The OIST Strategic Plan 2020-2030

OKINAWA INSTITUTE OF SCIENCE AND TECHNOLOGY GRADUATE UNIVERSITY

"The Okinawa Institute of Science and Technology [shall] promote internationally distinguished research and education on science and technology based in Okinawa [...] and thus contribute to the promotion and self-sustaining development of Okinawa and to the development of science and technology worldwide."

(From the Schools Corporation Act of 2009)

MESSAGE FROM THE PRESIDENT

OKINAWA INSTITUTE OF SCIENCE AND TECHNOLOGY GRADUATE SCHOOL

Our research university presents itself to its community and visitors as a young and vibrant place. OIST is home to talented people from all over the world united by one language and the pursuit of world-class research, education and innovation. A campus overlooking the beautiful green forests and blue waters of Okinawa will soon include its fourth laboratory building equipped with state-of-the-art facilities. We have truly become a university with independent research units that work across the borders of scientific disciplines to foster breakthrough discoveries and innovation for the 21st century.

Since its inception as a research university in 2011, OIST has achieved much: In 2018 we graduated our first PhD students, and they are already making remarkable contributions worldwide. For example, we were excited to learn that three of our first group of graduates gained appointments at Harvard University, one as assistant professor. In 2015, an international peer review concluded that our researchers deliver outstanding science, which is mirrored by further analysis of our high-impact publications published by Nature Index (https://www.natureindex.com/annual-tables/2019/institution/academic-normalized). Currently, our hiring committees can choose the best candidates from an overwhelming number of applications. Since OIST first started research in 2004, our discoveries have resulted in more than 110 patents worldwide, and we have around 400 pending patents in the pipeline.

OIST has quickly transformed itself from the small research institute founded in 2004 into a research university with more than 1,100 staff focused on the central vision of its founders:

> *"The new university in Okinawa will be a graduate university in science and technology that will conduct and provide the 'best-in-the-world' quality research and doctorate education with an emphasis on integrative work. The university aims to: Contribute to the advancement of science and technology in the world; Make Okinawa into the leading intellectual cluster of the Asia-Pacific region; Make the university a 'success story' and provide a model for the reform of Japanese universities."*
>
> *Proposed Framework of the University, 2003*

OIST was established to deliver benefits locally, nationally and globally, and to take bold actions toward enhancing the competitiveness of Japan. We have already achieved success in creating a modern university for outstanding research, a place to educate young scientists to become future leaders worldwide, and a solid platform to raise the visibility of Okinawa as an intellectual and scientific hub in Southeast Asia. Sydney Brenner, one of the founders of OIST, sadly passed away in April 2019. Sydney was one of the truly great scientists of our time. He played a crucial role not only in shaping the origins of our university but also in defining the entire field of modern molecular biology. In his own words, "Innovation comes only from an assault on the unknown." We work hard to fulfill

OIST was established to deliver benefits locally, nationally and globally, and to take bold actions toward enhancing the competitiveness of Japan.

his vision and the dream of all our founders.

We are aware of the need to deliver further benefits to Okinawa and Japan's innovation ecosystem, and we continue to increase our number of faculty, young researchers and graduate students. Our newly established incubator and accelerator facilities are attractive to entrepreneurs from OIST and all over the world.

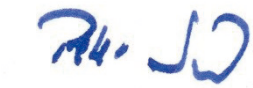
Our achievements and our plans will be scientifically peer reviewed by a distinguished external panel in November 2019, which will be followed by the Decennial Review by a panel convened by the Cabinet Office who should report at the latest by mid-2021 to inform the FY2022 budget.

This Strategic Plan is an indispensable part of this process. This plan was developed between August 2018 and May 2019 by open consultation within OIST, through task forces and working groups that involved directly more than 100 OIST members. There were many focus group and individual discussions with our external and internal advisors. There was a series of well-attended open meetings to keep people informed and to allow comments, ask questions and make suggestions. All documents were shared on the OIST internal website for comments. Finally, the strategy was discussed with the Board of Councilors, the Board of Governors and with others inside and outside OIST. It was endorsed by the Board of Governors at its meeting in May 2019.

I am grateful for the engagement of our university and wider community. I also want to thank the many people who have made critical contributions along the way, our community at OIST and across the globe, our past and current members of our Boards of Governors and Councilors and our partners in Japan and worldwide. In particular, I want to express our gratitude to the Japanese government for the long-term vision and steadfast investment in OIST as an innovation project to nurture fundamental research and transform society. Thank you all for your continuous support.

This Strategic Plan illuminates the way ahead to enable us to become a world-leading research university and a destination of choice for all who wish to contribute to the advancement of knowledge for the benefit of humanity.

I take great pride in being part of this endeavor, and I look forward to the future.



Peter Gruss
President and CEO
Okinawa, July 2019

EXECUTIVE SUMMARY

In the eight years since our inauguration, we have established OIST as a university focused on excellence, graduating our first PhD students in 2018. We have made OIST an attractive place to do world-leading science and are on course to reach 100 faculty units and 300 graduate students by 2023. Now is the right time to lay the foundation for the expansion to 200 faculty units and 600 graduate students by the early 2030s, essential if we are to realize the dream of our founders – to create in Okinawa a research university with 300 outstanding faculty-led research units and 900 exceptional students by the early 2040s able to compete with the best in the world.

The guiding principles that are the essence of this plan are:

We want to be globally recognized for world-leading cross-disciplinary research that benefits humanity.

We want to be the destination of choice to work, learn and collaborate, linking science to education leading to innovation and entrepreneurship, supported by an efficient administration.

We want to be the partner of choice for innovation and a catalyst in Okinawa, promoting economic growth and sustainable benefits, addressing problems important to Japanese and global society.

Our purpose was defined in the Act of the Diet that created OIST, namely, to promote internationally distinguished research and education in science and technology based in Okinawa and thus contribute to the promotion and autonomous development of Okinawa and to the development of science and technology worldwide. To achieve this, we have developed a vision, supported by a set of core values and a mission.

Our Vision is to advance knowledge for the benefit of humanity.

Our Values underpin everything that we do: Excellence, Respectfulness, Responsibility, Transparency, Sustainability, Diversity, Courage and Freedom.

Our Mission is to be a pioneering graduate university doing research that bridges disciplines to explore new frontiers of scientific knowledge, educating a new generation of scientific leaders and being a catalyst for an Innovation Hub in Okinawa.

