

# PRESTO

Precursory Research for Embryonic Science and Technology

**2009**



**Japan Science and Technology Agency**

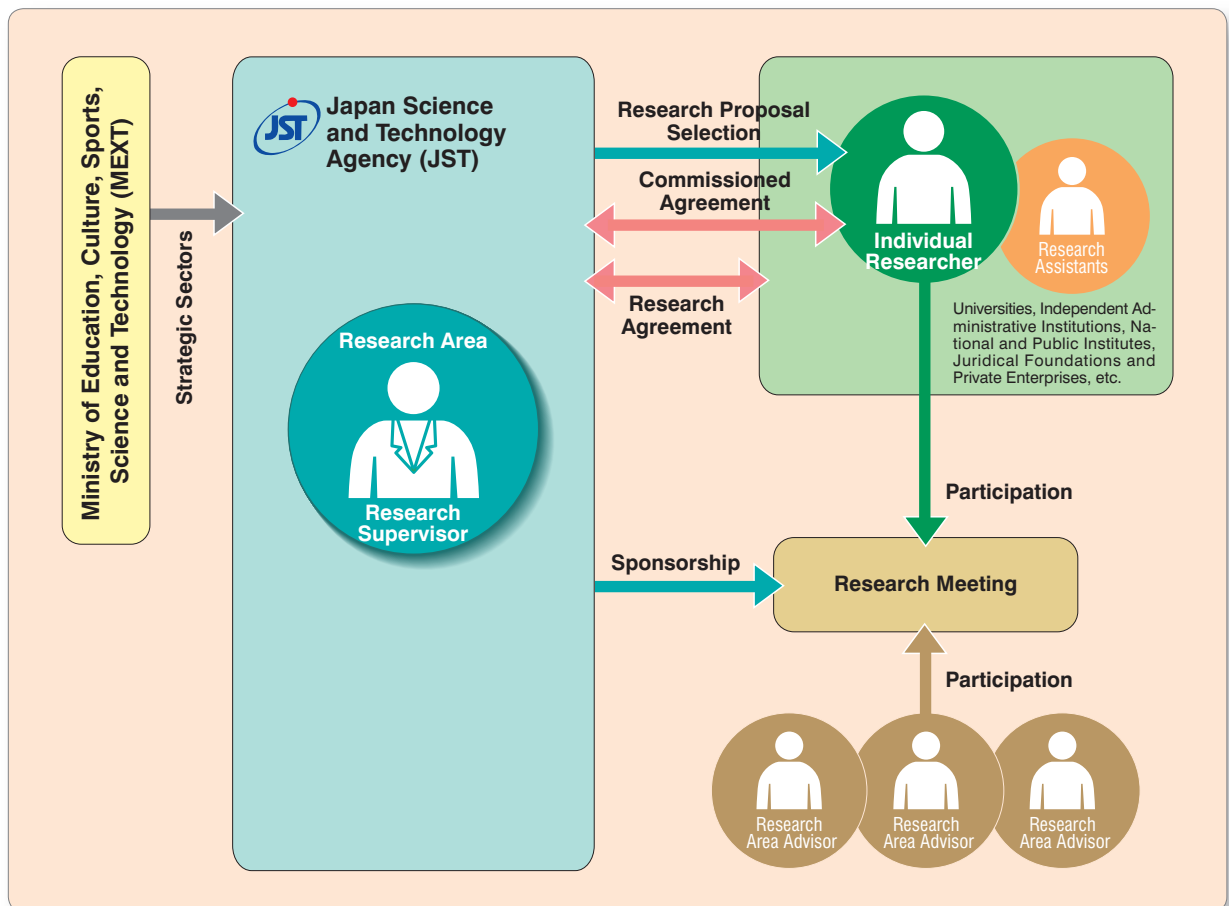
<http://www.jst.go.jp/EN/>

[http://www.jst.go.jp/kisoken/presto/index\\_e.html](http://www.jst.go.jp/kisoken/presto/index_e.html)

# What is PRESTO?

## Concept

PRESTO (Precursory Research for Embryonic Science and Technology) is a program to support research projects conducted by individual researchers, intended for fostering promising ideas for future innovation that fit the Strategic Sectors. The three- to five-year projects, managed by Research Supervisors and assisted by Research Area Advisors, provide participants with opportunities of contact with colleagues who share the research interest through research meetings held twice a year. Also known as “Sakigake Bokujo” or ranch of pioneers, the program has given birth to a number of human networks for innovation.



**Research Supervisor:** A person who acts as the representative and key manager of a research area.

**Research Area Advisor:** A person who offers advice for the promotion of research in a given.

**Individual Researcher:** A researcher who takes part in the PRESTO program.

**Research Assistant:** A person who performs auxiliary jobs to help the individual researcher, such as the setup of experiments or data recording and organization.

### ■ Research Area

JST establishes research areas that are to be promoted under the Strategic Sectors.

