. Sch. of Med.
240 B171 Reticulospinal-less: a zebrafish mutant defective in hindbrain, head periphery, and mesodermal patterning. L. Maves and C.B. Kimmel. Univ. of Oregon.
241 B172 Genetic analysis reveals a role for FGF signaling in the production of posterior mesoderm in zebrafish. B.W. Draper, D.W. Stock and C.B. Kimmel. Univ. of Oregon and Univ. of Colorado.
242 B173 The role of Hedgehog signaling in patterning the zebrafish sclerotome. S.H. Devoto, M.J.F. Barresi, J. D'Angelo and H.L. Stickney. Wesleyan Univ.
243 B174 Hedgehog signal transduction is required for early, but not late, slow muscle development in zebrafish. M.J. Barresi, H.L. Stickney and S.H. Devoto. Wesleyan Univ.

244 B175 Is Chordin a long-range or short-range acting factor? Roles for BMP1-related metalloproteases in regulating chordin action during early *Xenopus* embryogenesis. I.L. Blitz, O. Shimmi, K. Wuennenberg-Stapleton, M.B. O'Connor and K.W.Y. Cho. UC Irvine and Univ. of Minnesota.
245 B176 BMP binding modules in Chordin: new clues on the molecular mechanism that regulates dorsoventral patterning. J.A. Larrain, M. Oelgeschlager, D. Geissert and E.M. De Robertis. UCLA.
246 B177 Investigating the molecular interactions of chordin and BMP-1/TLD-like proteases in regulating TGFβ-like growth factor activities. W.N. Pappano, I.C. Scott, I.L. Blitz, K.W.Y. Cho and D.S. Greenspan. Univ. of Wisconsin Med. Sch. and UC Irvine.
247 B178 Voltage sensitive calcium channels participate in the dorsalization of the mesoderm in *Xenopus laevis*. V.A. Palma, R. Mayor and M. Kukuljan. Univ. of Chile.
248 B179 Regulation of anterior/posterior development by Spemann's organizer. M.C. Lane, T. Smith and M.D. Sheets. Univ. of Wisconsin.
249 B180 Pitx1: the next regeneration. S. Perry, W.Y. Chang and M.J. Crawford. Univ. of Windsor.
250 B181 Involvement of xPitx genes in cement gland formation and head development F. Khosrowshahian, W.Y. Chang, M.J. Crawford. Univ. of Windsor, Canada.
251 B182 Anterior ectodermal patterning in *Xenopus laevis*: the role of the homeobox genes *Pitx1* and *Pitx2*. A. Schweickert, H. Steinbeisser and M. Blum. Forschungszentrum Karlsruhe and Max-Planck-Institut, Germany.
252 B183 Embryonic expression of *Xenopus Mab21l2* is required for neural tube closure, eye development and posterior structure formation. G.T.C. Lau, O.G.W. Wong, P.M.Y. Chan, K.H. Kok, R.L.Y. Wong, K.T. Chin, M.C.M. Lin, H.F. Kung and K.L. Chow. Hong Kong Univ. of Sci. and Technol. and Hong Kong Univ., PRC
253 B184 Mesendoderm induction by *Hfh2*. D.S. Kessler, M.J. Engleka, E. Brown, V. Cluzet, E. Craig, R. Foreman and P.A. Labosky. Univ. of Pennsylvania.
254 B185 Maternal *VegT* initiates *Xenopus* endoderm formation. J. Xanthos, C. Wylie and J. Heasman. Univ. of Minnesota Sch. of Med.
255 withdrawn
256 B187 *Bapx1, Bmp4*, and *Nkx2.5* are involved in patterning regions of the chick gut. C.M. Nielsen, L.C. Murtaugh and D.J. Roberts. Massachusetts Gen. Hosp. and Harvard Med. Sch.
257 B188 Patterning of the chick pronephric kidney. R.G. James and T.M. Schultheiss. Beth Israel Hosp., Harvard Med. Sch.
258 B189 Hedgehog signaling during mouse ES cell embryoid body development. P. Maye, L. Kasameyer, S. Becker, N. Byrd and L. Grabel. Wesleyan Univ.
259 B190 Genetic control of the *nodal* locus. D.P. Norris and E.J. Robertson. Harvard Univ.
260 B191 Establishment of region specific knockout for gastrulation stage mouse embryo. S. Miura and Y. Mishina. NIEHS, NIH.
261 B192 The role of mouse *Mab21* genes in embryonic turning, neural tube, and notochord differentiation. R.L.Y. Wong and K.L. Chow. Hong Kong Univ. of Sci. and Technol., PRC
262 B193 A fate MAP of rhombomere 4 and its derived neural crest in normal and hoxb-1 mutant mice. S. O'Gorman, E.A. Barcarse, T. Trieu and C.-W. Liu. The Salk Inst. for Biol. Studies.
263 withdrawn
264 B195 A role for Gbx2 in repression of Otx2 and positioning the mid/hindbrain organizer. S. Millet, K. Campbell,D.J. Epstein, K. Losos, E. Harris and A.L. Joyner. HHMI, Skirball Inst., New York.
265 B196 The antagonistic relationship between *open brain* and Sonic Hedgehog in patterning the mouse neural tube. J.T. Eggenschwiler and K.V. Anderson. Sloan Kettering Inst.
266 B197 Pattern formation in the mammalian optic vesicle. M.T. Nguyen and H. Arnheiter. NINDS, NIH.
267 B198 Mouse endoderm development. J.M. Wells and D. Melton. Harvard Univ.
268 B199 Distal most limb structures develop despite absence of Shh signaling in mouse. P. Kraus, D. Fraidenraich, C. Basilico and C.A. Loomis. NYU Sch. of Med.
269 B200 Left-right patterning of the developing cardiovascular system. E.N. Meyers. Duke Univ.
270 B201 The role of *pumilio* in patterning and germ cell development in the mouse embryo. D.M. Boucher, Y. Ruan, M.L. Flannery, Y-N. Jan and R.A. Pedersen. UCSF.

