JST Basic Research Programs

PRESTO

Precursory Research for Embryonic Science and Technology

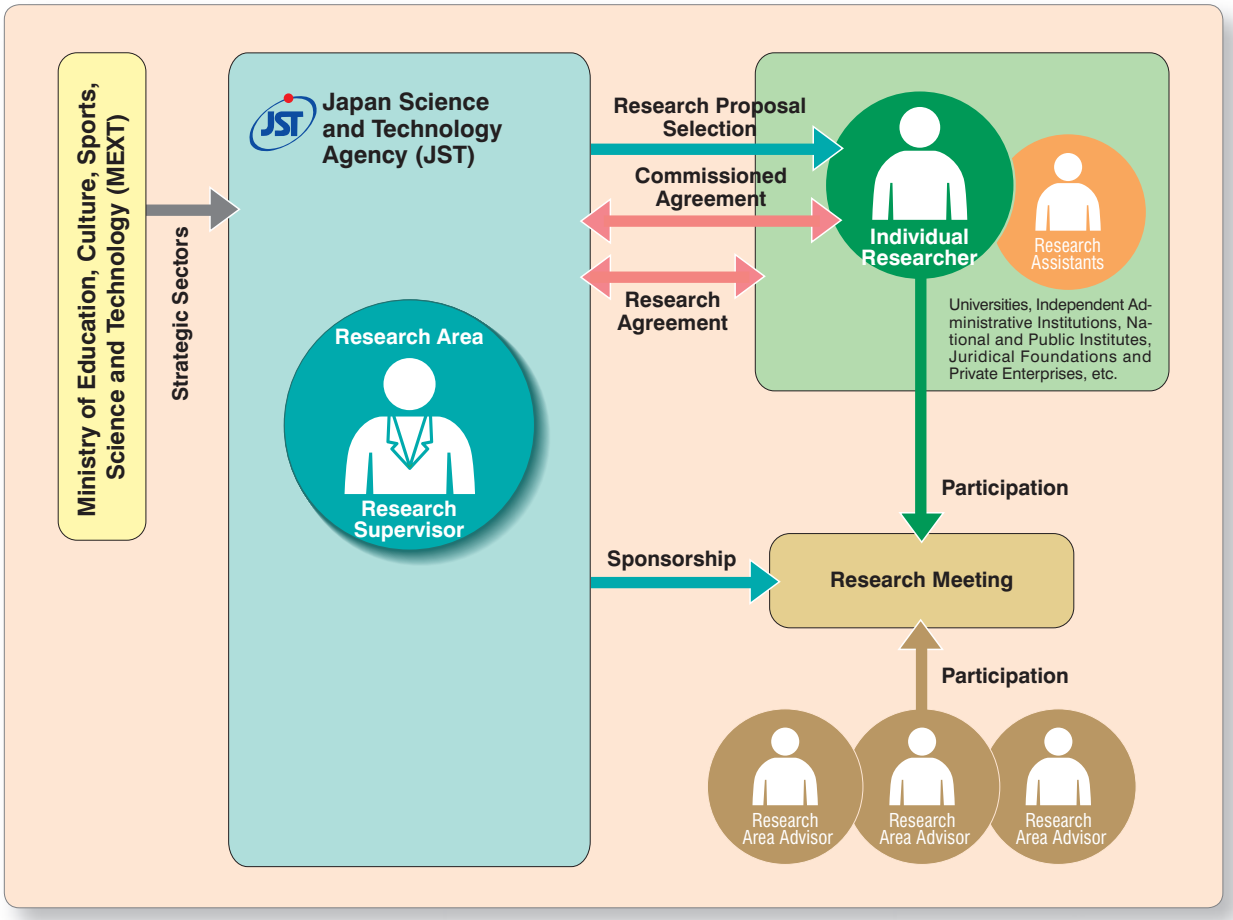
2011~2012

Japan Science and Technology Agency
http://www.jst.go.jp/EN/
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

