



Universiteit
Leiden
The Netherlands

Spatio-temporal gene expression analysis from 3D in situ hybridization images

Welten, M.C.M.

Citation

Welten, M. C. M. (2007, November 27). *Spatio-temporal gene expression analysis from 3D in situ hybridization images*. Leiden Institute of Advanced Computer Science, group Imaging and Bio-informatics, Faculty of Science, Leiden University. Retrieved from <https://hdl.handle.net/1887/12465>

Version: Corrected Publisher's Version

License: [Licence agreement concerning inclusion of doctoral thesis in the Institutional Repository of the University of Leiden](#)

Downloaded from: <https://hdl.handle.net/1887/12465>

Note: To cite this publication please use the final published version (if applicable).

REFERENCES

- Ahn, S. and Joyner, A. L. 2004. Dynamic changes in the response of cells to positive hedgehog signaling during mouse limb patterning. *Cell* 118: 505–516.
- Aitken, A., Howell, S., Jones, D., Madrazo, J. and Patel, Y. 1995. 14-3-3 α and δ are the phosphorylated forms of Raf-activating 14-3-3 β and ζ . *The Journal of biological chemistry* 270 (11) 5706-5709
- Aitken, A. 1996. 14-3-3 and its possible role in co-ordinating multiple signalling pathways. *Trends in cell biology* 6: 341-347
- Akimenko, M.A., Johnson, S.L., Westerfield, M. and Ekker, M., 1995. Differentiation induction of four *Msx* homeobox genes during fin development and regeneration in zebrafish. *Development* 121: 347-357
- Akiyama, H., Chaboissier, M.C., Martin, J.F., Schedl, A. and de Crombrughe, B.2002. The transcription factor Sox9 has essential roles in successive steps of the chondrocyte differentiation pathway and is required for expression of Sox5 and Sox6. *Genes Dev* 16(21):2813-28.
- Alberch, P. and Gale, E. A. 1983. Size dependence during the development of the amphibian foot. Colchicine-induced digital loss and reduction. *J. Embryol. Exp. Morphol.* 76: 177–197.
- Amores, A., Force, A., Yan, Y.L., Joly, L., Amemiya, C., Fritz, A., Ho, R.K., Langeland, J., Prince, V., Wang, Y.L., Westerfield, M., Ekker, M. and Postlethwait, J. H.1998. Zebrafish hox clusters and vertebrate genome evolution. *Science* 282: 1711-1714
- Bardeleben, K. 1889. On the præpollex and præhallux, with observations on the carpus of *Theriodesmus phylarchus*. *Proc. Zool. Soc. Lon.* 259–262.
- Bartosik-Psujek, H. and Archelos, J.J. 2004. Tau protein and 14-3-3 are elevated in the cerebrospinal fluid of patients with multiple sclerosis and correlate with intrathecal synthesis of IgG. *J Neurol* 251: 414–420
- Bathoorn, R. and Siebes, A.J.P.M. 2004. Constructing (Almost) Phylogenetic Trees from Developmental Sequences Data. 8th European Conf on Principles and Practice of Knowledge Discovery in Databases: 500-502.
- Baxter, H.C., Liu, W.G., Forster, J.L., Aitken, A. and Fraser, J.R. 2002. Immunolocalisation of 14-3-3 isoforms in normal and scrapie-infected murine brain. *Neuroscience* Vol. 109, No. 1, pp. 5-14

Bei, Y., Belmamoune, M. and Verbeek, F.J. 2006. Ontology and image semantics in multimodal imaging: submission and retrieval. Proc SPIE Internet Imaging VII 6061:C1–C12

Bellairs, R. and Osmond, M. 2005. Atlas of Chick Development. Second Edition. Elsevier Academic press.

Belmamoune, M. and Verbeek, F.J. 2006. Heterogeneous Information Systems: bridging the gap of time and space. Management and retrieval of spatio-temporal Gene Expression data. Proc. Int. Conf. Multidisciplinary Information Sciences and Technologies, InSCit2006 (in press).

Bennett, C.M., Kanki, J. P., Rhodes, J., Liu, T. X., Paw, B. H., Kieran, M. W., Langenau, D. M., Delahaye-Brown, A., Zon, L. I., Fleming, M. D. and Look, A. T. (2001). Myelopoiesis in the zebrafish, *Danio rerio* Blood 98: 643-651.

Besser, Y., Bagowski, C.P., Salas – Vidal, E., Hemert, M.J., Bussman, J. and Spaink, H.P. 2006. Expression analysis of the family of 14-3-3 proteins in zebrafish development. Gene expression patterns 7 (4):511-20.

Biesecker, L. G. 2002. Polydactyly: how many disorders and how many genes? Am. J. Med. Genet. 112: 279–283.

Bininda-Emonds, O.R.P, Jefferey, J.E. and Richardson, M.K. 2003. Is sequence heterochrony an important evolutionary mechanism in mammals? Journal of mammalian evolution 10 (4):335-361.

Blanco, M. J. and Alberch, P. 1992. Caenogenesis, developmental variability, and evolution in the carpus and tarsus of the marbled newt *Triturus marmoratus*. Evolution 46: 677–687.

Blanco, M. J., Misof, B. Y. and Wagner, G. P. 1998. Heterochronic differences of Hoxa-11 expression in *Xenopus* fore- and hind limb development: evidence for lower limb identity of the anuran ankle bones. Dev. Genes Evol. 208: 175–187.

Bordzilowskaya, N.P., Detlaff, T.A., Duhon, S.H. and Malacinski, G.M. 1989. Developmental-stage series of Axolotl embryos. In: Armstrong, J.B., and Malacinski, G.M. (eds). Developmental biology of the Axolotl. Oxford University Press, Oxford, pp. 201-219.

Boutet de Monvel, J., Le Calvez, S. and Ulfendahl, M. 2001. Image Restoration for Confocal Microscopy: Improving the Limits of Deconvolution, with Application to the Visualization of the Mammalian Hearing Organ. Biophys J 80 (5): 2455-2470.

