

University IP Commercialization and Entrepreneurship: The Experience of the Okinawa Institute of Science and Technology

TECHNOLOGY DEVELOPMENT & INNOVATION CENTER

Okinawa Institute of Science and Technology

Robert Baughman, Executive Vice President / Vice-CEO

December 14, 2017



OIST

OKINAWA INSTITUTE OF SCIENCE AND TECHNOLOGY GRADUATE UNIVERSITY

沖縄科学技術大学院大学

OIST OBJECTIVES

By conducting internationally distinguished education and research
in science and technology in Okinawa



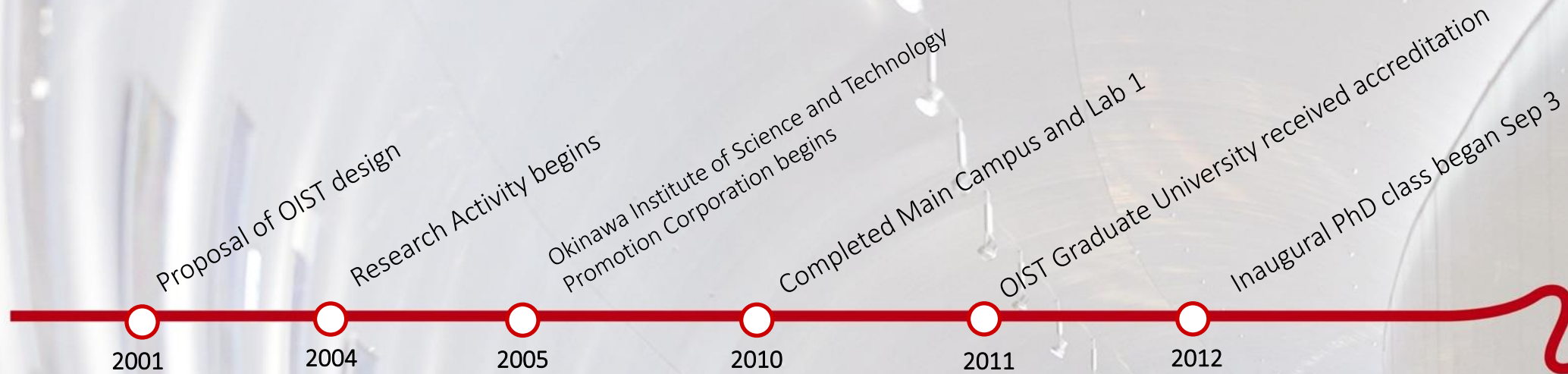
Contribute to the development
of science and technology worldwide



Contribute to the promotion and self-
sustaining development of Okinawa

- A private research University, with a 5-year PhD program
- Funded by the Japanese Government
- Truly international:
 - At least half the faculty, researchers & students must come from abroad
 - All University business – teaching, research – is conducted in English
 - Academic year starts in September

TIMELINE FOR ESTABLISHMENT OF OIST

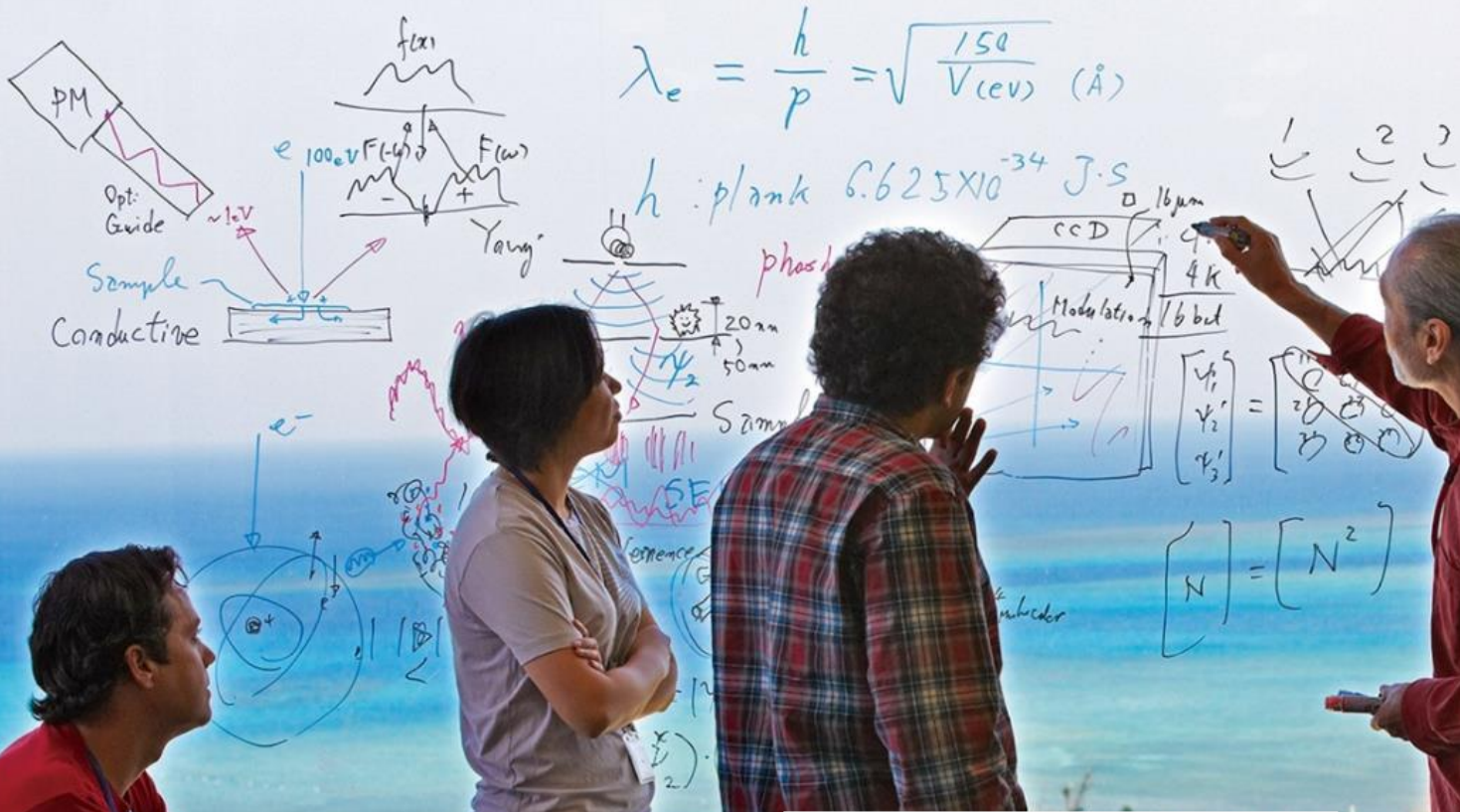


OIST

OKINAWA INSTITUTE OF SCIENCE AND TECHNOLOGY GRADUATE UNIVERSITY

NEW STYLE GRADUATE UNIVERSITY

Inaugural PhD class began Sep 3, 2012



Mix of different fields of research

Five year integrated doctoral program

Education and research in English

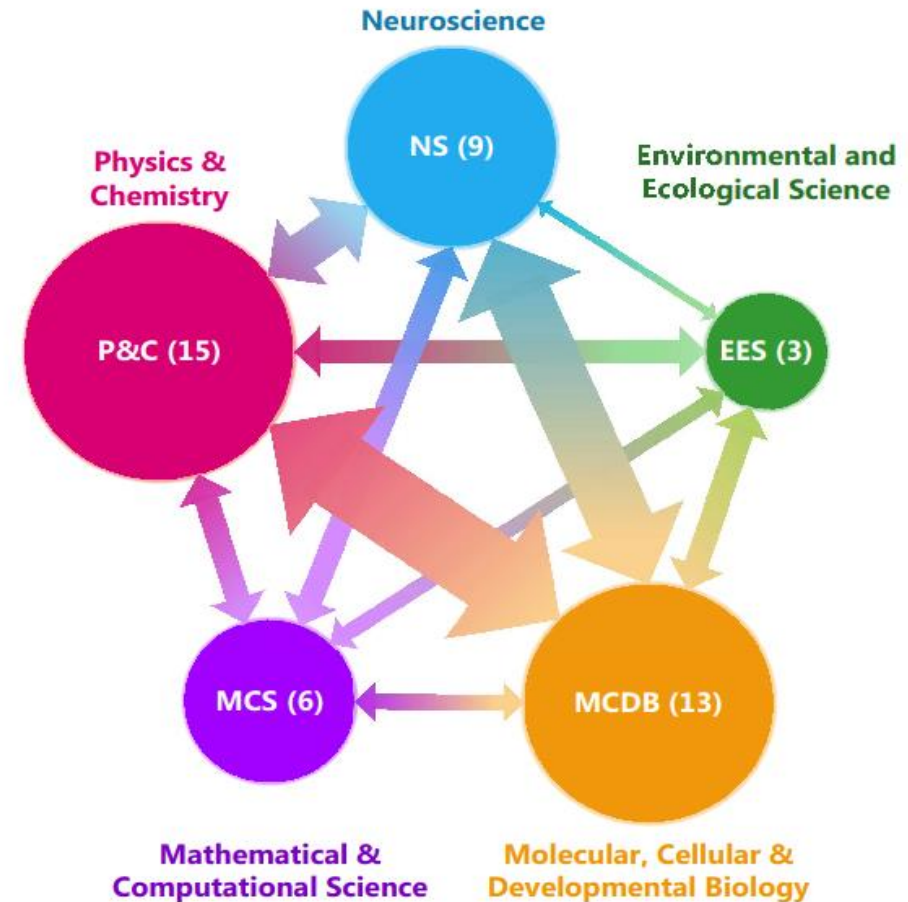
OIST ACADEMIC & RESEARCH FIELDS

Interdisciplinary Studies

Five Major Areas:

- Neuroscience
- Molecular, Cellular, and Developmental Biology
- Mathematical and Computational Sciences
- Environmental and Ecological Sciences
- Physics and Chemistry