The Strategic Plan details the next steps that we will take to deliver the purpose of our founders, through a series of *Strategic Goals* that will guide our development, which are discussed in more detail in the chapters that follow.

Chapter 3. Delivering World-Leading Research and Education

1. *To become a world-leading university, we will create a critical mass of researchers conducting cutting-edge cross-disciplinary research by using our state-of-the-art facilities and by continuing to develop as a local, national, regional and international research hub.*

2. *To deliver exceptional graduate training, we will provide a world-class PhD program in science and comprehensive support to a diverse group of students with the most promising talents.*

Chapter 4. Delivering Transformative Technology through Innovation

3. *To encourage and develop new ideas and innovation, we will create an environment that recognizes the value of risk-taking in the pursuit of knowledge and ensures that resources are available to translate discovery into impact.*

4. *To contribute to the societal and economic well-being of Okinawa and to seed a local innovation ecosystem, we will develop synergistic relationships with the wider Okinawan community to create an environment that nurtures entrepreneurship and entrepreneurial thinking, and we will build strategic partnerships with national and international universities, industry and the Japanese government.*

Chapter 5. Promoting Excellence in Governance and Efficient Administration

5. *To ensure that OIST operates with high international standards of governance, we will continue to refine internal and external governance processes as we grow and to recruit outstanding individuals to membership on our Board of Governors and Board of Councilors to reflect diversity, equity and inclusiveness and, through periodic self-analysis, high levels of effectiveness.*

6. *To create an efficient administration for a growing university, we will ensure effective structure, processes and tools, and skilled and highly motivated, customer-oriented and accountable professionals.*

Chapter 6. Delivering the Benefits Locally, Nationally and Globally

7. *To promote the intellectual life of Okinawa, we will deepen our relationships with all generations of the Okinawan community through cultural, educational, sports and career-development activities and will ensure Okinawan students are provided new opportunities to achieve their potential in global society.*

8. *To strengthen the benefits of Japan's investment in OIST, we will establish an Innovation Hub and create an entrepreneurial culture; strengthen our ties with Japanese universities and businesses to be an integral part of the Japanese research, higher-education and innovation systems; and extend our strategic partnerships with other universities, research institutes, industry and government, locally and globally.*

Chapter 7. Developing Individual Potential to Achieve Our Common Goals

9. *To achieve our ambitions to become a world-leading international research university, we aim to attract the best talents across the university to create an environment in which diversity is valued and people are encouraged to achieve their full potential through opportunities for personal and professional growth.*

Chapter 8. Developing Our Community

10. *To enrich our staff, students' and family members' experience, we will build an inclusive and welcoming university community with quality on- and off-campus housing, sporting, recreation and community activities and will further develop appropriate child care, educational facilities and other services.*

Chapter 9. Developing Our Campus

11. *To support our world-leading research programs, facilitate research across disciplinary boundaries and enable all members of our community to meet and communicate easily with each other, we will design an interconnected campus with modern, attractive, state-of-the-art buildings that promote interaction and cooperation among different research teams. We will ensure that our administrative, research support and education centers evolve with our growth.*

12. *To promote responsible stewardship of the environment, we will reduce CO_2 emissions using the latest sustainable methods for our environmentally friendly buildings. Furthermore, as part of our development of facilities we will conduct thorough environmental assessments, protect local plants and animals and encourage the development of environmentally sound work practices.*

Chapter 10. Developing Our Communications

13. *To advance the OIST brand and our international reputation in research, education and innovation, we will broaden the communication of our achievements locally, nationally and globally. We will strengthen our communications with our former students and colleagues through an alumni-relations team and develop an integrated, high-impact communication strategy to support fundraising.*

14. *To strengthen our internal communications, we will develop an open culture that embraces and values diversity, promotes harmony and well-being and allows everyone to express concerns or opinions freely.*

Chapter 11. Resource Requirements and Funding Strategy

15. *To build on our outstanding research and education achievements and to plan efficiently for growth over the next decade, we will work with the Cabinet Office to evolve our current high-trust funding model into long-term stable funding and reasonable multi-year projections for both the baseline and investment budgets to enable our scientists to pursue ambitious and challenging frontier research across disciplinary boundaries.*

16. *To complement the baseline funding, we are committed to generating additional resources through external grants, sponsorships and philanthropy by providing attractive opportunities for collaboration in areas of mutual interest, without compromising our autonomy, scientific freedom or ethical principles.*

The Strategic Plan sets down the guiding principles and strategic goals through which we will achieve the vision of our founders and deliver on the purpose for which we were founded. We will complete the first phase of OIST (100 faculty units) by 2023; we now need to plan for the next phase (200 faculty units) to be achieved by around 2033. For this, we need the continued support of the Japanese, prefectural and local governments, the dedication of our staff and students and their families, and the guidance from the Board of Governors and the Board of Councilors. Together we can build a university that can take its place among the best in the world.

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Chapter 1.
Overview

Figure 1-1 (left) The inauguration in November 2011, (middle) welcoming the first graduate class in September 2012 and (right) the first graduation ceremony in February 2018

The major milestones in the short history of OIST are given in Table 1-1.

In the seven and a half years since we welcomed our first students we have grown from 38 to more than 70 faculty units; enrolled more than 210 students and graduated 33; published over 1,700 papers in academic journals (see Figure 1-2); accumulated over 100 patents; and built a marine station, an engineering building, a third laboratory building and a nearly completed fourth laboratory building. We are building a pioneering university to do world-leading research, educate a new generation of scientific visionaries and deliver the benefits to Okinawa, Japan and the rest of the world in a uniquely beautiful physical environment and an innovative cross-disciplinary intellectual environment. We have demonstrated that this model works, and we can now move forward with great confidence in our ambition to become one of the world's foremost graduate universities. As the Honorable Koji Omi said at the inaugural graduation, *"I came to believe that science and technology was vital for energizing Japan and promoting further economic growth… In my role as science and technology minister, I began developing an idea to make Okinawa a leading intellectual cluster for science and technology in the Asia-Pacific region… OIST is one of my proudest achievements."*

