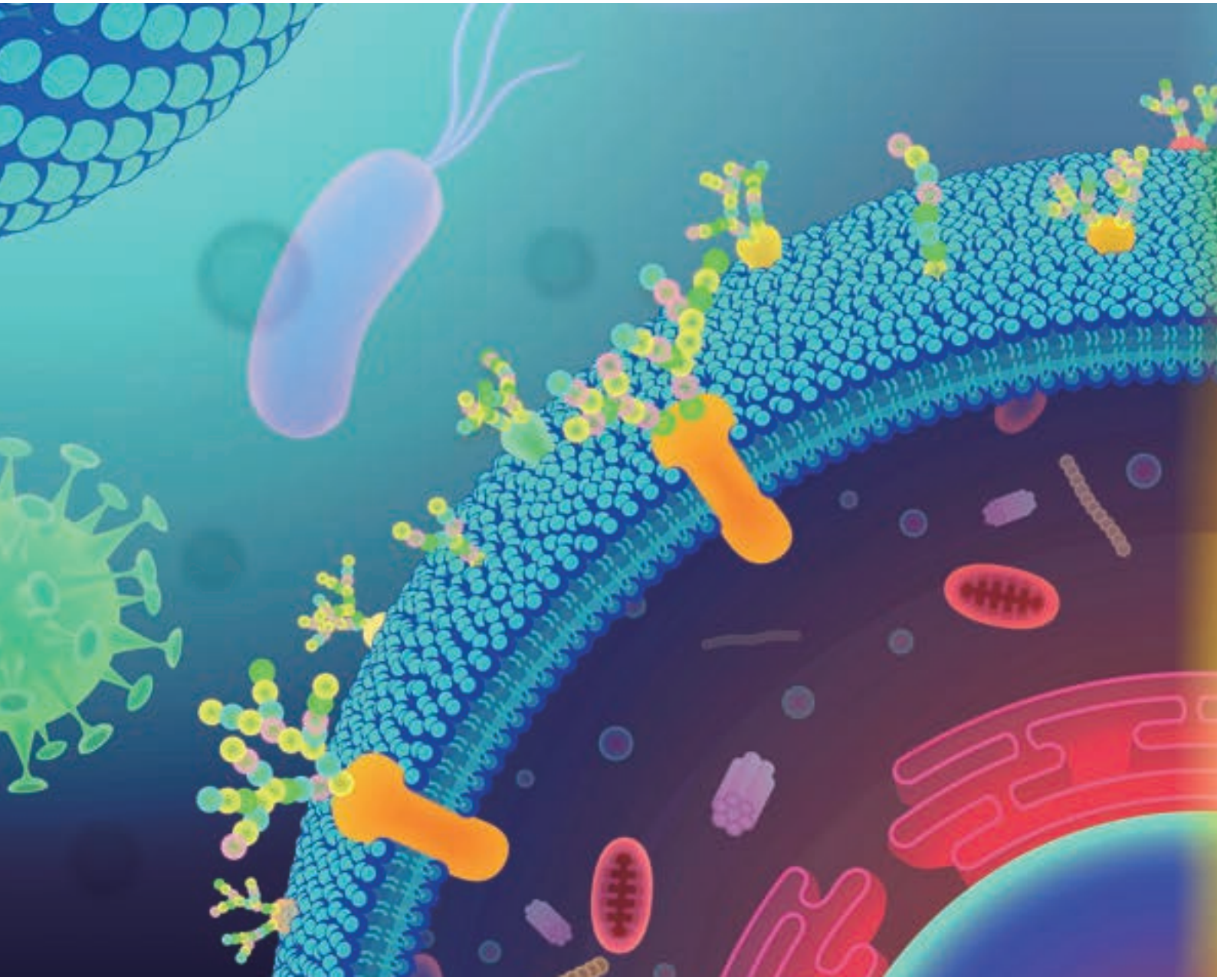
integrative glycoscience research institute

iGCORE

Institute for Glyco-core Research



NAGOYA UNIVERSITY

GIFU UNIVERSITY

iGCORE

Institute for Glyco-core Research

Institute for Glyco-core Research, iGCORE, is a cutting-edge integrative glycoscience institute that brings together researchers from two universities - Nagoya University and Gifu University - with outstanding achievements in the fields of glycan synthesis, imaging, glycobiology, and glycomedicine. Through our research, iGCORE is committed to gaining a deeper understanding of the fundamental nature of life, ultimately paving the way for groundbreaking innovations in medicine, such as personalized prevention and early detection of pre-disease.