### ■ Research Meeting

JST holds closed meetings conducted by the Research Supervisors twice a year to discuss the research plan, to report progress or to promote communication among researchers in the research area.

## Outline

### ■ Research Period

The research period is up to 3 years or 5 years\*.  
\*Research Areas launched from FY2008 onwards

### ■ Research Expenditures

Generally, research expenditures per research theme are approximately between 30 million and 40 million yen for 3-year themes, and between 50 million and 100 million yen for 5-year themes.

### ■ Participation

Researchers selected for this program will belong to JST as full-time, part-time or temporarily transferred researchers.

1. Envisioned full-time researchers
  - Postdoctoral fellows
  - Researchers who are retiring from their current institution.
2. Envisioned part-time researchers
  - Researchers who belong to universities
  - Researchers who belong to independent administrative institutions
  - Researchers who belong to national and public institutes
  - Researchers who belong to research institutions which are juridical foundations.
3. Temporarily transferred researchers
  - Researchers who belong to private enterprises
  - Researchers who belong to research institutions

of special corporation

### ■ Research Site

In principle, researchers should use the existing research site. By concluding research agreements, researchers can conduct research at the institution they belong to which.

### ■ Research Agreement

JST concludes commissioned or joint research agreement with the research institution where the researcher conducts the research.

### ■ Intellectual Property Rights

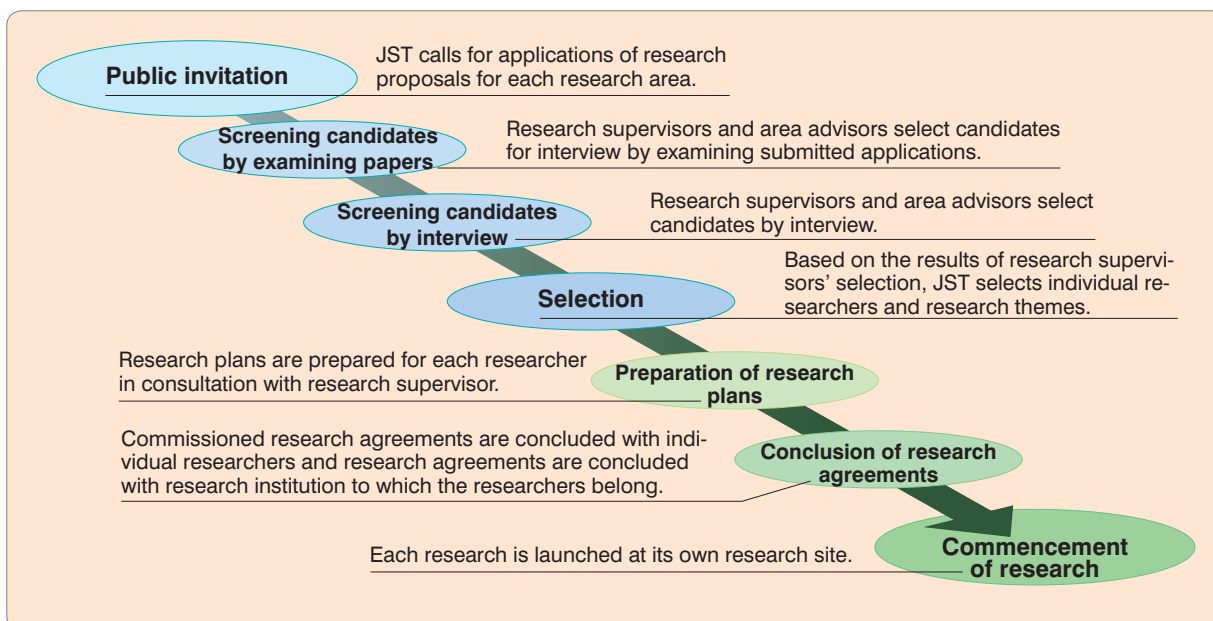
Intellectual property rights arising from research based on commissioned research agreements basically belong to the research institutes.

### ■ Research Results and Evaluation

Researchers are actively encouraged to present research results both inside and outside Japan. When the research period ends, researchers should report the research results in a symposium which is open to the public. When the research is complete, a post-evaluation is made and, when needs arise, a follow-up evaluation is conducted. The results of, and evaluations on, the research projects will be made public.

## From Public Invitation of Research Proposals to Commencement of Research

Detailed information about how to make research proposals can be found at the relevant submission-related pages on our website. The webpage addresses, together with a general overview and information about application acceptance periods, are available at <http://www.jst.go.jp/> and are also published in newspaper announcements and included in our magazine mailings.



