British Society for Developmental Biology

LIVERPOOL MEETING **4th-5th SEPTEMBER, 1975**

The 30th Meeting of the Society will be held in the Department of Zoology, University of Liverpool, on 4th-5th September, 1975.

Accommodation will be in one of the University Halls of Residence on the Carnatic Site. The Halls will provide bed, breakfast and evening meal. The **Conference Dinner** will be on Thursday, 4th September, at the Halls of Residence, and will be preceded by an informal **Sherry Reception.**

Lectures will be held in the Department of Zoology, University of Liverpool. **Morning Coffee** and **Afternoon Tea** will be served in the Zoology Department, and **Buffet Lunch** will be available in the Students' Union, on the main campus.

Car parking facilities are available at the Halls of Residence and the University campus. There is no convenient public transport between Halls and campus, but it might be possible to arrange for a private bus to take members between the Halls and University, if a sufficient number of members indicate that they would use this service.

Members are reminded that the **Annual General Meeting** of the Society will take place during the meeting and that resolutions and nominations should be sent to the Secretary of the Society, Dr. John McKenzie, before **22nd July, 1975.**

Please return completed booking forms as soon as possible but not later than **23rd July, 1975,** to

Dr. Martin Stanisstreet,
Department of Zoology,
Brownlow Street,
University of Liverpool,
P.O. Box 147,
Liverpool.
(Telephone 051-709-6022).

PROGRAMME

Thursday, 4th September

Chairman : **J. R. HINCHLIFFE**

10.00 M. STANISSTREET and J. L. SMITH (Liverpool).
Studies on the re-aggregation of dissociated cells on *Xenopus laevis* early embryos.

10.30 J. C. OSBORN and M. STANISSTREET (Liverpool).
Types of RNA and protein in abnormal embryos of *Xenopus laevis*.

11.00 **COFFEE.**

11.30 W. A. HEMMINGS and C. WOOD (Bangor).
The enhancement of protein absorption through the small intestine of the suckling rat.

12.00 E. W. WILLIAMS (Bangor).
Protein transport across the ileum of the suckling and adult rat studied by direct deposition EM autoradiography.

12.30 **LUNCH**

Chairman : **M. STANISSTREET**

14.00 R. G. HARRISON (Liverpool).
Presomite development of the human embryo.

14.30 R. C. CONNOLLY and P. H. DANGERFIELD (Liverpool).
Postnatal development of skeletal symmetry.

15.00 J. WILKINSON (Liverpool).
Abnormal bulboventricular septation in the human heart.

15.30 **TEA**

Chairman : **J. McKENZIE**

16.00 V. E. PAPAIOANNOU, M. McBURNEY, R. L. GARDNER (Oxford) and M. J. EVANS (University College, London).
The fate of teratocarcinoma cells injected into early mouse embryos.

16.30 J. GIBSON (Aberdeen).
The malformed foetus, a natural tool in developmental biology.

Friday, 5th September

Chairman : **P. BARLOW**

10.00 D. FRANCIS and R. D. MacLEOD (Newcastle-upon-Tyne).
Invertase activity during the development of secondary roots of *Vicia faba* L.

10.30 H. A. COLLIN (Liverpool).
Morphogenesis and secondary product formation in tissue cultures of celery *(Apium graveolens)*.

11.00 **COFFEE**

Chairman : **M. ABERCROMBIE**

11.30 J. COHEN, P. DYER and K. TYLER (Birmingham).
Failure of sperms in female mammals.

12.00 **ANNUAL GENERAL MEETING.**

13.00 **LUNCH**

14.15 B. SEDDON (Aberdeen).
Studies on the control of cell differentiation in prokaryotic systems. The function of peptide antibiotics in the producer organism, *Bacillus brevis*.

14.45 J. E. AARON and F. G. E. PAUTARD (Leeds).
The Golgi apparatus and mineral development in *Spirostomium* and the osteocyte.

15.15 R. ANDERSON (Brompton).
Normal and abnormal development of conducting tissue in the human heart.

15.45 **TEA**

BRITISH SOCIETY FOR DEVELOPMENTAL BIOLOGY

LIVERPOOL MEETING - 4th-5th SEPTEMBER, 1975

ABSTRACTS

M. STANISSTREET and J. L. SMITH (Liverpool)
Studies on the re-aggregation of dissociated cells of Xenopus laevis early embryos.
Early embryos of Xenopus laevis have been dissociated with E.D.T.A., and the cells allowed to re-aggregate. The structure of the aggregates has been studied by light- and electron-microscopy, and the effects of various substances on re-aggregation have been determined.

J. C. OSBORN and M. STANISSTREET (Liverpool)
Types of RNA and Protein in Abnormal Embryos of Xenopus laevis.
Exposure of early embryos of Xenopus laevis to Lithium chloride produces characteristic abnormalities which fail to form neural structures. We have found that such abnormal embryos show reduced cell numbers, decreased Thymidine incorporation and increased Uridine incorporation.
The types of RNA and Proteins synthesised in these abnormal embryos have now been compared with those synthesised in normal embryos.