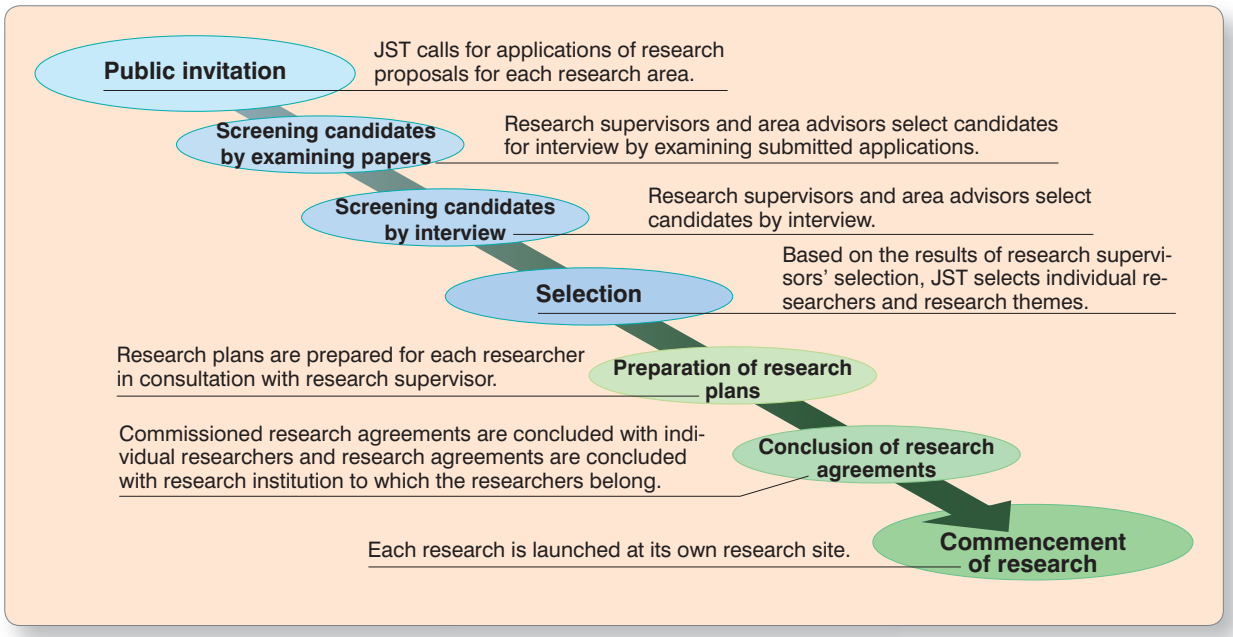
Intellectual property rights arising from research based on commissioned research agreements basically belong to the research institutes.

■ 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.



PRESTO URL http://www.jst.go.jp/kisoken/presto/index_e.html

Introduction of Research Area

On-going Research

24 Research Areas, 702 Research Themes

First Year	Research Area	Research Supervisor
FY 2011	Phase Interfaces for Highly Efficient Energy Utilization	**Kazuhito Hashimoto** (Professor, School of Engineering, The University of Tokyo) **Nobuhide Kasagi** 【Deputy Research Supervisor】 (Professor, School of Engineering, The University of Tokyo)
	Creation of Essential Technologies to Utilize Carbon Dioxide as a Resource through the Enhancement of Plant Productivity and the Exploitation of Plant Products	**Akira Isogai** (President, Nara Institute of Science and Technology)
	Design and Control of Cellular Functions	**Hiroki R. Ueda** (Project Leader, Center for Developmental Biology, Riken)
FY 2010	Elucidation and Control of the Mechanisms Underlying Chronic Inflammation	**Kiyoshi Takatsu** (Director, Toyama Prefectural Institute of Pharmaceutical Research)
	New Materials Science and Element Strategy	**Hideo Hosono** (Professor, Tokyo Institute of Technology)
	Creation of Basic Technology for Improved Bioenergy Production through Functional Analysis and Regulation of Algae and Other Aquatic Microorganisms	**Tadashi Matsunaga** (President, Tokyo University of Agriculture and Technology)
FY 2009	Information Environment and Humans	**Toru Ishida** (Professor, Kyoto University)
	Photoenergy Conversion Systems and Materials for the Next Generation Solar Cells	**Shuzi Hayase** (Professor, Kyushu Institute of Technology)
	Chemical Conversion of Light Energy	**Haruo Inoue** (Professor, Tokyo Metropolitan University)
	Development and Function of Neural Networks	**Fujio Murakami** (Professor, Osaka University)
	Epigenetic Control and Biological Functions	**Tsunehiro Mukai** (Professor Emeritus, Saga University)
FY 2008	Understanding Life by iPS Cells Technology	**Shin-ichi Nishikawa** (Deputy Director, Center for Developmental Biology, RIKEN)
	Innovative Use of Light and Materials/Life	**Hiroshi Masuhara** (Professor, Nara Institute of Science and Technology / Chair Professor, National Chiao Tang University)
	Nanosystems and Emergent Functions	**Yoshihito Osada** (Group Director, Advanced Science Institute, RIKEN)
	Decoding and Controlling Brain Information	**Mitsuo Kawato** (Director, ATR Fellow, ATR Brain Information Communication Research Laboratory Group)
	Synthesis of Knowledge for Information Oriented Society	**Hideyuki Nakashima** (President, Future University-Hakodate)
FY 2007	Materials and Processes for Innovative Next-generation Devices	**Katsuaki Sato** (Emeritus Professor, Tokyo University of Agriculture and Technology)
	Innovative Model of Biological Processes and its Development	**Nanako Shigesada** (Distinguished Visiting Professor, Doshisha University)
	Alliance for Breakthrough between Mathematics and Sciences (ABMS)	**Yasumasa Nishiura** (Professor, Hokkaido University)
FY 2006	RNA and Biofunctions	**Akio Nomoto** (Chairman of Board of Directors, Microbial Chemistry Research Foundation Director, Institute of Microbial Chemistry)
	Structures and Control of Interfaces	**Maki Kawai** (Executive Director, RIKEN / Professor, The University of Tokyo)
	Search for Nanomanufacturing Technology and its Development	**Naoki Yokoyama** (Leader, Green Nanoelectronics Collaborative Research Center, AIST)
	Photons on Soft Materials	**Tetsuo Tsutsui** (Professor Emeritus, Kyushu University)
	The Dynamic Mechanism of and Fundamental Technology for Biological System	**Shigetada Nakanishi** (Director, Osaka Bioscience Institute)

