Study Sessions for Administrative Staff FY2023

#3 Research Equipment, Facilities and Technical Assistance

October 26th, 2023 Mizuki Shimanuki / **Office of the Provost**

OIST | C-HUB Center for Professional Development & Inclusive Excellence

OKINAWA INSTITUTE OF SCIENCE AND TECHNOLOGY GRADUATE UNIVERSITY
沖縄科学技術大学院大学

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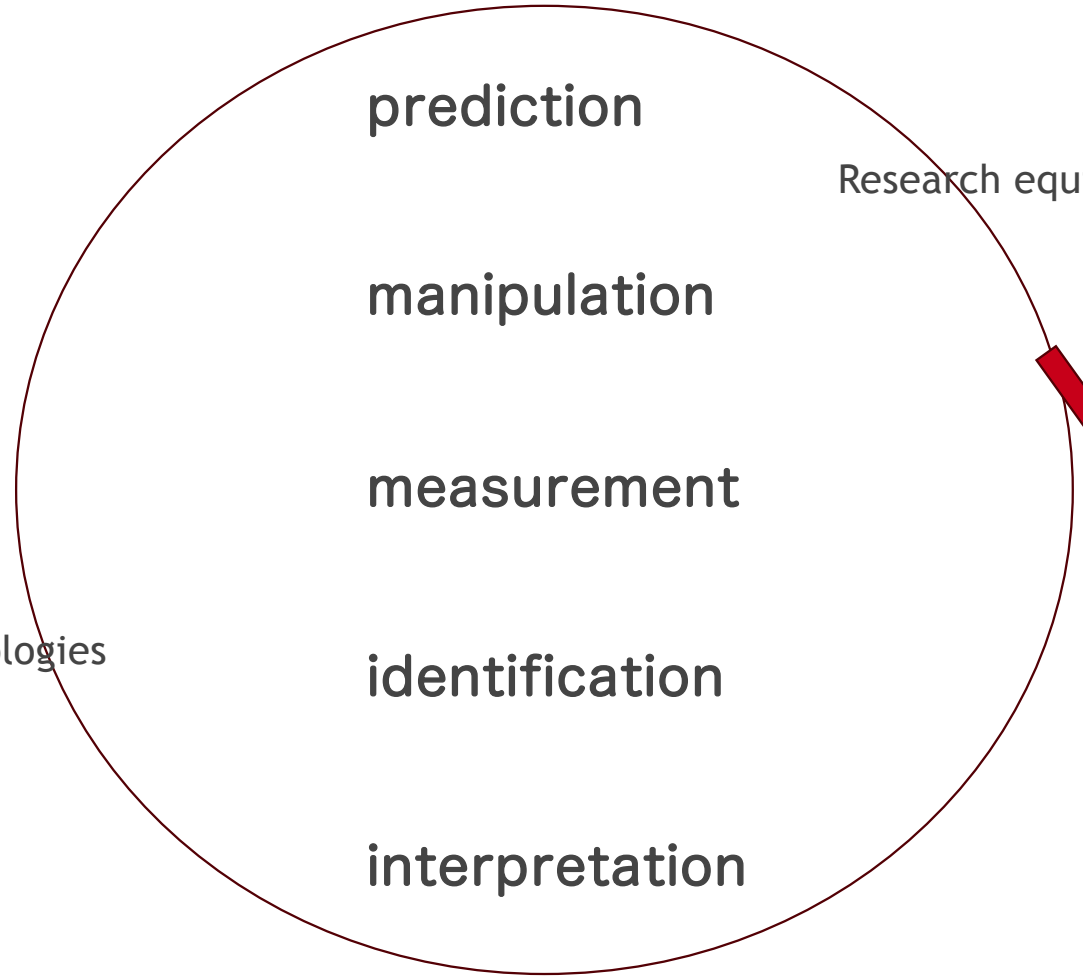
Scientific question

Strategy to address

Methods and technologies



Research equipment

loop

Finding

1. What is ”Core Facility”

Shared facilities providing advanced research equipment and technology

- Advanced equipment and facilities are managed and operated collectively by technological field and made available to researchers.
- Researchers can reserve and use equipment in the core facility. They will be taught how to use them if necessary.
- Technical staff at the Core Facility will also provide assistance with experimental design consultation, data acquisition, and analysis.

Why is the Core Facility necessary?

- It is impossible for researchers to master all advanced technologies and equipment by themselves (need for technical expert personnel).
- It is costly for researchers to have their own dedicated equipment of the same type. (Necessity/reasonableness of sharing equipment)