# Introduction of Research Area

## On-going Research

24 Research Areas, 454 Research Themes (As of July 2009)

First Year	Research Area	Research Supervisor
FY 2009	Information Environment and Humans	<b>Toru Ishida</b> (Professor, Kyoto University)
	Photoenergy Conversion Systems and Materials for the Next Generation Solar Cells	<b>Shuzi Hayase</b> (Professor, Kyushu Institute of Technology)
	Light Energy and Chemical Conversion	<b>Haruo Inoue</b> (Executive Director of the International Center, Tokyo Metropolitan University)
	Formation of and Information Processing by Neural Networks, and Control	<b>Fujio Murakami</b> (Dean, Osaka University)
	Epigenetic Control and Biological Functions	<b>Tsunehiro Mukai</b> (Trustee / Vice-President, Saga University)
FY 2008	Understanding Life by iPS Cells Technology	<b>Shin-ichi Nishikawa</b> (Deputy Director, Center for Developmental Biology, RIKEN)
	Innovative Use of Light and Materials/Life	<b>Hiroshi Masuhara</b> (Guest Professor, Nara Institute of Science and Technology)
	Nanosystem and Function Emergence	<b>Yoshihito Osada</b> (Deputy Director, Advanced Science Institute, RIKEN )
	Decoding and Controlling Brain Information	<b>Mitsuo Kawato</b> (Director, ATR Fellow, ATR Computational Neuroscience Laboratories)
	Synthesis of Knowledge for Information Oriented Society	<b>Hideyuki Nakashima</b> (President, Future University-Hakodate)
FY 2007	Materials and Processes for Innovative Next-generation Devices	<b>Katsuaki Sato</b> (Emeritus Professor, Tokyo University of Agriculture and Technology)
	Innovative Model of Biological Processes and its Development	<b>Nanako Shigesada</b> (Professor, Doshisha University)
	Alliance for Breakthrough between Mathematics and Sciences (ABMS)	<b>Yasumasa Nishiura</b> (Professor, Hokkaido University)
FY 2006	RNA and Biofunctions	<b>Akio Nomoto</b> (Professor, the University of Tokyo)
	Structures and Control of Interfaces	<b>Maki Kawai</b> (Professor, the University of Tokyo)
	Search for Nanomanufacturing Technology and its Development	<b>Naoki Yokoyama</b> (Fellow and General Manager, Fujitsu Laboratories Ltd.)
	Photons on Soft Materials	<b>Tetsuo Tsutsui</b> (Professor Emeritus, Kyushu University)
	The Dynamic Mechanism of and Fundamental Technology for Biological System	<b>Shigetada Nakanishi</b> (Director, Osaka Bioscience Institute)
FY 2005	Metabolism and Cellular Function	<b>Masahiro Nishijima</b> (Director General, The National Institute of Health Sciences)
	Evolution of Light Generation and Manipulation	<b>Hiromasa Ito</b> (Director, Japan Science and Technology Agency Innovation Plaza Miyagi)
	Structure Control and Function	<b>Yoshio Okamoto</b> (Distinguished Invited University Professor, Nagoya University)
	Life Phenomena and Measurement Analysis	<b>Isao Morishima</b> (Visiting Professor, Ritsumeikan University)
FY 2004	Structure Function and Measurement Analysis	<b>Shigeru Terabe</b> (Professor Emeritus, University of Hyogo Prefecture)
	Foundational Technologies to Support Creation of Digital Media Content	<b>Hiroshi Harashima</b> (Professor Emeritus, The University of Tokyo)

Themes	Strategic Sector	Call for Proposals	Page
-	Creation of Basic Technology that Enables an Information Environment that is in Harmony with People	Applicable	P. 4
-	Creation of natural light energy conversion material and utilization basic technology through the fusion of different fields		P. 4
-			P. 4
-	Clarification of the Control Mechanisms of Neural Circuit Operation and its Formation	Applicable	P. 5
-	Creation of innovative basic medical technologies by stem cell manufacturing and control based on cell reprogramming		P. 5
10			
11	Enhancing advanced materials science and life science toward innovations using new light sources, including state-of-the-art laser technology	Applicable	P. 6
10	Creation of next-generation nanosystems through process integration		P. 6
11	Creation of innovative fundamental technologies for utilizing information related to action and judgment in the brain		P. 6
10	Creation of fundamental technology for the generation and utilization of "knowledge" from diverse and large-scale information.		P. 7
21	Exploitation of materials and nanoproceses for the realization of novel electronic devices with novel concepts, novel functions and novel structures		P. 7
21	Elucidation of the Dynamic Mechanism of Biological System and Establishment of Fundamental Technology	Complete	P. 7
20	Search for Breakthrough by Mathematical / Mathematical Sciences Researches toward the Resolution of Issues with High Social Needs (Focusing on Collaboration with Wide Research Fields in Science and Technology)		P. 8
29	Establishment of technology to utilize RNA molecules (RNA technology) that contributes to medical applications	Complete	P. 8
34	Creation and application of innovative nano-interface technology that achieves high performance from materials and substances in different state		P. 8
29	Development of technologies for highly-efficient manufacturing of nanodevices and nanomaterials, and innovation in manufacturing technology based on nanoscale science		P. 9
28	Ultimate and local control of photon and applications		P. 9
38	Elucidation of the Dynamic Mechanism of Biological System and Establishment of Fundamental Technology		P. 9
33	Establishment of basic technologies for controlling of cell functions based on metabolomic analysis	Complete	P. 10
24	Ultimate and local control of photon and applications		P. 10
37	Programmed build-up of nano-structures and search for their functions		P. 10
32	Creation of basic technology for the realization of leading edge measuring and analytical equipment through development of new technique, etc.		P. 11
40	Creation of basic technology for the realization of leading edge measuring and analytical equipment through development of new technique, etc.	Complete	P. 11
16	Creation of advanced science and technology that support the raising the level of the creation of media art		P. 11