Body Plan

271 B202 Synergistic interactions between T-box transcription factors, FGF8 and one-eyed pinhead in posterior mesoderm formation. K.J.P. Griffin and D. Kimelman. Univ. of Washington.
272 B203 Functional analysis of a new bHLH family, hesr-1, -2, and -3: potential regulators of vertebrate. H. Kokubo, Y. Lun, L. Gan and R.L. Johnson. Univ. of Texas M.D. Anderson Cancer Ctr.
273 B204 Orphan receptor germ cell nuclear factor is required for somitogenesis and correct anterior-posterior development of mouse embryos. A.J. Cooney, F.A. Pereira and A.C-K. Chung. Baylor Col. of Med.
274 B205 The mouse Vg1-related gene, mGDF3 affects left-right axis formation in *Xenopus*. M. Li, J. Yost, J.

McGrath and M. Brueckner. Yale Univ. and Univ. of Utah.
275 B206 The *EGF-CFC* gene *Cryptic* is essential for left-right axis formation in mouse development. Y-T. Yan, J. Ding, S.M. Price and M.M. Shen. Robert Wood Johnson Med. Sch.-UMDNJ.
276 B207 The proprotein convertases SPC1/Furin and SPC4/PACE4 establish the balance between mutually antagonistic TGFβ signaling pathways required for left-right axis formation. D.B. Constam and E.J. Robertson. Harvard Univ. and Swiss Inst. for Exptl. Cancer Res.
277 B208 Vertebrate left-right asymmetry: the rabbit embryo as a new mammalian model system. A. Fischer. Forschungszentrum Karlsruhe and Univ. of Bonn, Germany.

Metamorphosis

278 B209 Regulation of metamorphosis in ascidians. C.D. Bishop, W.R. Bates and B.P. Brandhorst. Simon Fraser Univ., Canada, Bamfield Marine Sta., and Okanagan Univ. Col., Canada.
279 B210 Role of *Nkx-2.3* homeobox gene in skin differentiation of *Xenopus laveis*. C.M Ma and L. Miller. University of Illinois-Chicago.