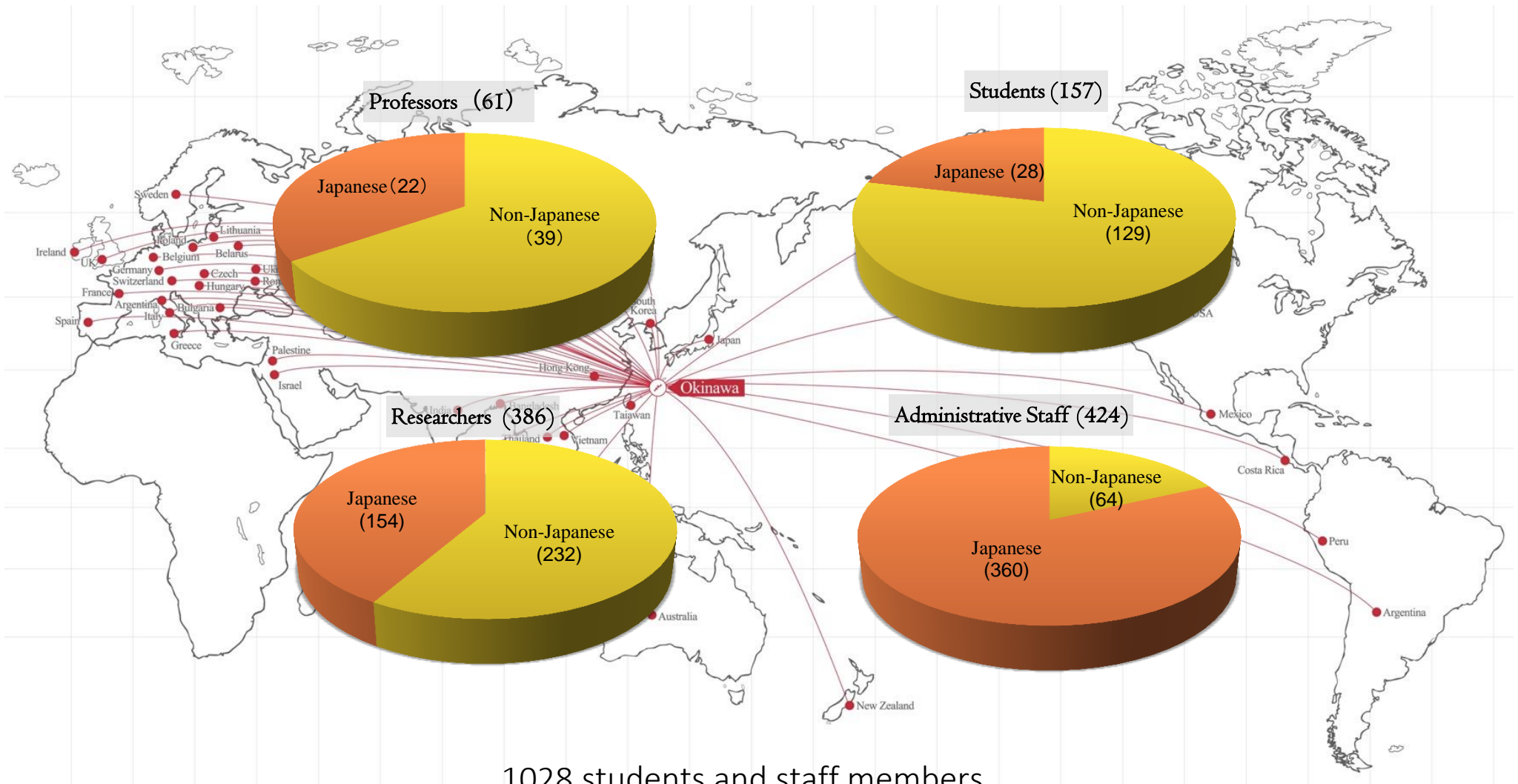
Collaboration Diagram



(The number of units are shown in parentheses)

STUDENTS AND STAFF MEMBERS

Statistics: As of Oct 1st. 2017



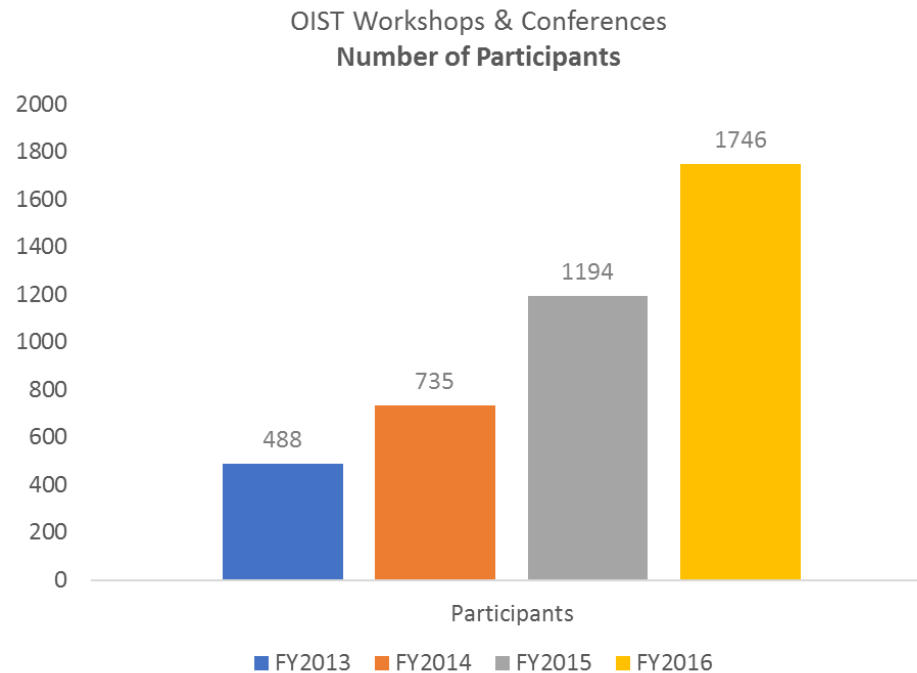
1028 students and staff members
from over 50 countries

PROMOTING INTERNATIONAL RESEARCH EXCHANGE

31 → Academic Exchange Agreements: arrangements with universities around the world for research collaborations and student exchange

21 → OIST academic workshops and conferences annually: 2-3 week educational and practical courses with top-level researchers from around the world

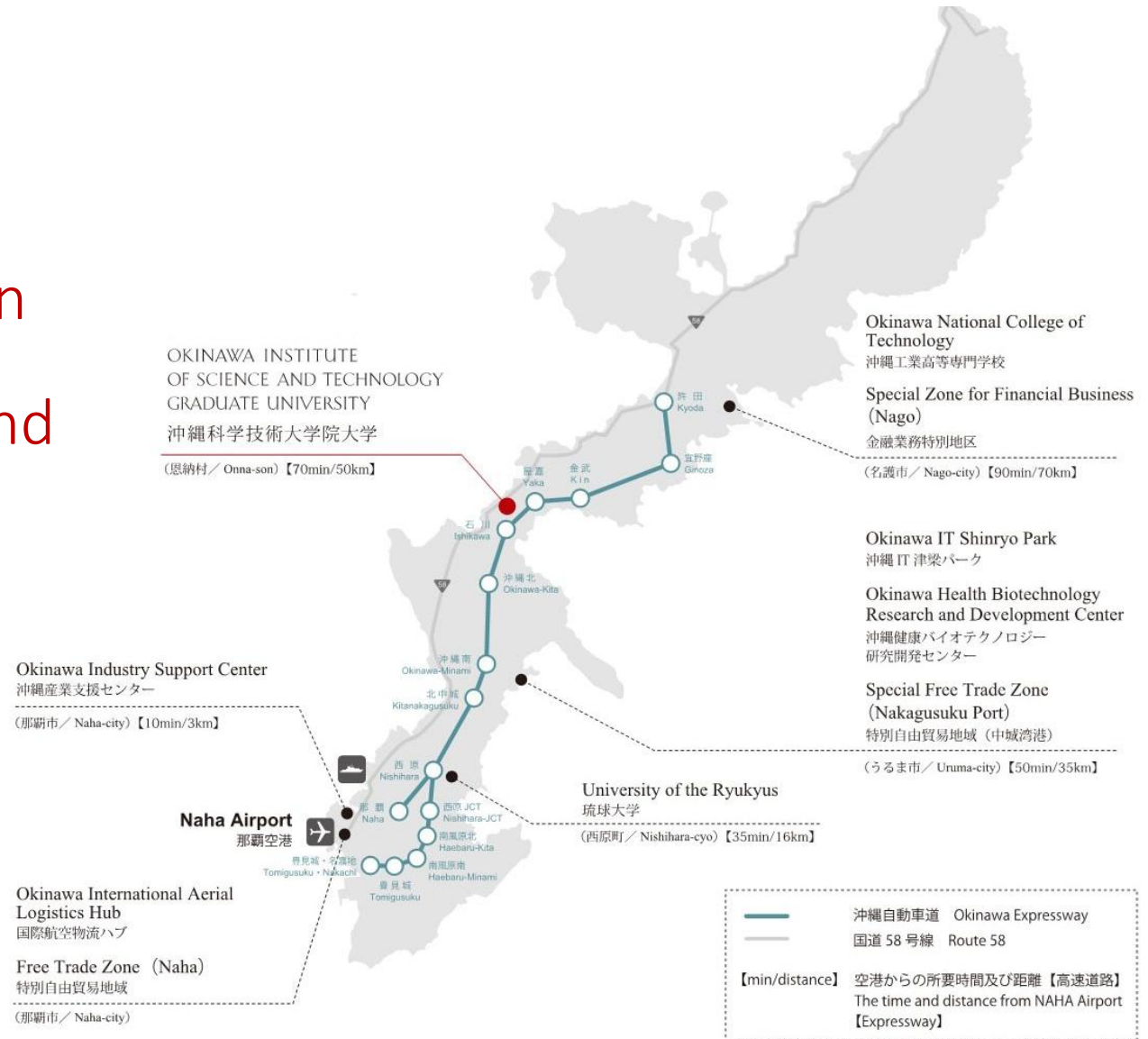
+40
Countries/Regions



TECHNOLOGY DEVELOPMENT & INNOVATION CENTER

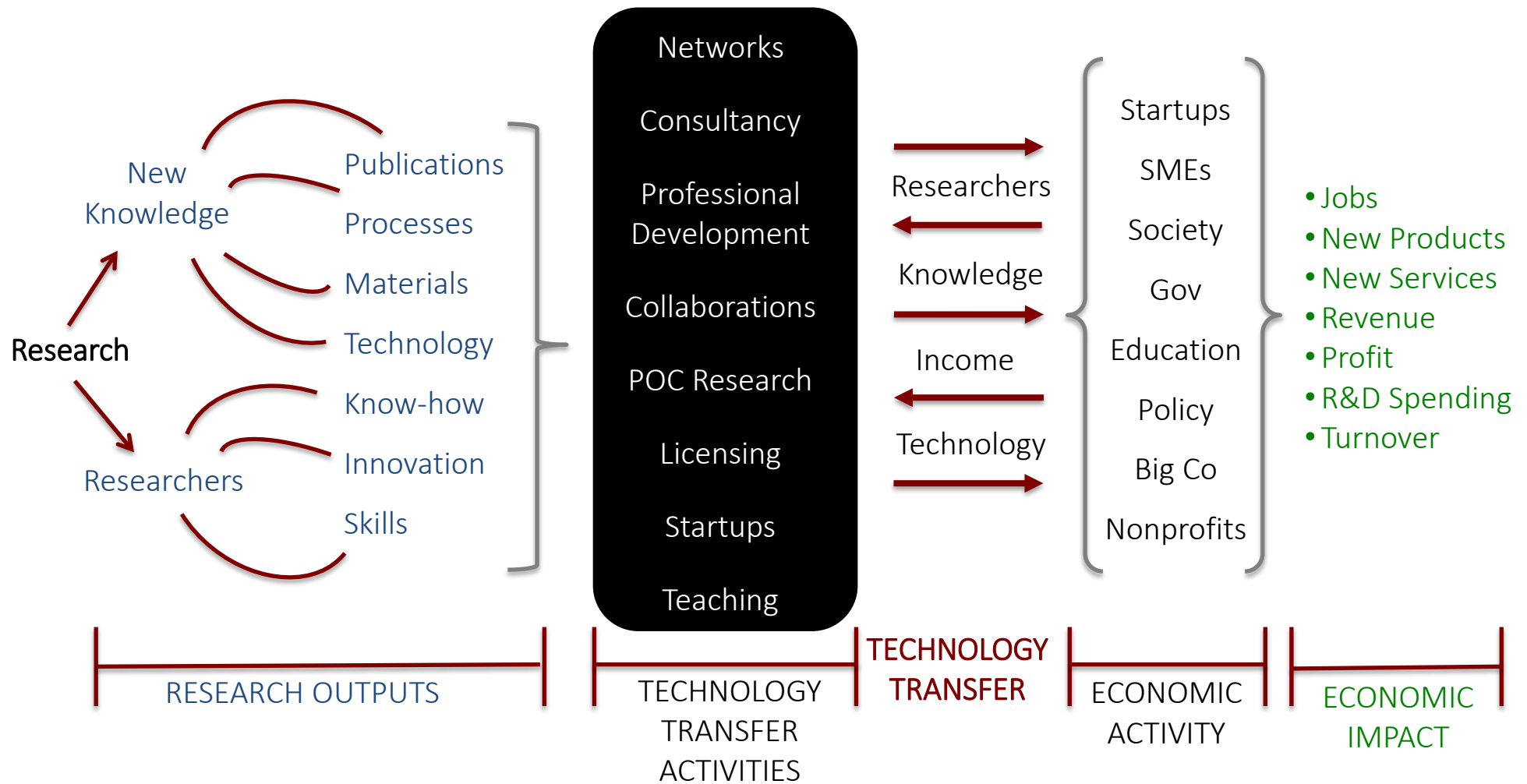
GOAL

Foster a global innovation ecosystem in Okinawa to create new businesses and industries based on R&D



