



Riken **C**enter for **D**evelopmental **B**iology

The CDB Opening Symposium

A New Paradigm in Developmental Biology

Program

○ Introduction to CDB

10:00-10:05 Shun-ichi Kobayashi (RIKEN President)

10:05-10:30  [Masatoshi Takeichi \(CDB Director\)](#)

① Novel Concepts of Development

10:30-11:10  [Igor Dawid \(NIH/NICHD\)](#)

11:10-11:50  [Peter Gruss \(Max-Planck-Institute of Biophysical Chemistry\)](#)

11:50-13:00 Lunch Time

② Cellular Mechanisms

13:00-13:40  [William Chia \(MRC Centre for Developmental Neurobiology\)](#)

13:40-14:20  [Elaine Fuchs \(The University of Chicago\)](#)

14:20-15:00  [Nobutaka Hirokawa \(University of Tokyo\)](#)

15:00-15:20 Coffee Break

③ Genetic Reprogramming and Regenerative Medicine

15:20-16:00  [Austin Smith \(University of Edinburgh\)](#)

16:00-16:40  [Yoshiki Sasai \(CDB\)](#)

16:40-17:20  [Takayuki Asahara \(Boston's St. Elizabeth's Medical Center\)](#)

④ Concluding Remarks

17:20-17:30 Shin-ichi Nishikawa (CDB)

17:30-19:00 Reception

Speaker Profiles

Masatoshi Takeichi

RIKEN Center for Developmental Biology
Director



Dr. Takeichi has been the director of the RIKEN Center for Developmental Biology since its foundation in 2000 and heads the laboratory for Cell Adhesion and Tissue Patterning. Dr. Takeichi is world-renowned for his discovery of cadherin, the major protein responsible for calcium-dependent cell adhesion. He subsequently established that cadherin constitutes a family of cell surface receptors responsible for cell-cell recognition and investigated their roles as key regulators during animal development. Since then, his group has been leading the field in studies of cell adhesion at the molecular, cellular and tissue level. In order to understand how cells are dynamically rearranged for organogenesis, his lab is currently investigating the role of catenins in the regulation of cell contacts. Dr. Takeichi is also interested in determining how neurons are connected to establish neural networks. To address this question he is working to determine the role of cadherins in interneuronal recognition and synapse formation. In addition, he is investigating the mechanisms by which neurons position themselves to form cortical laminar structures in the brain. Through Dr. Takeichi's research, we will gain deeper insight into the molecular mechanisms that mediate the arrangement of cells into precisely ordered patterns to form the body.

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Igor Dawid

Laboratory of Molecular Genetics , National Institutes of Health



Dr. Igor Dawid is chief of the Laboratory of Molecular Genetics at the National Institutes of Health and was the former Acting Scientific Director of the National Institute of Child Health and Human Development. A major interest of Dr. Dawid's laboratory is the molecular basis of vertebrate embryogenesis as studied in *Xenopus* and the zebrafish. More specifically, induction of mesoderm and the nervous system and the establishment of the dorsal axis are the focal points of his research. The role of signaling molecules including members of Wnt, TGF-beta, and FGF families are the subjects of study, as are signal transduction cascades, and the role of homeobox genes. Particular attention is being placed on the homeobox gene *Xlim-1* which has been implicated in the functions of the Spemann organizer during gastrulation. Additionally, his lab is involved in the refinement of a zebrafish radiation hybrid map and exploration of mutagenesis protocols that may be useful for introducing deletions into the zebrafish genome. Thus, by using cutting-edge bioinformatics and molecular genetics approaches, Dr. Dawid is exploring mechanisms of early embryogenesis in both the *Xenopus* and zebrafish systems.

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Peter Gruss



Department of Molecular Cell Biology, Max-Planck Institute of Biophysical Chemistry

Professor Peter Gruss is the director of the Max-Planck Institute of Biophysical Chemistry in Germany, where he heads the Department of Molecular Cell Biology. Last November, he was elected to President of the Max-Planck Society for the 2002-2008 term. Centered on the molecular mechanisms underlying the development of the vertebrate nervous system, Prof. Gruss' lab specifically addresses genes involved in the development of sense organs, such as the eye and the inner ear. Among his groundbreaking innovations in this field, he is especially renowned for his studies on *Pax6*, a gene which has been implicated in eye development in mouse, man and in the fruitfly. His lab also recently discovered another gene, *Six3*, a protein whose expression is found in the developing lens and the developing retina. Another gene, *Pax2* has been analyzed because of its activity in the developing eye and ear. Furthermore, regenerative processes, particularly the regeneration of insulin producing cells, were studied with the help of *Pax* genes. Prof. Gruss' research on these and other genes have provided insight into the complex processes involved in the development of the sense organs.

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William Chia



MRC Centre for Developmental Neurobiology

Professor William Chia is part of the Medical Research Council Centre for Developmental Neurobiology at the King's College London. His research has made important contributions towards establishing a genetic basis for understanding how the fate of CNS neurons is specified as the nervous system develops. His lab's studies on the *Drosophila* embryonic nervous system have led to the discovery of a number of key genes that are required for asymmetric divisions in the developing central nervous system. One of the major players in asymmetric cell division is *inscuteable* (*insc*), a gene that controls asymmetric division events, such as basal localization of cell fate determinants and spindle orientation during mitosis in neural stem cells. Another gene his lab has recently identified, partner of *inscuteable* (*pins*), is required for *insc* function. Both proteins form a complex in the apical cortex of dividing neural stem cells, where they play essential roles in the regulation of asymmetric division events. In addition, a current major project in Dr. Chia's lab challenges to extend our understanding of asymmetric division in vertebrates. Dr. Chia's work has greatly influenced both the way people think about the generation of neuronal diversity during the development of the CNS, and also the future direction of research in this field..