Signaling Pathways

280 B211 The Hedgehog signaling pathway in early mouse development. X. Zhang, M. Ramalho-Santos and A.P. McMahon. Harvard Univ.
281 B212 Structure/function studies of the Hedgehog receptor J.E. Hooper and R.A. Young. Univ. of Colorado Hlth. Sci. Ctr.
282 B213 Genetic separation of the Hh signaling pathway into three discrete branches Q.T. Wang and R.A. Holmgren. Northwestern Univ.
283 B214 Characterization of *habanero*: a gene that is involved in dorsal-ventral patterning in *Drosophila*. A.E. Scherer and J.B. Duffy. Indiana Univ.
284 B215 Activation of Toll signaling in *Drosophila* involves Pelle autophosphorylation. B. Shen and J.L. Manley. Columbia Univ.
285 B216 A molecular basis for competence and for the specificity of ras signaling in mesoderm development. M.S. Halfon, A. Carmena, M. Baylies and A.M. Michelson. HHMI and Brigham and Women's Hosp. and Mem. Sloan-Kettering Cancer Inst.
286 B217 Ras and Notch signaling pathways interact to generate specific cell fates during *Drosophila* mesoderm differentiation. A. Carmena, E. Buff, F. Jiménez, M. Baylies and A. Michelson. Mem. Sloan-Kettering Cancer Ctr., Brigham & Women's Hosp., and Univ. Miguel Hernández, Spain.
287 B218 Analysis of the function of the Scw prodomain. M.Q. Nguyen and K. Arora. UC Irvine.
288 B219 The *IMP-E1* gene is independently regulated by ecdysteroids and the *hemipterous*/JNK pathway during *Drosophila* embryogenesis. J.E. Natzle, K.E. Clark and G.D. Vesenka. UC Davis.
289 B220 Conventional and unconventional roles for POP-1/Tcf function in *C. elegans.* M.A. Herman. Kansas State Univ.
290 B221 Eph signaling is required for gastrulation and prechordal plate movement. J. Chan, J.D. Mably, J.N. Chen, N.B. Goldstein, M. Thomas, J. Cleary, M.C. Fishman and T.M. Roberts. Dana-Farber Cancer Inst. and Massachusetts Gen. Hosp.
291 B222 The regulation of organizer function by the FGF signaling pathway. T.M. Smith and M.D. Sheets. Univ. of Wisconsin-Madison.
292 B223 Maternal *Xaxin* is essential for normal dorsal axis formation in *Xenopus*. M. Kofron, P. Klein and J. Heasman. Univ. of Minnesota and Univ. of Pennsylvania Sch. of Med.
293 B224 Direct physical interaction among Lef/Tcf, B-catenin and Smad4 transcription factors in formation of Spemann's organizer. M.K. Hashimoto, M. Nishita, S. Ogata, M.N. Laurent, N. Ueno, H. Shibuya and K.W.Y. Cho. UC Irvine and Natl. Inst. for Basic Biol., Japan.
294 B225 A novel cleavage site within the pro domain of the BMP-4 precursor regulates the signaling range and biological activity of mature BMP-4. Y. Cui, V. Anthony and J. Christian. Oregon Hlth. Sci. Univ.
295 B226 Overlapping and distinct functions of GDF6 and BMPs. C. Chang and A. Hemmati-Brivanlou. Rockefeller Univ.
296 B227 Collagen XVIII is essential for early kidney tubulogenesis: evidence from Wnt signalling pathway induced by lithium chloride. Y. Lin, S. Zhang, R. Heljasvaara, M. Rehn, R. Pihlajaniemi and S. Vainio. Univ. of Oulu, Finland.
297 B228 Multiple roles for activated LEF/TCF/β-catenin transcription complexes during hair organogenesis. R. Dasgupta and E. Fuchs. HHMI and Univ. of Chicago.
298 B229 Notch signaling is required for ephrinB2 expression and proper vascular development. N.D. Lawson, C.-H. Kim, A. Chitnis and B.M. Weinstein. NICHD, NIH.
299 B230 Homocysteine-induced disruption of vascular development. K.S. Eastep and T.H. Rosenquist. Univ.