Themes	Strategic Sector	Call for Proposals	Page
-	To realize breakthroughs in phase-interface phenomena and create basic technologies for high-functionality interface that will result in dramatic advancements in highly-efficient energy utilization	Applicable	P. 4
-	Creation of basic technologies for utilizing plant photosynthetic functions and biomass that will enable the actualization of efficient carbon dioxide utilization		P. 4
-	Creation of the technology systems to have absolute control of cells and cell populations by reproducing cell kinetics in silico/in vitro in order to achieve an integrated understanding of life phenomena and realize safe and highly effective treatments among other benefits		P. 4
27	Creation of basic medical technologies for the prevention, diagnosis and treatment of cancer, arteriosclerotic diseases, and autoimmune disorders by the elucidation of the mechanisms underlying chronic inflammation	Applicable	P. 5
24	Creation of innovative function of materials by application of nanoscale material structural control technologies such as controlling atomic arrangement, towards practical use of rare-metal-free materials and new targeted functions such as ultra-high coercivity and ultra-high fracture toughness		P. 5
21	Establishment of basic technologies to create bioenergy from algae and other aquatic microorganisms, including growth rate control and metabolic network construction based on genome analysis and function modification		P. 5
36	Creation of Basic Technology that Enables an Information Environment that is in Harmony with People	Complete	P. 6
36	Creation of natural light energy conversion material and utilization basic technology through the fusion of different fields		P. 6
39			P. 6
45	Clarification of the Control Mechanisms of Neural Circuit Operation and its Formation		P. 7
40	Creation of innovative basic medical technologies by stem cell manufacturing and control based on cell reprogramming		P. 7
30		Closed	P. 7
40	Enhancing advanced materials science and life science toward innovations using new light sources, including state-of-the-art laser technology		P. 8
40	Creation of next-generation nanosystems through process integration		P. 8
37	Creation of innovative fundamental technologies for utilizing information related to action and judgment in the brain		P. 8
30	Creation of fundamental technology for the generation and utilization of "knowledge" from diverse and large-scale information.		P. 9
33	Exploitation of materials and nanoprocesses for the realization of novel electronic devices with novel concepts, novel functions and novel structures	Closed	P. 9
35	Elucidation of the Dynamic Mechanism of Biological System and Establishment of Fundamental Technology		P. 9
31	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. 10
29	Establishment of technology to utilize RNA molecules (RNA technology) that contributes to medical applications	Closed	P. 10
34	Creation and application of innovative nano-interface technology that achieves high performance from materials and substances in different state		P. 10
29	Development of technologies for highly-efficient manufacturing of nanodevices and nanomaterials, and innovation in manufacturing technology based on nanoscale science		P. 11
28	Ultimate and local control of photon and applications		P. 11
38	Elucidation of the Dynamic Mechanism of Biological System and Establishment of Fundamental Technology		P. 11

