

Report from the Physiome working group

Reporters:

Fumihiko Kajiya (Chairman)

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It is our pleasure to provide this status report on our working group and its activities.

The most pressing demand from this working group is to contribute to the international physiome project which is aiming at to develop, collect, preserve, and disseminate information and integrated understandings of functional biological systems. We have committed to provide an overall structure of the physiome project by emphasizing the role of medical and biological engineering (MBE) as shown in Fig 1. That is by creating the modules ranging from molecular module to system module as the platform in the virtual-human domain, researchers on medical engineering and informatics will be able to contribute to built up reasonable hypothesis which can be effective for the comprehensive functional integrations (horizontal and vertical) and understanding of the human biological systems.

To further establish and promote the concept of the physiome project derived on the basis of MBE, we continued to have effective communication with many of the organizations, especially the committee of International Union of Physiological Sciences (IUPS). Followings are the selected list of the physiome-related conferences, which we have actively participated, organized by the member societies of IFMBE, IUPS, etc.

Past Physiome-related Conferences:

Oxford-Kobe Seminars in Biomedical Science

International Seminar on In Silico Techniques in Pharmaceutical Research and Development, 23-24th April 2001, Kobe Japan

Invited speakers and organizers include

Thomas Colatsky, Physiome Sciences, USA

Kenichi Harumi, Vice-President, Japan Heart Foundation, Japan
Keitaro Hashimoto, Pharmacology, Yamanashi Medical College, Japan
Warren Hedley, Engineering, University of Auckland, New Zealand
Masayasu Hiraoka, Cardiology, Tokyo Medical & Dental University, Japan
Peter Hunter, Engineering, University of Auckland, New Zealand
Fumihiko Kajiya (IFMBE), Bioengineering, Okayama University, Japan
Scott Kahn, Pharmacopeia, USA
Junko Kimura, Pharmacology, Fukushima Medical College, Japan
Jeremy Levin, Biotechnology, USA
Philip Maini, Mathematics, University of Oxford, UK
Denis Noble, Physiology, University of Oxford, UK
Akinori Noma, Physiology, Kyoto University, Japan
Thomas Paterson, Entelos, USA
Shunsuke Sato (IFMBE), Bioengineering, Osaka University, Japan
Masaru Tomita, Bioinformatics, Keio University, Japan
Russell Wada, Pharsight, USA
Walt Woltoz, Simulations-Plus, USA

Topics include: From Genome to Function; The Physiome Project; The Virtual Human Project; The e-cell project; modelling the heart; modelling respiration; modelling the immune system; modelling pathways and signalling; modelling absorption; modelling Clinical Trials; In Silico Cell, Modelling languages (CellML, SystemsML, AnatML etc); Future trends in drug development and testing.

IUPS International Congress 2001, Christchurch, New Zealand, August 26-31, 2001

Synthesium: Computational Integrative Physiology

Moderator: P. Hunter

Presentations:

Introduction: P. Hunter

The IUPS Physiome Project: Progress and Plans

A. S. Popel

Computational modelling of microcirculatory blood flow and molecular transport

J. B. Bassingthwaight

The Physiome project. Why now? And how?

R. D. Kamm

Multi-scale modelling as a bridge between organ function and cellular or sub-cellular phenomena

Other: Spaan J (IFMBE), Kajiya F (IFMBE), etc.

IUPS Satellite Conference: Integrated Biology of the Heart, Queenstown, New Zealand, August 19-22, 2001

International Physiome Symposium, Korea, October 31, 2002

Yung E Earm, Department of Physiology and Biophysics, Seoul National University

Physiome Research in Korea

Denis Noble, Laboratory of Physiology, Oxford University

From Genes to Function: How to Read the Book of Life

Masaru Tomita, Institute for Advanced Biosciences, Keio University

E-CELL: Computer Simulation of the Cell

Akinori Noma, Department of Physiology, Kyoto University

Cardiac Cell Modeling for Excitation, Contraction and Energy Metabolism, Kyoto Model

Fumihiko Kajiya (IFMBE), Department of Cardiovascular Physiology, Okayama University

Physiomic Approach to Coronary Circulation

Peter Hunter, Bioengineering Institute, University of Auckland

The IUPS Physiome Project - Standards, Models and Tools for Integrating from Proteins to Organ Function