# Information Environment and Humans



Research Supervisor

**Toru Ishida**

Professor, Kyoto University

**2009 – 2016**

<http://www/human.jst.go.jp>

## ■ Outline of Research Area

The goal of the research area is to conduct advanced research on intelligent functions where interaction with people is essential, to provide those functions in the form of sharable services embedded in the information environment, and to further form the composite functions based on provided services through networking with other services created both inside and outside of the research areas.

More specifically, the research area includes ubiquitous computing, ambient intelligence, intelligent robots, advanced research on intelligent functions to support communication and group activities; evaluation research on intelligent functions for users such as usability testing, ethnography, and statistical analysis; and further networking research on intelligent functions using services computing to provide research results to society.

# Photoenergy Conversion Systems and Materials for the Next Generation solar cells



Research Supervisor

**Shuzi Hayase**

Professor, Kyushu Institute of Technology

**2009 – 2016**

<http://www/solar.jst.go.jp>

## ■ Outline of Research Area

This research area will lead to proposals for next generation solar cells. The aim is to build new basic technology for the future practical use of solar cells by promoting the fusion of different areas through the participation of researchers from a wide range of areas, such as chemistry, physics, and electrical engineering.

Specifically, it targets dye-sensitized, organic thin film, and quantum dot type high performance solar cell research, and research on silicon and compound solar cells with approaches that differ from the conventional. At the same time, basic research, such as surface control technology, membrane and crystal growth, development of new materials, new processes, and new device structures that lead to creation of solar cells based on completely new principles, is also included. With an emphasis on the creation of next generation solar cells, a wide range of research from theoretical studies to process research for practical use is included in this research area.

# Light Energy and Chemical Conversion



Research Supervisor

**Haruo Inoue**

Executive Director of the International Center, Tokyo Metropolitan University

**2009 – 2016**

<http://www/chem-conv.jst.go.jp>

## ■ Outline of Research Area

The present research area involves innovative and challenging investigations which aim to realize the highly efficient conversion, storage and utilization of light energy into useful and clean chemical energy by harnessing solar light as the ideal energy resource for mankind.

Specifically, this research includes investigations in light-induced hydrogen evolution using semiconductor catalysts and/or metal complexes, the photoreduction of carbon dioxide, highly efficient light harvesting electron transfer charge separation and electron relay systems, design and control of photochemical reaction environments, redox systems involving water molecules, photoelectric conversion incorporating advanced nanotechnologies, technical application of plants, algae, and bacteria with high photosynthetic properties, photo-assisted energy production from biomass, and the elucidation of the mechanisms involved in photosynthesis.

From such diverse fields as photochemistry, organic chemistry, materials science, nanotechnology and biotechnology, this research project explores the development of future energy systems through innovative technologies based on new and original approaches and concepts.

# Formation of and Information Processing by Neural Networks, and Control



Research Supervisor

**Fujio Murakami**

Dean, Osaka University

**2009 – 2016**

<http://www/neuronet.jst.go.jp>

## ■ Outline of Research Area

This research area will include research aimed at comprehensive understanding of how brain works via elucidation of the principles of the formation and functions of neural networks, as well as the control mechanism from a novel viewpoint.

Specifically, this area includes research on the formation of neuronal networks, nuclei and layer structures that constitute the functional units of the brain; regionalization/arealization of the brain and specification of neurons; information processing by a single neuron; communication between neurons and synaptic plasticity; development and plasticity of neural network functions; the principles of information processing by complex network assemblies; and controls mechanisms. This area also includes research on the role of glial cells and other non-neuronal cells as well as the mechanism of maintenance of the number of neurons. The area includes creation of innovative platform technology that contributes to dramatic progress in the elucidation of the formation of neural networks and the principle of information processing.

# Epigenetic Control and Biological Functions



Research Supervisor

**Tsunehiro Mukai**

Trustee / Vice-President, Saga University

**2009 – 2016**

<http://www/epigenetics.jst.go.jp>

## ■ Outline of Research Area

This area includes research to elucidate epigenetic control and biological functions. More specifically, this includes elucidation of the mechanism of epigenetic control, investigation of the association of a variety of biological phenomena and epigenetics, and analysis of the diversity of epigenetics and diseases associated with abnormalities of epigenetics. In the research, the molecular basis of epigenetics as a biological function will be elucidated to create fundamental technologies for advanced medicine through generation and regulation of stem cells, based on cellular reprogramming

Specific research projects may include (1) multilateral investigation and elucidation of the mechanism of epigenetic control in a variety of model organisms, including animals and plants; (2) investigation of individual variability and diversity of epigenetics and analysis of diseases caused by epigenetic abnormalities; and (3) development of technology for analysis and control of epigenetics.