of Nebraska Med. Ctr.
300 B231 PI3 kinase activity affects formation and expansion of the amniotic membrane in avian embryos. T.E. Macdonald and B. Holton. Univ. of Wisconsin, Oshkosh.
301 B232 FGF and TGFβ regulate different aspects of skeletal muscle development in vivo. H. Flanagan-Steet and B.B. Olwin. Univ. of Colorado, Boulder.
302 B233 Known and novel phosphatases expressed in the developing chick limb. D.D.W. Cornelison and B.B. Olwin. Univ. of Colorado, Boulder.
303 B234 Sonic Hedgehog-mediated regulation of myogenesis. Y. Bren and B.B. Olwin. Univ. of Colorado, Boulder.
304 B235 Profile of protein kinase C isozymes in preimplantation mouse development. H. Dehghani and A.C. Hahnel. Univ. of Guelph, Canada.
305 B236 Germ cell nuclear factor is critical for the left-right asymmetry in mouse embryos. A.C.-K. Chung, F.A. Pereira and A.J. Cooney. Baylor Col. of Med.
306 B237 Transcriptional regulation of mouse trophoblast development. C. Mao, D. Strumpf, B. Ciruna, L. Schwartz and J. Rossant. Samuel Lunenfeld Res. Inst., Mount Sinai Hosp., Canada
307 B238 Smad1 is required for chorioallantoic placenta formation during murine development. J. Ryan, L. Garrett, C. Deng, X-F. Wang, A. Wynshaw-Boris, A. Roberts and R. Lechleider. Uniformed Serv. Univ. of the Hlth. Sci., NCHGR, NIDDK, NIH, Duke Univ. and NCI, NIH.
308 B239 Dissection of the roles of wingless pathway members in hair morphogenesis and in hair tumor development. U. Gat, E. Chan, L. Degenstein and E. Fuchs. HHMI, Univ. of Chicago.
309 B240 Studies of the role of mNotch1 phosphorylation in signal transduction. D.R. Foltz and J.S. Nye. Northwestern Univ. Med. Sch.
310 B241 Cell density-dependent signaling in malignant cells. M.V. Agrez. Univ. of Newcastle, Australia.
311 B242 SIP2, an RNA-binding Smad-interacting protein, may identify a new mechanism of Smad function in TGF-b signal transduction. C. Collart, J.E. Remacle, L. Van Grunsven, K. Verschueren and D. Huylebroeck. Flanders Interuniv. Inst. for Biotechnol. and Univ. of Leuven, Belgium.

Gene Expression

312 B243 Enabling developmental genomics: representative mRNA amplification. L.R. Baugh, A.A. Hill, E.L. Brown and C.P. Hunter. Harvard Univ. and Genetics Inst.
313 B244 Microarray analysis reveals genes potentially functionally involved in specific vascular SMC growth phenotype. M.C.M. Weiser-Evans, P. Mourani, B.E. Quinn and K.R. Stenmark. Univ. of Colorado Hlth. Sci. Ctr.
314 withdrawn
315 B246 PITX2 expression and activity in a tooth epithelial cell line. T.A. Hjalt, L.B. Sutherland, E.V. Semina, J.C. Murray, M.L. Snead and B.A. Amendt. Univ. of Iowa, USC Sch. of Dent. and Univ. of Tulsa.
316 B247 Up-regulation of a fatty acid transporter in adipocyte differentiation and alcoholic fatty liver. M.W. Bradbury, X. Fan and P.D. Berk. Mt. Sinai Sch. of Med.
317 B248 Retinoic acid altered expression of *BMP2*. K.L. Abrams and M.B. Rogers. Univ. of South Florida.
318 B249 Isolation of early cardiomyocyte cell lines from *Nkx2.5*/simian virus 40 large tumor antigen transgenic mice E. Brunskill, D. Witte, K. Yutzey and S. Potter. Childrens' Hosp. Med. Ctr., Cincinnati.
319 B250 Immunocytochemical localization of Hex in cultured cells and mouse embryo. B. Ghosh, G.R. Ganea, H.C. Jacobs and C.W. Bogue. Yale Univ. Sch. of Med.
320 B251 Regulation of AP-2α in the developing frontal nasal mass. A.L. Donner and T. Williams. Yale Univ.
321 B252 Analysis of fibroblast growth factors in ear development. T.J. Wright and S.L. Mansour. Univ. of Utah.
322 B253 Transcriptional regulation of two putative corneal enzyme-crystallins in the rabbit: ALDH1 and TKT. R.B. Hough and J. Piatigorsky. NEI, NIH.
323 B254 A differential screen to identify genes during gastrulation in mouse embryos. C.C. Poncet and R.L. Johnson. Univ. of Texas M.D. Anderson Cancer Ctr.
324 B255 Expression patterns of Wnts and Sfrp family members suggest interaction during neural crest specification. M. Baranski, H. Magan, K. Terry, E. Berduogo, J. Sandler, L.M. Galli and L.W. Burrus. San Francisco State Univ.
325 B256 Mechanisms of gene regulation by the Msx1 homeoprotein *in vitro* and *in vivo*. A.J. Bendall, G. Hu, J. Ding, M.M. Shen and C. Abate-Shen. Ctr. for Adv. Biotechnol. and Med. and UMDNJ-Robert Wood Johnson Med. Sch.
326 B257 A novel RNA containing a potential promoter domain corrects the cardiac mutation in Mexican axolotls, *Ambystoma mexicanum*. C. Zhang, D. Foster, X. Huang, S. Lemanski, F. Meng, D. Dube and L. Lemanski. Texas A&M Hlth. Sci. Ctr. and SUNY, Syracuse.