- Bryson-Richardson, R.J., Berger, S., Schilling, T.F., Hall, T.E., Cole, N.J., Gibson, A.J., Sharpe, J., Currie, P.D. 2007. FishNet: an online database of zebrafish anatomy. *BMC Biol.* 2007 Aug 17;5(1):34
- Burke, A. C. and Alberch, P. 1985. The development and homology of the chelonian carpus. *J. Morphol.* 186: 119–131.
- Burke, A. C. and Feduccia, A. 1997. Developmental patterns and the identification of homologies in the avian hand. *Science* 278: 666–668.
- Burns, C. and Zon, L. 2006. Homing Sweet Homing: Odyssey of Hematopoietic Stem Cells. *Immunity* 25 (6):859-862
- Camon, E., Magrane, M., Barrell, D., Lee, V., Dimmer, E., Maslen, J., Binns, D., Harte, N., Lopez, R. and Apweiler, R. 2004. The Gene Ontology Annotation (GOA) Database: sharing knowledge in Uniprot with Gene Ontology. *Nucleic Acids Research*, Vol.32 Database issue DOI: 10.1093/nar.gkh021
- Carroll, R. L. 1987. *Vertebrate Paleontology and Evolution*. W.H. Freeman and Company, New York.
- Centonze, V.E. and White, J.G. 1998. Multiphoton Excitation Provides Optical Sections from Deeper within Scattering Specimens than Confocal Imaging. *Biophysical Journal* 75: 2015–2024
- Chamberlain, F. W. 1943. *Atlas of Avian Anatomy*. Michigan State College Agricultural Experiment Station, East Lansing, Michigan.
- Chatterjee, S. 2004. Counting the fingers of birds and dinosaurs. *Science* 280: 355a.
- Chaudhri, M., Scarabel, M. and Aitken, A. 2003. Mammalian and yeast 14-3-3 isoforms form distinct patterns of dimers in vivo. *Biochemical and Biophysical Research Communications* 300 679–685.
- Chen, X-D. and Turpen, J.B . (1995). Intraembryonic Origin of Hepatic Hematopoiesis in *Xenopus laevis*. *The journal of Immunology* 154: 2557-2567
- Chiang, C., Litingtung, Y., Harris, M.P., Simandl, B. K., Li, Y., Beachy, P.A. and Fallon, J.F. 2001. Manifestation of the limb prepatter: limb development in the absence of Sonic hedgehog function. *Dev. Biol.* 236: 421–435.
- Chimal-Monroy, J., Rodriguez-Leon, J., Montero, J.A., Ganán, Y., Macías, D., Merino, R. and Hurle, J.M. 2003 Analysis of the molecular cascade responsible for mesodermal limb chondrogenesis : sox genes and BMP signalling. *Developmental Biology* 257 Issue 2, pp 292-301

Christen, B. and Slack, J.M.W. 1997. FGF-8 is associated with anteroposterior patterning and limb regeneration in *Xenopus*. *Developmental Biology* 192: 455-466.

Christiansen, P. and Bonde, N. 2004. Body plumage in *Archaeopteryx*: a review, and new evidence from the Berlin specimen. *Comptes Rendus Palevol* 3: 99–118.

Clack, J. A. 2002. An early tetrapod from ‘Romer’s Gap.’ *Nature* 418: 72–76.

Clay, H. and Ramakrishnan, L. 2005. Multiplex Fluorescent In Situ hybridization in zebrafish embryos using tyramide signal amplification. *Zebrafish* 2(2):105-111

Coates, M. I. and Clack, J. A. 1990. Polydactyly in the earliest tetrapod limbs. *Nature* 347: 66–69.

Coates, M.I. and J. Cohn, M.J. 1998. Fins, limbs, and tails: outgrowths and axial patterning in vertebrate evolution. *BioEssays* 20:371-381

Cohn, M. J., Lovejoy, C. O., Wolpert, L. and Coates, M. I. 2002. Branching, segmentation and the metapterygial axis: pattern versus process in the vertebrate limb. *Bioessays* 24: 460–465.

Cole, N.J., Tanaka, M., Prescott, A. and Tickle, C. 2004. Expression of limb initiation genes and clues to the morphological diversification of threespine stickleback. *Current Biology* 13:24 R951-952

Corredor-Adámez, M., Welten, M.C.M., Spaink, H.P., Schoon, R.T., De Bakker, M.A.G., Bagowski, C.P., Meijer, A.H., Jeffery, J.E., Verbeek, F.J., and Richardson, M.K. 2005. Genomic annotation and transcriptome analysis of the *Danio rerio* hox complex with description of a novel member, *hoxb13a*. *Evol Dev.*7(5):362-75.

Crossman, A.R. and Neary, D. *Neuroanatomy: An Illustrated Colour Text*. Churchill Livingstone; 3rd edition (2005)

Crowhurst, M.O., Layton, J.E. and Lieschke, G.J. (2002) Developmental biology of zebrafish myeloid cells. *Int. J. Dev. Biol.* 46, 483-492.

Dahn, R. D. and Fallon, J. F. 2000. Interdigital regulation of digit identity and homeotic transformation by modulated BMP signalling. *Science* 289: 438–441.

Davidson, D., Bard, J., Brune, R, Burger, A., Dubreuil, C., Hill, W., Kaufman, M., Quinn, J., Stark, M. and Baldock, R. 1997. The mouse atlas and graphical gene-expression database. *Semin Cell Dev Biol.* 8(5):509-17.

De Jong, J.L.O. and Zon, L.I. 2005. Use of the zebrafish system to study primitive and definitive hematopoiesis. *Annual Review of Genetics* 39: 481-501.