Table 1-1 Major milestones in the development of OIST

Date	Description
June 2001	Minister of State for Okinawa and Northern Territories Affairs and Minister of State for Science and Technology Policy, the Honorable Koji Omi announced a plan for a new international graduate university in Okinawa
September 2005	Okinawa Institute of Science and Technology Promotion Corporation (OIST PC) was established by an Act of the Diet (Act No. 26, 2005)
July 2009	OIST School Corporation Act (Act No. 76, 2009) enacted
November 2011	Accreditation from the Ministry of Education, Culture, Sports, Science and Technology (MEXT)
	Inauguration of the Okinawa Institute of Science and Technology Graduate University (OIST) (see Figure 1-1(left))
September 2012	First students enrolled (see Figure 1-1(middle))
February 2018	First students graduated (see Figure 1-1(right))

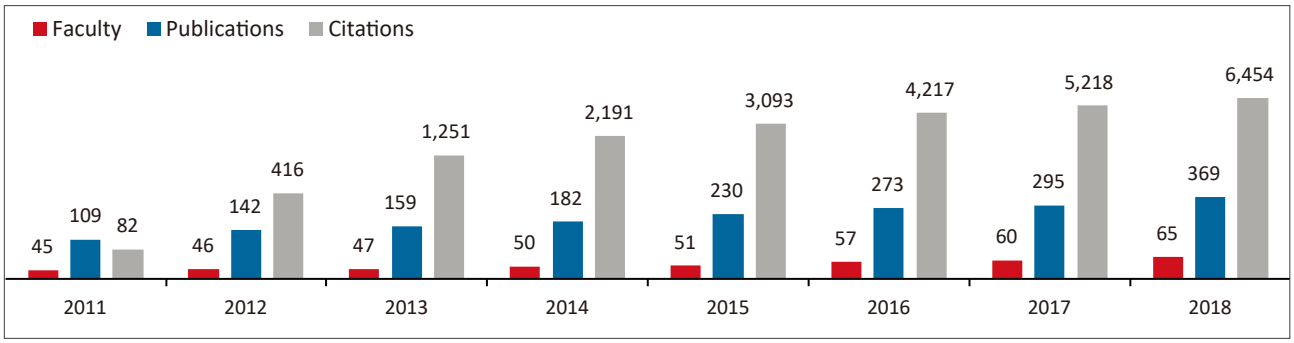

Figure 1-2 The number of faculty, publications and citations per year since 2011

Beyond world-leading research and internationalized graduate education, OIST was also created with a very specific purpose – to foster the creation of knowledge industries in Okinawa and to leverage local advantages in the Southeast Asia region to contribute toward a sustainable economy for Okinawa. While we focus on maintaining our strengths and deepening the coverage in our current globally competitive research areas as we expand to 100 faculty-led research units[1] by 2023, we are too small to compete with the top world-leading universities. The original estimates were that we would need to have around 300 faculty units[2] to be competitive on a global scale. We need to bring in additional faculty expertise and talents to broaden our research portfolio so that prospective students, post-doctoral researchers and partners can have the confidence to invest tangible and intangible capital in OIST and Okinawa. The next phase of growth to 200 faculty units is crucial for achieving our purpose.

This is a particularly opportune moment to define our medium-term strategy. Over the past years, we have put in place the organization and processes of a modern university, from enrollment through to graduation, and are currently developing alumni relations. We are focusing on needed innovation in administrative processes and research information management to remain flexible, accountable and organized to build fast-evolving multidisciplinary collaborations in new research frontiers. We are still expanding rapidly, with a base budget increasing at about 10% per year, creating about 10 new faculty units each year; we will also open two new laboratory buildings (Lab 4 in 2020 and Lab 5 in 2022). We are starting to have an impact upon the economic development of Okinawa, but we have more work to do.

For a mature university, the academic cycle and recruitment fall into a natural annual rhythm. Great leaps in scientific breakthroughs and technological advances are seamlessly translated into innovations. University expertise and curated knowledge have ready channels to reach university partners, sponsors, and society. As a young university, this rhythm is still being defined and refined; the cooperation channels with Okinawa prefectural government, industry partners, and a community of supporters for projects with common goals toward realizing the 21st Century Vision of Okinawa are being expanded and strengthened. We will not rest on our achievements and will never cease to learn, develop and innovate until OIST is an enduring success, a beacon of excellence in Okinawa and an exemplar for the university of the future.

1.1 A New Kind of University

OIST is designed to be a new type of university, built from the beginning to be genuinely cross-disciplinary; there are no academic departments (physics, chemistry, biology, etc.), and there are no discipline-restricted courses. In principle, students can attend any course that excites their interest. There is no conventional academic hierarchy (departments, divisions, schools); faculty members, including assistant and associate professors, head independent research units, responsible for their own research agenda. By design, the laboratory buildings are multi-disciplinary and multi-functional in order to create opportunities for more cross-disciplinary interaction. This philosophy extends to the graduate training program, so that we prepare future leaders in science and technology with a broad outlook and an open mind, able to make far-ranging strides that have a global impact.

While we are pioneering in this respect, we are not alone in believing that the traditional subject-based academic organization is a barrier to innovation. New research topics are emerging globally at an accelerated pace. No one knows from where the next big breakthrough will emerge, but it is as likely to come from a new and unexpected research area as it is from an established discipline. As we move into the fourth industrial revolution that merges the physical, digital and biological worlds in ways that combine great promise with potential dangers, those who wish to succeed will need to react quickly and proactively.

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1 Faculty units and research units will be used interchangeably for faculty-led research units, depending upon the context.

2 "Ideally, that of 300 [faculty], equivalent to the California Institute of Technology, will allow plenty of flexibility to adapt to future changes in society and academia." Framework I (2003); "The ideal size ultimately pursued by the university in the long term is around 300 [faculty]." Blueprint of the New Graduate University (2008).

We embrace this approach, with the strong support from our Board of Governors and Board of Councilors. Since we were created with a structure to foster creativity, collaboration and adaptability in the first place, our advantage is that we can advance more quickly and flexibly.

While we believe passionately in our approach, we cannot predict when it will deliver epochal breakthroughs and groundbreaking innovation, or even when we will become accepted as a world-leading university. This long timeframe is challenging, because it requires the continuation of the outstanding political support we have received so far. There are strong indicators that we are on the right track, as described in this plan. We will achieve the vision of the courageous founders of OIST with the continuous and long-term support of the wider community.