W. A. HEMMINGS and C. WOOD (Bangor)
The enhancement of protein absorption through the small intestine of the suckling rat.
The mechanism of protein absorption through the small intestine of the suckling rat is dual. The duodenum transports more native protein, is more selective, and possibly less degradation occurs there. The ileum transports at least an equal amount of protein, but less selectively and with much more proteolysis; the typical protein absorbed is high molecular weight break down products (BDP's) which have a very short life in the circulation. (1) This second mechanism is not subject to the closure at 21 days of age which affects the entry of native protein, but continues unabated into adult life. (2) In the adult rat it has been shown that a preliminary oral dose of antigen affects the subsequent absorption of a later test dose, reducing the uptake. (3) The present experiments were intended to test for a similar effect in the suckling. It was in fact found that a preliminary dose of bovine IgG at 1 and 5 days old led to increased absorption at 15 days, not only of the test protein but of homologous IgG fed simultaneously. (4)

(1) Hemmings, W. A. 1975 a I R C S Med Sci. 3 216
(2) Hemmings, W. A. 1975 b I R C S Med Sci. 3 262
(3) Andre et al (1974) Eur J. Immunol. 4 701
(4) Hemmings, W. A. and Wood, C. 1975. I R C S Med Sci (in press).

E. W. WILLIAMS (Bangor)
Protein transport across the ileum of the suckling and adult rat studied by direct deposition EM autoradiography.
Ferritin has been observed to pass the ileal epitheliun of the suckling rat, and has been demonstrated passing from the cells into the inter-cellular spaces. (1) It has been followed by trace-labelling experiments, and the entry through the ileum has been found to be substantial. The protein has been demonstrated in the liver and tissues of the young rat recipient, as well as in the blood. (2) However, ferritin may possibly be toxic to the cells and it was felt desirable to confirm the above findings using normal mammalian IgG's labelled with radioisotopes. Their presence in the epithelial cells and intercellular spaces of the ileum are demonstrated by direct deposition autoradiography in the present studies.

(1) Williams, E. W. I R C S Med Sci 2 1341 1974
(2) Williams, E. W. Thesis. Inst. Biol. 1975

R. G. HARRISON (Liverpool)
Presonite development of the human embryo.
Presonite human embryos of similar ages and of the same Horizon often show considerable variation of histological characteristics. The features of four such embryos, discovered and examined in Liverpool, will be reported and the presence of abnormal pathological features described.

R. C. CONNOLLY and P. H. DANGERFIELD (Liverpool)
Postnatal development of skeletal symmetry
Failure to maintain bilateral symmetry during postnatal development in Man is not an uncommon situation. It is, however, usually self-limiting and self-correcting. Some cases in which symmetry is not maintained result in gross skeletal, muscular and visceral deformity.
Detailed studies of growth patterns in these children indicate not only widespread disorders of growth in the long bones but a much more generalised abnormality of overall development related to the peripheral end-organ responses to central control of growth and failure of any lateral "standstill" or "catch-up" mechanisms to maintain bilateral symmetry.

J. WILKINSON (Liverpool)
Abnormal bulboventricular septation in the human heart.
Development of the inter-ventricular septum depends upon the simultaneous growth and correct spatial alignment of several septal structures including the left bulboventricular ridge, the conal ridges and the posterior inter-ventricular ridge. Additional processes which contribute to normal bulboventricular septation include regression of the right bulboventricular ridge and conal absorption. Abnormal orientation of the conal ridges and inappropriate conal absorption are seen in a spectrum of abnormalities including Fallots' tetralogy, double outlet right ventricle and transposition of the great arteries. More bizarre anomalies including "P" Transposition and double outlet left ventricle also show abnormalities of conal septal orientation and conal absorption. Univentricular hearts, with and without outlet chambers and tricuspid atresia show abnormalities which appear to imply faulty development of the posterior inter-ventricular ridge and persistence of the right bulboventricular ridge.

V. E. PAPAIOANNOU, M. McBURNEY, R. L. GARDNER (Oxford) and M. J. EVANS (University College, London)
The fate of teratocarcinoma cells injected into early mouse embryos.
Results of injection of teratocarcinoma cells from cell lines derived from several tumours into mouse blastocysts indicate that these cells are capable of colonizing the host embryo and giving rise to a variety of normal cell and tissue types. In some cases the cells give rise to tumours in the newborn which resemble the original embryonal carcinoma. The relevance of the karyotype and other conditions leading to these different paths of differentiation or malignancy as well as the developmental capacity of the different cell lines will be discussed.

J. I. GIBSON (Aberdeen)
The malformed foetus - a natural tool in developmental biology.
The interdependence of various disciplines are necessary to solve the problems concerned with perinatal mortality. This paper attempts to illustrate by example of infants and foetuses coning under the Pathologist's knife, the need for a developmental biologist as part of the team.