- Denkers, N., García-Villalba, P., Rodesch, C.K., Nielson, K.R. and Mauch, T.J. 2004. FISHing for Chick Genes: Triple-Label Whole-Mount Fluorescence In Situ Hybridization Detects Simultaneous and Overlapping Gene Expression in Avian Embryos. *Developmental Dynamics* 229:651–657.
- Dougherty, M.K. and Morrison D.K. 2004. Unlocking the code of 14-3-3. *Journal of cell science* 117 (10):1875-1884
- Driever, W., Solnica-Krezel, L., Schier, A.F., Neuhauss, S.C., Malicki, J., Stemple, D.L., Stainier, D.Y., Zwartkruis, F., Abdelilah, S., Rangini, Z., Belak, J. and Boggs, C. 1996. A genetic screen for mutations affecting embryogenesis in zebrafish. *Development*. 123: 37-46
- Dudley, A. T., Ros, M. A. and Tabin, C. J. 2002. A re-examination of proximodistal patterning during vertebrate limb development. *Nature* 418: 539–544.
- Duprez, D. 2002. Signals regulating muscle formation in the limb during embryonic development. *Int.J.Dev. Biol.* 46: 915-925
- Effthimios M., Skoulakis, C. and Davis, R.L. 1996. Olfactory Learning Deficits in Mutants for leonardo, a Drosophila Gene Encoding a 14-3-3 Protein. *Neuron* Vol. 17, 931–944.
- Feduccia, A. 1999. 1,2,3,5,2,3,4: accommodating the cladogram. *Proc. Natl. Acad. Sci. USA* 96: 4740–4742.
- Feduccia, A. and Nowicki, J. 2002. The hand of birds revealed by early ostrich embryos. *Naturwissenschaften* 89: 391–393.
- Forster, C. A., Sampson, S. D., Chiappe, L. M. and Krause, D. W. 1998. The theropod ancestry of birds: new evidence from the late cretaceous of Madagascar. *Science* 279: 1915–1919.
- Forster, S.A. and Baker, J.A. 2004. Evolution in parallel: new insights from a classic system. *Trends in Ecology and Evolution* 19 (9):456-459.
- Fountoulakis, M., Cairns, N. and Lubec, G. 1999. Increased levels of 14-3-3 gamma and epsilon proteins in brain of patients with Alzheimer's disease and Down syndrome. *J Neural. Transm. Suppl.* 57: 323-35
- Galis, F., Kundrát, M. and Sinervo, B. 2003. An old controversy solved: bird embryos have five fingers. *Trends Ecol. Evol.* 18: 7–9.
- Garner, J. P. and Thomas, A. L. R. 2004. Counting the fingers of birds and dinosaurs. *Science* 280: 355a.

Gauthier, J. A. 1986. Saurischian monophyly and the origin of birds. *Mem. Calif. Acad. Sci.* 8: 1–55.

Gegenbaur, C. 1864. *Untersuchungen zur vergleichenden Anatomie der Wirbelthiere: Erstes heft. Carpus und Tarsus.* Engelmann, Leipzig.

Gerth, V.E. and Vize, P.D. 2004. A Java tool for dynamic web-based visualization of anatomy and overlapping gene or protein expression patterns. *Bioinformatics* 21(7):1278-9.

Gerth, V.E., Katsuyama, K., Snyder, K.A., Bowes, J.B., Kitamyama, A., Ueno, N. and Vize, P.D. 2007. Projecting 2D gene expression data into 3D and 4D space. *Developmental Dynamics* 236:1036-1043.

Goff, D.J. and Tabin, C.J. 1997. Analysis of Hoxd-13 and Hoxd-11 misexpression in chick limb buds reveals that Hox genes affect both bone condensation and growth. *Development* 124, 627-636

Godin, I. and Cumano, A. 2005. Of birds and mice; hematopoietic stem cell development. *Int. J. Dev. Biol.* 49: 251-257

Goodwin, B. C. and Trainor, L. E. H. 1983. The ontogeny and phylogeny of the pentadactyl limb. In B. C. Goodwin, N. Holder, and C. C. Wylie (eds.). *Development and Evolution.* Cambridge University Press, Cambridge, UK, pp. 75–98.

Graham A, Begbie J. 2000. Neurogenic placodes: a common front. *Trends Neurosci.* 2000 Jul;23(7):313-6. Review.

Grandel, H. and Schulte-Merker, S. 1998. The development of the paired fins in the Zebrafish (*Danio rerio*). *Mechanisms of Development* 79 99-120

Grunwald, D.J. and Eisen, J.S. Headwaters of the zebrafish -- emergence of a new model vertebrate. *Nat Rev Genet.* 2002 Sep;3(9):717-24.

Haffter, P. and Nusslein-Volhard C. 1996. Large scale genetics in a small vertebrate, the zebrafish. *Int J Dev Biol.* 40(1):221-7.

Hamburger, V. and Hamilton, H. L. 1951. A series of normal stages in the development of the chick embryo. *J. Morphol.* 88: 49–92.

Hanken, J. 1993. Model Systems versus Outgroups Alternative Approaches to the Study of Head Development and Evolution. *Am. Zool.* 33(4), 448-456.

- Harfe, B. D., Scherz, P. J., Nissim, S., Tian, H., McMahon, A. P. and Tabin, C. J. 2004. Evidence for an expansion-based temporal Shh gradient in specifying vertebrate digit identities. *Cell* 118: 517–528.
- Hartmann, C. and Tabin, C. J. 2001. Wnt-14 plays a pivotal role in inducing synovial joint formation in the developing appendicular skeleton. *Cell* 104: 341–351.
- Hasumi, M. and Iwasawa, H. 1993. Geographic variation in the pes of the salamander *Hynobius lichenatus*: a comparison with tetradactyl *Hynobius hidamontanus* and pentadactyl *Hynobius nigrescens*. *Zool. Sci.* 10: 1027.
- He, M., Zhang, J., Shao, L., Huang, Q., Chen, J., Chen, H., Chen, X., Liu, D. and Luo, Z. Upregulation of 14-3-3 isoforms in acute rat myocardial injuries induced by burn and lipopolysaccharide. *Clinical and Experimental Pharmacology and Physiology* (2006) 33, 374–380
- Healy, C., Uwanogho, D. and Sharpe, P. T. 1999. Regulation and role of Sox9 in cartilage formation. *Dev. Dyn.* 215: 69–78.
- Hecht, M. K. 1985. The biological significance of Archaeopteryx. In M. K. Hecht, J. H. Ostrom, G. Viohl, and P. Wellnhofer (eds.). *The Beginnings of Birds: Proceedings of the International Archaeopteryx Conference, Eichstätt. Freunde des Jura-Museums Eichstätt, Willibaldsburg, Eichstätt*, pp. 149–160.
- Hecht, M. K. and Tarsitano, S. 1982. The paleobiology and phylogenetic position of *Archaeopteryx*. *Gebios Mem. Spec.* 6: 141–149.
- Herbomel, P., Thisse, B. and Thisse, C. 1999. Ontogeny and behaviour of early macrophages in the zebrafish embryo. *Development* 126: 3735- 3745.
- Herbomel, P., Thisse, B. and Thisse, C. 1999. Zebrafish early macrophages colonize cephalic mesenchyme and developing brain, retina, and epidermis through an M-CSF receptor- dependent invasive process. *Development* 238: 274-288.
- Hinchliffe, J. R. 1977. The chondrogenic pattern in chick limb morphogenesis: a problem of development and evolution. In D. A. Ede, J. R. Hinchliffe, and M. Balls (eds.). *Vertebrate Limb and Somite Morphogenesis. Cambridge University Press, Cambridge, UK*, pp. 293–309.
- Hinchliffe, J. R. 1985. ‘One, two, three’ or ‘two, three, four’: an embryologist’s view of the homologies of the digits and carpus of modern birds. In M. K. Hecht, J. H. Ostrom, G. Viohl, and P. Wellnhofer (eds.). *The Beginnings of Birds: Proceedings of the International Archaeopteryx Conference, Eichstätt. Freunde des Jura-Museums Eichstätt, Willibaldsburg, Eichstätt*, pp. 141–147.

