



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).

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

Cover design by Joep Büsdorf
Figures by Martin Brittijn
Printed by UFB Grafische producties

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

PROEFSCHRIFT

ter verkrijging van de graad van doctor aan de Universiteit Leiden,
op gezag van de Rector Magnificus prof.mr. P.F. van der Heijden,
volgens besluit van het College voor Promoties
te verdedigen op dinsdag 27 november 2007
klokke 16.15 uur

door
Monica Cornelia Maria Welten
geboren te Heemstede
in 1960

PROMOTIECOMMISSIE

Promotores

Prof. Dr. S.M. Verduyn Lunel

Prof. Dr. H.P. Spaink

Co-promotor

Dr. Ir. F.J. Verbeek

Referent

Prof. Dr. C.A. Tickle (University of Bath, UK)

Overige leden

Prof. Dr. A.J. Durston

Prof. Dr. A.P.J.M. Siebes (Universiteit Utrecht)

Prof. Dr. M.K. Richardson

Dr. H. Berkhoudt

Dr. A.H. Meijer

This study was financially supported by Netherlands Research Council through the BioMolecular Informatics programme of Chemical Sciences (grant number #050.50.213). The preparation of the thesis was supported by grants from **ZFScreens BV**.



Aan Jan en Frieda Welten - Hund

Aan Wim Welten

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

Contents

<i>Chapter 1</i>	General introduction	9
A tool to visualize gene expression:		
<i>Chapter 2</i>	ZebraFISH: Fluorescent in situ hybridization protocol and 3 D imaging of gene expression patterns.	19
Case study – early zebrafish development		
<i>Chapter 3</i>	Expression analysis of genes encoding 14-3-3 gamma and tau proteins using the 3D digital atlas of zebrafish development	33
<i>Chapter 4</i>	3D Reconstruction of gene expression patterns in the developing innate immune system of the zebrafish	53
Case study – late zebrafish and cross species development		
<i>Chapter 5</i>	Gene expression and digit homology in the chicken wing	69
<i>Chapter 6</i>	Application of frequent episode mining in developmental pattern analysis, based on gene expression and morphological characters.	87
<i>Chapter 7</i>	Discussion and conclusions	105
	References	115
	Summary	133
	Samenvatting	137
	Curriculum vitae	143
	Color supplement	145