2. Core Facilities of OIST : organization

Provost

Office of the Provost

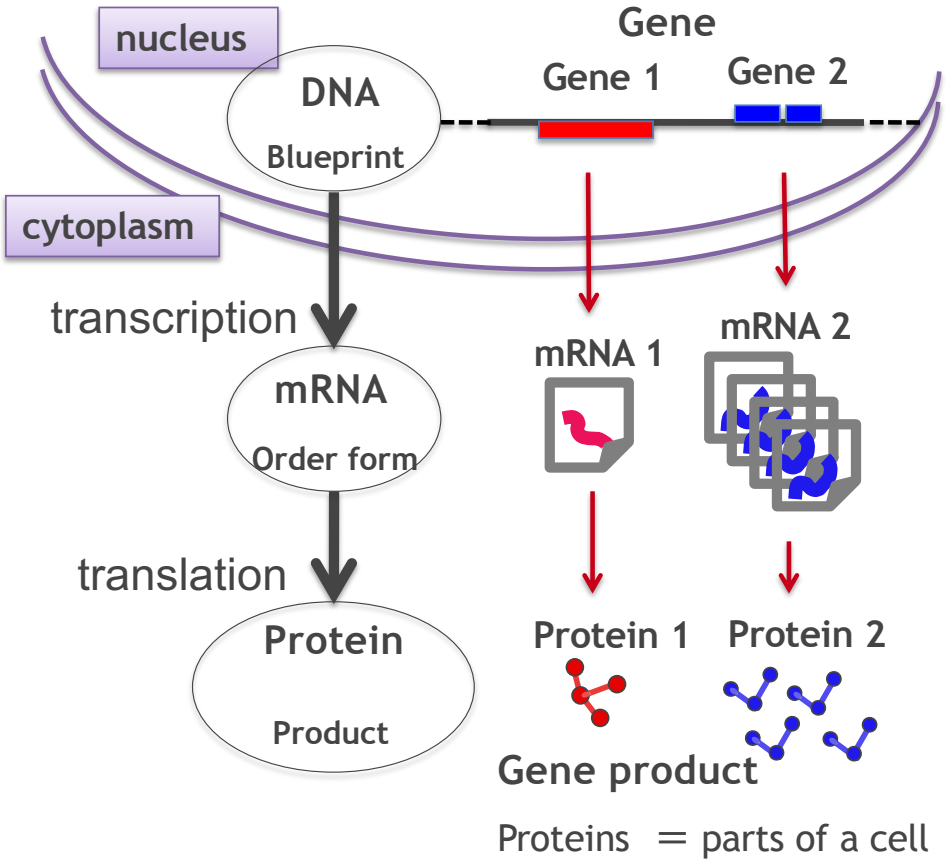
- Research Budget Allocation and Management
- Research Resource Allocation Management
- Academic Contracts
- Research administration planning
- Overall coordination of research and academic affairs

Director of Core Facilities

Sections

Sequencing	✓ Genetic analysis facilities ✓ DNA sequencing service
Scientific Imaging	✓ Imaging facilities (Optical and Electron microscopy) ✓ Technical support for imaging techniques
Instrumental Analysis	✓ NMR, mass spectroscopy, flow cytometry, etc. ✓ Technical support for instrumental analysis techniques
Engineering	✓ Engineering facilities ✓ Fabrication services & Materials characterization
Animal Resources	✓ OIST animal facility ✓ Provision of animal care
Marine Science	✓ OIST Marine Science Station ✓ Fieldwork support for marine science research
Environmental Science & Informatics	✓ Network of terrestrial field sites ✓ Environmental data analysis
Scientific Computing & Data Analysis	✓ Scientific computing resources ✓ High-performance computing and research storage
Basic Lab Support	✓ Basic common laboratories and equipment ✓ Labware redistribution and glass wash services

2. Core Facilities of OIST : Sequencing Section (SQC)



DNA is a substance consisting of four types of parts including structures called "bases" represented by the letters A, T, G, and C, which are connected in a linear fashion, and the string of letters is the DNA sequence (nucleotide sequence)
One letter of DNA is counted as one base pair.

Analysis to read the DNA is “Sequencing” and the device for that is “Sequencer”

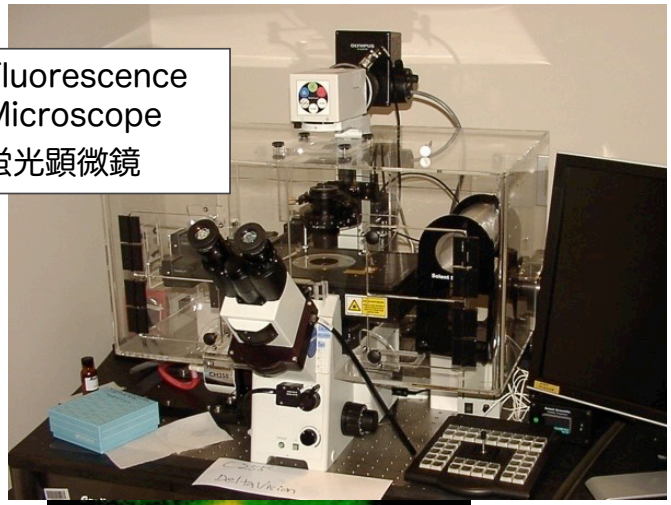
A set of information of all genes of an organism is called “Genome”.

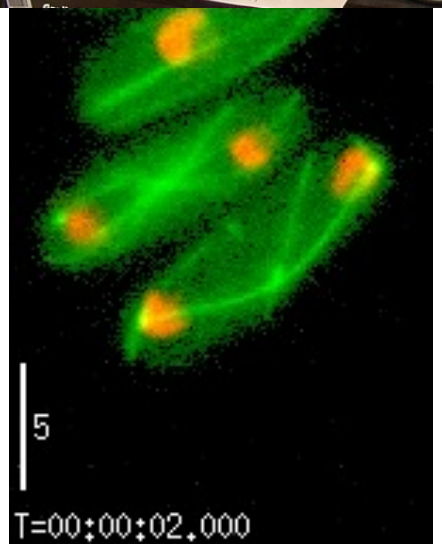
Human genome consists of 3.1 billion base pairs, and the number of genes are ~30 thousand.