NAGOYA UNIVERSITY

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Glycans in medicine / biology

Our research aims to uncover the biological functions and medical uses of glycans, with the goal of developing novel applications to improve human health.

GIFU UNIVERSITY

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Glycan synthesis / imaging

Our strength lies in our ability to synthesize complex glycans and image individual glycan molecules with expertise.

MAKE NEW STANDARDS.
東海国立大学機構

iGCORE is aiming to become a research center that ranks among the world's leading research centers, with support from the Tokai National Higher Education and Research System.

MESSAGE
from the Director

Kenji Kadomatsu

Director, Institute for
Glyco-core Research (iGCORE)

Clarification of essence of glycans, hidden in their diverse nature, will provide novel knowledge for human beings

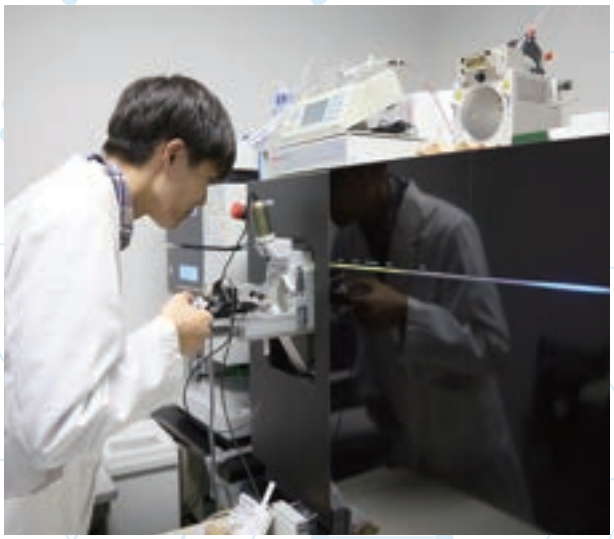
Throughout human history, humanity has confronted age-old questions such as "What is life?" and "What does it mean to be alive?" Other questions such as "Why do people get sick?" and "How can we cure diseases?" also share a common thread. I believe that intellectual curiosity, respect for nature, and love for other forms of life are the driving forces behind the development of life sciences.

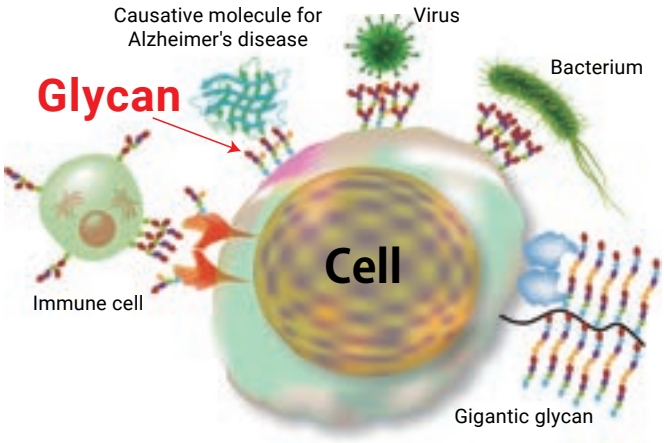
The mission of our institute is to promote research advancements on glycans, which play important roles in biological activities. Various types of glycans exist in nature, embedded in almost all types of cell surfaces in our bodies and play active roles in the boundary between cells and the outside world. Elucidating the roles of glycans, which differ from those of nucleic acids and proteins involved in several biological processes, will open up new horizons in life sciences. Amazingly, glycans are highly adaptable to variable external environments. Our pioneering research on glycans has led the world in clarifying the importance of glycans in life, but we are still far from complete understanding the phenomenon of biological life through the complexities found in glycans. As it becomes increasingly clear that the world of glycans is profound and complex, scientists are learning more about the importance of characterizing and analyzing the mysterious world of glycans across disciplines. With the establishment of the Tokai National Higher Education and Research System, THERS, we have gathered high-caliber researchers who can make it happen. The dual currents, involving cutting-edge research and integrating knowledge across disciplines, are a key thrust for the development of glycan research, like a great river flowing into the ocean. Our focus on exploring the function and potential of glycans at the molecular, cellular, and individual levels will help uncover the essence of glycans in diversity and complexities and build a collective pool of knowledge that will contribute to human well-being.