# Understanding Life by iPS Cells Technology



Research Supervisor

**Shin-ichi Nishikawa**

Deputy Director, Center for Developmental Biology, RIKEN

**2008 – 2015**

<http://www.ips-s.jst.go.jp/>

## ■ Outline of Research Area

This research area comprises several fields (including cellular reprogramming, transdifferentiation and stem cell biology) in which major breakthroughs are expected by use of the technology involved in establishing induced pluripotent stem (iPS) cells. Basic research using pioneering new approaches or having the potential for clinical medicine will be also involved.

Specifically included are 1) advancing and simplifying reprogramming technologies based on the molecular biological mechanisms of reprogramming, 2) analysis and artificial regulation of stem cell transdifferentiation processes, 3) elucidation of the molecular mechanisms underlying generation of iPS cells, 4) elucidation of pathogenesis of various diseases through the effective use of iPS cells, and 5) development of human disease models.

# Innovative Use of Light and Materials/Life



Research Supervisor

**Hiroshi Masuhara**

Guest Professor, Nara Institute of Science and Technology

**2008 – 2015**

<http://www.raisha.jst.go.jp/>

## ■ Outline of Research Area

The objective of this research area is to deepen studies and to create the seeds of the innovative technology by exploring light-related phenomena from the viewpoint of new light source in areas such as information/communication, nanotechnology/materials, life science, and environment/energy.

Specifically, this research area focuses on the studies for understanding the nature of light, making maximum use of light, synthesizing/characterizing/functionalizing molecular materials only with light, and processing/controlling chemical and biological production with light, which will be performed by applying various lasers with high power, ultrashort pulse width, and/or super long wavelength, synchrotron orbital radiation, extremely weak light, and single photon light source. Cellular function closely related with light, biological tissue structure revealed with light, and biological activity controlled only by light are important topics, while photonic measurement and dynamic imaging of substances and organism are included.

# Nanosystem and Function Emergence



Research Supervisor

**Yoshihito Osada**

Deputy Director, Advanced Science Institute, RIKEN

**2008 – 2015**

<http://www.emergence.jst.go.jp/>

## ■ Outline of Research Area

This research area focuses on challenging studies that aim at development of systems that will enable evolution of higher functions and serve as a key to the realization of next-generation nanosystems by promoting fusion of top-down and bottom-up approaches based on unique ideas. Specifically, this research area includes a wide range of studies to exploit operational and architectural principles of nanosystems that evolve higher functions autonomously, and to explore and expand elemental technologies including molecular self-organization systemic materials, adaptive three-dimensional nanoprocessing techniques, sensing/energy/motor function nanodevices, nano-assembly techniques, and nanosystem control techniques that will lead to the realization of such principles based on the every deepening nanoscience in interdisciplinary areas such as molecular science and biotechnology, nonlinear/nonequilibrium science, micro-electro-mechanical systems (MEMS), nano-electro-mechanical systems (NEMS), microfabrication, electronics, medical engineering, and intelligent information engineering.

# Decoding and Controlling Brain Information



Research Supervisor

**Mitsuo Kawato**

Director, ATR Fellow, ATR Computational Neuroscience Laboratories

**2008 – 2015**

<http://www.bmi.jst.go.jp/>

## ■ Outline of Research Area

This research area aims to create innovative technologies to exploit the brain information for motor control and decision-making. This subject covers areas of exploratory research and the development of technologies that is expected to greatly contribute to society and to connect basic neuroscience research and its newly emerging applied areas.

The main objective is to decode and control brain information from signals recorded from the brain so that extracted information is applied to areas such as brain machine interface (BMI), neurorehabilitation, neuromarketing, neuroeconomics, neurogenomics, and neuroethics.

From this perspective, this area includes various research approaches such as computational and experimental neurosciences, engineering, clinical medicine, biology, social sciences including economics, humanity sciences including psychology, as well as information science, which correspond with the expansion of brain science and its applied areas.

# Synthesis of Knowledge for Information Oriented Society



Research Supervisor

**Hideyuki Nakashima**

President, Future University-  
Hakodate

**2008 – 2015**

<http://www.info.jst.go.jp/>

## ■ Outline of Research Area

This Research Area shall aim to develop fundamental technology for the generation of societally effective “knowledge” (useful information) from diverse and/or large-scale data. Specific examples of research targets in this Area include: innovative technologies for the processing of large-scale data, technologies for analysis and modeling based on statistical and mathematical frameworks, technologies for extracting knowledge by structuralizing and analyzing diverse real-life data, and technologies for creating new knowledge from multiple resources (e.g. information acquisition through sensors and/or simulation results). In addition to these fundamental technologies, the Area includes research such as simulation and data visualization that support application of the obtained knowledge to real life; and that support the workings of the new information society.