- Hinchliffe, J. R. and Hecht, M. K. 1984. Homology of the bird wing skeleton: embryological versus paleontological evidence. *Evol. Biol.* 18: 21–39.
- Hinchliffe, J.R. 2002. Developmental basis of limb evolution. *Int. J. Dev. Biol.* 46: 835–845.
- Holmgren, N. 1933. On the origin of the origin of the tetrapod limb. *Acta Zool.* 14: 185–295.
- Holmgren, N. 1952. An embryological analysis of the mammalian carpus and its bearing upon the question of the origin of the tetrapod limb. *Acta Zoologica* 33: 1–115.
- Holzschuh J, Wada N, Wada C, Schaffer A, Javidan Y, Tallafuß A, Bally-Cuif L, Schilling TF. 2005. Requirements for endoderm and BMP signalling in sensory neurogenesis in zebrafish. *Development* 132:3731-3742
- Horie, M., Suzuki, M., Takahashi, E. and Tanigami, A. 1999. Cloning, expression, and chromosomal mapping of the human 14-3-3 γ gene (YWHAG) to 7q11.23. *Genomics* 60: 241-243.
- Isogai, S., Horiguchi, M. and Weinstein, B. M. The vascular anatomy of the developing zebrafish: an atlas of embryonic and early larval development. *Developmental Biology*, Volume 230, pp. 278-301.
- Ivanov, D., Dvorianchikova, G., Nathanson, L., McKinnon, S.J., and Shestopalov, V.I. 2006. Microarray analysis of gene expression in adult retinal ganglion cells. *FEBS Letters* 580: 331–335
- Jeffery, J.E., Bininda-Emonds, O.R.P., Coates, M.I. and Richardson, M.K. 2002. Analyzing evolutionary patterns in amniote embryonic development. *Evolution & Development* 4:4. 292-302 .
- Jeffery, J.E. Richardson, M.K., Coates, M.I. and Bininda-Emonds, O.R.P.. 2002. Analyzing Developmental Sequences Within a Phylogenetic Framework. *Systematic Biology* 51 (3): 478-491.
- Jeffery, J.E., Bininda-Emonds, O.R.P., Coates, M.I. and Richardson, M.K.2005. A new technique for identifying sequence heterochrony. *Syst. Biol.* (2):230-240.
- Ji, Q., Currie, P. J., Norell, M. A. and Ji, S. A. 1998. Two feathered dinosaurs from north eastern China. *Nature* 393: 753–761.
- Ji, Q., Norell, M. A., Gao, K. Q., Ji, S. A. and Ren, D. 2001. The distribution of integumentary structures in a feathered dinosaur. *Nature* 410: 1084–1088.

- Jones, S.L., Wang, J., Turck, W. et al. (1998) A role for the actin-bundling protein L-plastin in the regulation of leukocyte integrin function. *Proc. Natl. Acad. Sci. USA* 95, 9331-9336.
- Jowett, T. 2001. Double *in situ* hybridization techniques in zebrafish. *Methods* 23:345-358
- Karsenty, G. and Wagner, E.F. 2002. Reaching a genetic and molecular understanding of skeletal development. *Developmental Cell*, Vol 2, 389-406
- Kawamoto, Y., MD; Akiguchi, I., MD; Tomimoto, H., MD; Shirakashi, Y., MD; Honjo, Y., MD; and Budka, H., MD. 2006. Upregulated Expression of 14-3-3 Proteins in Astrocytes From Human Cerebrovascular Ischemic Lesions. *Stroke* 37:830-835
- Kearny, J.B., Wheeler, S.R., Estes, P., Parente, B. and Crews, S.T. 2004. Gene expression profiling of the developing *Drosophila* CNS midline cells. *Dev Biol* 275:473-492.
- Kerwin, J., Scott, M., Sharpe, J., Puelles, L., Robson, S.C., Martinez-de-la-Torre, M., Ferran, J.L., Feng, G., Baldock, R., Strachan, T., Davidson, D., Lindsay, S. 2004. 3 dimensional modelling of early human brain development using optical projection tomography. *BMC Neurosci.* 2004 Aug 6;5:27.
- Khan, P., Linkhart, B. and Simon, H.G. 2002. Different regulation of T-box genes Tbx4 and Tbx5 during limb development and limb regeneration. *Developmental Biology* 250
- Kimbrell, D.A. and Beutler, B. 2001. The evolution and genetics of innate immunity. *Nature Genetics* 2, 256-267
- Kimmel, C.B., Ballard, W.W., Kimmel, S.R., Ullman, B. and Schilling, T.F. 1995. Stages of embryonic development of the zebrafish. *Dev Dyn* 203:253-310.
- Koskinen, H., Krasnov, A., Rexroad, C., Gorodilov, Y., Afanasyev, S. and Molsa, H. 2004. The 14-3-3 proteins in the teleost fish rainbow trout (*Oncorhynchus mykiss*). *J Exp Biol.* 207(Pt 19):3361-8.
- Kousteni, S., Tura, F., Sweeney, G.E. and Ramji, D.P. 1997. Sequence and expression analysis of a *Xenopus laevis* cDNA which encodes an homologue of mammalian 14-3-3 zeta protein. *Gene* 190 279-285
- Kundrát, M., Seichert, V., Russell, A.P. and Smetana, K jr. 2002 Pentadactyl pattern of the avian wing autopodium and pyramid reduction hypothesis. *Journal of Experimental zoology (mol. Dev. Evol.)* 294: 152-159

Langford, K.J., Askham, J.M., Lee, T., Adams, M. and Morrison, E.E. 2006. Examination of actin and microtubule dependent APC localisations in living mammalian cells. *BMC Cell Biol.* 7:3.