TECHNOLOGY TRANSFER WITHIN THE INNOVATION ECOSYSTEM

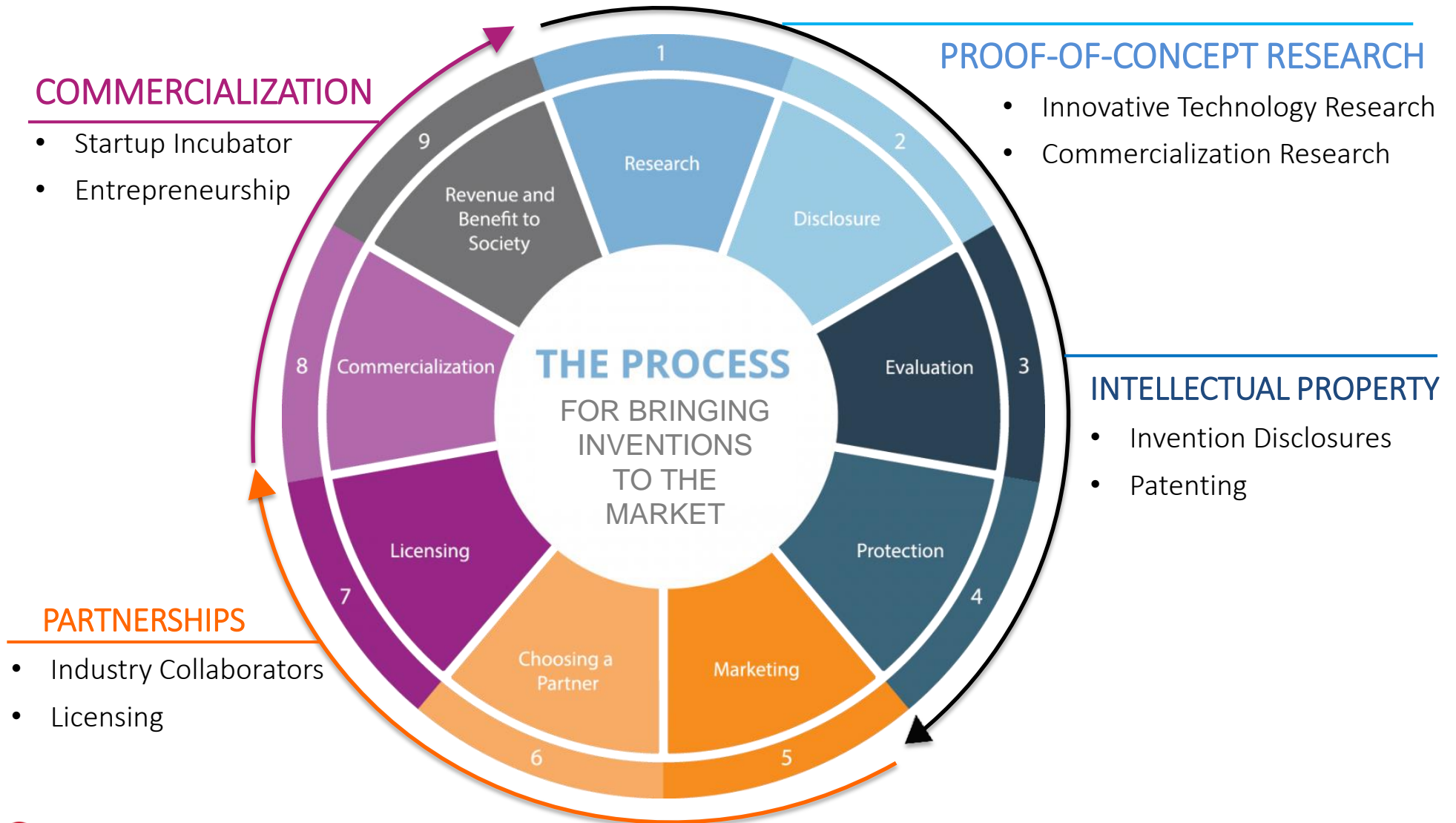
Multi-level, non-linear, complicated process of inputs, outcomes, and impact



SOURCE: Adapted from K. Cullen, University of Glasgow

TECHNOLOGY DEVELOPMENT & INNOVATION CENTER

Programs and services to support the entire technology transfer process



Technology Development and Innovation Center

for the self-sustaining development of Okinawa

Technology Licensing Section

- *Inventions, Patents*
- *Licensing*

Business Development Section

- *Industry collaborations*
- *Startup Support*

R&D Cluster Programs Section

- *Proof-of-Concept Research*
- *R&D Ecosystem Development*



PROOF-OF-CONCEPT RESEARCH

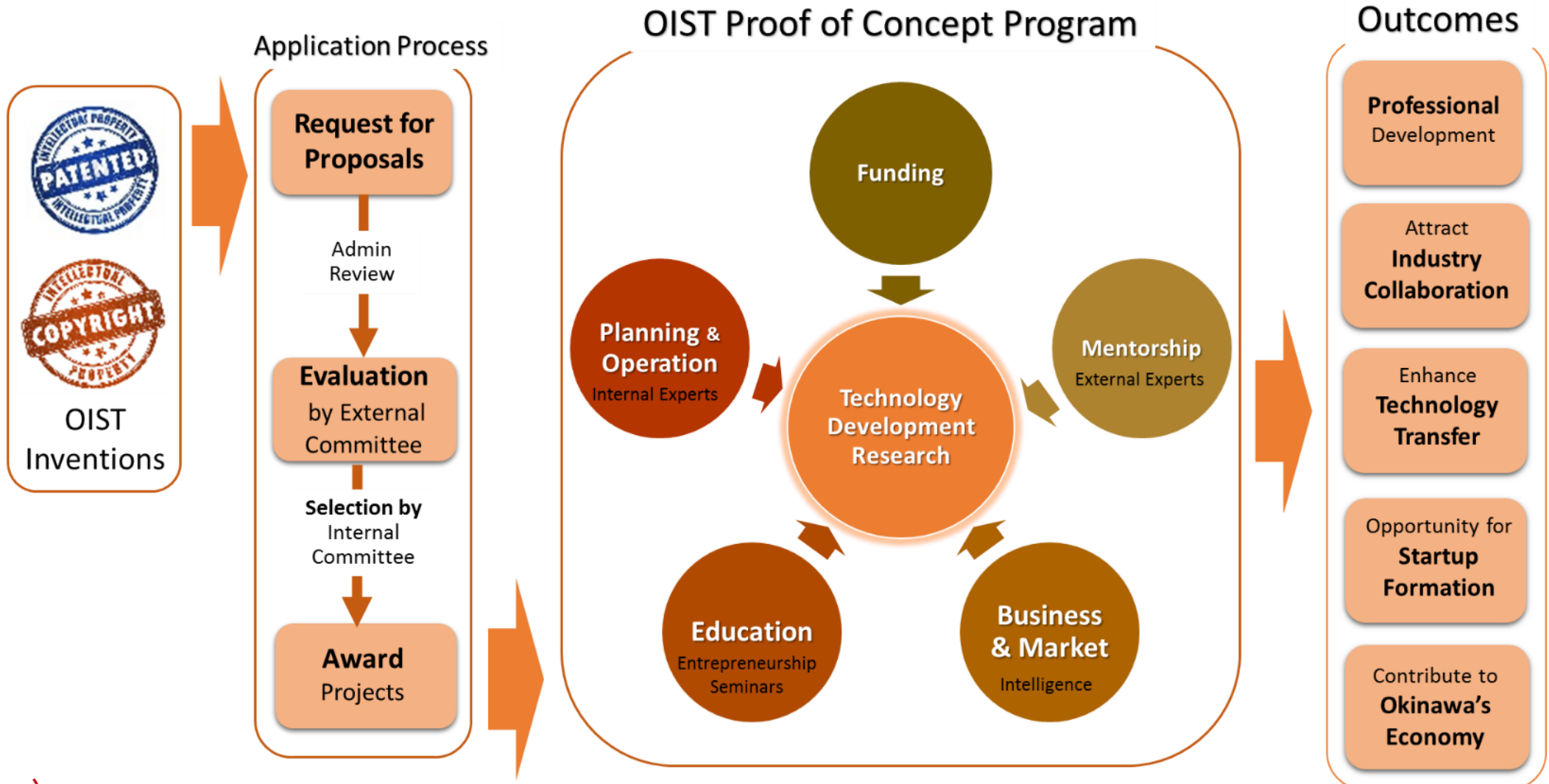


PROOF-OF-CONCEPT RESEARCH

Bridging the gap between lab discoveries and market application



PROOF-OF-CONCEPT RESEARCH





CATEGORIES OF PROOF-OF-CONCEPT RESEARCH

INNOVATIVE TECHNOLOGY RESEARCH (ITR)



Highly innovative research to solve important practical problems or meet societal needs

- Focus on developing innovative technologies
- Enhance both *knowledge and utility*
- High impact projects
- Lead to inventions and new patents
- Up to 3 years

