

**CRANIOFACIAL DEVELOPMENT**  
**BATH 21st – 23rd SEPTEMBER 1987**

**PROGRAMME**  
**&**  
**ABSTRACTS**

WELCOME to Bath and to the British Society for Developmental Biology meeting on 'Craniofacial Development'. It is the first time that the Society has hosted a meeting on this subject and it has been our intention to assemble a group of people from a wide range of disciplines - evolutionists, cell biologists, developmental biologists, molecular geneticists and those dealing with human craniofacial problems. We hope that the resulting mixture of interests and perspectives will make for a stimulating and novel meeting .....

A brief reminder about venues:

Accommodation is in WESTWOOD Block

All meals in the Refectory, 2W Block

All lectures in the lecture theatre Room 2E3.1, 2E Block

Poster sessions and workshops will also take place in 2E Block  
(Posters in 2E4.7 and workshops in 2E3.1 and 2E3.4)

For your convenience, a map of the campus is reproduced overleaf

For those displaying posters, please note that posters should be placed in position in Room 2E4.7 during the day on Monday. Adhesive discs and, where appropriate, thumbtacks will be provided at the entrance to the room, where a list of individual poster locations will be displayed. The poster session itself lasts from 5.00 - 7.00 pm and we ask that posters be manned during this period; free 'refreshments' will be provided and there will be a prize for the best postgraduate poster. To ensure maximum usefulness of the posters we request that they be left in position until Wednesday but that they be removed by lunchtime of that day.

BSDB is a thriving society with over 600 members and holds meetings twice yearly. Topics of recent symposia have been 'Cell Behaviour', 'The Y Chromosome' and 'The Immunology of Development'. Topics scheduled for 1988 symposia are 'Mechanisms of Segmentation', 'Stem Cells' and a meeting on the teaching of developmental biology 'Brush up your Development'. If you are not already a member of BSDB but wish to join, you will find an information sheet and membership application form in your conference wallet. Please complete it and hand it in at the Registration Desk during the meeting. Thank you.

#### ACKNOWLEDGMENTS

We would like to thank the Company of Biologists, the International Society for Developmental Biology, The Nuffield Foundation, The Royal Society and the British Council for their generous financial help in the staging of this meeting. In addition, we'd like to gratefully acknowledge the helpfulness and co-operation of the staff of the Conference Office, Bath University, and of the Mayor of Bath and his staff at Bath City Council. Thank you.

# The campus

University of Bath  
**Key**  
 CENTRAL ADMINISTRATION  
 Wessex House

Vice-Chancellor  
 Secretary and Registrar  
 Finance Office  
 Personnel Office  
 Careers Office  
 Other Offices  
 Security and Enquiries  
 Engineer and Surveyor 1E  
 SCHOOLS

Architecture & Building Eng. South Bldg., 4E

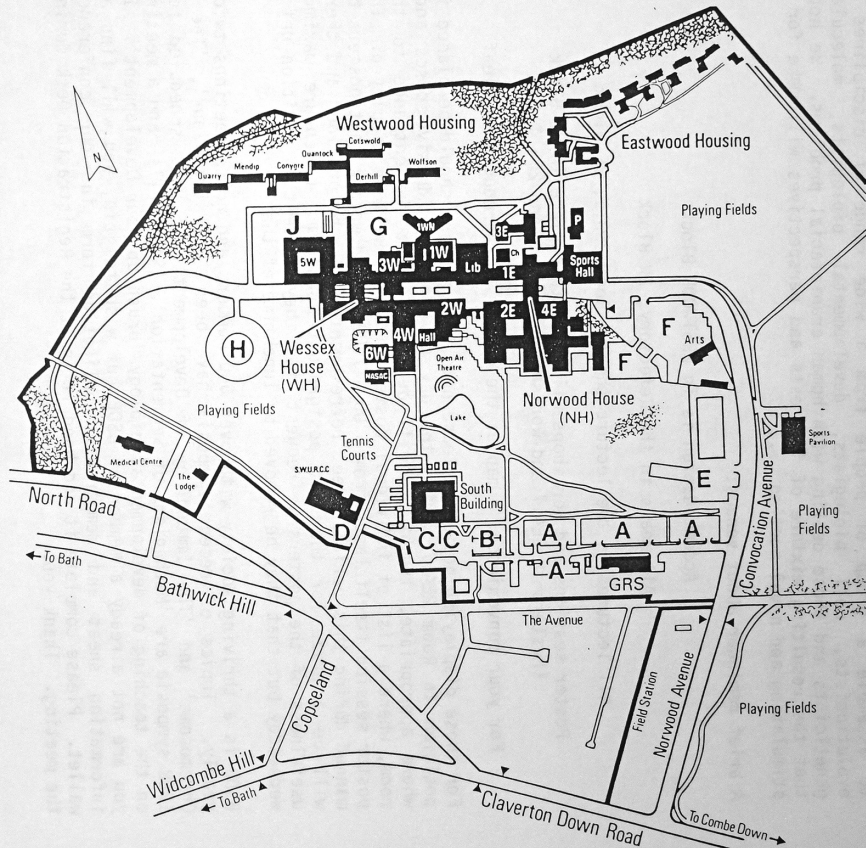
Biological Sciences South Bldg., 4W, 6W  
 Chemical Engineering 4W  
 Chemistry 4W  
 Education 1W, 1WN  
 Electrical Engineering 2E  
 Engineering 4E  
 Humanities & Social Sciences 3E  
 Management Wessex House  
 Materials Science 3W  
 Mathematics 1W  
 Modern Languages 1WN  
 Pharmacy & Pharmacology 5W  
 Physics 3W