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Elaine Fuchs



Department of Molecular Genetics and Cell Biology , The University of Chicago

Dr. Elaine Fuchs and her laboratory at the University of Chicago, Department of Molecular Genetics and Cell Biology, study the molecular mechanisms underlying development and differentiation of the mammalian skin epidermis and its appendages.

Dr. Fuchs is also interested in how these processes go awry in various human diseases of the skin, including genetic diseases and skin cancer. She utilizes mammalian epidermal stem cell culture and gene-knockout technology as model systems. These studies revealed that epidermal and hair follicle differentiation is influenced by a number of different external signaling molecules. A major focus of the lab is to understand how embryonic cells become committed to an epidermal or hair follicle cell fate and how the resulting cells respond to these various environmental cues. Such knowledge is essential to understanding how the epidermis is able to manifest the skin's function as a barrier to keep harmful microorganisms out and essential body fluids in. Transgenic and knockout mice are also being used to elucidate the genetic bases for human diseases of the skin. When mutations in major structural epidermal proteins occur in mice, they often cause perturbations in the skin, resembling certain known genetic skin disorders of humans. DNA analysis of patients with these candidate diseases has led the Fuchs' laboratory to discover the genetic basis of a number of different human skin diseases, ranging from blistering human disorders to skin tumors.

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Nobutaka Hirokawa



The University of Tokyo

Professor Hirokawa is the chairman of the Department of Cell Biology and Anatomy at the University of Tokyo. He began his research career as an electron microscopist and identified a number of filamentous structures linking cytoskeletal elements and membranous organelles. He later found that some of these structures comprise cytoskeleton-associated proteins, such as microtubule-associated proteins and molecular motors, which he has proven to be fundamental for cellular morphogenesis and intracellular transport. More recently, his group has identified more than 20 new members of the kinesin superfamily. He and his colleagues are now characterizing the function of these kinesin-related proteins using molecular, ultrastructural, biophysical and genetic approaches. Furthermore, they have elucidated the intracellular transport mechanism of various kinds of organelles and protein complexes essential for cellular functions. His recent analysis of KIF3B, a microtubule plus end-directed motor protein, led to a groundbreaking discovery indicating the involvement of extraembryonic fluid

flow at the node (nodal flow), in the determination of mammalian left-right asymmetry. Widely respected in international circles, Dr. Hirokawa has been on the boards of many important international journals including Cell, Science, Neuron, Developmental Cell, Journal of Cell Biology, Trends in Cell Biology, and Current Opinion in Cell Biology.

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Austin Smith



Embryonic Stem Cell Biology division, Center for Genome Research at the University of Edinburgh

Dr. Austin Smith is the Director of the Centre for Genome Research at the University of Edinburgh and Head of the Embryo Stem Cell Biology Group. His lab is concerned with the characterization of cellular and molecular mechanisms governing the self-renewal and differentiation of multipotential embryonic stem cells, of mouse, rat and human origin. Embryonic stem (ES) cells, which are derived directly from the pluripotential cells of the early mouse embryo, can be propagated and manipulated in vitro while retaining their full potential for multi-lineage development. His lab 's strategy is to utilize these prototypic stem cell cultures for the identification and characterization of key regulatory molecules, determine the significance of these molecules in vitro and in vivo, and then develop improved methods of stem cell propagation and manipulation. An evolving interest of the group is the study of reprogramming to a state of pluripotency via nuclear transfer and cell fusion.

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Yoshiki Sasai



RIKEN Center for Developmental Biology

Dr. Yoshiki Sasai is the Group Director heading the Laboratory for Organogenesis and Neurogenesis at the Center for Developmental Biology at RIKEN. As a post doctoral fellow at UCLA, he gained world-wide attention by isolating the neural inducer, Chordin. He later went on to show that the BMP vs. Chordin antagonistic signals for neural differentiation were conserved between vertebrates and arthropods. More recently, Dr. Sasai ' s lab made headlines again by establishing an efficient system to induce neural differentiation in ES cells (known as the SDIA method). The result of this study gave hope to millions of Parkinson ' s sufferers when his laboratory used the SDIA method to produce dopaminergic neurons at an unprecedented speed and purity level. Dr. Sasai ' s current interest at the CDB is to understand how cells as simple as those found in uncommitted ectoderm, can generate the complex pattern found in the vertebrate CNS. By using Xenopus, chick, mouse and ES cells, he attempts to nail down in molecular terms, the “ positional information ” that patterns early CNS and PNS

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Takayuki Asahara



Boston's St. Elizabeth's Medical Center

Dr. Takayuki Asahara is a cardiologist from St. Elizabeth's Medical Center in Boston. Highly acclaimed in the field of Stem Cell Biology, Dr. Asahara was the first researcher to identify bone marrow-derived endothelial progenitor cells (EPCs), and their involvement in neovascularization. His lab has studied the therapeutic application of these EPCs, through cell transplantation and gene therapy. In these studies, the potent regenerative properties of isolated EPCs were indicated following their transplantation into myocardial infarctions or hindlimb ischemias in animal models. Gene therapy of EPCs further enhanced these therapeutic effects on neovascularization. Dr. Asahara's lab is currently investigating the isolation and characterization of post-natal pluripotent stem cells. The goal of which would be therapeutic application of these stem cells for vascular development in cardiovascular diseases. Through his stem cell research, Dr. Asahara is leading the fight against one of the most devastating diseases of our time.

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