COMMERCIALIZATION RESEARCH

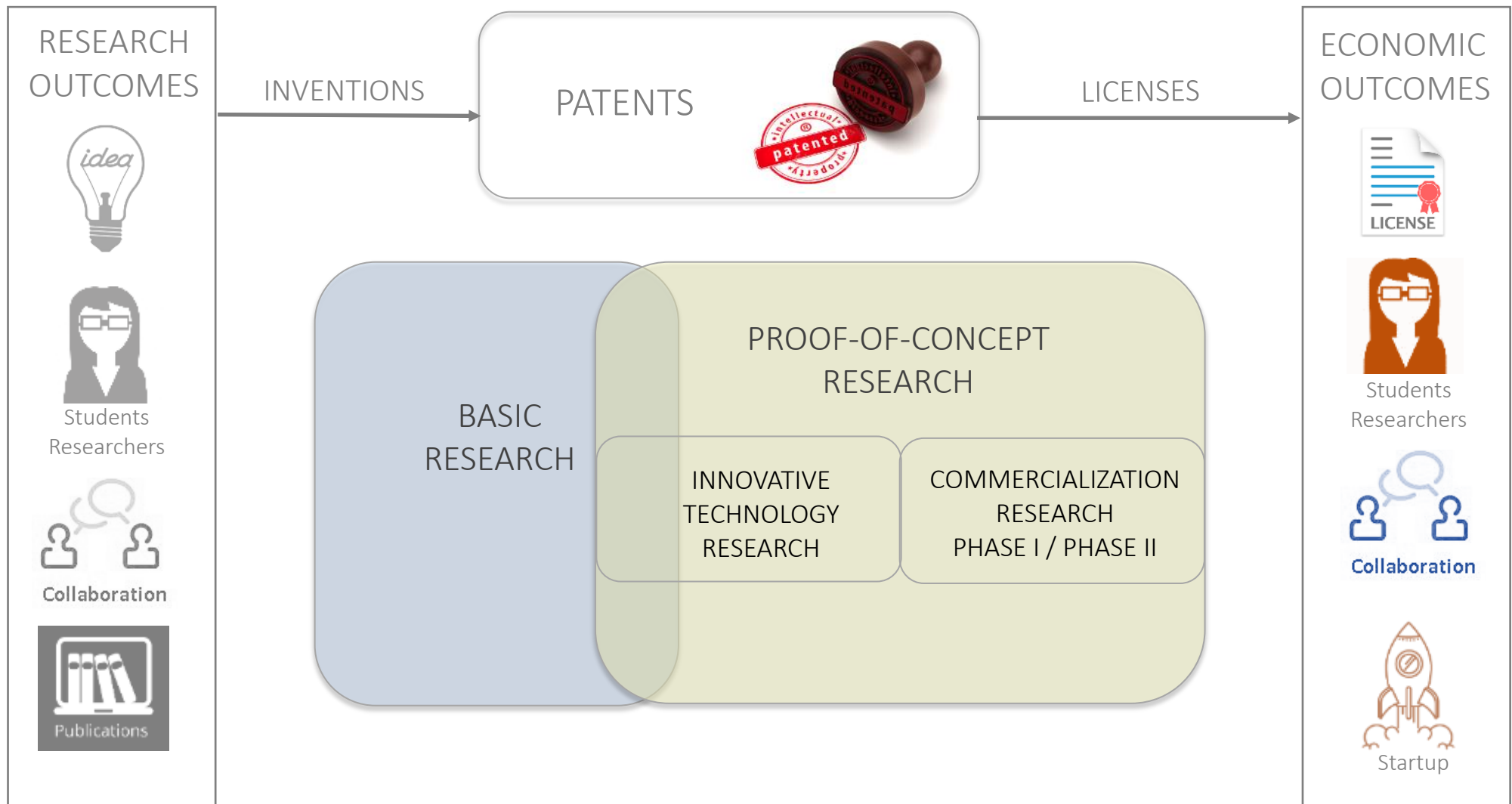


Research that develops a *patented technology* towards commercialization

- Enhances commercial value of patents
- Milestone-based, focused experiments
- Phase I Feasibility (prototype)
- Phase II Scale (better, bigger, faster, cheaper, etc.)
- 1-2 years



PROOF-OF-CONCEPT RESEARCH



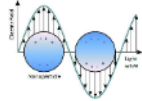



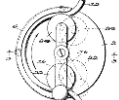

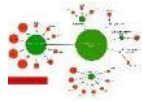


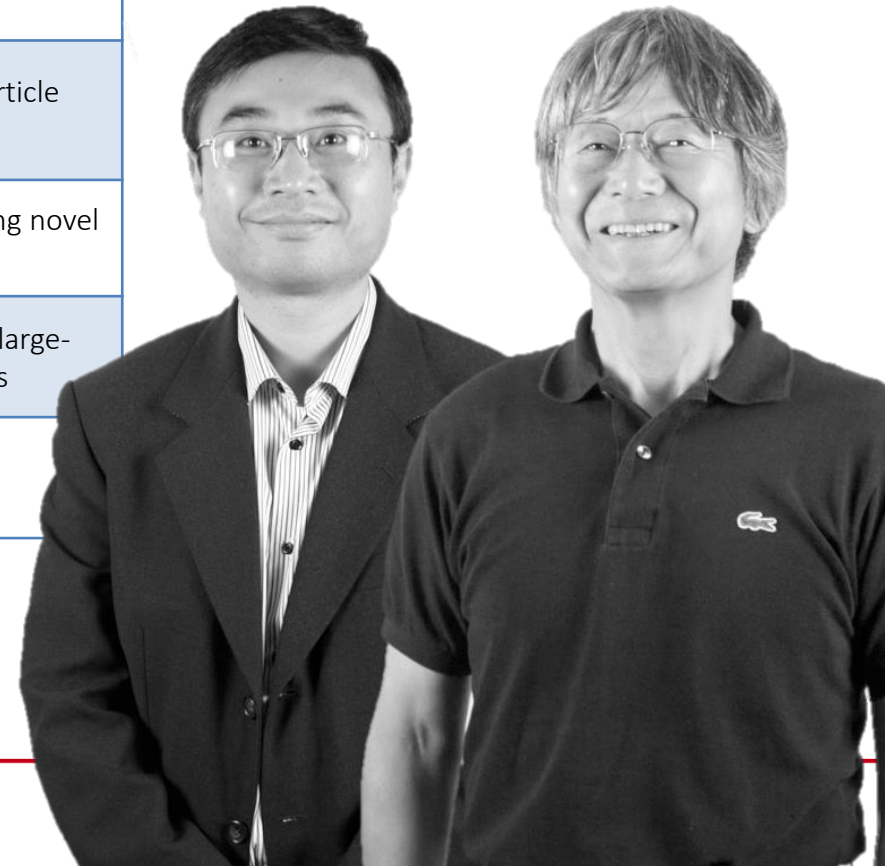
PROOF-OF-CONCEPT RESEARCH

Innovative Technology Research

	Ocean currents and marine ecosystems; new ocean observing instruments
	Next-generation solar energy technology
	Coral reef genomics; algae genes involved in bio-products
	Sustainable living technologies: micro-grids, electric car battery
	Advanced medical technologies, including accelerators and imaging
	Novel wave energy conversion technology

Commercialization Research

	Localized surface plasmon resonance platform for biomedical sensors
	Biosensors based on nanowire grids
	Microbial fuel cells for bioethanol production
	Laser stimulated nanoparticle drug delivery system
	Microfluidic pump utilizing novel magnetic coupling
	Process, instruments for large-area perovskite solar cells
	Privacy management architecture for big data





INTELLECTUAL PROPERTY



INTELLECTUAL PROPERTY

Identifying and protecting novel discoveries



OIST IP POLICIES

“... **all intellectual property** (IP) conceived, created, developed, or first reduced to practice in whole or in part by members of the University’s faculty (including **student** employees) or staff in the course of their University responsibilities ... **belongs to the University....**”

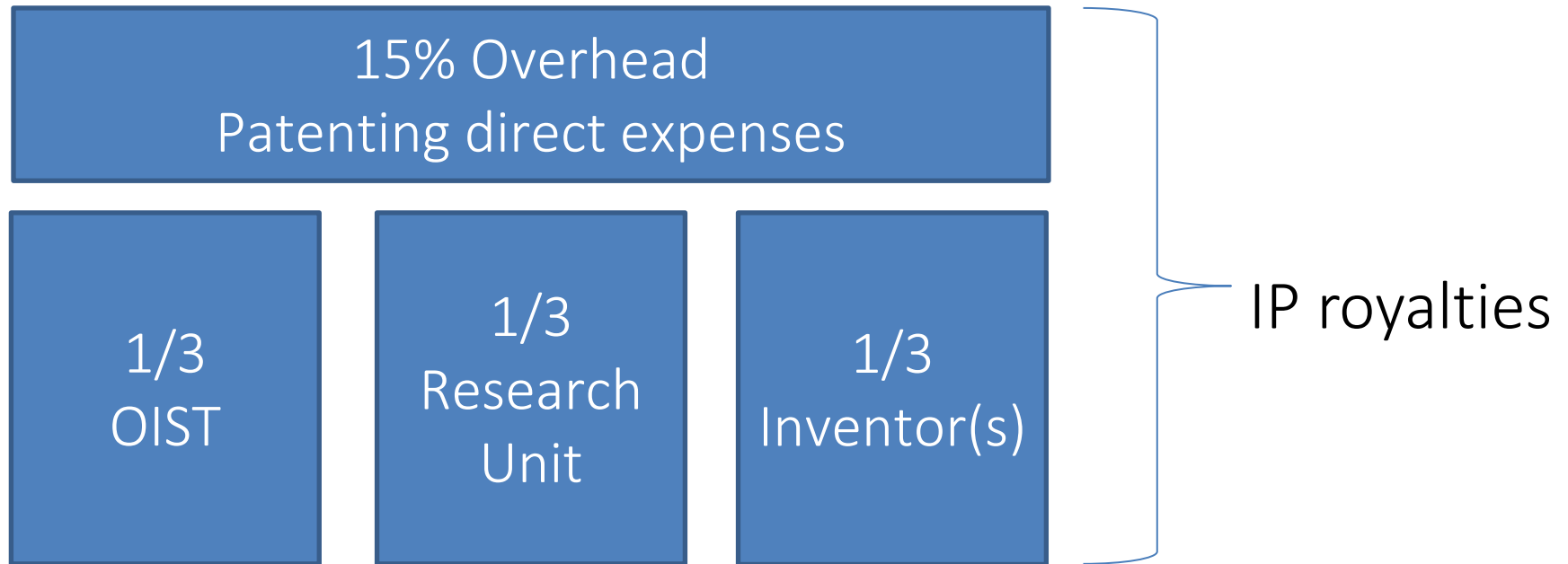
(PRP 14.1)

“**Graduate students**, postdoctoral fellows, visiting researchers and scientist, and other non-employees **must disclose to the University all potentially patentable inventions** conceived or first reduced to practice in whole or in part in the course of participation in research projects at the University, or with more than incidental use of University resources.”