ABOUT iGCORE

Glycans (sugar chains), which cover all the cells in our body, determine the characteristics of each cell, regulate intercellular communication and recognize extracellular substances (such as neighboring cells, pathogens, etc.). Therefore, glycans play crucial roles in many physiological phenomena and diseases, including immunity, neural functions, aging, infection, tumor, and dementia. For instance, application of glycoscience (research on glycans) to modern medicine is exemplified by the effectiveness of glycan-targeted drugs such as Tamiflu and 100-fold increase in the efficacy of antibody therapy for cancer treatment, etc. through the modification of glycans.

Although it has been revealed that glycans are involved in various physiological and pathological phenomena, glycoscience research has not advanced enough in the world. Therefore, in order to advance our understanding of the nature and essence of living systems and make progress in the applications of life science research for human health, it is necessary to promote glycoscience research.





Nerve regeneration | Infectious disease | Immunity | Fertilization | Dementia | Tumor

Glycans are currently not fully understood for the following three major reasons: (1) the higher complexity and structural diversity of glycans compared to nucleic acids (DNA and RNA) and proteins require highly specialized techniques for synthesis, analysis and biology of glycans; (2) the non-existence of an integrative research center which can bring together the findings from different glycoscience studies to help understand the whole picture; and (3) no research has been done to obtain and analyze glycan big data (glycomics) as in the case of genomics and proteomics.

The “Institute for Glyco-core Research (iGCORE)” is a state-of-the-art integrative glycoscience research institute, bringing scientists together from various disciplines and expertise, including chemistry, biochemistry, medicine and imaging. Research conducted at this institute will help to elucidate the functions and physical properties of glycans as well as the properties of assembled glycans. Through integrating the different components of glycoscience research, we aim to more fully understand the true nature of life core, which has not been accomplished by research on nucleic acids and proteins alone.

ORGANIZATION CHART

iGCORE
Institute for Glyco-core Research

Director
Kenji Kadomatsu

Vice-Director
Hiromune Ando

Vice-Director
Chihiro Sato

【iGMED】 Integrated Glyco-BioMedical Research Center

Center Director
Chihiro Sato

Molecular Physiology Division

Division Head
Tetsuya Okajima

Chihiro Sato
Hiroshi Abe
Takayuki Uchihashi
Atsunori Oshima
Tomoo Ogi
Takahiro Shibata
Midori Shimada
Yoshikatsu Matsubayashi
Hiroaki Wake
Akinori Nakamura
Yu Nakagawa
Kwok Kei Mak
Nao Yamakawa
Yuji Kondo
Yuko Tashima
Masaya Hane

Bioregulation of Cell and Organism Division

Division Head
Ken Kitajima

Kenji Kadomatsu
Masashi Ikeda
Masahisa Katsuno
Yutaka Kondo
Hiroshi Suzuki
Masahiko Hibi
Koji Yamanaka
Norio Ozaki
Yoichiro Harada
Fumitaka Osakada
Di Wu
Kazuya Izumi

【iGDATA】 Integrated Glycan-Big Data Center

Center Director
Kenji Kadomatsu

Systems Biology Division

Division Head
Yusuke Matsui

Motonori Ota
Naoki Honda
Kensaku Mori
Morten Thaysen-Andersen
Hiroyuki Kaji
Kiyoko F Kinoshita
Jennifer J Kohler
Jun-ichi Furukawa
Ryuji Kato
Hisatoshi Hanamatsu
Shiori Go
Bingyuan Zhang
Akihiro Fujita
Chengcheng Huang

Structural Analysis Division

Division Head
Yann Guérardel

Kazuki Nakajima
Yuichi Abe

【iGMOL】 Integrated Glyco-Molecular Science Research Center

Center Director
Yasuhiko Kizuka

Glyco-Molecular Science Division

Division Head
Kenichi G.N. Suzuki

Hiromune Ando
Yasuhiko Kizuka
Masato Ikeda
Akihiro Imamura
Natsuhisa Oka
Masayasu Taki
Morihisa Fujita
Tomio Yabe
Yann Guérardel
Hide-Nori Tanaka
Kazuki Nakajima
Yuichi Abe
Naoko Komura
Naoya Suzuki

Cooperative Research Facility Division

Division Head
Kaori Tanaka

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Tomoya Sawamura
Masahiro Hayashi

