

Study Sessions for Administrative Staff FY2023

#2 Research Areas of Science and Technology

October 4th, 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



Session 2 Research Areas of Science and Technology

0. What is science?
1. Basic Research & Applied Research
 - To address scientific questions & To create useful technologies or items
2. Subjects and fields of research: scientific questions and research methods
 - Research Discipline & Specialty
3. Where you can find OIST's research information
 - OIST website, external websites, news, seminars, etc.
4. Education programs of OIST graduate school
 - Admission workshop, lab rotation, classes based on research topics
5. Faculty Affairs Office & Graduate School Office



0. What is science ?

Science

knowledge

--> **Untiring systematic efforts and results that attempt to unravel things so that they can be explained logically,** and it is maintained with a humble attitude toward being modified by new findings.

So, there is a contradiction in the phrase "there are some things science can't figure out."

Pseudoscience

--> Blind faith, explanations or strong arguments that are not based on logical evidence but may seem to be scientific findings.

In many cases, critical control (comparisons) are missing.

Pre-science (preliminary, or immature stage to become science)

--> In the middle of a logical approach, still to be established as scientific knowledge

Working Hypothesis: A hypothesis that serves as a starting point for solving a problem.



0. What is science ?

In a narrow sense = **Natural science:**

Natural science: Biology, Chemistry, Physics, Astronomy, Geology, Mathematics, etc.

In a broader sense = **Natural science + Applied science:**

Applied science: Medicine, Agriculture, Engineering, etc.

STEM (Science, Technology, Engineering, & Mathematics)

In the broadest sense

= **Natural science + Applied science + Social science + Humanities**

Social science: Economics, Law, Political Science, Education, etc.

Humanities: Archaeology, Folklore, Cultural Anthropology, etc.



1. Basic Research vs Applied Research

Basic Science <-- Scientific Questions

= to understand existing nature and phenomenon

Biology: life, organism

Chemistry: elements, atoms, molecules, matter, chemical reactions

Physics: motion, light, sound, electricity, magnetism, heat, waves, space, particles, quantum

Mathematics: number, quantity, shape, structure, space, change

Geology: Earth

Astronomy: celestial bodies

Applied Science <-- Needs from Society

= to realize technologies and products that do not yet exist

Medicine: maintenance of health, treatment of illness and injuries

Agriculture: production of food and materials, environmental protection;

including agriculture, forestry, fisheries, and animal husbandry

Engineering: products, technologies and environments for safety, health and welfare



1. Basic Research vs Applied Research

But you can purely enjoy knowledge.

Basic Research

Intellectual curiosity
(Scientific questions)

-->

explore, elucidate

-->

Knowledge, Truth, Principle

Not always immediately useful
for everyday life.

Motivation

Action

Consequence

Common property of
humankind

Better quality of life
(Needs from Society)

-->

apply, develop

-->

Technology, Products

Contribute directly to everyday
life.