From sequencing, you can get information about set of genes of an organism, activities of the genes, mutations in the genome, etc.

2. Core Facilities of OIST : Scientific Imaging Section (IMG)

Fluorescence Microscope
蛍光顕微鏡



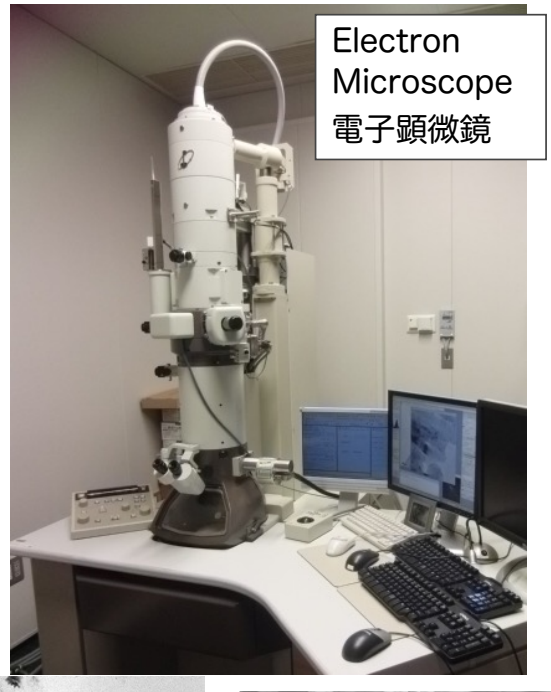


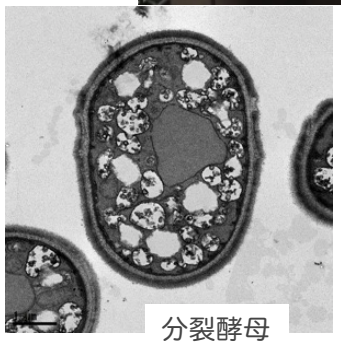
5 µm

分裂酵母

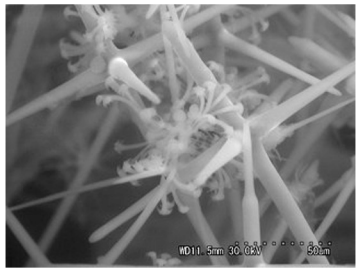
緑：微小管
赤：染色体

Electron Microscope
電子顕微鏡



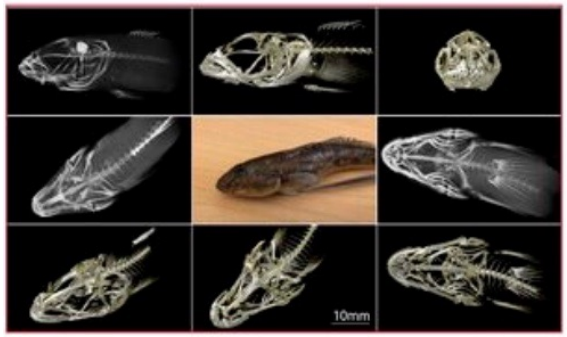


分裂酵母



カイメン

X-ray CT Microscope
X線CT顕微鏡

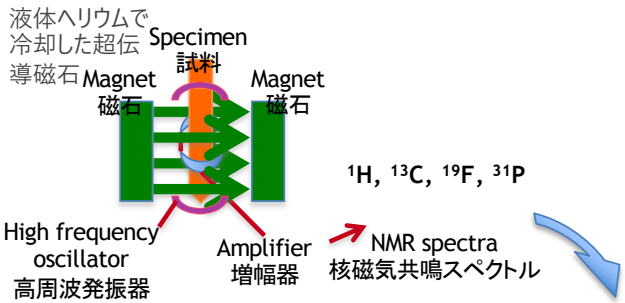


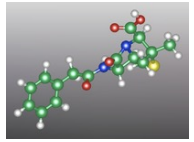
ハゼ

2. Core Facilities of OIST : Instrumental Analysis Section (IAS)

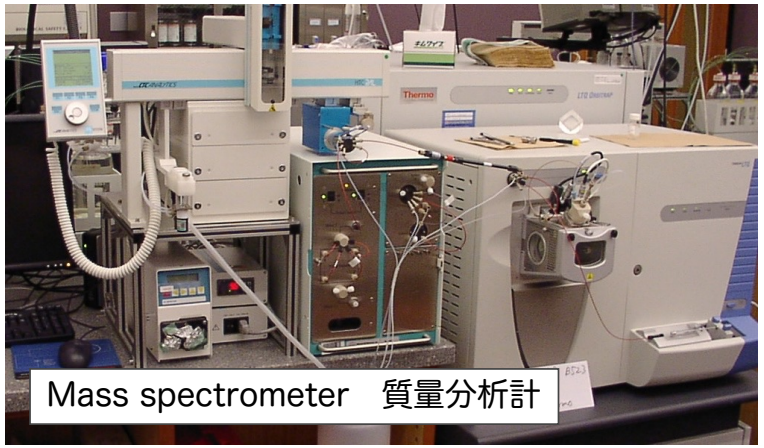
NMR (Nuclear Magnetic Resonance) spectrometer
核磁気共鳴分析計