CENTRES  
 Adult Studies 1W  
 European Industrial Studies 1WN  
 Fluid Power 4E  
 BARN ARTS CENTRE Arts  
 CHAPEL Ch  
 COMPUTER UNIT 1W  
 EDUCATIONAL SERVICES UNIT 3E  
 GOODS REC. & STORE GRS  
 LECTURE THEATRES 2E, 3E, 5W  
 MEDICAL CENTRE  
 POST OFFICE & BANKS

Wessex House  
 REFRATORY 2W  
 SENIOR COMMON ROOM 2W

STUDENT RESIDENCES  
 Norwood House  
 Wessex House  
 Eastwood  
 Westwood

STUDENTS' UNION Norwood House  
 SWIMMING POOL P  
 SWIRL Library  
 SWURCC Hall  
 UNIVERSITY HALL A-J  
 CAR PARKS A  
 CITY BUS SERVICE (218)



PROGRAMME

MONDAY 21st SEPTEMBER

Welcoming remarks and announcements: 9.00 - 9.05 am

SESSION 1 - THE EVOLUTION AND MORPHOGENESIS OF THE HEAD:

Chairman's introductory remarks -  
J.Z. Young (London) 9.05 - 9.10 am

'Craniofacial growth - evolutionary questions' -  
C. Gans (Ann Arbor) 9.10 - 9.50 am

'Patterns of mesodermal development in the  
vertebrate head' -  
E. Gilland (Harvard) 9.50 - 10.30 am

COFFEE 10.30 - 11.00 am

'Pattern formation in the facial primordia' -  
S. Wedden (Harvard) 11.00 - 11.40 am  
J.R. Ralphs & C. Tickle (London)

'Palate development; mechanisms and malformations' -  
M. Ferguson (Manchester) 11.40 - 12.20 pm

General remarks by Chairman and by Discussant,  
- R. Greene, (Philadelphia) 12.20 - 12.50 pm

LUNCH 12.50 - 2.00 pm

SESSION 2 - THE CEPHALIC NEURAL CREST AND PLACODES:

Chairman's introductory remarks -  
N. Le Douarin (Nogent) 2.00 - 2.05 pm

'Adhesion molecules and neural crest cell migration' -  
G. Tucker (Nogent) 2.05 - 2.45 pm

'Control of pathfinding by the avian trunk neural crest' -  
C. Erickson (Davis) 2.45 - 3.25 pm

TEA 3.25 - 3.50 pm

'Effect of the mouse Small Eyes (Sey) on nose and eye  
development' -  
B. Hogan & C.M. Heatherington (London)  
M.F. Lyon (Harwell) 3.50 - 4.30 pm

General remarks by Chairman and by Discussant,  
- G. Couly, (Nogent) 4.30 - 5.00 pm