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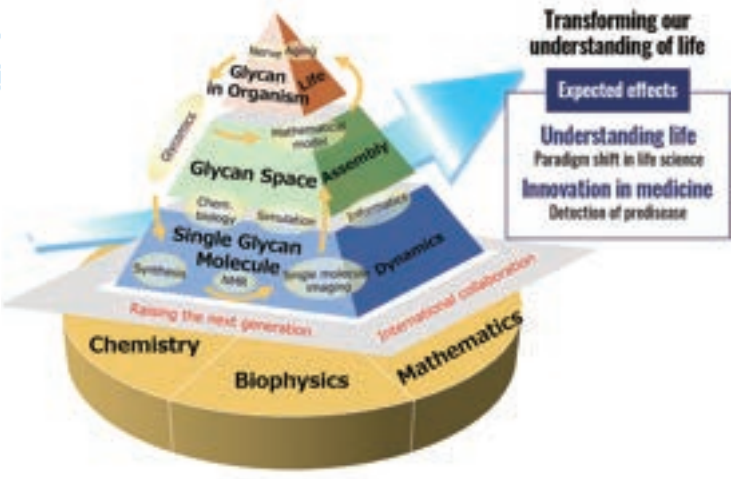
Support and Promotion Group Masayasu Taki / Akinori Nakamura / Yoichiro Harada / Fumihiro Shinoda / Kwok Kei Mak / Kazuya Izumi/ Naoya Suzuki

Faculty Members: 75, Researchers・Technical staff, etc. : 68

RESEARCH

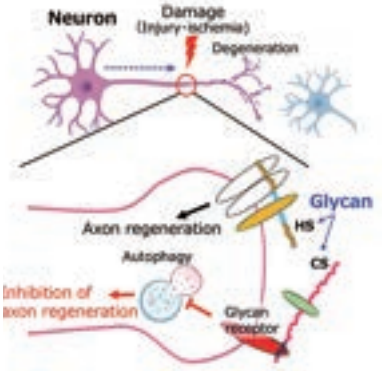
Understanding the core of life

Our research goal at iGCORE is to understand the functions of glycan assemblies which consist of complex and diverse glycans (glycoproteins and glycolipids) and reveal new principles underpinning all living systems. The eventual aim is to apply the insights from our research findings to facilitate the advancement of innovative medicine.
Our recent notable achievements include:



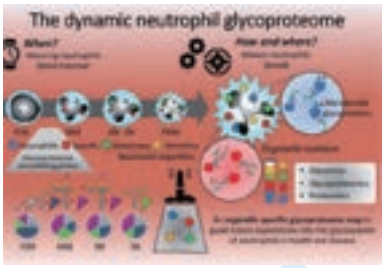
Elucidation of novel functions of Glycans in nervous system

We have discovered new functions of glycans such as proteoglycans and polysialic acid in nerves. We are aiming to apply glycans to therapeutic and other applications.(Sakamoto et al., Nat. Chem. Biol., 2019, Sato et al. Mol Aspects Med. 2021, etc.)



Elucidation of glycan functions by determining the structure of glycan

We have developed a new comprehensive method for glycomic analysis of total cellular glycans using MS, which allows for detection of glycan changes in various samples.
We have discovered new glycan changes in the differentiation and activation of immune cells and in various diseases through comprehensive glycan analysis.(Hanamatsu et al., J Chromatogr A. 2023, Kawahara et al. PNAS, 2023 etc.)

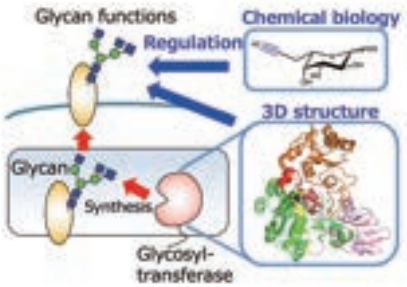


Establishment of novel methods for chemical synthesis of glycans

We have recently developed a new innovative method for chemical synthesis of sialylated glycans.
We also develop novel glycan probes by labeling glycans with fluorescence or search for new glycan binding molecules. Using these probes, we visualize the dynamics of a single glycan in cell membrane. (Komura et al, Science, 2019, K. G. N. Suzuki, Biochim. Biophys. Acta, 2023 etc.)