Larsson, H.C.E. and Wagner, G.P., 2002 Pentadactyl Ground State of the Avian Wing. *Journal of Experimental zoology (mol. Dev. Evol.)* 294: 146-151

Lau, J.M.C., Wu, Ch. and Muslin, A. 2006. Differential role of 14-3-3 family members in *Xenopus* development. *Developmental Dynamics* 235:1761-1776.

Lau, N.C. Lim, L.P. Weinstein, E.G. and Bartel, D.P. 2001. An abundant class of tiny RNAs with probable regulatory roles in *Caenorhabditis elegans*. *Science* 294:858-862

Lieschke, G.J., Oates, A.C., Crowhurst, M.O., Ward, A.C. and Layton, J.E. 2001. Morphologic and functional characterization of granulocytes and macrophages in embryonic and adult zebrafish. *Blood*;98(10):3087-3096.

Linney, E., Dobbs-McAuliffe, B., Sajadi, H. and Malek, R.L. 2004. Microarray gene expression profiling during the segmentation phase of zebrafish development. *Comp Biochem Physiol C Toxicol Pharmacol.* 138(3):351-62

Lipshutz, R.J., Morris, D., Chee, M., Hubbell, E., Kozal, M.J., Shah, N., Shen, N., Yang, R. and Fodor, S.P. 1995. Using oligonucleotide probe arrays to access genetic diversity. *Biotechniques.* 19(3):442-7. Review.

Liu, F. and Wen, Z. 2002. Cloning and expression pattern of the lysozyme C gene in zebrafish. *Mechanisms of Development* 113: 69-72.

Lu, G., de Vetten, N.C., Sehnke, P.C., Isobe, T., Ichimura, T., Fu, H., van Heusden, G.P. and Ferl, R.J. 1994. A single *Arabidopsis* GF14 isoform possesses biochemical characteristics of diverse 14-3-3 homologues. *Plant Mol Biol.* 25(4):659-67.

Lun, K. and Brand, M. 1998. A series of no isthmus (noi) alleles of the zebrafish pax2.1 gene reveals multiple signalling events in development of the midbrain-hindbrain boundary. *Development* 125:3049-3062

Mabee, P. 2000. *Developmental Data and Phylogenetic Systematics: Evolution of the Vertebrate Limb.* AMER. ZOOL., 40:789-800

Manders, E.M.M., Verbeek, F.J. and Aten, J.A. 1993. Measurement of co-localisation of objects in dual colour confocal images. *J. Microscopy* ;1 69:375-382.

McKenzie, J.C. and Klein, R.M. 2000. *Basic concepts in Cell Biology and Histology.* McGraw-Hill companies inc. New York.

Meijer, A.H., Van der Sar, A.M., Cunha, C., Lamers, G.E.M., Laplante, M.A.,

- Kikuta, H., Bitter, W., Becker, T.S. and Spaink, H.P. 2007. Identification and real-time imaging of a myc-expressing neutrophil population involved in inflammation and mycobacterial . granuloma formation in zebrafish. *Dev Comp Immunol*. 2007 May 22
- Mercier, P., Simeone, A., Cotelli, F. and Boncinelli, E. Expression pattern of two otx genes suggest a role in specifying anterior body structures in zebrafish. *Int J Dev Biol* 1995;39:559-573.
- Merino, R., Ganan, Y., Macias, D., Economides, A. N., Sampath, K. T. and Hurler, J. M. 1998. Morphogenesis of digits in the avian limb is controlled by FGFs, TGF betas, and noggin through BMP signaling. *Dev. Biol.* 200: 35–45.
- Metscher, B.D. and Ahlberg, P.E. 1999. Zebrafish in context: uses of a laboratory model in comparative studies. *Developmental Biology* 210, 1-14
- Meuleman, W., Welten, M.C.M. and Verbeek, F.J. 2006. Construction of correlation networks with explicit time-slices using time-lagged, variable interval standard and partial correlation coefficients. *Lecture Notes in Computer Science, Volume 4216, Computational Life Sciences II*, pp 236-246.
- Miyamura, Y. and Nakayasu, H. 2001. Zonal distribution of Purkinje cells in the zebrafish cerebellum: analysis by means of specific monoclonal antibody. *Cell Tissue Res* 305:299-305.
- Moinar, R. E. 1985. Alternatives to Archaeopteryx: a survey of proposed early or ancestral birds. In M. K. Hecht, J. H. Ostrom, G. Viohl, and P. Wellnhofer (eds.). *The Beginnings of Birds: Proceedings of the International Archaeopteryx Conference*, Eichstätt. Freunde des Jura-Museums Eichstätt, Willibaldsburg, Eichstätt, pp. 209–217.
- Montagna, W. 1945. A re-investigation of the development of the wing of the fowl. *J. Morphol.* 76: 87–113.
- Morgan, B. A., Izpisua-Belmonte, J. C., Duboule, D. and Tabin, C. J. 1992. Targeted misexpression of Hox-4.6 in the avian limb bud causes apparent homeotic transformations. *Nature* 358: 236–239.
- Mueller, T. and Wulliman, M.F. 2005. *Atlas of early zebrafish brain development*. First edition 2005. Amsterdam, The Netherlands: Elsevier B.V. 183 p.
- Murayama, E., Kissa, K., Zapata, A., Mordelet, E., Briolat, V., Lin, H-F., Handin, R.I. and Herbomel Ph. 2006. Tracing Hematopoietic Precursor Migration to Successive Hematopoietic Organs during Zebrafish Development. *Immunity* 25, 963–975.