Poster Session 5.00 - 7.00 pm

Sherry 7.00 - 7.30 pm

Conference Dinner 7.30 pm



SESSION 3 - PATTERNING OF CONNECTIVE TISSUES IN THE HEAD

Chairman's introductory remarks - B. Hall (Dalhousie)	9.00 - 9.05 am
'Interactions and fates of craniofacial mesoderm' - D. Noden (Cornell)	9.05 - 9.45 am
'The developmental specification of skull form' - P. Thorogood (Southampton)	9.45 - 10.25 am
<u>COFFEE</u>	10.25 - 10.50 am

'Spatial organization of the epithelium and the role of neural crest cells in the initiation of the mammalian tooth germ' A. Lumsden (London)	10.50 - 11.30 am
General remarks by Chairman and by Discussant, - J. Weston, (Eugene)	11.30 - 12.00
<u>LUNCH</u>	12.00 - 1.00 pm

SESSION 4 - PATTERNING OF NERVE AND SENSE ORGANS IN THE HEAD

Chairman's introductory remarks - H. van der Loos (Lausanne)	1.00 - 1.05 pm
'The trigeminal system in the study of neuronal development' - A. Davies (London)	1.05 - 1.45 pm
'Tissue interactions and cell differentiation: neuron- receptor cell interplay during development of the inner ear' - T. van der Water (New York)	1.45 - 2.25 pm
'Patterns of extracellular matrix in the developing eye: diversity, design and deposition' - J. Bard (Edinburgh)	2.25 - 3.05 pm
<u>TEA</u>	3.05 - 3.30 pm
General remarks by Chairman and by Discussant, - C. Stern (Oxford)	3.30 - 4.00 pm
Workshop sessions - to run simultaneously -	4.15 - 6.15 pm
1. 'Cellular and molecular aspects of cephalic neural crest development' Convenors: D. Newgreen (Manchester), J. Bee (London).	
2. 'Strategies of head development' Convenors: P. Alberch (Harvard), E. Kollar (Farmington).	

Dinner from 6.30 onwards

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Dinner from 6.30 onwards

Buses leaving campus for Civic Reception at 7.20 & 7.45 pm

Civic Reception in Pump Room, Bath 8.0 pm

WEDNESDAY 23 SEPTEMBER

SESSION 5 - ABNORMALITIES OF CRANIOFACIAL DEVELOPMENT

Chairman's introductory remarks - M. Johnston (Chapel Hill)	9.00 - 9.05 am
'The aetiology and pathogenesis of human craniofacial deformity' D. Poswillo (London)	9.05 - 9.45 am
'Teratogens and craniofacial malformations' - K. Sulik, M.C. Johnson & C.S. Cook (Chapel Hill) W.S. Webster (Sydney)	9.45 - 10.20 am
<u>COFFEE</u>	10.25 - 10.50 am
'The application of molecular genetics to detection of craniofacial abnormality' - G. Moore & R. Williamson (London)	10.50 - 11.30 am
General remarks by Chairman and by Discussant, - L. Brinkley (Ann Arbor)	11.30 - 12.00
'Summing up: parallels and problems' - L. Wolpert (London)	12.00 - 12.30 pm
<u>LUNCH</u>	12.30 onwards

END OF CONFERENCE

A special Development issue relating to this meeting was edited by Peter Thorogood and Cheryll Tickle, the conference organisers, and is available online: <http://dev.biologists.org/content/develop/103/Supplement/1.full.pdf>

DEVELOPMENT

# CRANIOFACIAL DEVELOPMENT

EDITED BY

PETER THOROGOOD AND CHERYLL TICKLE

VOLUME 103 SUPPLEMENT

1988

Papers presented at a meeting of the  
British Society for Developmental Biology  
at the University of Bath  
September 1987

THE COMPANY OF BIOLOGISTS LIMITED

CAMBRIDGE

## Preface

How a single cell, the fertilized egg, gives rise to a new individual is one of the most challenging problems in Biology. In a remarkable effort, it has been possible to trace the fate of every cell during development of the determinate embryo of the nematode, which is a relatively simple animal. However, this strategy presents an overwhelming task for vertebrate development and instead attention has typically been focused on crucial stages of development or the generation of specific structures. In the apparently indeterminate embryos of higher vertebrates it may not be necessary or even realistic to give the same detailed attention to the development of every constituent body part, because the same generative processes will be involved repeatedly and will be mediated by cells that have a rather limited repertoire of behaviour. The desire to understand the development of vertebrates generally and the human embryo, in particular, is not simply an intellectual preoccupation – there is also the practical clinical goal of finding out how congenital defects arise.