Measure Energy Levels of Certain Atoms in Molecules
分子内の特定原子のエネルギー状態を測る

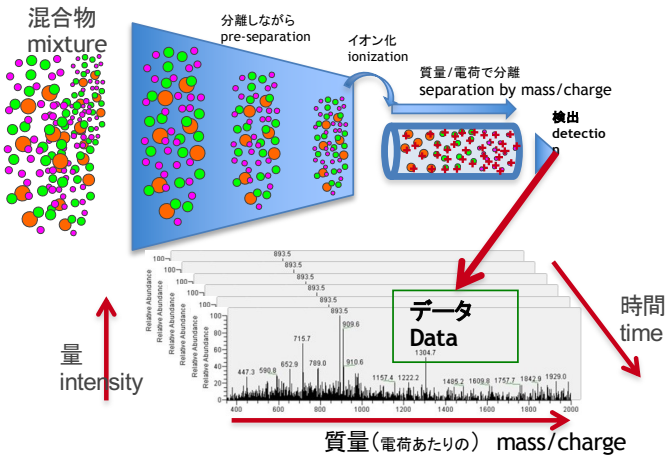




Estimate structure of molecules
分子の構造が推定できる

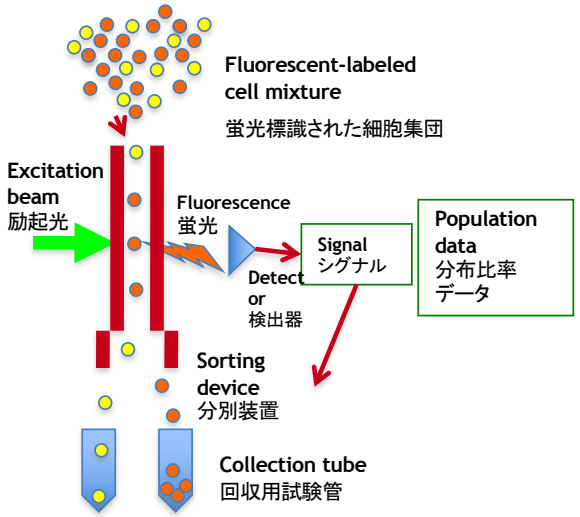


Mass spectrometer　質量分析計



What molecule? How much?
どんな物質がどれくらい含まれているか調べる

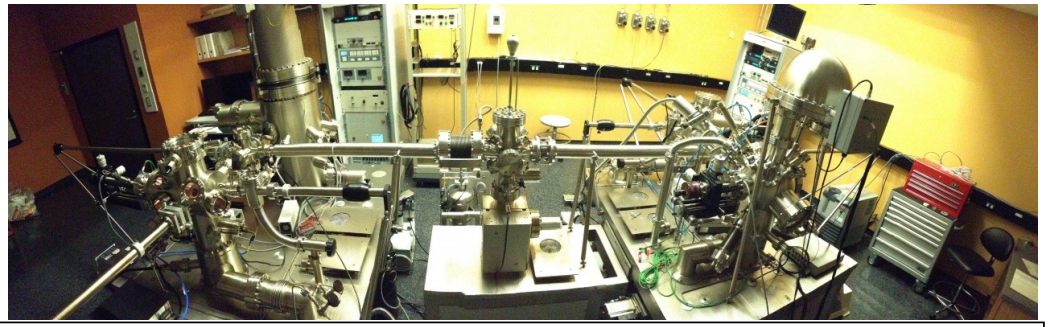
Cell sorter　セルソーター



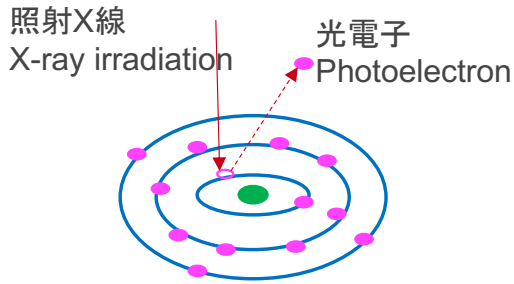
Select a certain population of the cells
特定の細胞を選別する

2. Core Facilities of OIST : Engineering Section (ENG)

Material characterization 材料分析



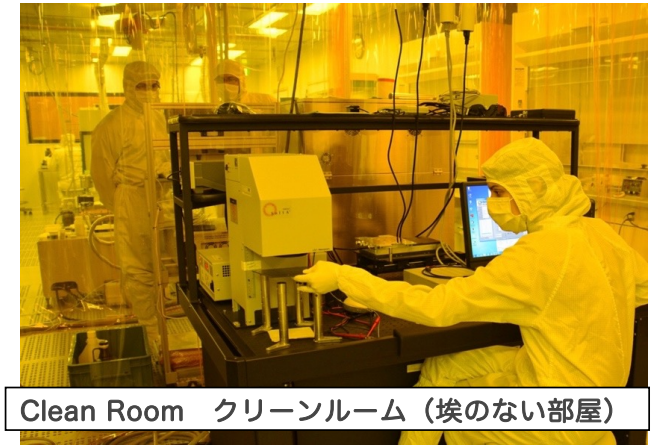
例えば、XPS (X-ray Photoelectron Spectroscopy)　X線光電子分光分析装置　など



When irradiated with X-rays, electrons are ejected from the atoms that make up the sample.
This is called photoelectrons, and by examining their energy, we can determine what elements exist on the surface of the sample (< a few nm) and in what chemical bonding state. By examining the energy of the photoelectrons, we can determine what elements are present on the surface of the sample (< a few nm) and in what chemical bonding state.

