Introduction of Newly Established Research Centers and a Laboratory

Research Center for Glycoscience

The inauguration of the Research Center for Glycoscience (RCG) on June 1, 2002 had been eagerly awaited by industry and academia. The center is an integrated research unit that covers a wide range of research fields related to both glycoscience and glycotechnology. It aspires to be an international leading research center for glycoscience. RCG is an organization with a limited life until 2008 and implementing the intensive research projects based an industry-academia-government collaboration, concentrating on 1) the analysis of human genes related to sugar chains, 2) the development of an automated sugar chain synthesizer and 3) a high-throughput analytical system for sugar chains.

Background and Outline of the Center

Over half of the proteins carry sugar-chains important elements that regulate proteins' functions. Glycoproteomics, the comprehensive analysis on the structure of proteins carrying sugar chains, is regarded as a key of the post-genome science. The study on complex carbohydrates including glycoproteins is one of the few biotechnology research fields where Japan has had an advantage over Europe and the U.S. Recently, related academic societies presented "Concept for Research Centers/Consortium for Glycoscience" to the government, in which AIST was expected to become a hub that takes a principal role to link academia and industry.

RCG has approximately 120 members comprising seven research teams, i.e., Glycobiosynthesis Team, Glycogene Function Team, Cell Regulation Analysis Team, Gene Dynamics Team, Applied Gene Technology Team, Glycostructrue Analysis Team and Glycochemosynthesis Team.

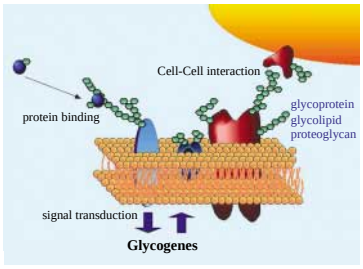
Research Subjects

Basic Research Subjects include: 1) isolation of a sugar chain synthetic gene of various living organisms and their functional analysis, 2) analysis of the tertiary structure of enzymes related to sugar chain synthesis and designing of specific inhibitors, 3) analysis on the sugar chain related genes of micro-organisms, plants and animals and their application, 4) development of synthesizing technology of useful sugar compounds such as glycoprotein and glycolipid using sugar chain related genes and 5) high-throughput analysis for a sugar chain structure including sugar chains of glycoprotein.

Applied technologies aiming at the creation of a new industrial field include: 1) development of diagnostic/treatment systems for cancer and infectious diseases, 2) real time analysis of a cell surface function and cell growth regulation and 3) development of systems and devices to synthesize, analyze and exploit sugar chains.

Future Prospects

RCG sets its specific targets as follows: 1) analysis of unidentified human sugar chain related genes (estimated at approximately 150 out of a total of 300 sugar chain related genes), 2) automated synthesis of any sugar chain using an appropriate glycosyltransferases, 3) development of a new technology on glycoproteomics using sugar chain recognition proteins (lectins), 4) analysis of in vivo receptor of sugar chains and 5) development of a diagnostic system applicable to various diseases.



Reorganization of Gene Discovery Research Center

As of July 1, 2002, the “Gene Discovery Research Center”, which was established on April 1, 2001, was reorganized. It created a new center, the Age Dimension Research Center, which inherited the major portion of the original center and a separate laboratory, the Gene Function Research Laboratory. The purpose of this reorganization was to transform the original research center that covered a wide spectrum of research areas, from mammalian biology to plant biology, into well focused research units. Researchers sharing similar research interests in each unit will be able to create better environments for strong synergy.

Age Dimension Research Center

Outline of the New Center

The mission of this new Center is to discover new knowledge that will lead to better health. Basic research will be

conducted with an emphasis on the time dimension of physiological systems and underlying regulatory mechanisms. In the post-genome sequence era in Japan and other countries, major efforts are now made into exciting new research fields such as bioinformatics, proteomics, individual's genome polymorphisms, regenerative medicine and gene therapy. Although these research activities are important, few scientists focus their serious research efforts on the role of time (age) on biological phenomena at the molecular level, which is an essential element of life. For a comprehensive understanding of many complex biological systems and homeostasis, we pay particular attention to this critical aspect and aim to determine the genetic and molecular mechanisms responsible for age-related regulation of genes, cells and physiological systems. The new knowledge that we uncover will be rapidly made available for use by industry for developing new valuable technologies, disease prevention and therapy as well as for drug development.