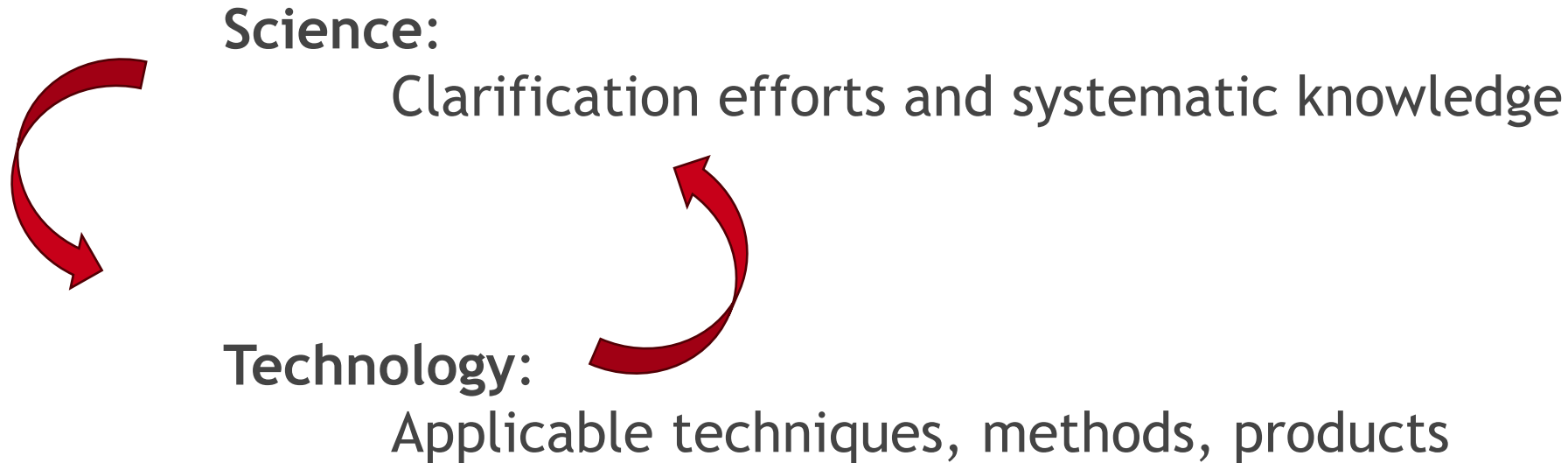
Applied Research

Basics which is not immediately useful is the most important, because it is the basis of every useful things.



1. Basic Research vs Applied Research

Science and Technology help each other grow.





1. Basic Research vs Applied Research

Procedures of Basic Research

Set a scientific question to solve

Set strategy, materials and methods

Acquire data

Analyze data, interpret, verify the hypothesis

Publish → Share the new knowledge with humankind

Procedures of Applied Research

Set target technology and/or product to develop

Set strategy, materials and methods

Develop

Verify safety, efficiency, economy, etc.

Acquire a patent

Publish and produce → Share the new technology with humankind

Three key questions
to get an overview
of a research project

What's the subject?

How is it addressed?

At what stage is it?



2. Subjects and fields of research: scientific questions and research methods

- **Biology:** biology, evolutionary biology, molecular biology, biophysics, biotechnology, physiology, genomics, botany, synthetic biology, genetics, cell biology, developmental biology, complex systems, nanoscience, health science, biochemistry, structural biology, immunology, bioinformatics, virology, medicine
- **Chemistry:** structural biology, organic chemistry, polymer chemistry, synthetic organic chemistry, chemistry, biochemistry, nanoscience, quantum
- **Computer Science:** Informatics, Machine Learning, Cyber Security, Bioinformatics, Computer Science, Artificial Intelligence, Deep Learning
- **Physics:** nanoscience, quantum field theory, physics, soft matter physics, quantum, atomic physics, biophysics, complex systems, condensed matter physics, mechanics, fluid dynamics, optics, materials science, optical engineering
- **Engineering and Applied Sciences:** Fluid Mechanics, Robotics, Engineering and Applied Sciences, Biotechnology, Mechanics
- **Ecology and Evolution:** Botany, Complex Systems, Ecology, Environmental Science, Evolutionary Biology
- **Neuroscience:** Psychology, Complex Systems, Developmental Neuroscience, Nanoscience, Neuroscience
- **Mathematics:** topological geometry, mathematics, algebra, analysis, complex systems
- **Marine Sciences:** marine biology, marine geology