Machine engineering 機械工作

Nanofabrication 微細加工

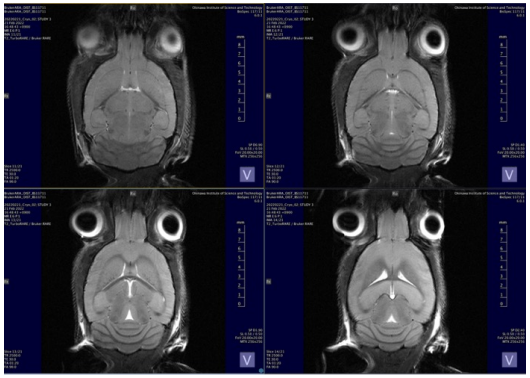


Clean Room　クリーンルーム（埃のない部屋）

2. Core Facilities of OIST : Animal Resources Section (ARS)

Management of experimental animal facility
Animal care

Research MRI



2. Core Facilities of OIST : Marine Science Section (MSS)

OIST Marine Science Station　臨海実験施設　Seragaki 瀬良垣漁港

Indoor tanks 屋内水槽

Outdoor tanks 屋外水槽

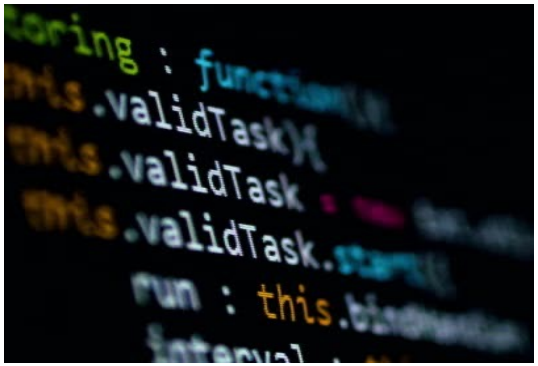
Laboratory 実験室

2. Core Facilities of OIST : Environmental Science Section (ESS)

Terrestrial field research
陸地の環境調査

OKEON project
美ら森プロジェクト

Data analysis support
環境データの解析支援



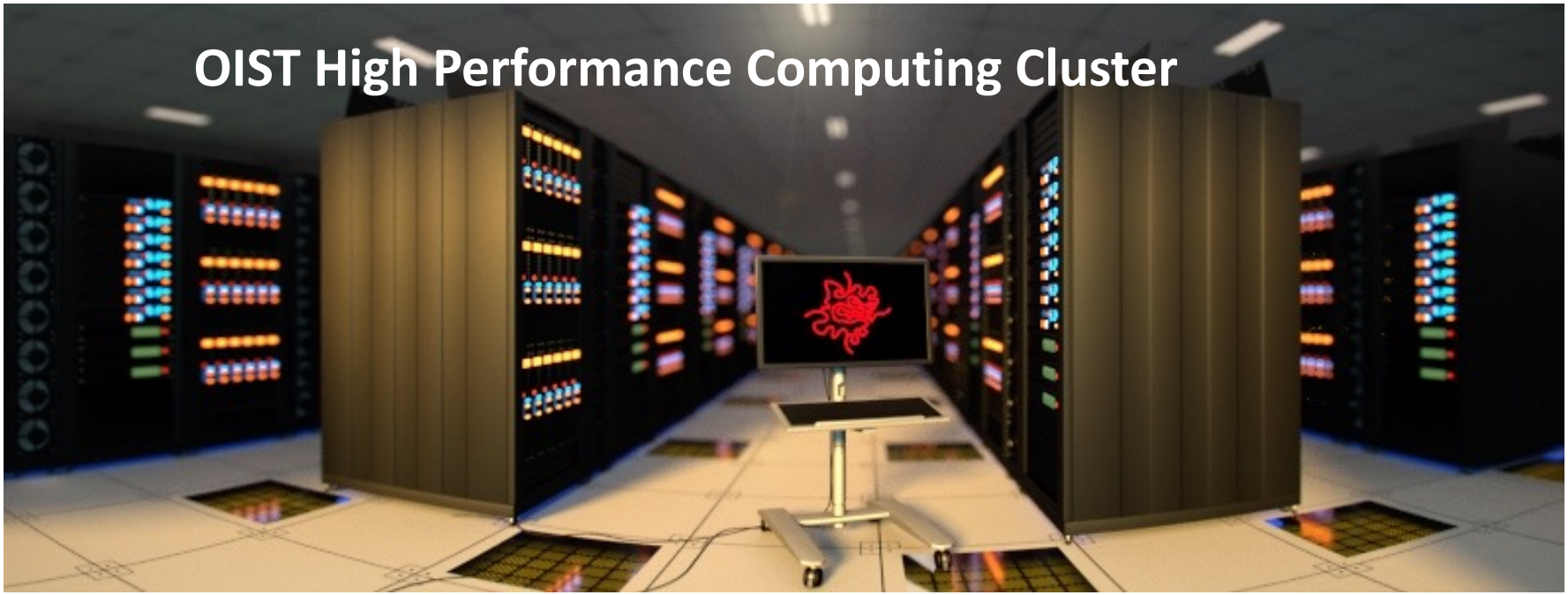
Terrestrial invertebrates sample collection
陸上無脊椎動物コレクション