Peter Morrissey, IBM

IBM Medical Informatics

Kyoung Tai No, Bioinformatics and Molecular Design Research Center

In Silico PBPK Model Development in BMDTIC

The 42nd Annual Conference of Japanese Society for Medical and Biological Engineering

Integrative recognition of biological systems June 3, 2003

Toshihisa TAKAGI, University of Tokyo

Extracting and representing knowledge of biological functions

Masaki SASAI, Nagoya University

Protein dynamics: from structure to function and to cell

Masaru TOMITA, Keio University

Cell simulation and systems biology

Akinori NOMA, Kyoto University

Comprehensive cardiac cell model (Kyoto Model)

Shigeru KURATANI, RIKEN

Evolution of the gnathostome jaw and turtle carapace viewed as changes in developmental patterning program

Hiroshi TANAKA, Tokyo Medical and Dental University

Life as evolving network: towards the establishment of evolutionary signalomics

Given these physiome-related meetings, we continue to feel generally positive about the aim and activities of the working group. Thus, we will further promote our concept and possible contribution to the international and domestic activities on physiome project through the upcoming physiome-related conferences. We would like to encourage the professional membership to even greater commitment in the leadership of the multidisciplinary movement. Participation in the activities of the physiome-related meetings will be a very meaningful experience.

Upcoming Physiome-Related Conferences:

World Congress on Medical Physics and Biomedical Engineering, August 24-29, 2003

Physiome Modelling, Simulation and Visualisation

Chairs: Fumihiko Kajiya; Katsuhika Tsujioka

C Guiot; PG Degiorgis; PP Delsanto; TS Deisboeck, University Of Torino

Tumor Growth Dynamics: A General Model Accounting For Intrinsic And Environmental Factors

A Cuellar; M Halstead; P Nielsen; M Dunstan; D Bullivant; P Hunter, The University Of Auckland

The Use of Ontologies in CellML to Describe Cellular Models

F Kajiya; S Sato, Okayama University Graduate School of Medicine and Dentistry

Promotion of Physiome by MBE in Japan

S Lal; A Craig, University Of Technology Sydney

Description and Assessment of Algorithm for Detecting Fatigue Levels from the EEG of Drivers

M Terasawa; H Fujiwara; A Sugahara; T Nakahara; Y Itokawa, Tamagawa University

The Relationship of Hyper oxidized Brain Lipid and Lactic Acid to Ion Circumstances

K Tsujioka; H Asahara; T Miyasaka; K Hashimoto; N Himi, Kawasaki Medical School

Production of Nitric Oxide and Enos Expression Decrease at Curvature of Renal Artery -

Physiomic Approach to Atherogenesis

David Goode; R Hidajat; R Hidayat; J McLay, Christchurch Hospital

A Fast and Accurate System for Reporting the FM 100-Hue Colour Vision Test

M S Imtiaz; D van Helden, The University Of Newcastle

Distributed Pacemaking Through Coupled Oscillator-Based Mechanisms: A Basis For

Long-Range Signaling In Smooth Muscle

M Goto; F Kajiya, Kawasaki Medical School

Basis for the Physiomic Approach to the Endothelial Functions - Report from

Endothelome Conference in Japan -

P Richardson; A Forsberg; JA Sobel; DH Laidlaw; DF Keefe; I Pivkin; GE Karniadakis,

Brown University

Arterial Motions and Flows Seen in Virtual Reality

N Tsafnat; S Jones, University Of New South Wales

Numerical Simulation of Ferromagnetic Embolisation Hyperthermia for Treatment of

Liver Cancer

T Yamamoto; Y Ono; T Kinukawa; S Yamada; S Hirabayashi; R Hattori; S Ohshima; M

Goto; F Kajiya, Nagoya University School Of Medicine

Direct In Vivo Visualization of Human Renal Microcirculation using Noninvasive

Detection for Capillary Blood Flow by Intravital Videomicroscopy: Vascular Structure

and Renal Blood Flow

35th Congress of the International Union of Physiological Sciences (IUPS) in San Diego, CA., March 31 - April 5, 2005.

In closing, we encourage the members of IFMBE to join us in supporting our leadership

in advancing the mission and goals of the physiome working group and international movement of physiome.