The economic case for investment in research also requires focus on the long-term. The commitment of the Japanese government to this project has been essential and appreciated, especially given the higher construction costs incurred in Okinawa reflected in our commitment to respect and protect a beautiful and fragile environment, the challenges involved in building in a mountainous forest with very difficult access, the high-quality demanded of the multi-disciplinary laboratory buildings if we are to compete successfully with the world's best, the increased costs in Okinawa compared with the mainland due to the specialized nature of the project, and the local construction boom.

We have already begun to deliver a return on investment. We are beginning to make an impact on the economy, attracting a diverse, international and highly qualified workforce to Japan while our graduates begin to make their way in the world, taking with them their experience of, and contacts within, Japan. This will become increasingly important as Japan deals with an aging and shrinking population.

We are given the objective of contributing to science and technology worldwide, of attracting leading researchers from Japan and abroad to conduct high-quality research, of advancing the development of a world-class research hub with an outstanding research environment and a high level of research,[1] and of nucleating a knowledge cluster to catalyze technology transfer and innovation industry in Okinawa.[2] Because OIST is truly international and already building a strong research and technology-transfer presence throughout the world, this can be achieved more successfully here than elsewhere in Japan. Here in Okinawa, we can offer our scientific community superb facilities in an area of outstanding natural beauty, embedded in a rich and diverse culture with an exceptional quality of life.

Maximizing the potential of Okinawa and OIST requires a partnership with the Okinawa prefectural government, local authorities and private investors to create the long-term vision for the development of the region around our campus, including employment and economic investment opportunities, children's education and even tourism to a "university town" (see Chapters 4, 6 and 9). We want to create an entrepreneurial culture that embraces innovation, acting as a catalyst for a neighborhood economic zone that creates jobs and wealth. Being in Okinawa creates a wealth of research opportunities to work with local institutions on important topics of global concern, such as marine conservation, terrestrial ecology, healthy aging and other subjects (see Chapter 6 and Appendix D).

There are also challenges. In general, international academic institutions are socially liberal, whereas Japanese and Okinawan society is socially conservative, which can create a sense of "otherness" amplified by language barriers. Japanese academic and administrative structures are traditionally hierarchical, whereas those in our international competitors are less formal, with more encouragement to take individual initiatives. On the other hand, the casual informality of many of the top universities to which we aspire may seem strange or disrespectful in a society grounded in politeness and respect, especially for the elderly. These differences create opportunities for social and cultural enrichment – dialogue has more dimensions than language.

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1 5th Science, Technology, and Innovation Basic Plan FY2016-2021, endorsed by the Cabinet Office

2 Strategy and Roadmap for the Vision of Okinawa in the 21st Century, endorsed by Okinawa prefectural government, http://www.21okinawa.com

OIST is a unique university in Japan – an international, English-language graduate university with independent governance under the Private Schools Act and public funding under the sponsorship of the Cabinet Office. Our status as a private university under the stewardship of a board of governors gives us the flexibility necessary to compete successfully for talent with other leading universities around the world and to respond more quickly to new opportunities and challenges. In our short life, we have demonstrated conclusively that this new model works. To meet our ambitious growth goals while embedded in a Japanese commercial, legal and legislative environment, we must do things differently and address issues like multi-year funding, carryover of unspent but committed funds for the purchase of long-lead time equipment, visas and other policies. The challenges involved in joining the ranks of the world's best research universities in two or three decades – a remarkable feat for a young university – mean that we need to work with the Japanese government to adapt the rules that apply to OIST as a bold experiment that is working, without sacrificing accountability to Japanese taxpayers.

While research and education are the essence of a university, we have been given an additional mission, which is to contribute to the "promotion and autonomous development of Okinawa." Such impact is historically associated with having a prestigious, internationally recognized academic institution in a city or region. We are committed to creating an emerging entrepreneurial ecosystem.

We are both fortunate and challenged by being in Okinawa. Fortunate because Okinawa is a beautiful island, and we are in a beautiful part of it. Okinawa is an extremely safe and secure island in a geopolitically important region subject to developments beyond our control. Today, it is mainly a holiday destination, relatively isolated from the main Japanese academic and innovation centers and major technology industries, which necessitates travel, for example, for both OIST members and visitors, with cost and time considerations. For international travelers, a stop in Tokyo or another Asian city is necessary.

It is against this background that we must plan to take advantage of the opportunities while addressing the challenges. Okinawa brings special scientific opportunities in, for example, marine science and health in an aging population, which can be pursued in partnership with other Okinawan researchers. There are many other scientific challenges, from understanding the origins of the universe and of life to addressing pressing societal issues such as the impact of climate change and the need to develop clean-energy technologies. There are opportunities to improve the quality of life through a better understanding of cells and organs in organisms from C. elegans to humans and through development in technology. Apart from the science, we have an opportunity to create a "university town" as an integral part of the local community, enriching it both culturally and economically, which can help to address the challenge of embedding an international cohort into Okinawan society.

High-trust funding is provided up-front, and the results undergo robust peer review afterward; the model is very efficient in encouraging exploration of new ideas and new methods, especially when compared with more traditional, grant-based funding models that are often limited in impact because of the innate conservatism and risk aversion of peer-review panels, not to mention the diversion of precious time to find appropriate funding schemes and write grant applications. The trust-funding model from which OIST has benefited to date has encouraged junior faculty to undertake more ambitious research program while they are the most creative and to successfully compete with the more established scientists in the world. Although all pioneering and ground-breaking research conducted by scientists who later won Nobel Prizes between 1980 and 2010 occurred before these scientists were 51, and before an even younger age of 41 in chemistry and physiology or medicine,[1] traditional grant-funding models tend to support researchers older in age and later in their career stage.[2] As Sir

1 PLoS One. 2011; 6(12):e29738. doi: 10.1371/journal.pone.0029738

2 According to NIH data, the average age at which PhD scientists receive their first R01 grant – a sign of a successful research career – has increased from 35.7 in 1980 to 43 in 2016, Sarah Mann, NIH, Research Community Target Next Generation of Scientists, American Association of Medical Colleges News (2017). https://www.aamc.org/news-insights/nih-research-community-target-next-generation-scientists