2. Core Facilities of OIST :

Scientific Computing & Data Analysis Section (SCDA)

Computing on HPC and data storage
HPCを用いた計算とデータ保管

License management of research software
研究用ソフトウェアのライセンス管理



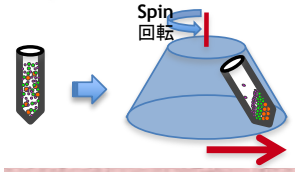
2. Core Facilities of OIST : Basic Lab Support Section (BLS)

Basic Common Equipment

Ultra High-Speed Centrifuge
超遠心機

Ultra pure water system
超純水製造装置

Autoclave
高圧蒸気滅菌器



Separation by Centrifugal Force
遠心力を使って分離する

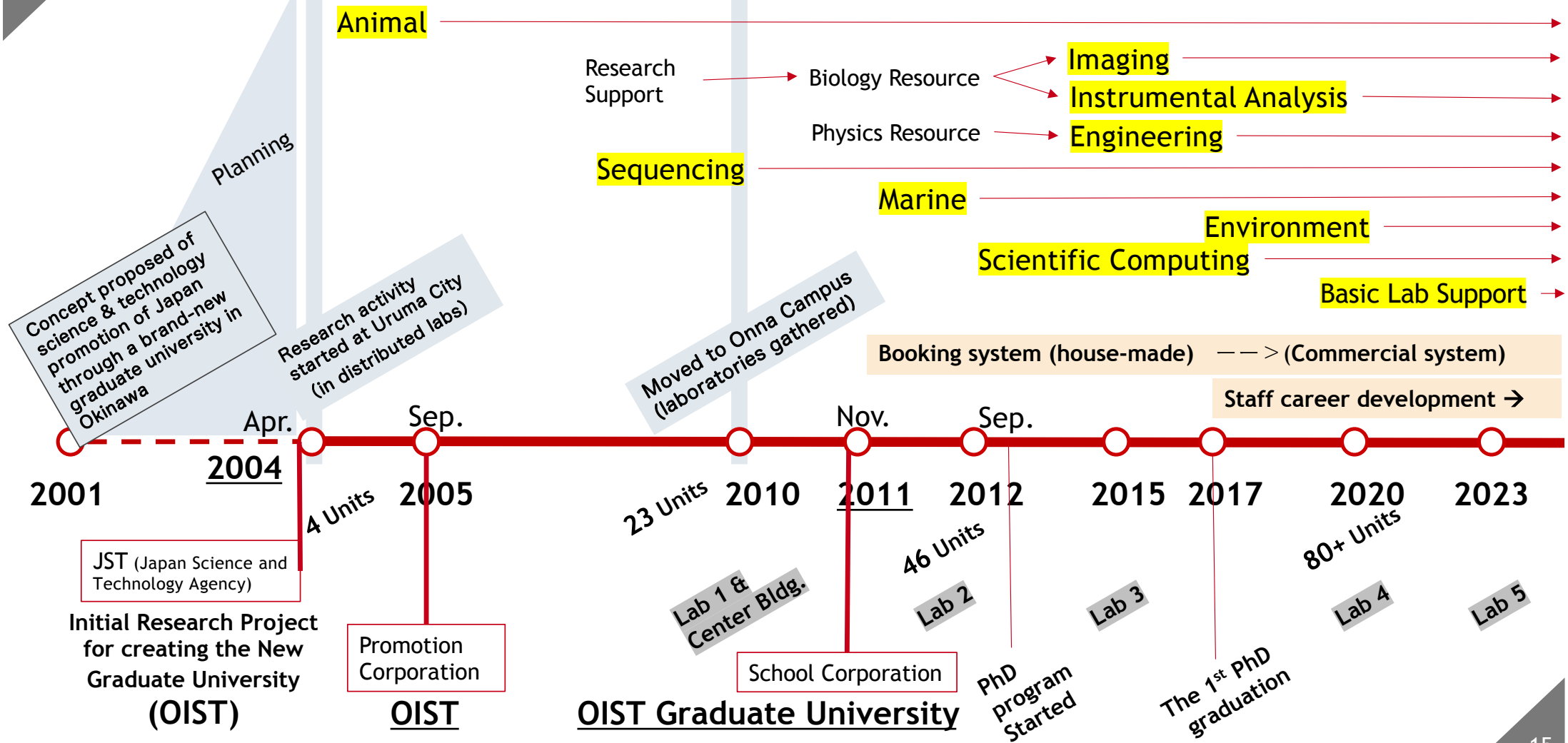
Basic Common Laboratories

- Culture rooms
- Cold rooms
- Common equipment rooms
- Freezer rooms
- Service alcoves