- Murray, B. M. and Wilson, D. J. 1994. A scanning electron microscopic study of the normal development of the chick wing from stages 19 to 36. *Anat. Embryol.* 189: 147–155.
- Nelson, C.E., Morgan, B.A., Burke, A.C., Laufer, E., DiMambro, E., Murtaugh, L.C., Gonzales, E., Tessarollo, L., Parada, L.F. and Tabin, C. 1996. Analysis of Hox gene expression in the chick limb bud. *Development* 122(5):1449-66
- Nieuwkoop, P.D. and Faber, J. 1967. Normal table of *Xenopus laevis*. Daudin, North Holland, Amsterdam.
- Nikaido, M., Tada, M. and Ueno, N. 1999. Restricted expression of the receptor serine /threonine kinase BMPR1b in Zebrafish. *Mechanisms of Development* 82 (1-2): 219-222
- Nye, H.L.D., Cameron, J. A., Chernoff, E.A.G. and Stocum, D.L 2003. Extending the table of stages of normal development of the axolotl: limb development. *Developmental Dynamics* 226:555-560.
- Norman J.R. and Greenwood P.H., *A history of Fishes*. Third Edition, 1975. Ernest Benn Ltd, London.
- Old, J.M. and Deane, E.M. 2003. The lymphoid and immunohaematopoietic tissues of the embryonic brushtail possum (*Trichosurus vulpecula*). *Anat Embryol* 206:193-97
- Osborn, H. F. 1916. Skeletal adaptations of *Ornitholestes*, *Struthiomimus*, *Tyrannosaurus*. *Bull. Am. Mus. Nat. Hist.* 35: 733–771.
- Ostrom, J. H. 1969. Osteology of *Deinonychus antirrhopus*, an unusual theropod from the Lower Cretaceous of Montana. *Bull. Peabody Mus.* 30: 1–165.
- Ostrom, J. H. 1976. *Archaeopteryx* and the origin of birds. *Biol. J. Linn. Soc.* 8: 91–182.
- Paddock, S.W. An introduction to confocal imaging. In *Confocal Microscopy: Methods and Protocols*. Paddock SW (ed), pp 1-34, Humana Press, Totowa, NJ, 1999.
- Padian, K., Hutchinson, J. R. and Holtz, T. R. 1999. Phylogenetic definitions and nomenclature of the major taxonomic categories of the carnivorous Dinosauria (Theropoda). *J. Vertebr. Paleontol.* 19: 69–80.
- Paton, R. L., Smithson, T. R. and Clack, J. A. 1999. An amniote-like skeleton from the Early Carboniferous of Scotland. *Nature* 398: 508–513.
- Phelps, H.A. and Neely, M. N. 2005. Review paper: Evolution of the Zebrafish Model: From development to Immunity and Infectious Disease. *Zebrafish* 2: 87- 103.

- Pizette, S. and Niswander, L. 2000. BMPs are required at two steps of limb chondrogenesis: formation of prechondrogenic condensations and their differentiation into chondrocytes. *Developmental Biology* volume 219, Issue 2, 15 March 2000, pp 237-249
- Pozdeyev, N., Taylor, C., Haque, R., Chaurasia, S.C., Visser, A., Thazyeen, A., Du, Y., Fu, H., Weller, J., Klein, D.C. and Iuvone, P.M. 2006. Photic Regulation of Arylalkylamine N-Acetyltransferase Binding to 14-3-3 Proteins in Retinal Photoreceptor Cells. *The Journal of Neuroscience* 26(36): 9153–9161
- Renshaw, S.A., Loynes, C.A., Trushell, D.M.I., Elworthy, S., Ingham, P.W. and Whyte, M.K.B. 2006. A transgenic zebrafish model of neutrophilic inflammation. *Blood* 108:3976-3979.
- Richardson, M.K. 1995. Heterochrony and the phylotypic period. *Developmental Biology* 172: 412-421
- Richardson, M.K. and Oelschlager, H.A. 2002. Time, pattern, and heterochrony: a study of hyperphalangy in the dolphin embryo flipper. *Evolution & Development* 4:6 435–444
- Richardson, M. K., Jeffery, J. E. and Tabin, C. J. 2004. Proximodistal patterning of the limb: insights from evolutionary morphology. *Evol. Dev.* 6: 1–5.
- Robb, L. 1997. Hematopoiesis: origin pinned down at last? *Curr. Biol.* 7 (1): R10-2.
- Rombout, J.H.W.M., Huttenhuis, H.B.T., Picchiatti, S. and Scapigliati, G. 2005. Phylogeny and ontogeny of Fish leucocytes. *Fish & Shellfish Immunology* 19 441e455
- Romer, A. S. 1956. *Osteology of the Reptiles*. University of Chicago Press, Chicago.
- Rosner, M. and Hengstschlager, M. 2006. 14-3-3 proteins are involved in the regulation of mammalian cell proliferation. *Amino Acids* 30(1):105-9.
- Ruvkun, G. 2001. Glimpses of a tiny RNA world. *Science* 294: 797-799
- Santa Luca, A. P. 1980. The postcranial skeleton of *Heterodontosaurus tucki* (Reptilia, Ornithischia) from the Stormberg of South Africa. *Ann. S. Afr. Mus.* 7: 159–211.
- Sanz-Ezquerro, J. J. and Tickle, C. 2003. Digital development and morphogenesis. *J. Anat.* 202: 51–58.
- Schena M. 1996. Genome analysis with gene expression microarrays. *Bioessays*. 1996 May;18(5):427-31.
- Schestakowa, G. S. 1927. Die Entwicklung des Vlogelflügels. *Bull. Soc. Nat. Moscou. (Biol.)* 36: 163–210.

Schindler, C.K., Heveri, M. and Henshall, D.C. 2006. Isoform- and subcellular fraction-specific differences in hippocampal 14-3-3 levels following experimentally evoked seizures and in human temporal lobe epilepsy. *Journal of Neurochemistry* 99, 561–569

Schlosser, G. 2001. Using heterochrony plots to detect the dissociated coevolution of characters. *Journal of experimental zoology (mol dev evol)* 291:282-304.

Schulmeister, S. and Wheeler, W.C. 2004. Comparative and phylogenetic analysis of developmental sequences. *Evolution and development* 6:1, 50-57

Sereno, P. C. 1993. The pectoral girdle and forelimb of the basal theropod *Herrerasaurus ischigualastensis*. *J. Vertebr. Paleontol.* 13: 425–450.

Sereno, P. C. 1999. The evolution of dinosaurs. *Science* 284: 2137–2147.

Shapiro, M.D. 2002. Developmental Morphology of Limb Reduction in *Hemiergis* (Squamata: Scincidae): Chondrogenesis, Osteogenesis, and Heterochrony. *Journal of Morphology* 254:211–231

Shapiro, M.D., Hanken, J. and Rosentahl, N. 2003. Developmental Basis of evolutionary digit loss in the Australian lizard *Hemiergis*. *Journal of Experimental Zoology.* 297B,1:48-56

Shapiro, M.D., Marks, E.M., Peichel, C.L., Blackman, B.K., Nereng, K.S., Jonsson, B., Schluter, D. and Kingsley, D.M. 2004. Genetic and developmental basis of evolutionary pelvic reduction in threespine sticklebacks. *Nature* 428(6984):717-23. Erratum in: *Nature*. 2006 Feb 23;439(7079):1014.