(PRP 14.3.1.1)



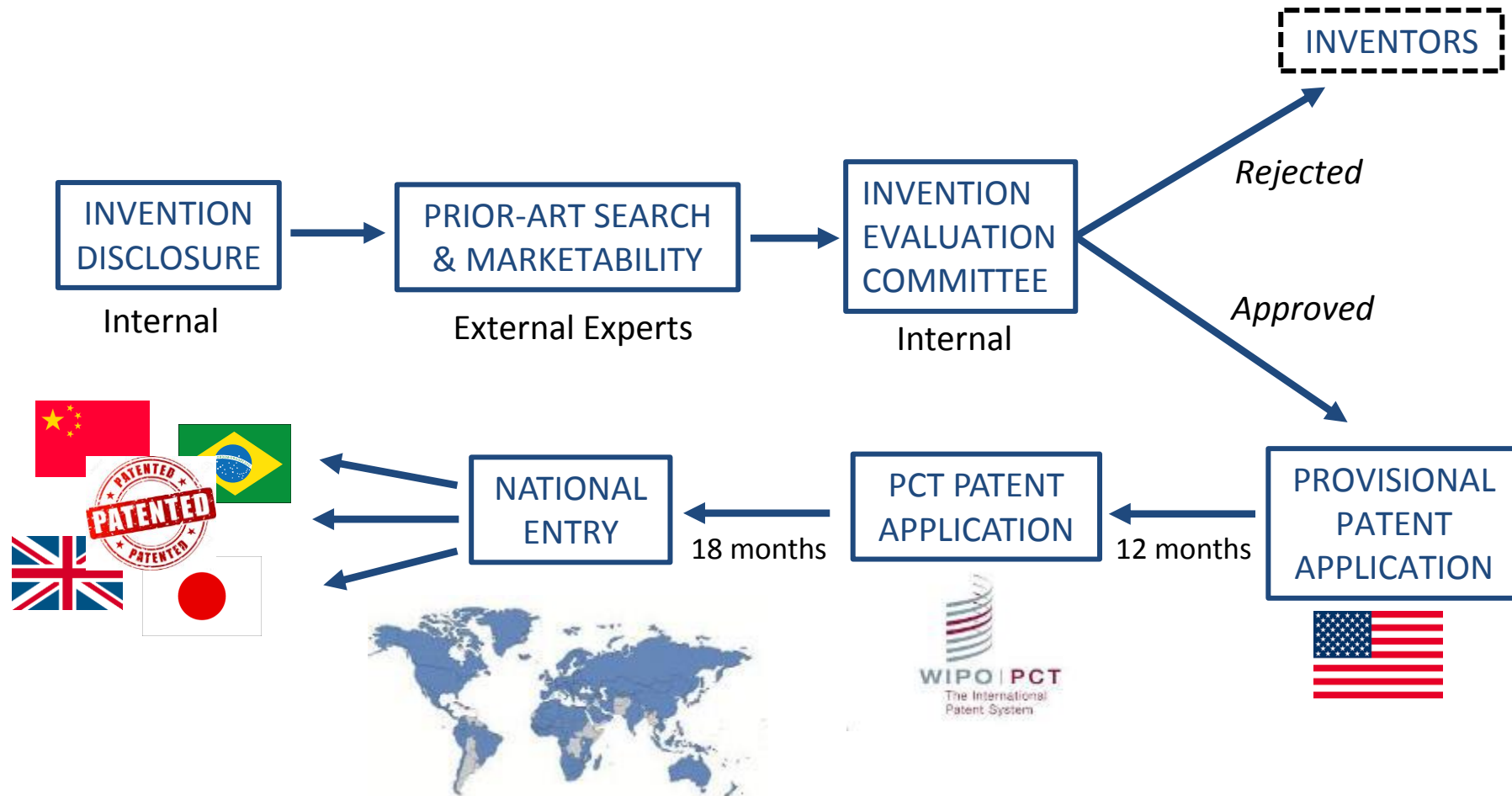
OIST ROYALTY DISTRIBUTION



(PRP 14.3.7.3.1)

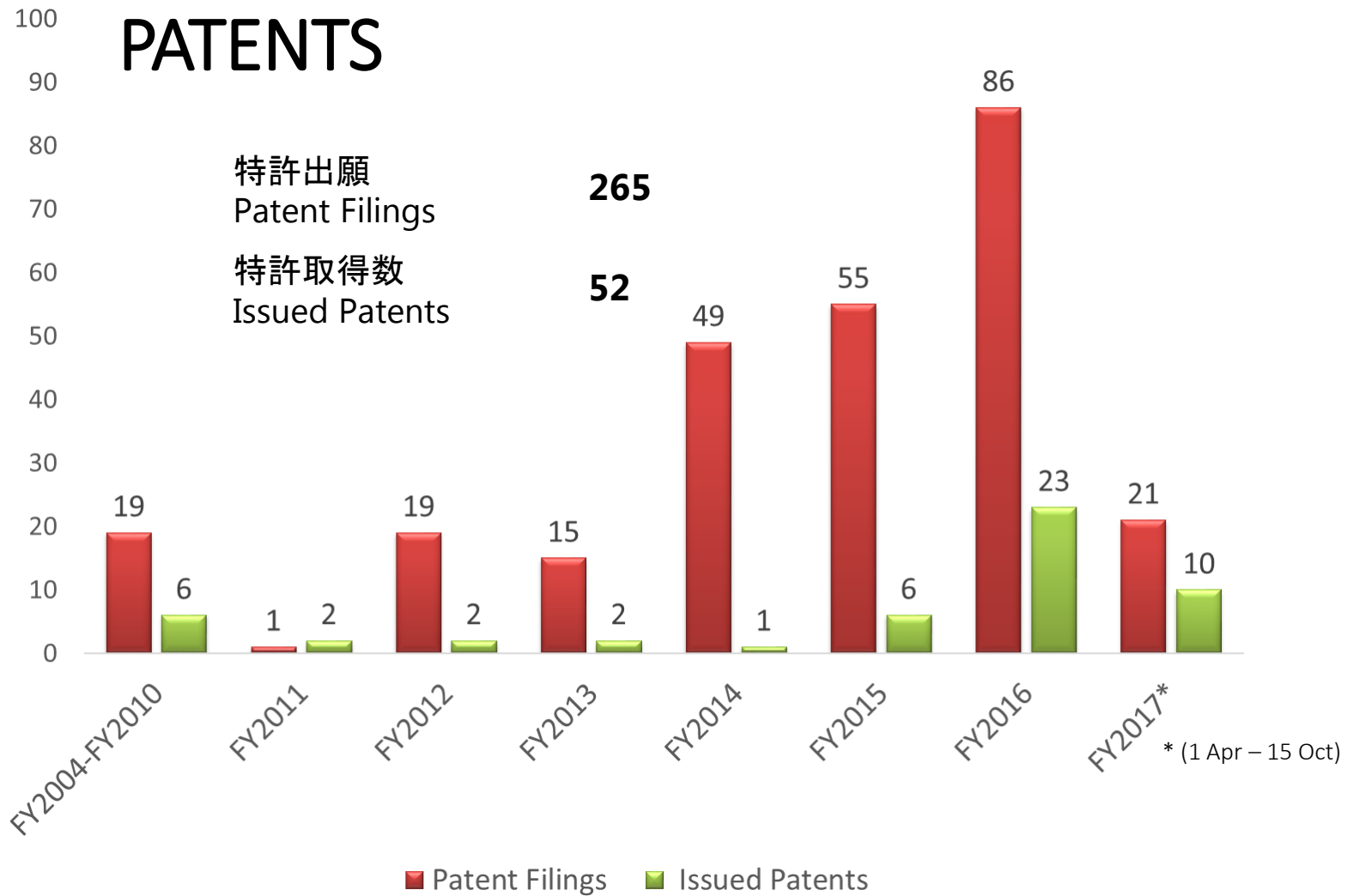


OIST PATENT PROCESS





INTELLECTUAL PROPERTY





PARTNERSHIPS

Identifying industry collaborators, sponsors, licensees, investors



COLLABORATIONS WITH INDUSTRY

Multiple Opportunities to Engage with Industry



Recruit Students and Researchers



Access to Research and Facilities



Launch or Work with Startups



License Technologies



Establish R&D Center



Train Workforce

University:
Link students to jobs after graduation

Industry:
Gain access to top talent coming from universities

University:
Introduce industry to university; earn income to support core facilities

Industry:
Gain access to latest technologies and equipment (particularly in new areas)

University:
Route for technology transfer; socio-economic impact in region

Industry:
Gain access to latest technologies and potential acquisitions

University:
Route for technology transfer

Industry:
Gain access to latest technologies

University:
Link students to jobs after graduation; training opportunity for students

Industry:
Gain access to top talent in core research areas; training opportunity for staff

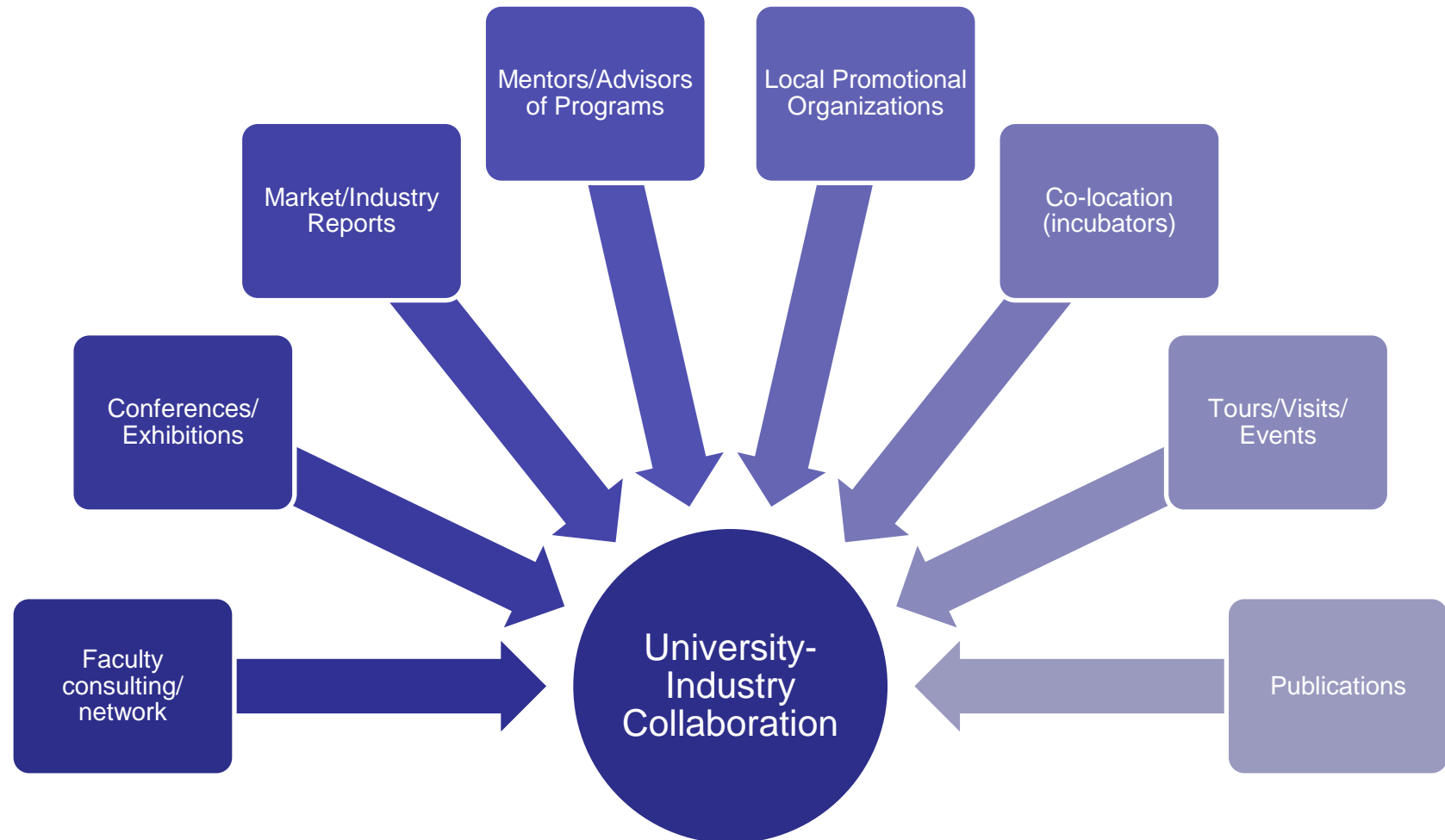
University:
Introduce industry to university; earn income for teaching