Research Themes

As the country's birthrate rapidly falls and the elderly population expands , the promotion of senior citizens' health has become an urgent issue and indispensable for creating a future productive society. At this center, we conduct our research on various biological phenomena with a unique view of analyzing the longitudinal time (age) dimension. We aim to contribute to the fundamental understanding of age-related regulatory mechanisms of genes and physiological systems such as aging and immunity as well as adult and geriatric diseases including cardiovascular diseases for which age is known to be a risk factor. We also will develop a new research paradigm, the Age Dimension Technology (ADT), which will help us to develop valuable technologies, effective and safe prevention/treatment methods as well as new drugs for such diseases.

Prospects for the Future

The purpose of this new center, therefore, is to conduct basic researches discovering principles and new knowledge of age-related genetic, molecular and cellular mechanisms of physiological systems and pathophysiological conditions and establish a new research paradigm. At the same time, we will proactively transfer our research achievements to developmental uses by industry. Through these activities, we will contribute to creating a healthy and active society in this country.

This center started with two research teams, Age Dimension and Cell Regulation. We intend to add two to three new teams in the near future.

Gene Function Research Laboratory

Outline of the Laboratory

Our mission is to identify new functional genes and elucidate their function systems. In the field of biotechnology where research outside Japan is prevailing, we propose a novel and unique approach in the basic research, which may develop technologies made for practical application.

Our research covers a wide range of subjects from basic to applied science including RNA chemistry, nanotechnology, structural biology, biological studies using both animal and plant cells as well as model animals. We will contribute to industry and clinical medicine by combining these basic and applied researches.

Our Goal and Activities

The results of basic researches in this field can be easily put into practice for both industrial and medical applications. Consequently, a research project with higher potential will directly give an impact on the society. We will pursue our research activities through two different approaches: i.e. "Basic Studies" and "Highly Interdisciplinary Studies". "Basic Studies" includes basic research projects on functional nucleic acid, cutting edge engineering, vector development, application of vectors to improve the efficiency in discovery of both human and animal functional genes and analysis of gene functions. Meanwhile, "Highly Interdisciplinary Studies" comprises of multiple areas centering on the discovery of new functional genes, which regulate diseases as well as other complex biological reactions such as the proliferation and cytokinesis of cancer cells and functions of central nerves.

Future Prospects

The laboratory aims at contributing to domestic industry in the field of life science through the active involvement in various consortiums with the academic community and industry both at home and abroad in co-operation with other AIST research centers.

Although GFRL is currently an organization with a limited life of 3 fiscal years, it is expected to be reorganized as a research center in the future.

Commemorative Seminar for the 120th Anniversary of the Foundation of Geological Survey of Japan

The Geological Survey of Japan marked its 120th anniversary this year.

In commemoration of this occasion, the "Commemorative seminar for the 120th Anniversary of Geological Survey of Japan" was held at the Meiji Memorial Hall in Tokyo on June 7, 2002.

Dr. Hiraishi, Vice President of AIST, made the opening speech followed by the congratulatory addresses from representatives of the Ministry of Economy, Trade and Industry as well as other related industrial and academic entities. Dr. J. Devine, Senior Science Advisor of U.S. Geological Survey, and Dr. Zhang Hongtao, Vice Director of Geological Survey of China, delivered commemoration speeches. Both speakers explained the present status of the geological survey of their countries, transition of their roles and their future tasks in the international community. They also expressed their expectations for Japanese contributions in this field. The Geological Survey of Japan introduced one of their recent research topics, the significance of scientific drilling at Mt. Unzen Volcano, Nagasaki prefecture.

Geological Survey of Japan

In April 2001, the National Institute of Advanced Industrial Science and Technology (AIST) was established as an Independent Administrative Organization by reorganizing 15 research institutes of the former Agency of Industrial Science and Technology in the Ministry of Economy, Trade and Industry (AIST/METI). It consists of 55 research units to work as the core of research and development, research support departments to facilitate efficient and effective activities on research and development, and administrative departments in charge of management. Five research units, two collaborative research teams in Hokkaido and Kansai and three research support departments are engaged in research activities on geological survey which had been conducted by the Geological Survey of Japan as a national research institute. Now all these units, collaborative teams and support departments relating to activities on geological survey are generally referred to as the “Geological Survey of Japan”.