Phase Interfaces for Highly Efficient Energy Utilization

Research Supervisor
Kazuhito Hashimoto
Professor, School of Engineering, The University of Tokyo

2011 – 2018

Outline of Research Area

The primary goal of this research area is to greatly advance fundamental science and technology, which include exploration of phase-interfacial energy conversion/transport phenomena and creation of high-performance phase interfaces, in order to achieve ever more efficient energy utilization and thus to realize an enriched sustainable society.
Specifically, we take up the challenge of creating phase interfaces with significantly reduced energy losses and/or those for highly efficient energy use by deepening fundamental theory and control/optimization methodology of phase interface phenomena. To accomplish these goals, it is indispensable to establish analytical and design techniques integrating nano-, meso- and macro-scales, as well as theoretical methods for the control and optimization of phase interface structures.
Furthermore, it is important that the results of such cutting edge fundamental research should be transferred and effectively applied to the design of real equipment and systems, leading to dramatically improved performance, reduced carbon emissions and lower costs.
The ultimate goal of this research area, therefore, is to elucidate energy conversion and transport mechanisms at phase interfaces in order to enable highly efficient energy use; to develop measurement, modeling and simulation methods for integrative analysis and design of phase interface phenomena at multiple scales; to establish mathematical methods for the control and optimization of phase interface structures; and to realize highly functional phase interfaces that allow for theoretically possible maximal performance in actual devices and equipment. To meet these goals, we encourage integrated challenges that go beyond the bounds of existing scientific disciplines and combine the knowledge gained in different fields.

Creation of Essential Technologies to Utilize Carbon Dioxide as a Resource through the Enhancement of Plant Productivity and the Exploitation of Plant Products

Research Supervisor
Akira Isogai
President, Nara Institute of Science and Technology

2011 – 2018
http://www.plantsci.jst.go.jp/

Outline of Research Area

This research area targets the creation of essential technologies for utilizing carbon dioxide, as a resource, through the enhancement of plant photosynthesis and the exploitation of plant products.
In detail, the research topics include 1) developing essential technologies that enhance photosynthetic potential through an integrative and systematic approach to understanding the regulatory mechanisms of photosynthesis, the basis of material productivity in plants, with consideration of the interaction between metabolism and translocation of photosynthetic products and other metabolic pathways such as nitrogen assimilation; 2) developing essential technologies that improve the photosynthetic activity, carbon storage potential, and biomass productivity of plants, through the elucidation of the mechanisms by which plants adapt to various environments; and 3) the study of mechanisms of biomass production and decomposition, and the development of technologies for improved biomass utilization. In parallel with these three research topics, this research area focuses on collaboration and synergy in the fields of plant science and biomass engineering.

Design and Control of Cellular Functions

Research Supervisor
Hiroki R. Ueda
Project Leader, Center for Developmental Biology, Riken

2011 – 2018

Outline of Research Area

In this area of research, we seek to gain insights into the principles of living systems through the design and control of cellular functions. Toward this end, we will seek to establish new concepts and technologies with broad applications. In particular, this research will address, but not be limited to, the following areas:

1) Logical (or efficient) design and control of biomolecules involved in cellular functions
2) Reconstitution and design of processes that support the infrastructure of cellular function (e.g., genomes, metabolic networks, cell-free translation systems, cell membrane division)
3) Reconstitution, design, and control of processes that implement higher-order cellular functions (e.g., signal transduction, gene network, intercellular communication)
4) Reconstitution, design, and control of populations of cells, tissues, organs, and individual organisms.
5) Construction of a framework for the implementation of open innovation toward the design and control of cellular function unifying diverse fields, such as chemistry, physics, information science, engineering and life science.

This field of study covers not only creative basic research projects based in unique concepts, but more ambitious applied researches, which may advance medicine and solve energy problems, as well.