Until recently, the head, i.e. the craniofacial system, has not been favoured for studying development. Open any textbook on Developmental Biology and craniofacial development is barely mentioned. Of course, anatomically the head is very complex and contains many cells types arranged in precise locations. The anatomical complexity of the 'finished product' is undoubtedly one of the factors that has previously discouraged developmental biologists from tackling craniofacial systems. Furthermore, imposed on the standard facial pattern, there are more subtle qualitative features that are also determined genetically and make each face recognizably different and are, to greater or lesser extents, heritable. Definition of the control mechanisms operating at both these levels is a problem posing a unique intellectual challenge.

In September 1987, the British Society for Developmental Biology held, for the first time, a meeting that focused on these challenges of vertebrate craniofacial development. This book is a collection of the papers presented and reports of some of the discussion that took place. The meeting was designed to be comprehensive, considering the evolution of vertebrate heads; how the face is constructed and the behaviour of neural crest cells; the generation of head-specific structures including sense organs; and finally craniofacial defects. This programme therefore represented a wide range of interests and yet nevertheless, the emphasis was very much on basic mechanisms particularly at the cell and molecular level.

This is an exciting time to be studying embryonic development. With the new techniques in molecular biology, it is now possible to begin to tackle major questions, for example, how gene expression is translated into cell behaviour and specification of position or identity. The solutions will be pieced together from studies on a wide range of different animals from insects to mice and development of organs as diverse as kidneys and limbs. In this context, the study of the craniofacial system has great potential to illuminate many mysteries including the mechanisms of segmentation, cell migration and differentiation, and nervous system connections. The craniofacial system may also be suitable for identification of genes involved in morphogenetic processes by investigation of families with inherited conditions that affect craniofacial development. Therefore, the future appears to hold out great promise for unravelling both fundamental and special problems of face development and approaching a greater understanding of the basis of congenital defects.

*P. Thorogood  
C. Tickle  
London, January 1988.*



## From the newsletters

The Bath meeting is the BSDB/COB

### SYMPOSIUM ON CRANIOFACIAL DEVELOPMENT

This meeting will be published as a supplement to Development (JEEM). It is organized by Peter Thorogood and Cheryll Tickle, who write:

The development of the vertebrate head is a challenging and fascinating problem. It is challenging because the entire basic repertoire of cell behaviour, ranging from migration to differentiation, is called into play. The head is fascinating because it not only houses the major sense organs but also because the face has a key role in human social interactions, allowing the recognition of individuals and the mirroring of emotions. The first BSDB conference on Craniofacial Development will take place on 21st-23rd September, 1987 at Bath University.

The purpose of the conference is two-fold: first, to bring together research workers in the field from this country and to invite outstanding experts from abroad, both from the US and Europe; second, to be educational and provide an outline of the current status of research on the head and face. This will serve to demonstrate that craniofacial development is not impossibly complicated and will highlight general principles of development that have traditionally been studied in other systems. The conference thus aims to appeal not only to those actively working on craniofacial development but to developmental biologists in general. In addition, the subject is relevant in a broader medical context, particularly to dentistry and orthodontics.

Sessions will include the following topics:

- Evolution and morphogenesis of the head
- Neural crest and placodes
- Patterning of muscle and connective tissue
- Patterning of nerve and sense organs
- Abnormalities of craniofacial development.

Bath : 21st-23rd September, 1987.

This is the BSDB/Company of Biologists Symposium on

### CRANIOFACIAL DEVELOPMENT

The meeting is organized by Peter Thorogood and Cheryll Tickle and the proceedings will be published as a supplement to Development. The programme is as follows:

Monday, 21st September

#### EVOLUTION AND MORPHOGENESIS OF THE HEAD

Chairman - Harold Slavkin (Los Angeles)  
 Carl Gans (Ann Arbor)  
 Ed Gilland (Harvard)

# COFFEE

Sarah Wedden/Cheryll Tickle (London)  
Mark Ferguson (Manchester)

General remarks by Chairman/Discussion

# LUNCH

## THE CEPHALIC NEURAL CREST AND PLACODES

Chairman - Nicole Le Douarin (Nogent)  
Gordon Tucker (Nogent)  
Jan Lofberg (Uppsala)

# TEA

Brigid Hogan (London)