Paul Nurse[1] said, "We really have to identify good people when they are young, when they are most creative. We have to back them. And then we make a judgment, and if they are not doing well you pull the money out. Give them a chance. Let them get on with it." High-trust funding also encourages researchers at any stage of their career to explore new and unexpected avenues in science, in contrast to successful grant applications that are based on concepts that already point to an expected result using an approach considered feasible by a peer-review panel. There are numerous examples of later Nobel Prizes awarded for scientific research that was not supported by the community.[2] Grant funding has an in-built tendency to support mainstream research, while high-trust funding places the responsibility on the individual scientist to follow their instincts, subject to rigorous evaluation of the scientific output that comes from the research. In this way, high-trust funding is a primary route to breakthrough innovation, as evidenced by the number of Nobel laureates in the few high-trust funded institutions in the world.[3]

As part of a new kind of university, young and established researchers are given the opportunity backed by the trust-funding model to try new things in new ways to create knowledge and make discoveries, subject always to robust ex-post review. The challenge is to evolve into a funding model that combines the stability of high-trust funding, which allows for sensible planning the economic execution of our growth, with incentives to attract investment from other sources. OIST is a long-term investment for Japan – it will take another 25 years to reach the capacity of our current campus when we will be able to compete with the best universities in the world. We have a clear direction for growth to 100 faculty units and are ready to embark on the next stage to grow to 200 faculty units by the early 2030s.

1.2 Planning for Success

Achieving the purpose for which we were created requires further growth beyond 100 faculty units, essentially for three reasons.

1. We must be world-leading in each area of science in which we engage, and this means not two or three outstanding faculty in each field but 20 or 30 research units, each led by an internationally recognized scientist or a young scientist with significant early achievements and great potential to become a future leader in the field, together with a team of highly motivated and brilliant postdoctoral scholars and graduate students. This creates a rich intellectual environment where new ideas can emerge, be challenged and flourish thus enabling us to lead the best in the world.
2. We must be the place where people want to do their science, to be educated about their passion for science or to seek answers to their science and technology questions. This means that we must cover a broad enough spectrum of science and technology that people can look at what we offer and find it the best environment for what they want. This enables us to compete with other world-leading universities at the institutional level and not just at single research domain levels.
3. There is great potential for high-impact science and technology from the connection of knowledge between different disciplines, and the probability of making such discoveries is increased when there is freedom to establish close interaction among disciplines – inter- and intra-institutional boundaries create barriers to collaboration. Covering a broad range of sciences in depth with our deliberately multidisciplinary laboratories and organization offers the best chance of making such discoveries when combined with a culture that encourages and nurtures new ways of thinking and doing science.

We know that this cannot be achieved at our present planned size. We believe that the minimum number of faculty units required to meet the requirements is somewhere between 200 and 300, which is the capacity of the current single campus site.

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1 Nobel laureate in Medicine 2001

2 For example, Neher and Sakmann's work on the function of single ion channels in cells

3 For example, Bell labs, Max Planck Institutes and Eidgenoessische Univeristaet Zurich (ETH)

This Strategic Plan covering the next decade, 2020-2030, lays the foundations for the continued expansion to 200 faculty units and 600 students by the early 2030s. Since Framework Documents I and II were published, we have learned much about how to attract outstanding faculty, researchers, staff and students to OIST and provide them with the appropriate environment to produce ground-breaking and high-impact research in emerging domains. The high-trust funding model, under which the resources for research are provided up front and the research outcomes are subjected to rigorous ex-post external peer review, has enabled our faculty and students to develop ambitious research programs. For example, one of our first PhD graduates recently accepted an assistant professorship joint appointment with Brigham and Women's Hospital and Harvard Medical School to develop deep artificial intelligence (AI) applications in medical imaging for cancer diagnostics, an ideal example of a cross-disciplinary focus. In the process of building partnerships with Okinawa communities and developing procedures for talent retention, we have also learned the importance of cultural intelligence and well-being support for our people and grown to appreciate the value of diversity in our daily work environment. We are confident that our Strategic Plan 2020-2030 with its ambitious strategic goals for implementation is achievable.

1.3 The Guiding Principles

People are the foundation of our organization. Distilled from the voices those who come from all over the world to Okinawa to lay the groundwork and fulfill the vision of our founders, our Strategic Plan is built upon three guiding principles (see Figure 1-3).

Globally Recognized	Destination of Choice	Partner of Choice
We want to be globally recognized for world-leading cross-disciplinary research that benefits humanity.	We want to be the destination of choice to work, learn and collaborate, linking science to education leading to innovation and entrepreneurship, supported by an efficient administration.	We want to be the partner of choice for innovation and a catalyst in Okinawa, promoting economic growth and sustainable benefits, addressing problems important to Japanese and global society.

Figure 1-3 The guiding principles

We want to be globally recognized for world-leading cross-disciplinary research that benefits humanity.

Excellence underpins everything that we do at OIST. Outstanding faculty and postdoctoral researchers provide a rich and open-minded intellectual environment that attracts and stimulates the best graduate students to produce highly original work and go on to exciting careers in universities, research laboratories, industry, education and public service. A small proportion of OIST alumni pursue advocacy for science and technology through law, government, secondary education and communications to the public to bring the results of scientific endeavors closer to society at large. Excellence in research

fuels innovation and technology. Innovation takes many forms, for example finding new ways of doing existing things better, inventing completely new things that satisfy demands not previously recognized or resolving long-standing problems in science or society through a completely different approach. These technological insights and scientific rigors combined with entrepreneurship lead to the creation of new technologies and new industries. There are many opportunities for discovery by combining knowledge from different areas of science and many opportunities for radical new ways of thinking in one domain by benefitting from advances in a completely different domain. Our flexible academic structure without disciplinary boundaries encourages collaboration and cross-disciplinary research. By publishing our research in leading academic journals and through a vigorous communications campaign, we will ensure that our contributions are recognized globally.

We want to be the destination of choice to work, learn and collaborate, linking science to education leading to innovation and entrepreneurship, supported by an efficient administration.