D. FRANCIS and R. D. MacLEOD (Newcastle-upon-Tyne)
Invertase activity during the development of secondary roots of Vicia faba L.
Specific activity of the enzyme invertase has been determined in large prinordia (LP), lateral roots which have just emerged through the tissues of the primary (JE) and secondary roots of various lengths in Vicia faba. Invertase activity was high in LP and JE, declined to comparatively low levels in the apical meristems of 1-4 mm long lateral roots, but increased again in the apices of 5 mm, 1 cm and 4 cm long roots. Moreover, in the longest roots investigated, a second peak of invertase activity was found 4-5 mm distal to the apex. These changes in enzyme activity will be discussed with respect to the organisation of the lateral root apical meristem and the onset of differentiation in developing secondary roots.

H. A. COLLIN (Liverpool)
Morphogenesis and secondary product formation in tissue cultures of celery (Apium graveolens).
Tissue cultures of celery have been derived fron petiole sections of the nature plant and fron germinating seedlings. Callus and cell suspension cultures can be induced to differentiate to form embryos and finally small plants which in turn can be grown to maturity. The development of the pattern of secondary compounds characteristic of the nature plant is being examined at all stages of differentiation using histological, TLC and GLC methods.

J. COHEN, P. DYER and K. TYLER (Birmingham)
Failure of sperms in female mammals.
Redundancy of gametes, especially sperms, is commonly observed. It has classically been attributed to the design of the female. The alternative explanation is that during the process of gametogenesis events occur which result in gametes which are normally incapable of reaching fertilisation. A correlation between sperm redundancy and chiasma frequency has been demonstrated. This idea appears to link several observations such as the number of sperms inseminated, oocyte atresia and many of the apparently contradictory immunological results, but several recent findings are difficult to explain. We are at present investigating the distribution of ^{3}H-thymidine and ^{3}H-arginine labelled sperms in the female tract and during gametogenesis by autoradiography. Attachment of immunoglobulins to spermatozoa is being examined, using immunofluorescence and other techniques, to reveal the mode of attachment of these molecules and any differences in the antigenicity of sperms from different regions of the female tract. The results will be used to test selection of sperms by the female mammal.

B. SEDDON (Aberdeen)
Studies on the control of cell differentiation in prokaryotic systems. The function of peptide antibiotics in the producer organism, Bacillus brevis.
Sporulation in bacilli offers a model system for the study of cell differentiation. Recent investigations using this developmental programme have indicated that early events relevant to the process of endospore formation may play regulatory roles controlling the subsequent appearance of the ordered, temporal sequence of events leading to the production of the mature endospore, e.g. serine protease production, modification of DNA - dependent RNA polymerase etc.
Antibiotic production is also one of the very early events associated with sporulation in bacilli and recent suggestions imply that these molecules may play an important regulatory role in sporulation. The current situation concerning this topic will be discussed together with preliminary findings made in this laboratory using Bacillus brevis which produces peptide antibiotics early in the sporulation process.

J. E. AARON and F. G. E. PAUTARD (Leeds)
The Golgi apparatus and mineral development in Spirostomum and the osteocyte.

SEE PAGE 5

R. ANDERSON (Brompton)
Normal and abnormal development of conducting tissue in the human heart.
Both phylogenetic and ontogenetic studies support the concept that the cardiac specialized tissues originate from the junctional areas of the primitive heart tube. Thus in early stages sinuatrial, atrioventricular, bulboventricular and bulbotruncal rings of conducting tissue are recognizable. The looping process together with the formation of the posterior interventricular septum bring the sinuatrial, atrioventricular and bulboventricular rings into apposition, thus permitting the formation of the atrioventricular junctional area and the ventricular specialized tissues. The node and atrioventricular bundle are formed astride the developing septum, and therefore maintain a position astride this structure following maldevelopment of the septum. Should the posterior septum not be developed as in univentricular hearts, or be incorrectly aligned with the atrial septum as in classically corrected transposition, then the normal node and bundle will not be formed. Instead an anterior expansion of the atrioventricular ring, present in normal hearts, establishes contact with the ventricular specialized tissues and forms an unusually situated conducting system of considerable surgical significance.

A current view that the inorganic substance of bones and teeth is the result of extracellular events is examined in the light of observations of calcium phosphate deposition in the protozoan Spirostomum ambiguum and in the osteocyte of the developing mouse calvarium. Correlated optical and electron microscope studies suggest that the mineral that appears at the calcification front in bone commences in the golgi apparatus of the osteocyte as part of a complex cycle of cell activity. The characteristic clusters of mineralized filaments within the osteocyte closely resemble those in Spirostomum. The histochemical identification of particles of calcium phosphate in soft tissues indicates that a common mechanism of mineral fabrication may be a fundamental feature of most, if not all, cells. Bone may therefore be regarded as a tissue in which the normal intracellular cycle of calcium phosphate formation has been extended to create, by organised extrusion of mineral structures, a specialized extracellular environment. The relationships between the cell and its mineral products are such that they provide a flexible support as well as a metabolic reserve which can be repositioned or resorbed in response to external stimuli.