Elucidation and Control of the Mechanisms Underlying Chronic Inflammation

Research Supervisor
Kiyoshi Takatsu
Director, Toyama Prefectural Institute of Pharmaceutical Research

2010 – 2017
http://www.inflam.jst.go.jp/

Outline of Research Area

Inflammation, which forms a part of the complex biological response of vascular tissues to pathogens, damaged cells, or irritants, is a protective response of an organism to remove the injurious stimuli and to initiate the healing process. There are two types of inflammation: acute and chronic. Acute inflammation is the initial response of the body to harmful stimuli. Prolonged inflammation, known as chronic inflammation, is characterized by simultaneous destruction and healing of tissue as a part of the inflammatory process. Abnormalities associated with inflammation, particularly chronic inflammation, comprise a large group of disorders that underlie a vast range of human diseases.

Recent progress in immunology and inflammation research has revealed a molecular basis for inflammation and chronic diseases. However, it remains elusive as to how acute inflammation progresses to chronic inflammation spatiotemporally, and how chronic inflammatory diseases develop in various tissues.

This research area aims to create innovative research to clarify the regulatory mechanisms involved in the pathogenesis of inflammation and chronic diseases. The subject covers areas of exploratory research and development of technologies that are expected to benefit the society and to connect basic inflammatory research to clinical research on chronic disorders. The main objective is to clarify and control chronic inflammation and inflammatory disorders by analyzing not only the pathogenesis and maintenance of chronic inflammation with a spatiotemporal perspective but also the severe progression of diseases with a background of chronic inflammation.

From this perspective, this research area includes various research approaches, such as immunology, microbiology and virology, cell biology, pathology, experimental inflammation and tissue engineering, and clinical medicine.

New Materials Science and Element Strategy

Research Supervisor
Hideo Hosono
Professor, Tokyo Institute of Technology

2010 – 2017
http://www.elest.jst.go.jp/

Outline of Research Area

It is known that the function of material is inseparably related with the elements of its own. However, existing elements are only about 100, and the number of elements which can be actually used for materials is becoming limited because of their scarcity and toxicity. Therefore, in order to create materials to support society and answer the social demand, scientists are required to re-create images of each element and to achieve the development of a new opportunity. Investigation of nano technology is selectively conducted worldwide, based on the common understanding that the development of science and technology in the nano area is indispensable for making rapid progress in materials science. From now on, the policy needs to be carried out that reflects each country's characteristics in addition to the basic understanding. "Element Strategy" is to achieve effective functions by using common elements as much as possible, the functions that have been realized by using rare elements until now. And, it is one of the scientific measures that Japan started for the first time in the world because of the scarcity of natural resources. This means "Element Strategy" is to establish a new materials science for a sustainable society from the academic standpoint.

This Research Area aims to establish a new materials science based on creating innovative functional materials using elements with a higher Clarke number by manipulating and utilizing nano structures, surfaces, interfaces, and defects and also based on theoretical modeling and advanced characterization, which will contribute to the green innovation to resolve resource, environment, and energy problems.

Bioenergy Production by Algae and Other Aquatic Microorganisms

Abbreviation of Creation of Basic Technology for Improved Bioenergy Production through Functional Analysis and Regulation of Algae and Other Aquatic Microorganisms

Research Supervisor
Tadashi Matsunaga
President, Tokyo University of Agriculture and Technology

2010 – 2017
http://www.bioenergy.jst.go.jp/

Outline of Research Area

This research area aims to create new basic technologies for bioenergy production using algae and other aquatic microorganisms. Some algae and other aquatic microorganisms have high lipid or carbohydrate content, produce various hydrocarbons, and show high growth capability. These properties can be applied to innovative technologies for bioenergy production.

Specifically, research proposals should focus on improvements in the efficiency of energy production through the elucidation of the physiological functions and metabolic pathways of algae and other aquatic microorganisms, which are effective bioenergy producers, using advanced scientific technologies from the fields of genomics, proteomics, metabolomics, and cell analysis. Moreover, the results of proposed research may also benefit various other technologies related to the production of useful chemicals and water treatment using algae and other aquatic microorganisms.

Challenging research themes in broad areas including biology, chemistry, and engineering are welcome for the future realization of innovative technologies leading to bioenergy production.

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.

Chemical Conversion of Light Energy

Research Supervisor
Haruo Inoue
Professor, 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.

Development and Function of Neural Networks

Research Supervisor
Fujio Murakami
Professor, 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
Professor Emeritus, Saga University

2009 – 2016
http://www.epigenetics.jst.go.jp/

Outline of Research Area

This research 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
Professor, Nara Institute of Science and Technology / Chair Professor, National Chiao Tang University

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.