We want OIST to be an exciting and inclusive place, where those with a bold and pioneering spirit come to realize their dreams, to interact with each other and to become engaged with our mission. We will build upon our reputation for excellence in science, education, innovation and technology and act with fairness and integrity to ensure equal opportunities for the under-represented. We have a beautiful campus on a beautiful island, with superb facilities and equipment. We want to provide a warm and welcoming environment, not only to our personnel (staff and students) but also to their families and to visitors to our campus. We will ensure that everyone at OIST has personal development opportunities that will allow them to reach their full potential. We will ensure that our students are well-rounded and knowledgeable about many things in addition to their thesis work, that they develop a network of contacts across disciplines and cultures and that they learn a range of additional skills that will prepare them for the next stage of their careers whether in further academic research or in the wider world. We believe that our alumni (students, postdoctoral scholars, researchers, academics and administrators) will be our best ambassadors, and that visitors will tell their friends and colleagues of the remarkable intellectual vibrancy of OIST. We also want to be a destination of choice for visiting researchers, working in partnership with us or attending workshops and conferences, further enriching our cultural diversity and while they discover Okinawa.

The focus of any world-leading university is excellence in research and education, but success relies upon the support of many others – researchers, support scientists, technicians, administrators, support staff and executives. In order to achieve our goals in research, education and technology, as well as promoting Okinawa and contributing to the general well-being of humanity, we need a shared vision. We need to be united in our objectives and work together seamlessly to achieve our goals and fulfil the purpose for which OIST was created by the Japanese government. Our administration needs to be efficient, effective, responsive and accountable, enabling the research, education and innovation sectors to pursue excellence.

While we strive to achieve excellence in research, education and innovation, we firmly believe that our policies and initiatives regarding diversity and inclusion play a pivotal role in reaching this goal. We have made considerable efforts to support and encourage the recruitment and subsequent career development of our diverse workforce. We also value diversity and inclusion, enabling access for and embracing the success of all members of the OIST community.

We want to be the partner of choice for innovation and a catalyst in Okinawa, promoting economic growth and sustainable benefits, addressing problems important to Japanese and global society.

Okinawa historically has always been a prosperous maritime trading hub of the Ryukyu Kingdom in the Age of Great Trade. An important part of our mission is to build upon the competitive advantages of Okinawa, promote the co-creation of knowledge-based industries with our partners and cultivate an internationally oriented talent pool in Okinawa through research, education and innovation. OIST serves as the intellectual center where stimulating exchange of ideas, even opposing ones, happen daily, and new unconventional experimental approaches are guided and safeguarded with deep expertise and

extensive experience. However, our ambition is not limited to influencing the development of Okinawa but of Japan and elsewhere. We would like OIST and Okinawa to become a preferred destination for those who want to address profound challenges in health and sustainability that our planet and societies face and to support the United Nations' Sustainable Development Goals for 2030.

Great ideas for innovation are seldom conceived in a vacuum. Partners in research, education, technology development and social engagement are the seeds for a fertile innovation ecosystem for a university. While it is not possible to predict what research will lead to the next big breakthrough, the larger the pool of good ideas and the higher the concentration of talented people, the greater the chance of making discovery a reality. We want to be a partner of choice for like-minded research institutions, ambitious industries and public and private foundations. We train our students and postdoctoral scholars to be future leaders, to have the vision to innovate, to take risks and to drive science and technology in the pursuit of knowledge, aware of the benefits for humanity. We facilitate technology-transfer and offer our deep expertise and state-of-the-art research infrastructure for collaboration and co-development. We foster the exchange of ideas and support lifelong learning in our staff, alumni and friends to bring the wonders of scientific discovery into a full circle of knowledge that empowers and enables people, and to make Okinawa a magnet for the best scientists, engineers, technologists and entrepreneurs from Japan, Southeast Asia and the rest of the world. Our people will take their experience of the unique OIST environment through their careers and stimulate new ways of thinking, acting and innovating.

The Strategic Goals are faithful to the Guiding Principles and are summarized below:

Chapter 3. Delivering World-Leading Research and Education

1. *To become a world-leading university, we will create a critical mass of researchers conducting cutting-edge cross-disciplinary research by using our state-of-the-art facilities and by continuing to develop as a local, national, regional and international research hub.*

2. *To deliver exceptional graduate training, we will provide a world-class PhD program in science and comprehensive support to a diverse group of students with the most promising talents.*

Chapter 4. Delivering Transformative Technology through Innovation

3. *To encourage and develop new ideas and innovation, we will create an environment that recognizes the value of risk-taking in the pursuit of knowledge and ensures that resources are available to translate discovery into impact.*

4. *To contribute to the societal and economic well-being of Okinawa and to seed a local innovation ecosystem, we will develop synergistic relationships with the wider Okinawan community to create an environment that nurtures entrepreneurship and entrepreneurial thinking, and we will build strategic partnerships with national and international universities, industry and the Japanese government.*

Chapter 5. Promoting Excellence in Governance and Efficient Administration

5. *To ensure that OIST operates with high international standards of governance, we will continue to refine internal and external governance processes as we grow and to recruit outstanding individuals to membership on our Board of Governors and Board of Councilors to reflect diversity, equity and inclusiveness and, through periodic self-analysis, high levels of effectiveness.*

6. *To create an efficient administration for a growing university, we will ensure effective structure, processes and tools, and skilled and highly motivated, customer-oriented and accountable professionals.*

Chapter 6. Delivering the Benefits Locally, Nationally and Globally

7. *To promote the intellectual life of Okinawa, we will deepen our relationships with all generations of the Okinawan community through cultural, educational, sports and career-development activities and will ensure Okinawan students are provided new opportunities to achieve their potential in global society.*

8. *To strengthen the benefits of Japan's investment in OIST, we will establish an Innovation Hub and create an entrepreneurial culture; strengthen our ties with Japanese universities and businesses to be an integral part of the Japanese research, higher-education and innovation systems; and extend our strategic partnerships with other universities, research institutes, industry and government, locally and globally.*

Chapter 7. Developing Individual Potential to Achieve Our Common Goals

9. *To achieve our ambitions to become a world-leading international research university, we aim to attract the best talents across the university to create an environment in which diversity is valued and people are encouraged to achieve their full potential through opportunities for personal and professional growth.*

Chapter 8. Developing Our Community

10. *To enrich our staff, students' and family members' experience, we will build an inclusive and welcoming university community with quality on- and off-campus housing, sporting, recreation and community activities and will further develop appropriate child care, educational facilities and other services.*

Chapter 9. Developing Our Campus

11. *To support our world-leading research programs, facilitate research across disciplinary boundaries and enable all members of our community to meet and communicate easily with each other, we will design an interconnected campus with modern, attractive, state-of-the-art buildings that promote interaction and cooperation among different research teams. We will ensure that our administrative, research support and education centers evolve with our growth.*