# Materials and Processes for Innovative Next-generation Devices



Research Supervisor

**Katsuaki Sato**

Emeritus Professor, Tokyo  
University of Agriculture and  
Technology

**2007 – 2012**

<http://www.mat-bcmos.jst.go.jp/>

## ■ Outline of Research Area

This Research Area is intended to create innovative next-generation devices with concepts beyond conventional silicon technology represented by CMOS, and is inviting challenging research proposals to develop novel materials and processes which enable realization of high-speed, large capacity, and highly advanced processing, storage, and transfer of information, with particular consideration to environment, resources, and energy consumption problems. For example, as well as high-mobility wide-gap semiconductors, spintronics materials, strongly correlated materials including high temperature superconductors, quantum dots, nanocarbons, and organics, challenging and creative proposals on materials, structures and processes that have perspective to future device application will be included.

# Innovative Model of Biological Processes and its Development



Research Supervisor

**Nanako Shigesada**

Professor, Doshisha University

**2007 – 2012**

<http://www.model.jst.go.jp/>

## ■ Outline of Research Area

This Research Area supports research projects that aim at establishment of a novel model which can promote the understanding of mechanisms underlying diverse biological processes. The model is expected either to have a high predictive power or to be likely to gain such an ability in near future, which eventually contributes to medical treatment, epidemic control, environmental preservation.

More specifically, this Research Area invites innovative and fundamental studies to construct and analyze a model that promotes conceptual, integrative and mathematical understanding. The models can cover diverse aspects of life systems that function in a manner adaptive in their environment.

Examples of these aspects include gene expression, cell functioning, development and morphogenesis, immunity, brain, formation of biological societies, ecosystem functioning; as well as disfunctioning, such as aging and illness. The outcome of the research should help us to solve diverse pressing issues faced by human being.

# Alliance for Breakthrough between Mathematics and Sciences (ABMS)



Research Supervisor

**Yasumasa Nishiura**

Professor, Hokkaido University

**2007 – 2012**

<http://www.math.jst.go.jp/>

## ■ Outline of Research Area

This research area is set up to promote such a research activity by mathematicians that is motivated by social needs, conducted in cooperation with scientists in non-mathematical fields, and is expected to make a scientific breakthrough. It may be viewed as attempting to integrate the rationalism of Descartes and the empiricism of Bacon in the 21st century.

The grant program will cover studies of the mathematical problems in diverse fields of science: materials science, life science, environmental science, information science, telecommunication science, financial engineering, etc. Research activities in other fields will also be within the scope of the program if those activities propose new research problems arising from social needs, and explore mathematical approaches to them.

Priority will be given to such a research activity that develops new mathematical ideas through the study of natural or social phenomena in a field of science while applying existing mathematical methods to that study. The program therefore emphasizes research activity which contributes to the integration of mathematical and experimental sciences.

# RNA and Biofunctions



Research Supervisor

**Akio Nomoto**

Professor, the University of Tokyo

**2006 – 2011**

<http://www.rna.jst.go.jp/>

## ■ Outline of Research Area

This Research Area seeks to discover the various functions of RNA molecules to better understand the basic principles of RNA's life-support mechanism and to develop innovative technological seeds based on creative ideas of individuals for medical applications of RNA molecules.

More specifically, this Area is designated for studies to seek new RNA functions to support and control life phenomena and studies that are intended to use known RNA functions. The latter includes technologies to improve the design and functions of functional RNA, to control cellular functions using functional RNA, to detect specific RNA at the single-molecule level, and other technologies such as drug delivery systems to deliver RNA to target tissues and cells. The studies that are solicited in this Area are those that are likely to engender the development of new technologies to apply functional RNA molecules to advanced medical technologies and other fields.

# Structures and Control of Interfaces



Research Supervisor

**Maki Kawai**

Professor, the University of Tokyo

**2006 – 2011**

<http://www.interface.jst.go.jp/>

## ■ Outline of Research Area

This Research Area fosters studies that are aimed at the creation and application of new nano-interface functions and control technology, with an emphasis on bonding interfaces of heterogeneous materials and substances.

More specifically, observation of interfaces at the nanoscale level, development of analytical techniques, knowledge accumulation through such observation and analysis, and technology for nanostructure control in state-of-the-art molecular engineering, interface engineering, thin film engineering, chemistry for precision material creation, nanomechanics, precise molecular manipulation, surface reaction dynamics, micromachining and other fields are essential for controlling the structures and functions at interfaces between different material systems and for creating functions with high added value. Studies that are anticipated in this Area are those based on ideas from such a broad range of perspectives.