Nanosystems and Emergent Functions

Research Supervisor
Yoshihito Osada
Group Director, Advanced Science Institute, RIKEN

2008 – 2015
http://www.emergence.jst.go.jp/

Outline of Research Area

This research area is to support original and challenging research proposals aimed at creating novel nanosystems with emergent functions. Here, the term “emergence” is defined as integrated and synchronized functions expressed at higher hierarchical level. This research area encourages researchers attempting to clarify the mechanisms and processes of emergence, or to design and create novel nanosystems with emergent functions.
This research area is to support original and challenging research proposals aimed at creating novel nanosystems with emergent functions. Here, the term “emergence” is defined as integrated and synchronized functions expressed at higher hierarchical level.
An important fact is that emergence often arises from newly organized macroscopic structures (or patterns and properties) autonomously formed as a result of a very large nonlinear ensemble of interactions at a lower hierarchical (elemental) level in an environment. From this perspective, this research area encourages researchers attempting to clarify the mechanisms and processes of emergence, or to design and create novel nanosystems with emergent functions.
One possible bottom-up approach is self-assembly and its applications that undergo spatial and temporal development. Top-down techniques that have made rapid progress in the fields of MEMS, robotics, and others are another option. However, an original approach fused with both bottom-up and top-down techniques could also be considered.

Decoding and Controlling Brain Information

Research Supervisor
Mitsuo Kawato
Director, ATR Fellow, ATR Brain Information Communication Research Laboratory Group

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
Distinguished Visiting 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
Chairman of Board of Directors, Microbial Chemistry Research Foundation Director, Institute of Microbial Chemistry

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
Executive Director, RIKEN
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
Leader, Green Nanoelectronics Collaborative Research Center, AIST

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.

PRESTO

Japan Science and Technology Agency

http://www.jst.go.jp/EN/
http://www.jst.go.jp/kisoken/presto/index_e.html

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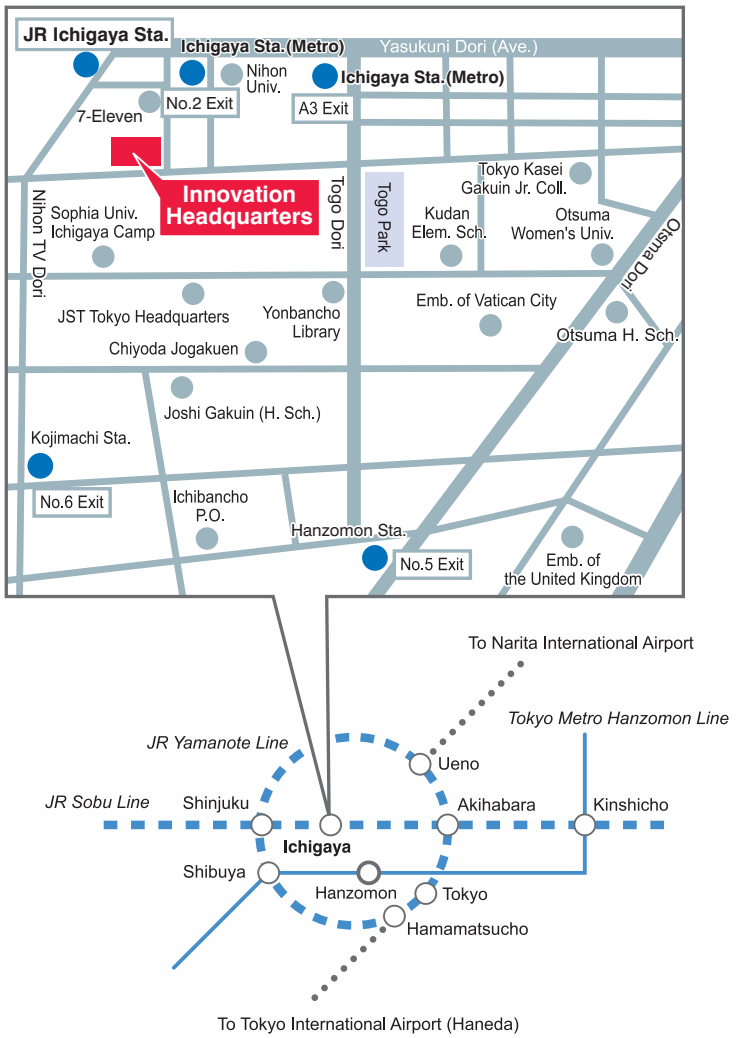

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