12. *To promote responsible stewardship of the environment, we will reduce CO_2 emissions using the latest sustainable methods for our environmentally friendly buildings. Furthermore, as part of our development of facilities we will conduct thorough environmental assessments, protect local plants and animals and encourage the development of environmentally sound work practices.*

Chapter 10. Developing Our Communications

13. *To advance the OIST brand and our international reputation in research, education and innovation, we will broaden the communication of our achievements locally, nationally and globally. We will strengthen our communications with our former students and colleagues through an alumni-relations team and develop an integrated, high-impact communication strategy to support fundraising.*

14. *To strengthen our internal communications, we will develop an open culture that embraces and values diversity, promotes harmony and well-being and allows everyone to express concerns or opinions freely.*

Chapter 11. Resource Requirements and Funding Strategy

15. *To build on our outstanding research and education achievements and to plan efficiently for growth over the next decade, we will work with the Cabinet Office to evolve our current high-trust funding model into long-term stable funding and reasonable multi-year projections for both the baseline and investment budgets to enable our scientists to pursue ambitious and challenging frontier research across disciplinary boundaries.*

16. *To complement the baseline funding, we are committed to generating additional resources through external grants, sponsorships and philanthropy by providing attractive opportunities for collaboration in areas of mutual interest, without compromising our autonomy, scientific freedom or ethical principles.*

1.4 The Strategic Plan

The Strategic Plan starts with an Overview of OIST since its establishment followed by the Vision, Values and Mission statements that have been developed with the staff at OIST, presented to and endorsed by the Board of Governors, followed by chapters on Research and Education, Innovation and Technology, Delivering the Benefits, Governance and Administration, Community Developments, Communications, Campus Developments and Resources and Funding, followed by several Appendices. The Strategic Plan will be actively used in the management of OIST with rigorous goals and accountability in all areas.

Chapter 2.
Purpose, Vision, Values and Mission

The Okinawa Institute of Science and Technology Graduate University (OIST) was created with a very clear purpose by the Japanese government through an act of the Diet (see Figure 2-1).

> 第一章 総則
> Chapter I General Provisions
>
> （目的 Purpose）
> **第一条** この法律は、沖縄科学技術大学院大学の設置及び運営に関し必要な事項を定めることにより、沖縄（沖縄県の区域をいう。以下同じ。）を拠点とする国際的に卓越した科学技術に関する教育研究の推進を図り、もって沖縄の振興及び自立的発展並びに世界の科学技術の発展に寄与することを目的とする。
>
> **Article 1** The purpose of this Act is to provide for necessary matters concerning the establishment and operation of the Okinawa Institute of Science and Technology in order to promote internationally distinguished research and education on science and technology based in Okinawa (within Okinawa Prefecture; the same shall apply hereinafter), and thus contribute to the promotion and self-sustaining development of Okinawa and to the development of science and technology worldwide.

Figure 2-1 Excerpt from the Schools Corporation Act of 2009 (Act No. 76)

"*The Proposed Framework of the University*[1]" envisaged the creation of a graduate university to conduct outstanding research and doctoral education with an emphasis on cross-disciplinary principles, contributing to the advancement of science and technology in the world and making Okinawa an intellectual hub in the Asia-Pacific region. It defined its structure and major aims, which were amplified in the "Purpose and Necessity of the Establishment of the Graduate University" in 2011. It identified a growing need in Japan for a larger pool of people highly educated in science and technology who would contribute to the national research effort and open new fields in research and industry. The university was required to develop the full potential of its graduate students and postdoctoral scholars for scientific excellence and independence in a fully international environment by attracting excellent researchers and students to Japan. English would be the main language because it is the recognized and widely used language of science and technology. The research and education should be cross-disciplinary because many rapidly emerging areas of science and technology extend beyond existing, artificial barriers created between fields of research. OIST should take its place among the world's leading academic institutions delivering fundamental science and advanced technology by addressing big challenges that are important to society.

These are the founding principles that govern OIST: a focus on excellence in research and education, fostering new ways of working that transcend the traditional boundaries that divide scientific disciplines within a fully international environment, recruiting outstanding faculty, students and postdoctoral scholars from around the world. Not more than half of either the faculty or the students should be Japanese, although it is essential that there is a strong Japanese component of both. New technologies that flow from OIST research must benefit Okinawa, Japan and the wider world.

OIST is a private school, created under the 1949 Private School Act,[2] with the status of a university.[3] While the broad goals for OIST were set out in the Schools Corporation Act, the task of delivering those goals was delegated to a Board of Governors consisting of outstanding scientists and distinguished individuals with knowledge and experience in promoting Okinawa and in university management.

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1 Usually referred to as Framework I (2003)

2 Act number 270.

3 Article 103 of the School Education Act (26 of 1947)

We have developed a vision for our future, built upon a solid set of core values and guided by a mission to deliver the purpose for which OIST was established (see Figure 2-2).

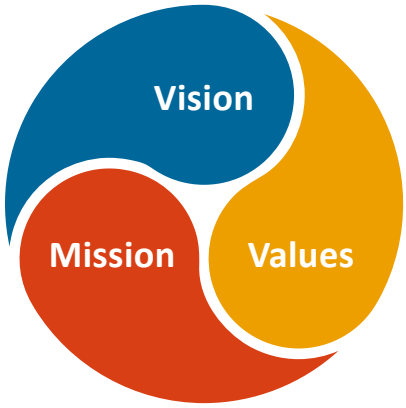


Figure 2-2 The Strategic Plan is built upon foundations of our vision, values and mission

2.1 Our Vision

The advancement of knowledge for the benefit of humanity

We will achieve our vision by becoming a world-leading international research university in the next twenty years. We will attract to our faculty outstanding researchers with great ambitions who are able to prosper in our cross-disciplinary and multicultural environment.

Our students experience the thrill of discovery while working with renowned scientists and superb equipment. We will train these outstanding students to become future leaders. We will ensure that the results of our research are used to promote Okinawa as a science and technology center of excellence and as a place where new technologies are developed and new industries are established and built upon our research. We are unique within Japanese higher education. With the strong financial commitment of the Japanese government, we have the freedom to focus on basic science, a powerful driver for transformative innovation. We want OIST to be a community of hope and enlightenment, a university that helps build a better world for this and future generations.