Moreover, studies that use biological materials such as cells and tissues as part of devices are in the field of pioneering research at present. Fundamental research in this field, based on original ideas at the individual level, will also be a subject that is addressed in this Area.

# Search for Nanomanufacturing Technology and its Development



Research Supervisor

**Naoki Yokoyama**

Fellow and General Manager,  
Fujitsu Laboratories Ltd.

**2006 – 2011**

<http://www.nanofab.jst.go.jp/>

## ■ Outline of Research Area

The objective of this Research Area is to provide the infrastructure for “nanomanufacturing technology” that will be essential at the time of full-scale application of nanotechnology. The studies subject to this Area are those that are creative and which are aimed at using nanoscale science to identify various phenomena related to technologies for highly efficient manufacturing of nanodevices and nanomaterials.

More specifically, the studies will facilitate improved manufacturing efficiency and reduced environmental burdens based on nanoscale science by means of, for example, technologies for nanostructure design and creation, higher reproducibility and large-scale production of nanomaterials and integration of different nano-processing technologies. Such studies include those that are creative and will contribute to the creation of methodologies and innovative technological development based on new nanoscale science.

# Photons on Soft Materials



Research Supervisor

**Tetsuo Tsutsui**

Professor Emeritus, Kyushu  
University

**2006 – 2011**

<http://www.photon.jst.go.jp/>

## ■ Outline of Research Area

This Research Area is designated for studies that look into the action of photons on condensed matter, composed of organic, inorganic, biological, and their combinations (solids, thin films, molecular assemblies, liquid crystals, gels, etc.) from new and multiple view angles with the focus points of “extracting out photonic functions from materials”, “elucidating the nature of materials using photons” and “creating functional materials using photons”.

More specifically, studies subject to this Area are those of chemistry and physics that relate to various interactions between the electronic states that are specific to materials and photons. The Area also includes studies for: creating photonic and electronic functional materials that lead to innovative future photonics and electronics technologies; exploring the principles of and establishing basic technology for photonic and electronic devices; pioneering technologies to utilize biological materials; synthesizing ultra-pure materials and measurement of their physical properties; and pursuing stability and reliability of materials in their practical usage for the purpose of device application.

# The Dynamic Mechanism of and Fundamental Technology for Biological System



Research Supervisor

**Shigetada Nakanishi**

Director, Osaka Bioscience  
Institute

**2006 – 2011**

<http://www.sysbio.jst.go.jp/>

## ■ Outline of Research Area

The research covered by the present research area will aim to 1) find out the dynamic mechanism of biological system, 2) establish the fundamental technology for analysis from a novel perspective, 3) integrally analyze the interactive relationship and the integrative mechanisms of various functional molecules present in organisms, and 4) understand the expression of dynamic biological information.

More specifically, it will cover those research which aims to understand the biological system as a whole by analyzing from a new stand point, the expression mechanism of information network at intracellular, intercellular and organism levels on the basis of understandings obtained from recent studies of genetic information and functional molecular assembly. Such research should look at the dynamic non-linear reaction characteristic of biological system.

Furthermore, it will also include those research which aims to create a simulation model for expression of biological information or those which aims to create fundamental technology such as a novel analytical method, though those which combines the experimental analysis of biological system will be preferred.

# Metabolism and Cellular Function



Research Supervisor

**Masahiro Nishijima**

Director General, The National  
Institute of Health Sciences

**2005 – 2010**

<http://www.metabolism.jst.go.jp/>

## ■ Outline of Research Area

The research area is aimed at the creation of innovative technological seeds based on creative ideas of individual researchers to analyze cellular metabolites and to control cellular functions efficiently.

Specifically, it targets the research expected to the creation of new methodologies and technological developments about systematic or comprehensive analyses of such metabolite groups as lipids, carbohydrates, amino acids, nucleic acids, etc., evaluation and classification of cellular conditions based on metabolite information, modeling and simulation of metabolic pathways in cells, prediction and design of compounds that control metabolic pathways, and preparations of cells with newly conferred functions, and so on. These researches are wide range from each technological element to cell control.

# Evolution of Light Generation and Manipulation



Research Supervisor

**Hiromasa Ito**

Director, Japan Science and  
Technology Agency Innovation  
Plaza Miyagi

**2005 – 2010**

<http://www.light.jst.go.jp/>

## ■ Outline of Research Area

This research area covers researches of a nature never seen so far, based on unique ideas of individuals and looking into new paradigms which are expected to be brought about in the future, in relation to pursuit of new conceptions & methods regarding control of light and control of materials by light.

To be concrete, it covers researches which are researches regarding methods and techniques of generation, transmission and detection of not only infrared light, visible light, ultraviolet light but also light in a wide area, researches regarding local interaction between light and material, researches regarding control of atoms & molecules by light, understanding of essence of light such as wavelength or frequency of light, phase, energy density, etc. and expected to open a new horizon for discovery of new principles, creation of methodology and innovative technological development.