Industry:
Train staff in the latest technologies and techniques



COLLABORATIONS WITH INDUSTRY

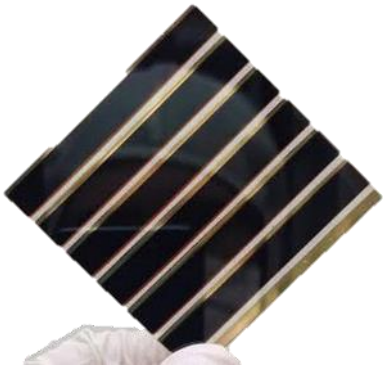
Sources of Industry Partners





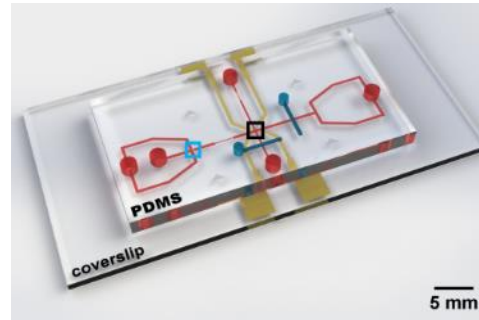
COLLABORATIONS WITH INDUSTRY

OIST + Chemical Co



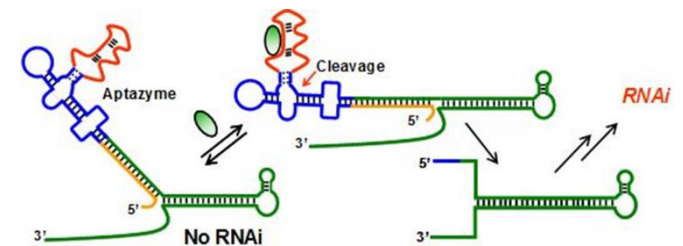
QI Unit and Japanese chemical company collaborate to improve conversion efficiencies in **solar cells**

OIST + Medical Device Co



SHEN Unit and a Japanese Co. listed on the Tokyo Stock Exchange with a market cap of ¥1.5 trillion collaborate on development of **micro and nano fluidics for biomedical applications.**

OIST + Pharma Co



YOKOBAYASHI Unit and Japanese pharma company collaborate on applications of **RNA-based gene switches (riboswitches) to drug discovery**



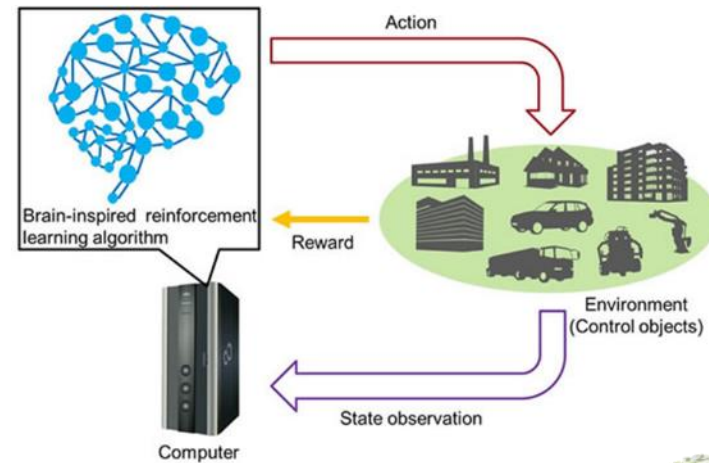
COLLABORATIONS WITH INDUSTRY

OIST + SONY



KITANO Unit and SONY collaborate on **autonomous vehicles**

OIST + FUJITSU



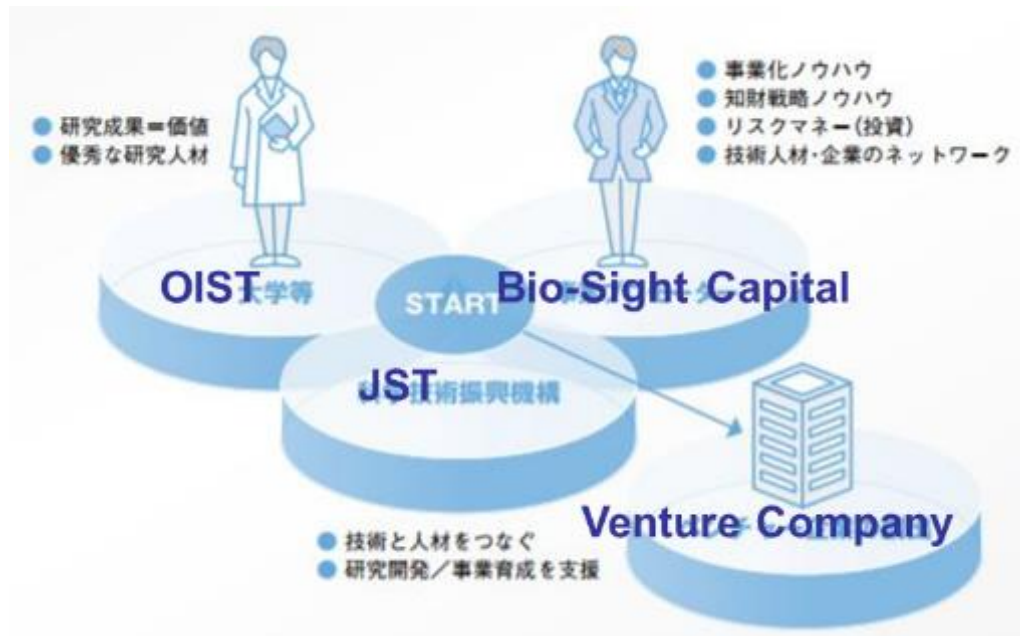
DOYA Unit and FUJITSU collaborate on **artificial intelligence** applied to energy efficiency





COLLABORATIONS WITH LOCAL INDUSTRY

JST START PROJECT



PROJECT:

Novel Eco-Wastewater Treatment System Utilizing Microbial Fuel Cells

GOAL:

Create Venture Company ~June 2019

PARTNERS AND ROLES:

- ① Catalyst, membrane, electrodes, unit design: **OIST**
- ② Test site: **Mizuho Brewery** (Shuri, Naha)
- ③ Cover, stand: **Engineering firm** (Yamada, Onna)
- ④ Internal plastic parts: **Parts factory** (Suzaki, Uruma)
- ⑤ Surrounding Equipment: **Chemical company** (Konbu, Uruma)
- ⑥ Project Coordination: TDIC BD Section
- ⑦ IP landscape analysis: TDIC TL Section



COLLABORATIONS WITH LOCAL INDUSTRY

OIST + OKINAWA ENVIRONMENTAL SCIENCE CENTER



PROJECT:

Engineering Microorganisms to Remove Nitrogen and Phosphorus for the Treatment of Swine Waste

PARTNERS AND ROLES:

- ① Bacteria community analysis: **OIST**
- ② Overall management and chemical analysis: **Okinawa Environmental Science Center** (Kyozyuka, Urasoe)
- ③ Swine waste sample: **Livestock Research Center** (Shoshi, Nakijin)
- ④ Sewage tank layout, technical support: **Engineering design firm** (Madanbashi, Tomishiro)
- ⑤ Project coordination: TDIC Business Development Section



COLLABORATIONS WITH LOCAL INDUSTRY

OIST + OKINAWA ENVIRONMENTAL SCIENCE CENTER



PROJECT:

Engineering Microorganisms to Purify Contaminated Soil and Groundwater

PARTNERS AND ROLES:

- ① Overall management and chemical analysis: **Okinawa Environmental Science Center** (Kyozyuka, Urasoe)
- ② Soil contamination purification research: **National Institute of Technology, Okinawa Kosen** (Henoko, Nago)
- ③ Groundwater contamination purification research: **OIST**
- ④ Soil samples: **Construction company** (Nishizaki, Itoman)
- ⑤ Soil samples: **Construction company** (Oroku, Naha)
- ⑥ Project coordination: TDIC Business Development Section



COLLABORATIONS WITH LOCAL INDUSTRY

OIST + UNIVERSITY OF THE RYUKYUS



PROJECT:

Development and analysis of fermented *Koji* rice malt beverage as a health supplement

PARTNERS AND ROLES:

- ① Overall management and chemical analysis: **Ryukyu University**
- ② Animal test: **Ryukyu University**
- ③ Mouse intestinal bacteria flora DNA analysis: **OIST**
- ④ Sugar chain analysis: **National Institute for Physiological Science** (Okazaki Prefecture)
- ⑤ Manufacturing method improvement and evaluation: **Mizuho Brewery** (Shuri, Naha)



COLLABORATIONS WITH INDUSTRY

	PROJECT	OIST RESEARCH UNIT	PARTNER(S)	AREA
1	Synthesis of novel pharmaceutical chemicals	TANAKA	Japanese Medical Device Company	Health
2	Privacy management architecture for big medical data	KITANO	Drug discovery startup	Health
3	Modified rice with reduced carbohydrate	SAZE	NARO U. of the Ryukyus	Health
4	Micro- and nano-fluidics for biomedical applications	SHEN	Japanese Medical Device Company	Health
5	Process and instruments for large area perovskite solar cells	QI	Japanese Chemical Company	Energy
6	Microgrid sustainable electricity production & management	KITANO	SONY CSL Okisoko	Energy
7	Sustainable living architecture technologies	KITANO	Misawa Homes	Architecture
8	Microbial fuel cells for wastewater treatment	GORYANIN	Mizuho Shuzo Bio-sight Capital	Environment
9	Drive and control systems for electric vehicle applications	KITANO	PUES	Transportation
10	Algorithms applied to AI for energy management	DOYA	Fujitsu	AI, Energy
11	Protein therapeutic for cancer	YAMAMOTO	Japanese Pharma Company	Health