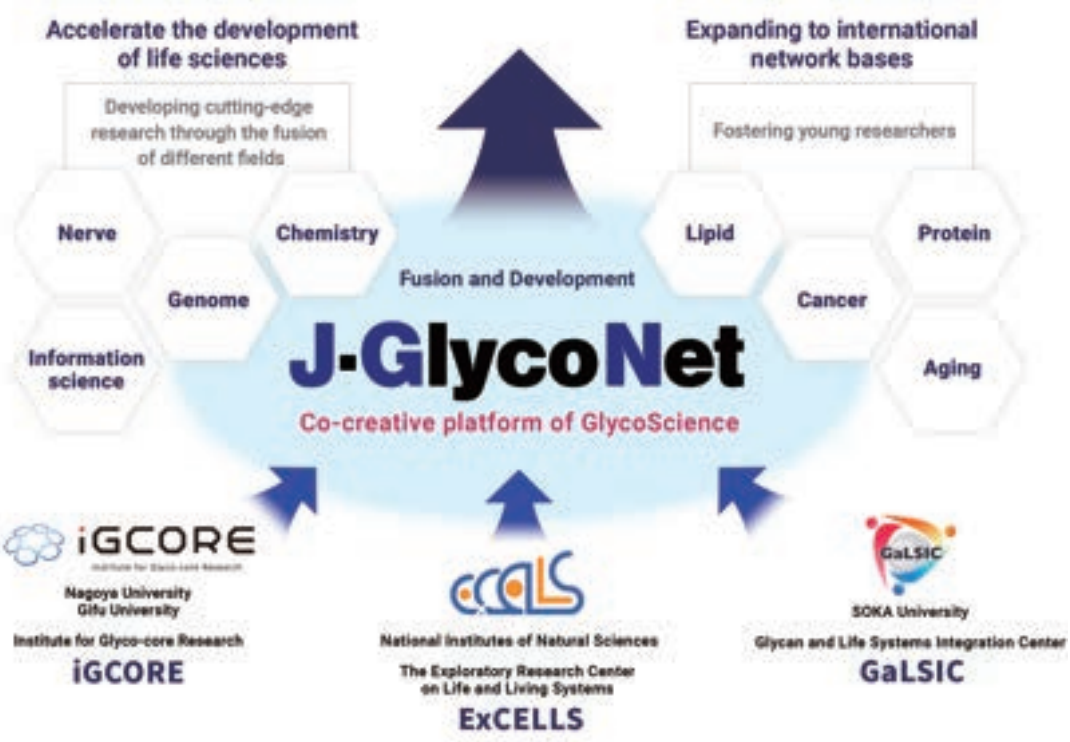
Understanding, prediction and remodeling of glycan biosynthesis and function

We focus on glycan-biosynthetic enzymes (glycosyltransferases) and aim to elucidate the mechanisms of their reactions and regulation using biochemical and genetic approaches. We also integrate glycosyltranasferase data to predict and remodel cellular glycan structures.
(Hirata et al, iScience, 2022, Yi-Shi Liu et al, J. Cell Biol., 2023 etc.)



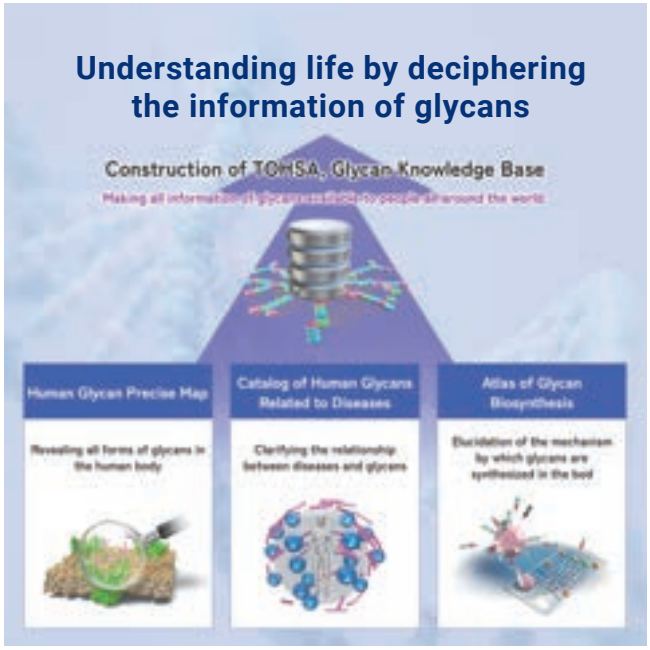
Joint Usage / Research Center : Glyco Science Cooperative Network (J-GlycoNet)

J-GlycoNet is the world's unique integrated glyco-research institution is composed of an exclusive combination of resources from iGCORE, ExCELLS (National Institutes of Natural Sciences) and GaLSIC (Soka University). iGCORE covers comprehensive glycoscience including a wide range of research capability from the molecular to the organismal level. ExCELLS features in advanced glyco-structural biology. GaLSIC offers a combination of glyco-bioscience with informatic science. Thus J-GlycoNet is dedicated to advance glycan research by planning integrated and multidisciplinary research and by executing the plans among these three institutions.