For further information on the Geological Survey of Japan

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World's Largest "Super Clean Room" is Completed

"Super Clean Room" for the research consortium of Industry-Academia-Government was completed at AIST Tsukuba West at the end of March 2002.

The commemorative ceremony for the completion was held at the location on June 17, 2002.

In the presence of Mr. Yoshihisa Oshima, Vice Minister of Economy, Trade and Industry, Dr. Hiroyuki Yoshikawa, the President of AIST made his opening remarks followed by words of congratulations from guests. Dr. Masataka Hirose, the director of advanced Semiconductor Research Center, made an introductory presentation on "Semiconductor Research at AIST". After the ceremony, the guests attended a tour of the Super Clean Room and reception party.

The construction of this facility is financed by the Ministry of Economy, Trade and Industry. It boasts a 3,000 m^2 super clean room (class 3) and a 1500 m^2 clean room for research use (class 5). It is one of the largest clean rooms with research facilities in the world. Super Clean Room will be the center of three flagship R&D projects of the most advanced semicon-

ductor technology, that is: "Semiconductor MIRAI project", "HALCA project" and "ASUKA" project. "MIRAI" research project includes new materials, material processing, device technology and measurement technology for the next generation semiconductor technology, whereas the objective of "HALCA" project is the development of highly efficient and energy-saving manufacturing systems which accommodate a variety of types of products or production volume. "ASUKA project" aims at the development of new materials and total processing technology for the next generation of semiconductors.

Super Clean Room will be Japan's largest research center of Industry-Academia-Government collaboration where over 400 researchers will strive on the most advanced semiconductor R&D projects.

Floor Space	1300 m^2
Liquid Used	Kerosene, Light oil
Flow Rate	3 ～ 300 m^3/h
Pipe diameter	50 mm, 100 mm, 150 mm

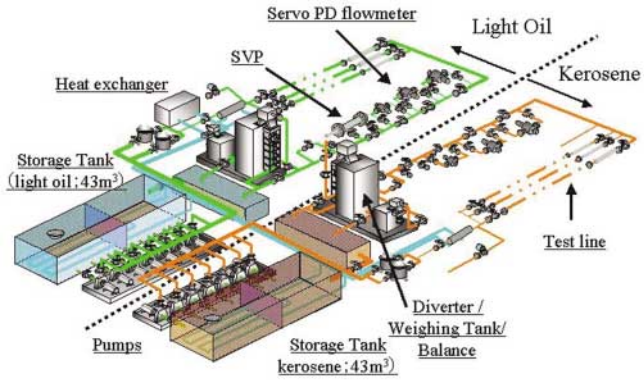
Primary Standard
1. Static and gravimetric method with flying start and stop
2. 10t, 1t balances, diverter, density meter

Uncertainty (k=2)
0.04% for volumetric flow rate,
0.03% for mass flow rate

Specifications of the primary standard

Successful Completion of Oil Flow Calibration Facility for Petroleum Tanks at AIST Tsukuba Center

- Aiming for the Highest Accuracy in the World -



Inside view of the facility

A new primary standard for hydrocarbon flow measurements has been made at the AIST Tsukuba center.

There had been no national standard for hydrocarbon flow measurements used at petroleum industrial complexes in Japan. As a result, flowmeter manufacturers and users have responsibility for the calibration by the standard flow rate. However, to comply with the requirement to set up a traceablity certification system based on international standards, a primary standard facility with a hydrocarbon flow that conforms to the measurement standards of international oil transactions was established.

The oil flow calibration facility is designed to calibrate hydrocarbon flowmeters in the flow rate range between 3 to 300 m^3/h with the expanded uncertainty less than 0.04 % for volumetric flow rates and 0.03 % for mass flow rates. Light oil and kerosene are used as the fluids. Each fluid has its own test line. This primary standard works based on static and gravimetric methods with flying start and stop so that the total mass pass through the flowmeter in a given time is measured by a diverter. Although the volumetric flow rate standard is fundamentally based on mass, time and density standards, it reduces the measurement uncertainty and meets contract conditions for calibration. A new diverter system developed by AIST was applied to minimize the uncertainty in the collection time of the hydrocarbon into the weighing tanks. The test lines' diameters for the flowmeters are 50, 100 and 150 mm. Two 43-m^3-storage tanks are used for the two lines to achieve a better stability of the liquid temperature.

At present, the detailed uncertainty and long-term stability for the facility has been estimated in order to achieve a traceable a system in 2005.

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