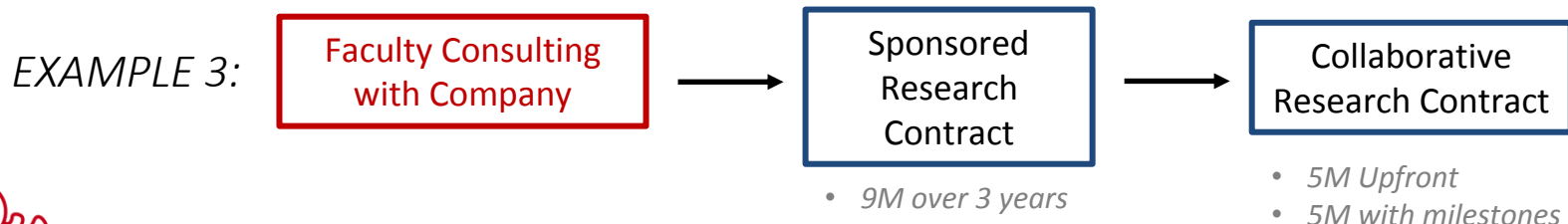
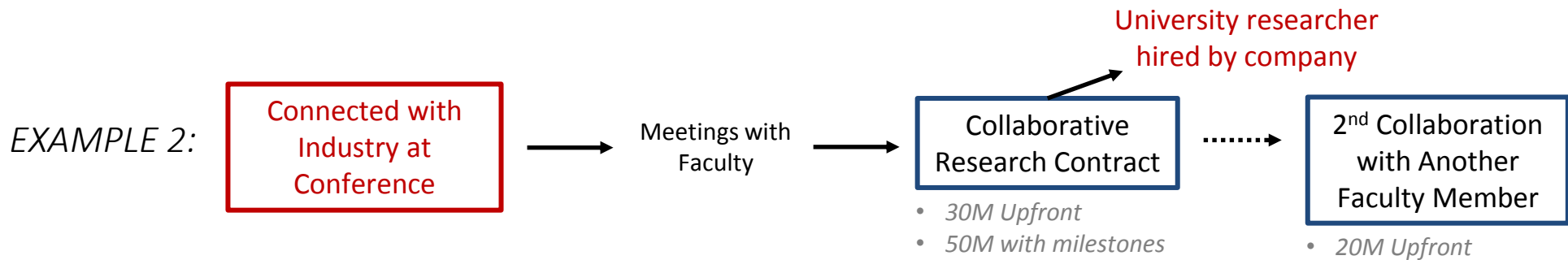
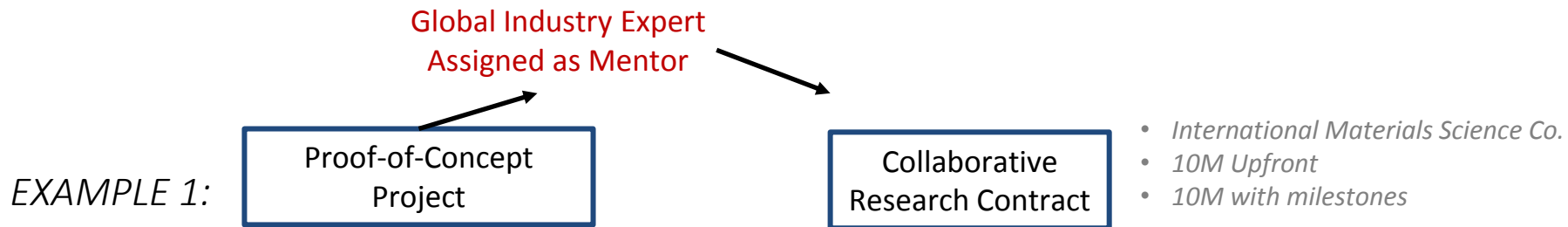
COLLABORATIONS WITH INDUSTRY

	PROJECT	OIST RESEARCH UNIT	PARTNER(S)	AREA
12	Alien species countermeasures	ECONOMO	Okinawa Environmental Science Center	Fisheries
13	Protein imaging for drug discovery	SKOGLUND	Okinawa Protein Tomography	Health
14	Genomic analysis for the pearl oyster industry	SATOH	Agricultural and Food Research Organization	Environment
15	Genomic analysis for coral restoration	SATOH	Okinawa company	Environment
16	Genomic analysis for mozuku production	SATOH	Fisheries Association	Fisheries
17	Bioactivity analysis of natural product for cancer	YAMAMOTO	Inst Biological Resources	Health
18	DNA sequencing for the fermented beverage industry	SAZE	U. of the Ryukyus	Environment
19	New materials for energy efficiency	QI	Intl Materials Science Co.	Energy
20	Novel wave energy conversion system (<i>under negotiation</i>)	SHINTAKE	Japanese Co & Intl Govt	Energy
21	New concept cart	KITANO	SONY	AI
22	RNA-based gene switches in drug discovery	YOKOBAYASHI	Japanese Pharma Co.	Health
23	Compact high-current proton ion source	SUGAWARA	Japanese Instrument Co.	Physics



COLLABORATIONS WITH INDUSTRY

Case Studies at OIST





ENTREPRENEURSHIP



ENTREPRENEURSHIP

Transferring technologies to startup companies



STRATEGY FOR ENTREPRENEURSHIP IN OKINAWA

1. Provide an **environment** in which entrepreneurs can *thrive*
 - Create a place that fosters connections between entrepreneurs and others around them
2. **Recruit** talented entrepreneurs from around the world
 - Allow innovative ideas & solutions to enter Okinawa from *anywhere*
3. Give entrepreneurs access to **funding** to pursue innovative ideas
4. Strengthen capabilities: **technical advice, business connections**
5. Provide **entrepreneurship education** to help entrepreneurs develop their business *strategy*



INNOVATION SEMINARS AND WORKSHOPS

Seminar Series



Gwilym Roberts, Ph.D.
(IP Expert, UK)



Scott Brown, Ph.D.
(CEO, UK)

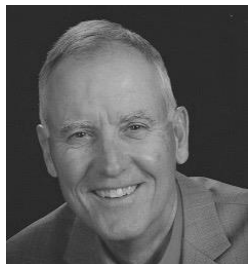


Nancy Hecker-Denschlag, Ph.D.
(Industry Leader, Germany)



Sir Richard Roberts, Ph.D.
(Nobel Laureate, USA)

Professional Development Workshops



Project Management in University Research

Instructor: Bill Dietrich, Stanford
Instructor: King Chow, PMP



Business Planning

Instructors: Hiroshi Sato
Instructor: Kaz Ohmae





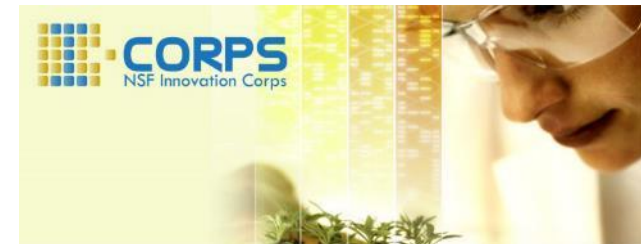
ENTREPRENEURSHIP EDUCATION



5th ANNUAL WORKSHOP: 20 Oct – 2 Nov 2017

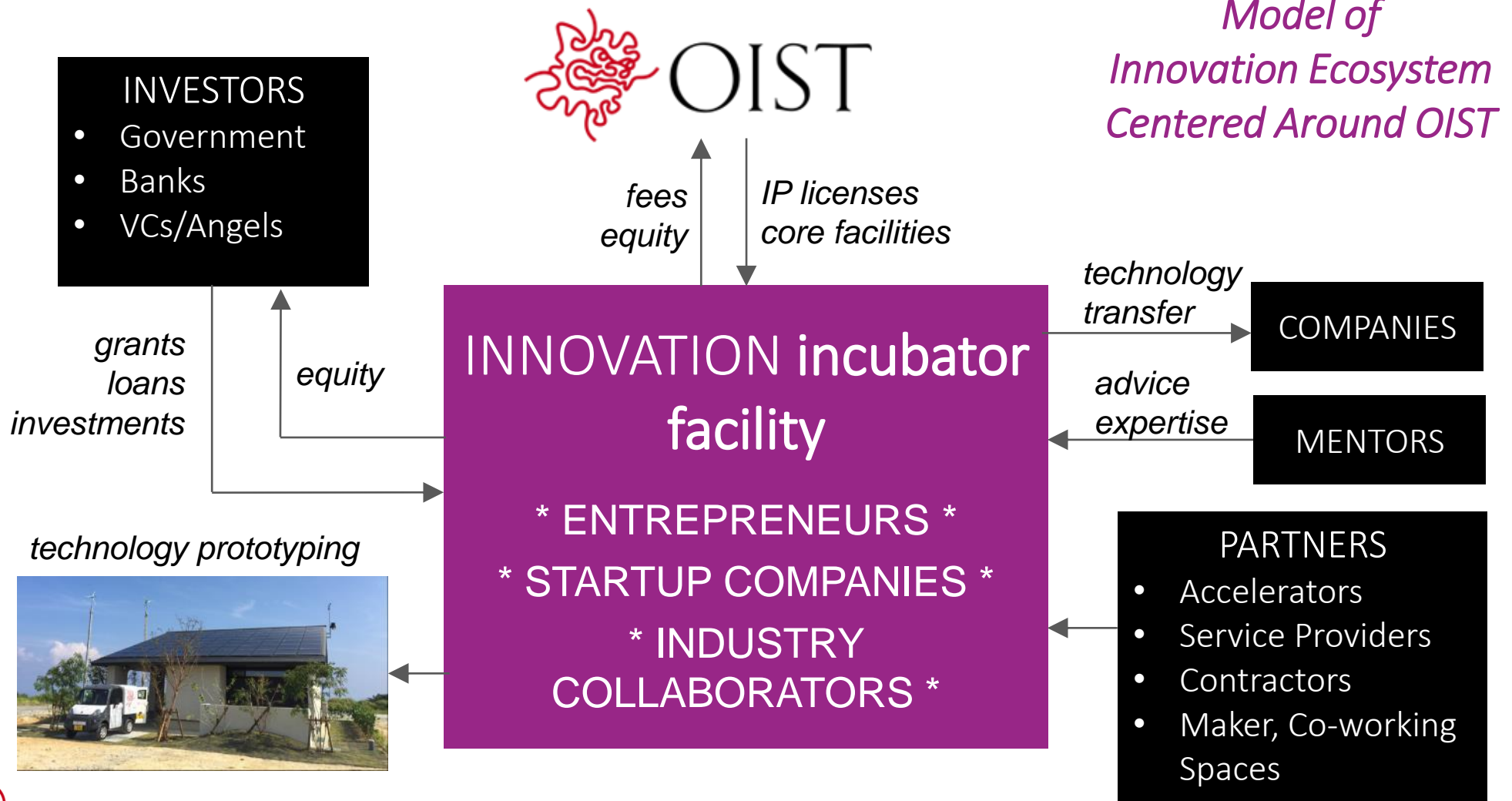


- 32** Participants
- 3** Startup Teams
- 2** NSF I-Corp Instructors





FUTURE DIRECTION: Startup Incubation





FUTURE DIRECTION: Startup Accelerator

Startup Accelerator Model

- **Fixed term, Cohort-based** (entrepreneurs enter/exit in groups)
- **Connections** (pool of industry mentors to tap into or matched one-on-one)
- **Educational component** (entrepreneurship seminars, courses)
- **Investment** (equity and non-equity-based funding)
- **Space** (lab space, office space)