# Structure Control and Function



Research Supervisor

**Yoshio Okamoto**

Distinguished Invited University  
Professor, Nagoya University

**2005 – 2010**

<http://www.build-up.jst.go.jp/>

## ■ Outline of Research Area

This research area covers challenging studies aiming to build up a desired structure at a desired place at a desired timing by introducing hitherto unknown new techniques into scientific technologies that build nano-sized materials and structures on the basis of control at atomic and molecular levels.

For example, this research area includes the following studies and search for functions with the aim to find their applications: controls at atomic and molecular levels to create nano-sized substances, organizations, space, and the like to combine required molecular structures, spatial structures, template structures, device structures, and the like with phenomena occurring at various scales for designing and constructing a process.

# Life Phenomena and Measurement Analysis



Research Supervisor

**Isao Morishima**

Visiting Professor, Ritsumeikan University

**2005 – 2010**

<http://www.seimei.jst.go.jp/>

## ■ Outline of Research Area

The area of this research covers studies aiming to create seeds for innovative technologies based on creative ideas of living matter concerning techniques for measurements and analyses based on new principles and methods necessary for the elucidation of life phenomena.

More concretely, it covers new techniques for measurements and analyses of various chemical processes in cells and for the elucidation of life phenomena of cells, living matter, and ecological systems ranging from a micro-scale to a macro-scale. It covers studies expected to trigger the creation of new methodologies and technological development that aim to obtain unique results in life science technologies. It also includes environmental measurements associated with life phenomena.

# Structure Function and Measurement Analysis



Research Supervisor

**Shigeru Terabe**

Professor Emeritus, University of Hyogo Prefecture

**2004 – 2009**

<http://www.kozo.jst.go.jp/>

## ■ Outline of Research Area

We seek to engage the creative capability of individual researcher in the task of developing the beginnings of new measurement and analytic technologies essential to the discovery and elucidation of new phenomena.

More specifically, we are interested in developing new methods and technologies in relation to topics such as: analysis of the structure and function of biological matter; measurement of life-related phenomena; measurement and analysis, at the atomic and molecular levels, of physical and chemical physiochemical phenomena, physical attributes, and the structures and functions of surfaces and interfaces; and measurement and analysis of environments and ecosystems.

We are also interested in peripheral technologies that offer potential breakthroughs in measurement and analysis, for example in the areas of sample pretreatment, reagents, and software.

# Foundational Technologies to Support Creation of Digital Media Content



Research Supervisor

**Hiroshi Harashima**

Professor Emeritus, The University of Tokyo

**2004 – 2009**

<http://www.media.jst.go.jp/>

## ■ Outline of Research Area

Our goal is to create original representation methods, and the technologies to implement such methods, so as to support new and pertinent ways to produce content within the rapidly evolving, technology-driven culture of media arts.

In particular, we are working to support the advance of computer animation, game software, CG art, and network art through research into interface technologies, network technologies, and technologies for the representation, input, processing, editing, and display of high-quality (and multidimensional) imaging. We are also interested in technologies for producing virtual realities, and for producing composite realities that combine both real and virtual space, so as to convey full experiences that extend beyond just sight and sound. Other research topics include: new representational methods that take full advantage of the potential of digital media; representational methods appropriate to human sensibility, comfort and safety; sophisticated content production methods for storytelling; and development of software and hardware implementations that allow novice users to freely and efficiently create sophisticated digital content.



# List of Research Office

## Information Environment and Humans

Photoenergy Conversion Systems and Materials for the Next Generation Solar Cells

## Light Energy and Chemical Conversion

Formation of and Information Processing by Neural Networks, and Control

## Epigenetic Control and Biological Functions

## Understanding Life by iPS Cells Technology

## Innovative Use of Light and Materials/Life

## Nanosystem and Function Emergence

## Decoding and Controlling Brain Information

## Synthesis of Knowledge for Information Oriented Society

## Innovative Model of Biological Processes and its Development

## Materials and Processes for Innovative Next-generation Devices

## Search of Breakthrough by Collaboration of Mathematics and Various Fields

## RNA and Biofunctions

## Structures and Control of Interfaces

## Search for Nanomanufacturing Technology and its Development

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Chiyoda-ku, Tokyo 102-0075 Japan  
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## Photons on Soft Materials

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## The Dynamic Mechanism of and Fundamental Technology for Biological System

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## Metabolism and Cellular Function

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## Evolution of Light Generation and Manipulation

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University, 2-1-1, Katahira, Aoba-ku, Sendai-shi, Miyagi 980-8577  
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## Structure Control and Function

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## Life Phenomena and Measurement Analysis

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## Structure Function and Measurement Analysis

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## Foundational Technologies to Support Creation of Digital Media Content

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# PRESTO

## Japan Science and Technology Agency

<http://www.jst.go.jp/EN/>  
[http://www.jst.go.jp/kisoken/presto/index\\_e.html](http://www.jst.go.jp/kisoken/presto/index_e.html)

## Department of Research Promotion

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