327 B258 *Xenopus MRF4* gene regulation. S.S. Dirscherl and T.J. Hinterberger. Univ. of Alaska Anchorage.
328 B259 *Xenopus* six1 gene is expressed broadly throughout all neurogenic cranial placodes and is maintained in the differentiating lateral lines. P.D. Pandur, S.A. Brugman and S.A. Moody. George Washington Univ.
329 B260 A novel family of retrotransposons in *Xenopus* with a developmentally regulated expression. S.Shim and J.K. Han. Pohang Univ. of Sci. and Technol., South Korea.
330 B261 The regulation of Rpx/Hesx1 gene in early embryonic development. S-J. Chou, H. El-Hodiri, E. Hermesz and K. Mahon. Baylor Col. of Med.
331 B262 β-catenin regulates the early expression of the *Xenopus* anti-neural factor DIx3. M.J. Beanan, J.A. Feledy and T.D. Sargent. NICHD, NIH.
332 B263 The role of HIF genes and hypoxia in early *Xenopus* development. E.J. Gruber, N. Sadjadi and M.S. Saha. Col. of William and Mary.
333 B264 Transgenic analysis of the zebrafish *chordin* promoter. V. Miller-Bertoglio and M.E. Halpern. Carnegie Inst. of Washington.
334 B265 Cloning and expression of zebrafish homolog of human Ring 3/Drosophila fsh/rat mud-6 gene. T.D. Ebert, J. Guinto and A.J. DiBenedetto. Villanova Univ.
335 B266 Distribution of polycomb protein during embryogenesis in zebrafish. R.I. Achong, D. Greene, G. Packert, Y-W.P. Lin and T. Petrino. Barry Univ., FL.
336 B267 Insertional mutagenesis and gene tagging with the sleeping beauty transposon system in zebrafish. P.B. Hackett, K. Clark, A. Davidson, A. Dupay, D. Largaspaeda and S.C. Ekker. Univ. of Minnesota.
337 B268 Partner of Paired is part of a protein degradation complex. T.K. Das, L. Raj and M. Weir. Wesleyan Univ.
338 B269 A protein with many faces: the functions of Cap 'n' collar B in anterior-posterior diversification of the *Drosophila* head. A. Veraksa, N. McGinnis, X. Li, J. Mohler and W. McGinnis. UCSD and Barnard Col., New York.
339 B270 Aryl hydrocarbon receptor signaling in *C. elegans*. J.A. Powell-Coffman, H. Jiang and R. Guo. Iowa State Univ.
340 B271 Transcriptional control of the *C. elegans* hox gene *ceh-13*. A. Streit, R. Kohler, T. Marty, M. Belfiore, C. Stoyanov, M. Affolter, R. Schnabel and F. Müller. Univ. of Fribourg, Univ. of Basel and TU Braunschweig, Switzerland
341 B272 *mab-21* expression is required for sensory ray 6 differentiation and is dynamically regulated during postembryonic *C. elegans* development. S. Ho and K. Chow. Hong Kong Univ. of Sci. and Technol., PRC
342 B273 Characterization of the Cnidarian *daughterless/E12* hololog *Cnda*. A. Grens. Indiana Univ.