Sharpe, J., Ahlgren, U., Perry, P., Hill, W., Ross, A., Hecksher-Sorensen, J., Baldock, R. and Davidson, D. 2002. *Science* 296(5567):541-5.

Sharpe, J. 2003. Optical projection tomography as a new tool for studying embryo anatomy. *J Anat.* Feb;202(2):175-81.

Shiga, Y., Wakabayashi, H., Miyazawa, K., Kido, H. and Itoyama, Y. 2006. 14-3-3 protein levels and isoform patterns in the cerebrospinal fluid of Creutzfeldt-Jakob disease patients in the progressive and terminal stages. *J Clin Neurosci.* 13(6):661-5.

Shubin, N. H. and Alberch, P. 1986. A morphogenetic approach to the origin and basic organisation of the tetrapod limb. In M. K. Hecht, B. Wallace, and G. I. Prance (eds.). *Evolutionary Biology*. Plenum Press, New York, pp. 319–387.

Shubin, N.H., Daeschler, E.B. and Jenkins, F.A. Jr. 2006. The pectoral fin of *Tiktaalik roseae* and the origin of the tetrapod limb. *Nature* Apr 6;440(7085):764-71.

- Smith, K.K. 2002. Sequence heterochrony and the evolution of development. *Journal of morphology* 252:82-97.
- Smith, K.K. 2003. Time's arrow: heterochrony and the evolution of development. *Int. J. Dev. Biol.* 47:613-621
- Smith, S.J., Kotecha, S., Towers, N., Latinkic, B.V. and Mohun T.J. 2002. XPOX2-peroxidase expression and the XLURP-1 promoter reveal the site of embryonic myeloid cell development in *Xenopus*. *Mechanisms of Development* 117 173–186
- Stern, H.M. and Zon L.I. 2003. Cancer genetics and drug discovery in the zebrafish. *Nat Rev Cancer* 3(7):533-539.
- Streisinger, G., Walker, C., Dower, N., Knauber, D. and Singer, F. 1981. Production of clones of homozygous diploid zebra fish (*Brachydanio rerio*). *Nature* 28;291 (5813): 293-6.
- Swanson, K.D. and Ganguly, R. 1992. Characterization of a *Drosophila melanogaster* gene similar to the mammalian genes encoding the tyrosine/tryptophan hydroxylase activator and protein kinase C inhibitor proteins. *Gene*. Apr 15;113(2):183-90.
- Tarsitano, S. and Hecht, M. K. 1980. A reconsideration of the reptilian relationships of *Archaeopteryx*. *Zool. J. Linn. Soc.* 69: 149–182.
- Tavella, S., Biticchi, R., Schito, A., Minina, E., Di Martino, D., Pagano, A., Vortkamp, A., Horton, W.A., Cancedda, R. and Garofalo, S. 2004. Targeted Expression of SHH Affects Chondrocyte Differentiation, Growth Plate Organization, and Sox9 Expression. *Journal of bone and mineral research* 19 (10):1678-1688
- The Gene Ontology Consortium. 2000. Gene Ontology: tool for the unification of biology. *Nat. Genet.* 25, 25-29
- Theiler, K. 1972. In *The House Mouse: Development and normal stages from fertilization to 4 weeks of age*. Springer-Verlag, New York.
- Thisse, C., Thisse, B., Schilling, T.F. and Postlethwait, J.H. 1993. Structure of the zebrafish *snail1* gene and its expression in wild-type, *spadetail* and *no tail* mutant embryos. *Development* 119:1203–1215.
- Thisse, B., Heyer, V., Lux, A., Alunni, V., Degraeve, A., Seiliez, I. et al. 2004. Spatial and temporal expression of the zebrafish genome by large scale *in situ* hybridization screening. *Methods Cell Biol*;77:505–519.
- Thulborn, R. A. and Hamley, T. L. 1982. The reptilian relationships of *Archaeopteryx*. *Aust. J. Zool.* 30: 611–634.

Tickle, C. 2002. Molecular basis of vertebrate limb patterning. *Am J Med Genet.* 112(3):250-5.

Tiecke, E., Turner, R., Sanz-Ezquerro, J.J., Warner, A. and Tickle, C. 2007. Manipulations of PKA in chick limb development reveal roles in digit patterning including a positive role in Sonic Hedgehog signaling. *Developmental Biology* 305: 312–324

Umahara, T., Uchihara, T., Tsuchiya, K., Nakamura, A., Iwamoto, T., Ikeda, K. and Takasaki, M. 2004. 14-3-3 proteins and zeta isoform containing neurofibrillary tangles in patients with Alzheimer's disease. *Acta Neuropathol.* 108: 279-286

Van Everbroeck, B.R.J., Boons, J. and Cras, P. 2005. 14-3-3 γ -isoform detection distinguishes sporadic Creutzfeldt–Jakob disease from other dementias. *J Neurol Neurosurg Psychiatry* 76:100–102

Vargas, A.O. and Fallon, J.F. 2004. Birds Have Dinosaur Wings: The Molecular Evidence. *Journal of Experimental Zoology (Mol Dev Evol)* 000:1–5 (2004)

Verbeek F.J., Lawson, K.A. and Bard, J.B. Developmental bioinformatics: linking genetic data to virtual embryos. *Int J Dev Biol* 1999;43:761–771.

Verbeek, F.J., Den Broeder, M.J., Boon, P.J., Buitendijk, B., Doerry, E., Van Raaij, E.J. and Zivkovic, D. 2000. A standard atlas of zebrafish embryonic development for projection of experimental data. *Proc SPIE, Internet Imaging I* 3964:242-252

Verbeek, F.J. 2000. Theory & Practice of 3D-reconstructions from serial sections. In *Image Processing, A Practical Approach*. R.A. Baldock and J. Graham, eds. (Oxford: Oxford University Press), pp. 153-195

Verbeek, F.J., Boon, P.J., Sloetjes, H., Van der Velde, R. and Vos, N. 2002. Visualization of complex data sets over Internet: 2D and 3D visualisation of the 3D digital atlas of zebrafish development. *Proc SPIE Internet Imaging III* 4672:20–29.