General remarks by Chairman/ Discussion

# POSTER SESSION

# CONFERENCE DINNER

Tuesday, 22nd September

## PATTERNING OF CONNECTIVE TISSUES IN THE HEAD

Chairman - Brian Hall (Dalhousie)  
Drew Noden (Cornell)  
Peter Thorogood (Southampton)

# COFFEE

Andrew Lumsden (London)  
General remarks by Chairman/Discussion

# LUNCH

## PATTERNING OF NERVE AND SENSE ORGANS IN THE HEAD

Hendrik van der Loos (Lausanne)  
Alun Davis (London)  
Lewis Tilney (Philadelphia)

# TEA

Jonathan Bard (Edinburgh)  
General remarks by Chairman/Discussion

# WORKSHOPS

- (i) 'Cellular and molecular aspects of cephalic neural crest development'.

Convenors - Don Newgreen (Manchester), Jim Bee (London)

(ii) 'Strategies of head development'.

Convenors - Pere Alberch (Harvard), Ed Kollar (Farmington)

D I N N E R

CIVIC RECEPTION AND ROMAN BATHS

Wednesday, 23rd September

ABNORMALITIES OF CRANIOFACIAL DEVELOPMENT

Chairman - Malcolm Johnston (Chapel Hill)

David Poswillo (London)

Kathy Sulik (Chapel Hill)

C O F F E E

Bob Williamson (London)

General remarks by Chairman/Discussion

Lewis Wolpert (London)

L U N C H

END

Please return booking forms for this meeting to Peter Thorogood by 7th August, 1987. If you wish to present a poster, please send the title and abstract to Dr. Thorogood by the same date. A prize will be awarded for the best poster.

CRANIOFACIAL DEVELOPMENT

September 1987, Bath, England.

How the vertebrate head develops and how it has evolved is a fascinating problem but one that has traditionally been avoided by many developmental biologists who have felt that the head is far too complicated a structure to study. One of our purposes in organising this meeting was to overcome this prejudice and illustrate not only that the head is amenable to developmental analysis but that very exciting work in this field is currently being carried out in laboratories around the world. Our intention in composing the programme was to bring together specialists from a number of different fields to provide a unique mixture of scientists and medics. To a large extent this worked and worked well. Over 130 people attended ranging from evolutionists right through to craniofacial plastic surgeons and travelling from as far afield as Japan and California. Clearly it was one of the first occasions on which European and American craniofacial developmental biologists had assembled together on such a scale.

The programme was organized around five major themes:

- The evolution and morphogenesis of the head
- The cephalic neural crest and placodes
- Patterning of connective tissues in the head
- Patterning of nerves and sense organs in the head
- Abnormalities of craniofacial development

and included two workshops:

- Cellular and molecular aspects of cephalic neural crest development
- Strategies of head development.



Perhaps the underlying theme running throughout was an attempt to define those mechanisms which specify the patterning of the various tissues of the head, not simply the differentiation of the various constituent cell types. Emerging from this was also discussion of just how changes in those mechanisms might underly evolutionary/phylogenetic change in organization of the head, and also generate the various human craniofacial abnormalities encountered by the clinician or surgeon. Several directions for future research emerged. Firstly, the question of lineage composition of the neural crest was raised on a number of occasions and is clearly going to be the focus of attention in several labs. Secondly, the old nineteenth century anatomists question of whether or not the head is a segmented structure now seems likely to be resolved by parallel developments in two different fields; somitomes (nascent somites) have been identified in early head mesoderm before becoming obscured by subsequent developmental events, and also cDNA probes to homeobox-containing genes may be used to map their expression in the developing head by in situ hybridization techniques. And thirdly, we learnt of the achievements and potential of applying recombinant DNA technology as a diagnostic technique in screening for various familial craniofacial disorders, illustrated by the chromosomal mapping and imminent isolation of the gene involved in familial cleft palate.

We were blessed with active lively registrants who guaranteed good discussions, sunny and dry autumn weather and a pleasant campus setting adjacent to a beautiful old city. The meeting was organized under the auspices of the British Society for Developmental Biology and its success ensured by generous support from BSDB, the Royal Society, The Nuffield Foundation and the British Council. The proceedings of the meeting will be published by the Company of Biologists as a supplementary volume of Development in the Spring of 1988.

Peter Thorogood and Cheryl Tickle.