Glassware Washing Service

Labware Redistribution System

2. Core Facilities of OIST : History of OIST Core Facilities



2. Core Facilities of OIST : Equipment Gallery & Booking System

Microscope Olympus BX51
RED-00000515
Model Name: BX51-N34MD
Manufacturer: Olympus
Equipment Category: Microscope (regular)
Asset ID: 16773
Keywords: prs
Camera =
Eyepieces =
Objectives =
Site: On-campus
Building: L2
Floor level: LevelA
Room: A645a (Class 1000 Gowning Clean Room)
Sharing status: COMMON
Responsible Unit/Section: Engineering Support Section
Contact: Szikszai Laszlo (laszlo.szikszai@oist.jp)
Supporting section: Engineering Support Section

Upright Microscope
RED-00000528
Model Name: Axioimager Z1
Manufacturer: Carl Zeiss
Equipment Category: Microscope (regular)
Serial No.: 351200623
Asset ID: 9232
Keywords: compound
Camera =
Eyepieces =
Objectives =
Site: On-campus
Building: L1
Floor level: LevelC
Room: C253 (Microscope Room)
Sharing status: INDIVIDUAL
Responsible Unit/Section: Satoh Unit
Contact: Tanahara Shoko (syamakaw@oist.jp)
Supporting section: Imaging Section

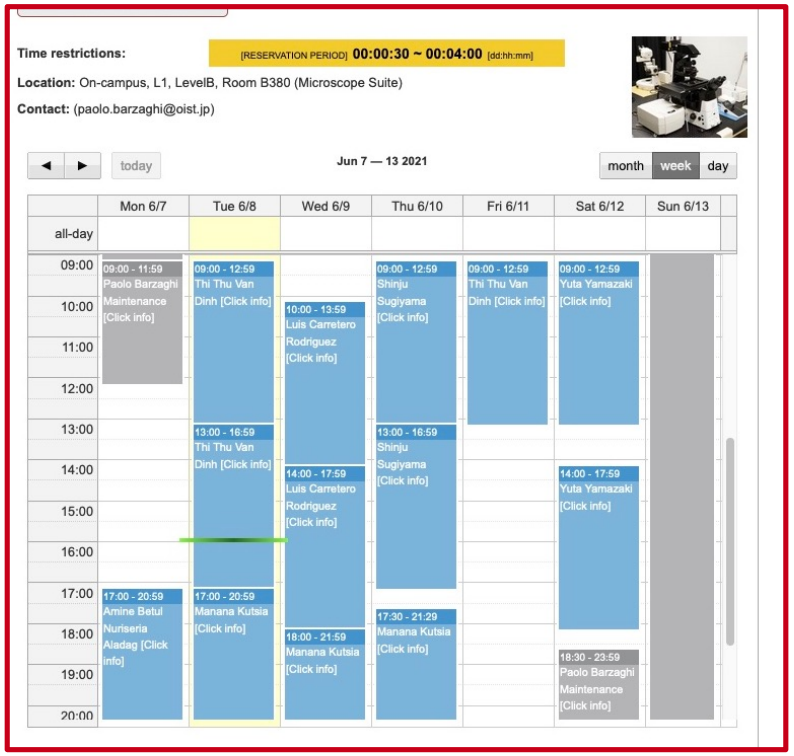
Fluorescence Microscope
RED-00000362
Model Name: BZ-9000
Manufacturer: Keyence
Equipment Category: Microscope (regular)
Serial No.: BD800003
Asset ID: 9540
Keywords: inverted, all in one, compound
Camera =
Eyepieces =
Objectives =
Site: On-campus
Building: L1
Floor level: LevelD
Room: D364 (Microscope Room)
Sharing status: SHARED
Responsible Unit/Section: Wickens Unit
Contact: Suzuki Yukako (ysuzuki@oist.jp)
Supporting section: Imaging Section

Digital Microscope
RED-00000361
Model Name: DMD108
Manufacturer: Leica
Equipment Category: Microscope (regular)
Serial No.: 11 888400/5601536
Asset ID: 9222
Keywords: compound
Camera =
Eyepieces =
Objectives =
Site: On-campus
Building: L1
Floor level: LevelD
Room: D364 (Microscope Room)
Sharing status: INDIVIDUAL
Responsible Unit/Section: Wickens Unit
Contact: Suzuki Yukako (ysuzuki@oist.jp)
Supporting section: Imaging Section

Upright Microscope
RED-00000358
Model Name: BX51WI
Manufacturer: Olympus
Equipment Category: Microscope (regular)
Serial No.: A02436
Asset ID: 8820
Keywords: compound, patch clamp
Camera =
Eyepieces =
Objectives =
Site: On-campus
Building: L1
Floor level: LevelD
Room: D456 (Patch Clamp)
Sharing status: INDIVIDUAL
Responsible Unit/Section: Wickens Unit
Contact: Suzuki Yukako (ysuzuki@oist.jp)
Supporting section: Imaging Section

Gallery to show major common equipment
(under construction for renewal)

https://groups.oist.jp/rsd/research-equipment-gallery-0



House made booking system (2012~2020)
has been replaced with
PPMS (Pasteur Platform Management System)

STRATOCORE

2. Core Facilities of OIST : Dedicated equipment are also needed

Common Equipment from Core Facilities

Series of equipment with different specifications for different purposes.