Human Glycome Atlas Project (HGA)

We will build TOHSA: A knowledge base that comprehensively acquires information on all forms of glycans present in the human body, the relationship between disease and glycans, and the mechanisms by which glycans are synthesized, and that information can be used by people around the world.
This will be widely applied in the research and medical fields, and will be utilized for the true understanding of the mechanism of life and the development of innovative treatment and preventive methods.



thers iGCORE

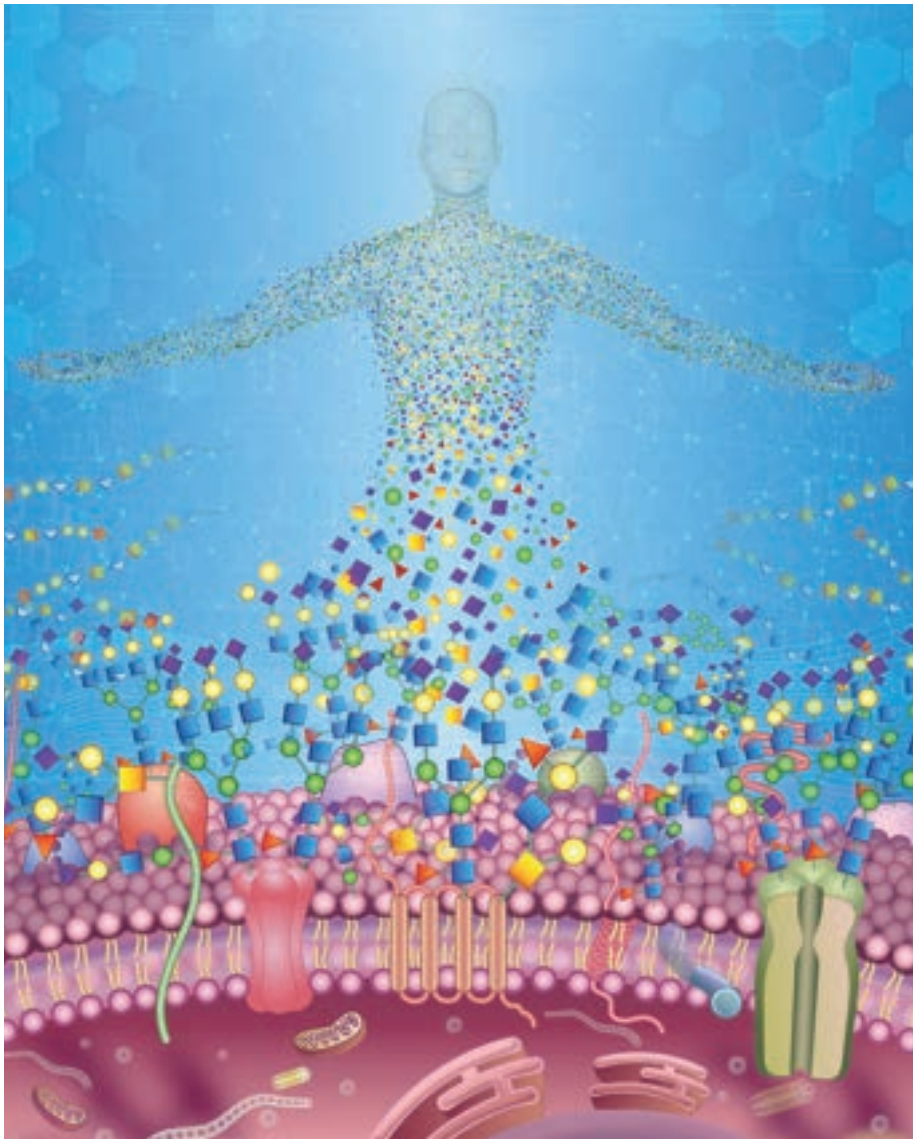
https://igcore.thers.ac.jp/en/

J-GlycoNet

https://j-glyconet.jp/en/

Human Glycome Atlas Project HGA

https://human-glycome-atlas.org/en/



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