2. Subjects and fields of research: scientific questions and research methods

Research field groups classified by the OIST faculty

OIST Science 100 Symposium

8:30 – 17:15, Monday, May 15, 2023

OIST Auditorium & Conference Center / Zoom



Neuroscience

Physics

Engineering & Applied Sciences

Ecology, Environment, Marine

Life Sciences

Mathematics & Computer Sciences

Quantum

Materials and Chemistry

8:00	<i>Doors open</i>	
8:30-8:45	Opening	Albrecht Wagner, Acting President
8:45-10:10	Session 1: Neuroscience and Physics	Chair: Nick Luscombe
8:45-9:20	Neuroscience	Erik De Schutter
9:20-9:55	Physics	Keshav Dani
9:55-10:10	Q&A, Discussion	
10:10-10:25	<i>Coffee break</i>	<i>Conference Center</i>
10:25-11:50	Session 2: Engineering & Applied Sciences and Ecology, Environment, and Marine	Chair: Thomas Busch
10:25-11:00	Engineering and Applied Sciences	Pinaki Chakraborty and Marco Rosti
11:00-11:35	Ecology, Environment, and Marine	Tim Ravasi
11:35-11:50	Q&A, Discussion	
11:50-13:50	<i>Lunch Break*</i>	
13:50-15:15	Session 3: Life Sciences and Math & Computer Science	Chair: Amy Shen
13:50-14:25	Life Sciences	Hidetoshi Saze
14:25-15:00	Mathematics and Computer Science	Makoto Yamada
15:00-15:15	Q&A, Discussion	
15:15-15:30	<i>Coffee break</i>	<i>Conference Center</i>
15:30-17:30	Session 4: Quantum and Materials & Chemistry	Chair: Evan Economo
15:30-16:05	Quantum	Jason Twamley
16:05-16:40	Materials and Chemistry	Paola Laurino
16:40-16:55	Q&A, Discussion	
17:00-17:10	Summary of Discussions	Evan Economo and Amy Shen
17:10-17:15	Concluding Remarks	Cherry Murray, Chair of the OIST Board of Governors
17:30-19:00	<i>Free Discussion & Social**</i>	<i>Conference Center</i>



3. Where you can find OIST's research information

OIST Science 100 Symposium

Groups website > Divisions > Faculty Affairs Office (FAO)
> Faculty Assembly > Agenda & Minutes Year 12 (Sep 2022 - Aug 2023)

<https://groups.oist.jp/fassembly/agenda-minutes-year-12-sep-2022-aug-2023>

Unit websites in OIST Groups

Groups website > Units > XXX Unit

OIST websites

Faculty and Research: <https://admissions.oist.jp/faculty-and-research>

Faculty and Research: <https://www.oist.jp/research/research-units>

Discover Research Specialties: <https://www.oist.jp/research/discover>



3. Where you can find OIST's research information

Press Releases and News

When a noteworthy paper is published or an award is received, it is reported in the mass media and disseminated on social networking sites, etc.

External online articles

esse-sense, Asahi shinbun 朝日新聞 Globe+ , etc.

Internal seminars

Provost Lecture Series

(Seminars to honor faculty members for their achievements in conjunction with promotions, awards, or retirements)

Open access database of published papers from OIST

OIST Institutional Repository

<https://oist.repo.nii.ac.jp/>



4. Education programs of OIST graduate school

Admissions Workshop Screening

Educational background, qualifications, English proficiency, etc.

Applicant's Statement: Essay

- The applicant's **scientific interests** and aspirations. (Motivation?)
- What the applicant hopes to gain from graduate study at OIST. (Why OIST?)

Individual and face-to-face interviews with four faculty members

Admission to OIST is competitive and based on the same criteria as graduate programs at major universities around the world. Admission will be based on consideration of all aspects of the OIST graduate school application, including academic records, letters of recommendation, additional materials related to academic ability such as GRE General Test scores, additional materials such as copies of publications and abstracts of oral presentations, and other evidence of performance submitted. For those applicants who are selected as finalists, an additional four face-to-face interviews with faculty members will also be considered. All of these factors will be considered as a whole in making a final decision on each candidate.

Lab rotation

In the first year at OIST, students experience three research units (one of which is in a different field) for three months each, after which they decide which professor they will conduct their PhD research under and are assigned to a unit.

Therefore, at the time of admission, the unit to which you will be assigned has not yet been decided



4. Education programs of OIST graduate school

Classes

Provided along with the field of research, from the history and fundamentals of the field to specialized knowledge

Students can systematically obtain the knowledge needed to undertake research

<https://groups.oist.jp/grad/list-courses-number>

<https://groups.oist.jp/sites/default/files/imce/u128948/edgar-lopez/CourseMap2023%20V12.pdf>



5. Faculty Affairs Office & Graduate School Office

Faculty Affairs Office: responsible for hiring and evaluating OIST faculty

- Secretariat of procedures for recruitment, review, and hiring of new faculty members
- Secretariat for faculty evaluation (tenure, promotion, unit evaluation) procedures
- Secretariat for personnel procedures for researchers and technical staff
- Library and C-Hub also belong to FAO

Graduate School Office: support the educational activities of graduate students

- Secretariat of student admissions and procedures
- Compilation of the student's educational curriculum
- Management of students' academic records
- Administrative office for degree examination procedures
- Other student support
- Advertising for student recruitment (internship and outreach)