OIST STARTUP ACCELERATOR: Leveraging OIST Resources

Startup
Accelerator
Program



RESOURCES@OIST

Incubator facility

Funding

High-tech equipment

Educational courses

Access to OIST expert network

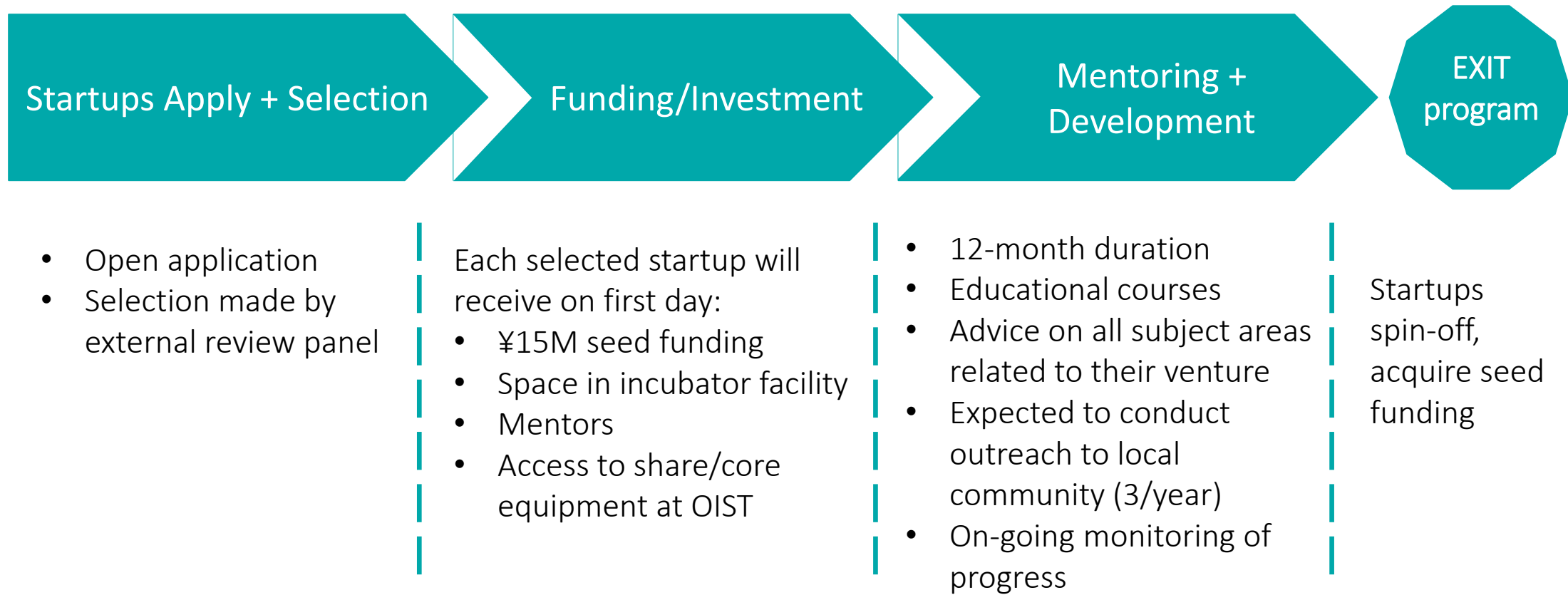
Support from TDIC staff

Publicity & community outreach

Connections to investors



OIST STARTUP ACCELERATOR: Process





STARTUP SUPPORT@OIST

- Patenting/Licensing
- Industry Collaborations
- Proof-of-Concept Research
- External Grants
- Entrepreneurship Education
- Networking/Mentorship
- Core Equipment
- Startup Accelerator Program

→ FEEDER AND PARTNER



Other Incubators in Okinawa

- Okinawa Science & Technology Promotion Center
- Okinawa Health Biotechnology Research Center
- Okinawa Life Science Research Center

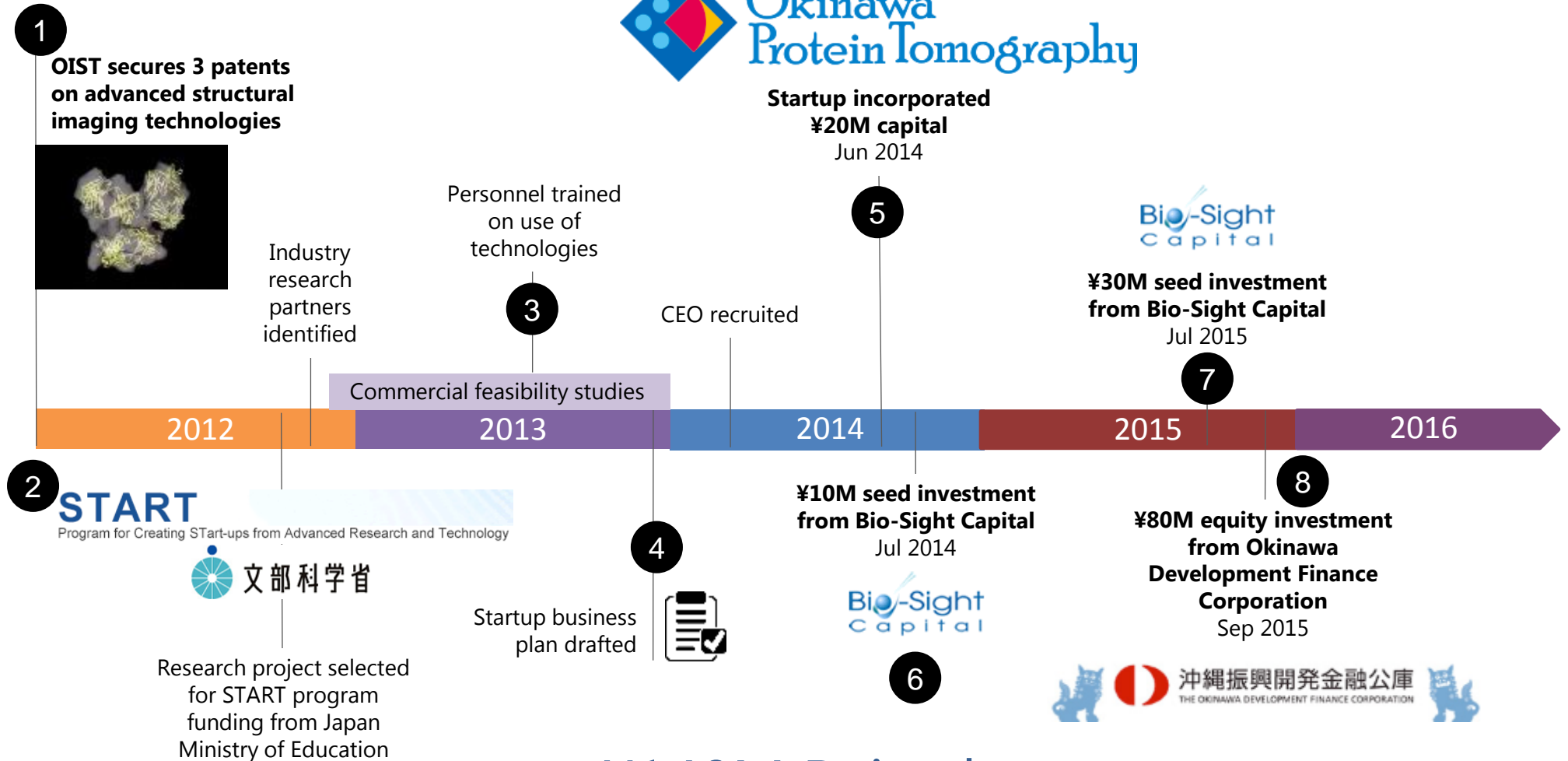
OIST Laboratories

OIST Innovation Incubator





STARTUP SUPPORT: Case Study 1



> ¥140M Raised



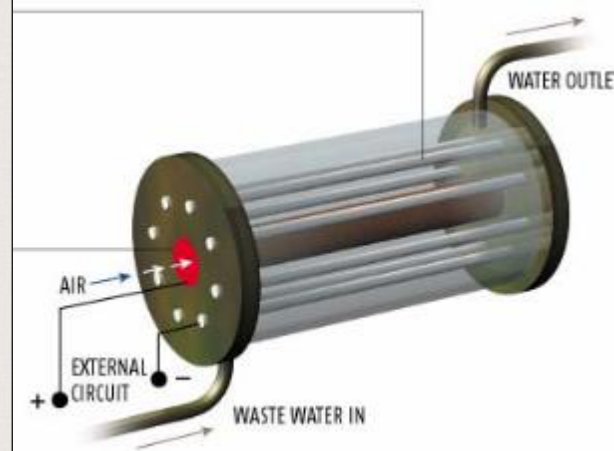
STARTUP SUPPORT: Case Study 2



START GRANT AWARDED 2017

Prepare launch of 2nd OIST Startup

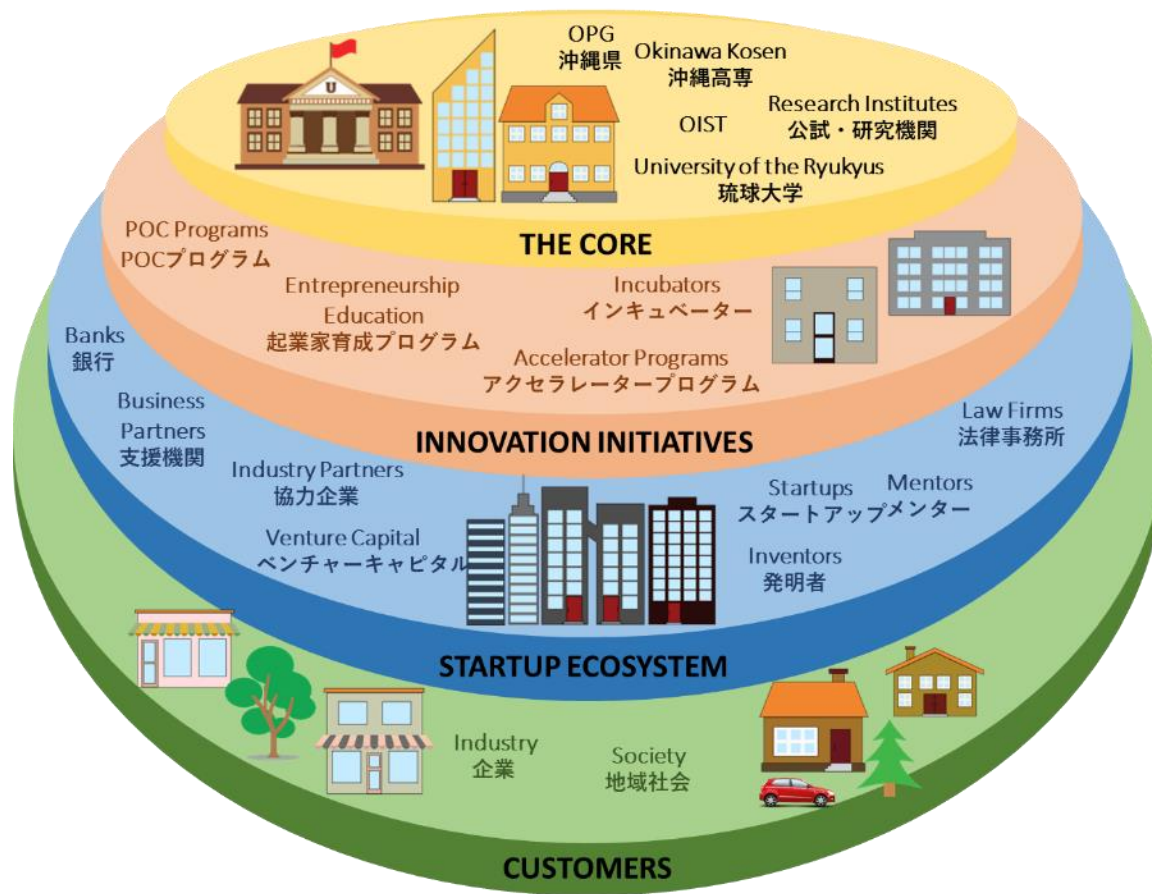
GORYANIN Unit receives START grant to commercialize wastewater treatment technologies based on microbial fuel cells





SEEDING AN INNOVATION ECOSYSTEM IN OKINAWA

Universities, Government, Startups & Industry



THE CORE: Provides the seeds of innovation: educated and trained personnel, research discoveries, and public funding for research

INNOVATION INITIATIVES: Provide facilities and programs to bridge the gap between research discoveries and innovative technologies and services

STARTUP ECOSYSTEM: Connects business expertise, market needs, and risk financing to support entrepreneurship and grow new ventures

CUSTOMERS: Industry expands markets with new technologies; social prosperity increases through new technologies, jobs, and higher wages.