Verbeek, F.J., Rodrigues, D.D., Spaink, H.P. and Siebes, A.J.P.M. 2004. Data submission of 3D image sets to a bio-molecular database using active shape models and a 3D reference model for projection. *Proc SPIE Internet Imaging V* 5304:13–23.

Wagner, G.P. 2005. The developmental evolution of avian digit homology: An update *Theory in Biosciences* 124 (2005) 165–183

Wagner, G. P., and Gauthier, J. A. 1999. 1,2,3,5,2,3,4: a solution to the problem of the homology of the digits in the avian hand. *Proc. Natl. Acad. Sci. USA* 96: 5111–5116.

- Walker, A. 1985. The braincase of Archaeopteryx. In M. K. Hecht, J. H. Ostrom, G. Viohl, and P. Wellnhofer (eds.). *The Beginnings of Birds: Proceedings of the International Archaeopteryx Conference*, Eichstätt. Freunde des Jura-Museums Eichstätt, Willibaldsburg, Eichstätt, pp. 123–134.
- Wang, W. and Shakes, D.C. 1996. Molecular evolution of the 14-3-3 protein family. *J Mol Evol.* 43(4) 384-98.
- Watanabe, M., Isobe, T., Ichimura, T., Kuwano, R., Takahashi, Y., Kondo, H. and Inoue, Y. 1994. Molecular cloning of rat cDNAs for the α and β subtypes of 14-3-3 protein and differential distributions of their mRNAs in the brain. *Molecular Brain Research* 25 113-121
- Watanabe, M., Isobe, T., Ichimura, T., Kuwano, R., Takahashi, Y. and Kondo, H. 1993. Developmental regulation of neuronal expression for the β subtype of the 14-3-3 protein, a putative regulatory protein for protein kinase C. *Developmental Brain Research*, 73 225-235
- Watanabe, M., Isobe, T., Ichimura, T., Kuwano, R., Takahashi, Y. and Kondo, H. 1993. Molecular cloning of rat cDNAs for α and β subtypes of 14-3-3 protein and developmental changes in expression of their mRNAs in the nervous system. *Molecular Brain Research*, 17 135-146
- Weinberg, E.S., Allende, M.L., Kelly, C.S., Abdelhamid, A., Murakami, T., Andermann, P. et al. 1996. Developmental regulation of zebrafish *MyoD* in wild type, *no tail* and *spadetail* embryos. *Development* 122:271-280
- Wellnhofer, P. 1985. Remarks of the digit and pubis problems of *Archaeopteryx*. In M. K. Hecht, J. H. Ostrom, G. Viohl, and P. Wellnhofer (eds.). *The Beginnings of Birds: Proceedings of the International Archaeopteryx Conference*, Eichstätt. Freunde des Jura-Museums Eichstätt, Willibaldsburg, Eichstätt, pp. 113–122.
- Wilker, E. and Yaffe, M.B. 2004. 14-3-3 Proteins – a focus on cancer and human disease. *J. Mol Cell Cardiol.* 37 (3):633-42
- Wilkinson, D.G. 1998. *In situ* hybridization, a practical approach. Oxford university press, Oxford, England
- Willett, C.E., Cortes, A., Zuasti, A. and Zapata, A.G. 1999. Early hematopoiesis and developing lymphoid organs in the zebrafish. *Developmental dynamics* 214: 323- 336.
- Wolpert, L. and Hornbruch, A. 1990. Double anterior chick limb buds and models for cartilage rudiment specification. *Development* 109: 961–966.
- Wilson AL, Shen Y-C, Babb-Clendenon SG, Rostedt J, Liu B, Barald KF, Marrs JA, Liu Q. 2007. Cadherin-4 plays a role in the development of zebrafish cranial ganglia and lateral line system. *Developmental Dynamics* 236:893-902

Wolpert, L., Beddington, R., Jessell, T.M., Lawrence, P., Meyerowitz, E.M. and Smith, J. Principles of Development, 2nd Ed., 2002

Woo, K. and Fraser, S.E. 1998. Specification of the Hindbrain fate in the zebrafish. *Dev Biol* 197:283-296

Wu, C. and Muslin, A.J. 2002. Role of 14-3-3 proteins in early *Xenopus* development. *Mech Dev.* 119(1):45-54.

Yan, Y.L., Willoughby, J., Liu, D., Gage Crump, J., Wilson, C., Miller, C.T., Singer, A., Kimmel, C., Westerfield, M. and Postlethwait, J.H. 2004. A pair of Sox: distinct and overlapping functions of zebrafish *sox9* co-orthologs in craniofacial and pectoral fin development. *Development* 132: 1069-1083

Yang, Y., Drossopoulou, G., Chuang, P.T., Duprez, D., Marti, E., Bumcrot, D., Vargesson, N., Clarke, J., Niswander, L., McMahon, A. and Tickle C. 1997. Relationship between dose, distance and time in Sonic-Hedgehog-mediated regulation of anteroposterior polarity in the chick limb. *Development* 124: 4393–4404.

Yasuda, M. 2002. The Anatomical Atlas of Gallus (English Edition). University of Tokyo Press, Tokyo.

Zaidi, A.U., Enomoto, H., Milbrandt, J. and Roth, K.A. 2000. Dual fluorescent *in situ* hybridization and immunohistochemical detection with tyramide signal amplification. *J Histochem Cytochem.* 48(10):1369-75

Zakany, J., Gerard, M., Favier, B. and Duboule, D. 1997. Deletion of a HoxD enhancer induces transcriptional heterochrony leading to transposition of the sacrum. *EMBO J.* Jul 16; 16(14):4393-402.

Zakany, J., Fromental-Ramain, C., Warot, X. and Duboule, D. 1997. Regulation of digit number and size of digits by posterior Hox genes: a dose-dependent mechanism with potential evolutionary implications. *Proc. Natl. Acad. Sci. USA* 94: 13695–13700.

Zakany, J., Kmita, M. and Duboule, D. 2004. A dual role for Hox genes in limb anterior-posterior asymmetry. *Science* 304: 1669–1672.

Zhou, Z., Barrett, P. M. and Hilton, J. 2003. An exceptionally preserved Lower Cretaceous ecosystem. *Nature* 421: 807–814.

Zupanc, G.K.H., Hinsch, K. and Gage, F.H. 2005. Proliferation, Migration, Neuronal Differentiation, and Long-Term Survival of New Cell in the Adult Zebrafish Brain *Journal of Comparative Neurology* 488:290–319 (2005)