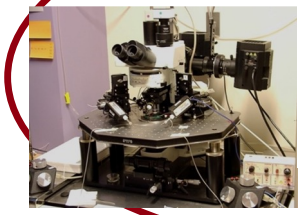
Managed/maintained by Core Facilities.

Need a reservation to use.

Unit dedicated equipment

for the reason of super-high frequency of use by a research project in a unit.

Unit dedicated equipment



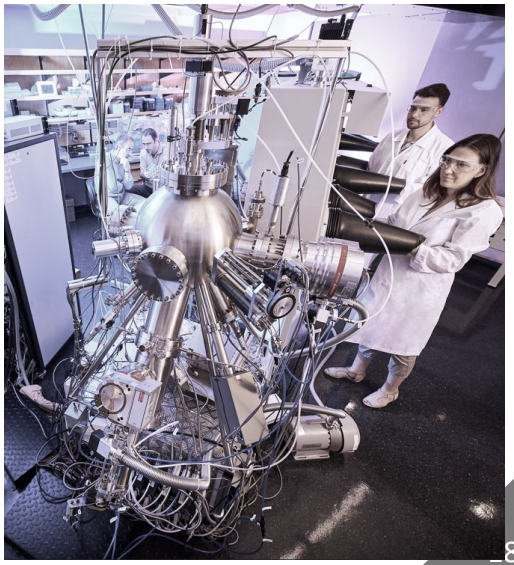
for the reason of need of customized setup including special accessories for special experiments

2. Core Facilities of OIST : Effort for saving

Labware Redistribution System

Research equipment and instruments that are no longer used due to termination or changes in projects are taken back through the university's reallocation system and reallocated to another department that wishes to use them.

OIST is making a university-wide, systematic effort to make effective use of research equipment!



3. External collaboration of core facilities

Reasons why core facilities are needed

- It is impossible for researchers to master all advanced technologies and equipment by themselves (Need for technical expert personnel).
- It is costly for researchers to have their own dedicated equipment of the same type. (Necessity and rationality of equipment sharing)

Collaboration and networking is important.

External use (under preparation)

Charges a fee based on the type of user and the type of use.
(not for profit but for covering the actual running cost)
Prices are different according to the type of users
(academic or industry, collaborator of OIST or not, etc.)

(Basically free of charge for OIST researchers and students. Only the actual cost of expensive consumables is borne by the user)

3. External collaboration of core facilities

ABiS: Advanced Bioimaging Support: https://www.nibb.ac.jp/abis/ OIST Scientific Imaging Section
Grant-in-Aid for Transformative Research Areas — Platforms for Advanced Technologies and Research Resources; Funded by MEXT (FY2016-2021, FY2022-2027) Bioimaging support for the researchers who receives Grant-in-Aid. OIST provides training and support on Light Microscopy.

先端バイオイメージング支援プラットフォーム(ABiS)

文部科学省、科学研究費助成事業「学術変革領域研究(学術研究支援基盤形成)」のプロジェクト。科研費を受けている研究者を支援するプラットフォームで、OISTは光学顕微鏡の支援とトレーニングを担当。

BINDS: Basis for Supporting Innovative Drug Discovery and Life Science Research: https://www.binds.jp/ OIST Scientific Imaging Section
Funded by Japan Agency for Medical Research and Development (AMED) (FY2017-2021, FY2022-2026) OIST provides training and support on structural analysis of protein molecules using cryo-electron microscopy.

創薬等先端技術支援基盤プラットフォーム(BINDS)

日本医療研究開発機構(AMED)の生命科学・創薬研究支援基盤 事業。創薬につながる基礎研究を支援するプラットフォームで、OISTはクライオ電子顕微鏡によるタンパク質分子構造解析のトレーニングと支援を担当。

Research MRI Sharing Platform: https://www.mripf.jp/ OIST Animal Resources Section
Advanced Research Facilities Platform Program; Funded by MEXT (FY2021-2025) OIST provides support on research (non-medical) MRI.

研究用MRI共有プラットフォーム

文部科学省「先端研究基盤共用促進事業」によるプラットフォームで、OISTは実験動物施設内にある研究用MRI装置を用いた研究支援を担当。

etc. などなど

4. Challenges of Core Facilities

Japan’s political effort to promote resources sharing

Core facilities are common in overseas universities and research institutes, but still few in Japan. MEXT (Ministry of Education, Culture, Sports, Science and Technology) published "Guidelines for the Promotion of Shared Use of Research Facilities and Equipment".
In Japanese universities, research equipment has generally been exclusive and used by each laboratory, MEXT has been promoting the creation of a national system to promote the shared use of such equipment.


研究設備・機器の共用推進に向けたガイドライン 概要
～すべての研究者がいつでもアクセスできる共用システムの構築を目指して～

Challenges of Core Facilities

Maintenance： Equipment maintenance costs a lot.

Personnel： Recruiting experts are difficult.

New technology： Need to employ newest technology with the state-of-the-art equipment, together with the expertise to fully utilize those. Cost a lot.