Cell Biology of Development

343 B274 Analysis and characterization of two conserved domains in the *Drosophila* split ends gene. K.A. Mace and W. McGinnis. UCSD.
344 B275 In vivo functional cooperation of insulin-like growth factor I and leukemia inhibitory factor studied in mutant mice. F. de Pablo, C. Ferandez-Moreno, C. Vicario-Abejon, P.H. Patterson and J.G. Pichel. Ctr. of Investigaciones Biologicas, CSIC, Spain and Caltech.
345 B276 A hairy homolog in leech. M.H. Song and D. Weisblat. UC Berkeley.
346 B277 A nanos-homolog in *Helobdella* (leech) germline precursors. D.A. Weisblat, M. Pilon and D. Kang. UC Berkeley.
347 B278 Intracellular motility genes and asymmetric cell division in the nematode *C. elegans*. R.J. Cheeks and B. Goldstein. Univ. of North Carolina.
348 B279 Chromosome segregation during embryonic mitosis requires importin α-2. K.G. Geles and S.A. Adam. Northwestern Univ. Med. Sch.
349 B280 Kinesins in the early *Xenopus laevis* embryo. A. Moran, C. de la Cova, J. Heasman and C.C. Wylie. Univ. of Minnesota Sch. of Med.
350 B281 Cell polarity and microtubules: the PAR-1 connection? R. Benton, J. Shulman and D. St. Johnston. Univ. of Cambridge, U.K.
351 B282 Expression of PAR-6 in *Xenopus laevis*. S.C. Choi, J.Kim and J.K. Han. Pohang Univ. of Sci. and Technol., South Korea.
352 B283 Membrane dynamics during cytokinesis in *Xenopus* embryos. M.V. Danilchik, E.E. Brown and K. Ray. Oregon Hlth. Sci. Univ.
353 B284 Role of p53 family members in the early development of *Xenopus laevi*. P. Lu, J. Wallingford and P. Vize. Univ. of Texas, Austin.
354 B285 Modulation of N1 protein levels by intracellular antibody transfection inhibits the initial heartbeating in Mexican axolotl. F. Meng, X. Huang, R. Zadjel, S. Lemanski, C. Zhang, D. Foster, D. Dube and L. Lemanski. Texas A&M Univ. Hlth. Sci. Ctr. and SUNY Hlth. Sci. Ctr.
355 B286 The regulation of apoptosis in the endocardial cushions of the developing chick heart. W.M. Keyes,

D.W. Li and E.J. Sanders. Univ. of Alberta, Canada.

356 B287 Transcription factor ERG variants and functional diversification of chondrocytes during limb skeletogenesis. M. Iwamoto, Y. Higuchi, E. Koyama, M. Enomoto-Iwamoto, K. Kurisu, H. Yeh, W.R. Abrams, J. Rosenbloom and M. Pacifici. Osaka Univ. Fac. of Dent., Japan and Univ. of Pennsylvania Sch. of Dent. Med.

357 B288 Analysis of the molecular clock implicated in somitogenesis. K.J. Dale, J. Dubrulle, C. Jouve, M. Maroto, M. McGrew and O. Pourquie. CNRS, Campus de Luminy, France

358 B289 Identification of new satellite cell markers and their role in signaling in satellite cells on intact myofibers. B.B. Olwin, H. Stenley, D. Cornelison, M. Filla and A.C. Rapraeger. Univ. of Colorado and Univ. of Wisconsin-Madison.

359 B290 Characterization of focal adhesion kinase in the sea urchin embryo. M. Guadalupe García and M.B. Hille. Univ. of Washington.

360 B291 Disruption of cell contacts alters the development of amphibian taste buds. M.A. Parker and L.A. Barlow. Univ. of Denver and Univ. of Colorado Hlth. Sci. Ctr.

361 B292 Isolation, characterization, and functional studies of rac, rho, and cdc42 in *Xenopus* development. J.M. Lucas, R. Ren and M.D. Hens. Univ. of North Carolina Greensboro.

362 B293 Developmental expression of Tiam-1 in preimplantation mouse embryo. P.M. Martin and A.E. Sutherland. Univ. of Virginia.

363 B294 The Hand1 bHLH factor regulates trophoblast differentiation via multiple mechanisms. I.C. Scott, L. Anson-Cartwright, P. Riley and J.C. Cross. Mount Sinai Hosp. and Univ. of Toronto, Canada.

ACKNOWLEDGMENTS

Grants
National Science Foundation
National Institutes of Health
March of Dimes Birth Defects Foundation

Sponsors
Academic Press - *Annual AP Symposium in Developmental Biology*
BD PharMingen – *Travel Awards*
Carl Zeiss
Merck Research Laboratories

EXHIBITORS

Meeting participants are urged to visit the exhibits held concurrently with the poster sessions.

Partial list of vendors:

Academic Press
BD PharMingen
Fine Science Tools
Humana Press
McGraw-Hill Higher Education
Olympus America, Inc.
Oxford University Press
Sinauer Associates
St. Jude Children's Research Hospital:

Several postdoctoral positions are available and interviews may be scheduled at the meeting with Dr. William S. Walker.
(T: 901/495-3470, Email: linda.johnson@stjude.org)