2.2 Our Values

We abide by a core set of values that underpin everything that we do: Excellence, Respectfulness, Responsibility, Transparency, Sustainability, Diversity, Courage and Freedom.

We are a community of scholars, students, executives, deans, researchers, technicians, administrators, contract staff, visitors and their families, many of whom live on campus. We are part of a local community in Okinawa, we collaborate with Okinawan researchers and we interact with many other individuals and organizations in Japan and the wider world. In dealing with others both inside and outside the university and in performing our daily tasks, we hold ourselves willingly to the highest ethical standards and a set of core values that govern all of our actions and underpin the Policies, Rules and Procedures that govern conduct in the university.

Excellence: We strive for excellence in everything that we do.

Excellence is our standard in research, education, innovation, technology, entrepreneurship and administration. We believe strongly that striving for excellence drives efficiency, and efficiency leads to effectiveness and economy. Excellence extends to our quality of life and our beautiful campus, which are conducive to health and well-being, making people happier and more productive.

Respectfulness: We are committed to fostering a community that respects the rights of individuals.

OIST is built on respect – for the individual, for the environment, for the traditions of the local cultures, for differences and for the law. We strive always to act honorably and with dignity. There is no dominant culture or group within OIST – we are a unique assembly of people working together to build something new, different and exciting.

Responsibility: We accept responsibility for our actions and for the health, safety and well-being of ourselves and others.

We value and encourage the pioneering research that our funding allows us to do, always within a robust ethical framework where we are individually and collectively responsible for our actions and our job performance. When research involves techniques or substances that have risk, we ensure that we protect ourselves and others from harm.

Transparency: We embrace transparency and authenticity, acting honestly, fairly and properly while maintaining the highest ethical standards in all things.

As a publicly funded institution, we are open, honest and accountable about the use of the resources provided by the Japanese government and ultimately taxpayers. We publish all our research in respected academic journals, through open access when possible, to benefit science globally. We welcome formal external review of our research. Breaches of our values are investigated, with independent external review if warranted, and we disclose the outcomes of our investigations to the extent possible. Scientific misconduct – falsification or fabrication of results, plagiarism, failure to give due credit and unethical research – is not acceptable and is rigorously investigated. We aim to conduct our research to the highest ethical standards, fulfilling our obligations to science, to our fellow scientists to Japan and to the world.

Sustainability: We aim for sustainability of the environment and of Okinawa.

We are in a beautiful location with a precious ecosystem that we wish to preserve for future generations to enjoy. We are committed to a sustainable future for ourselves and for Okinawa, including building to high architectural and environmental standards and working to reduce the environmental impact of all our activities.

Diversity: We believe that creativity thrives in a diverse environment in which different cultures come together free from prejudice and discrimination.

We are all different in many ways, some open and visible and some less visible and private. As a truly international university, we welcome diversity in all its forms, rejoicing in the richness of our many peoples as a stimulus for excellence and creativity. We prohibit discrimination or harassment based on gender, gender identity, gender expression, age, sexual orientation, mental or physical disability, medical condition, race, ethnicity, ancestry, culture, national origin, religion, marital status or any other human characteristic. We are committed to inclusiveness, promoting equality and equity, valuing diversity and respecting the rights and dignity of the whole OIST family.

Already, we are a rich and diverse community with students from more than 40 different countries around the world. About 60% of our faculty and 55% of our research staff are from outside Japan. We have committed to increasing the proportion of female faculty from the present 20%; already, more than 40% of our research and research support staff are women. Our approach was recognized in 2018 by the Optical Society's inaugural Institute Award for Diversity and Inclusion Advocacy.

Courage: We want to be pioneers in cross-disciplinary research.

To fulfil Japan's goal that OIST become a world-leading international research university in a short period of time, we embrace challenges and risks. Faculty, students, researchers, administrators and other staff must have the courage to take risks, to be pioneers. We do things that have not been done before; we reach across traditional boundaries and risk failure to advance science. The high-trust

funding model of OIST allows faculty, students and researchers to have the courage and the freedom to explore new areas and topics in accordance with high ethical principles where risks are evaluated, managed and mitigated in harmony with the spirit of respectfulness and responsibility.

Freedom: We are committed to academic freedom, which encourages innovation in a cross-disciplinary environment.

The special status of OIST allows faculty members and researchers to pursue research driven by curiosity, to follow innovative ideas or to take research risks that might lead to discoveries or advanced technologies, subject to ex post external peer review. Freedom is constrained only by the values outlined above, particularly the requirement to conduct only ethical research. Freedom of expression in all parts of OIST, subject to respectfulness, is an essential part of a healthy campus environment.

2.3 Our Mission

We are a pioneering graduate university. We conduct research that bridges disciplines to explore new frontiers of scientific knowledge. We educate a new generation of scientific leaders. We are a catalyst for an innovation hub in Okinawa.

The key components of our mission are our people, our research, our education, our innovation, our administration, our partnerships and our community. A university is a community not only of scholars (faculty, students and researchers) but also those who support them, and its influence extends far beyond the boundaries of its campus.

People: We recruit the best talent locally and from around the world to create a diverse and inclusive campus community.

Talented people from around the world are at the heart of our ability to deliver on our mission including outstanding faculty and graduate students as well as postdoctoral scholars; research, technical and support staff; and administrators. Our people enable us to embed an international, English-language research university in the local and Japanese cultural environment, to the enrichment of both. We are committed to investing in our people – our greatest asset – to develop their full potential and help them achieve their personal goals.

Research: We create an intellectual environment with the principle of "science first," with the best equipment and laboratories within which healthy debate and discussion in the pursuit of cross-disciplinary research, education and innovation can flourish.

Our rich intellectual environment allows faculty, students and researchers to be free to follow their instincts and to make new discoveries. The lack of departmental boundaries lowers barriers to collaboration and encourages genuinely cross-disciplinary work to flourish. The fundamental drive is to advance knowledge and to ensure that, where appropriate, this knowledge is used to drive innovation and technology with social change for the economic benefit to the Okinawan, Japanese and global communities; for improvements in health and the environment; and in the pursuit of general well-being. To ensure outstanding research, we provide outstanding resources. To provide the best available equipment cost-effectively, much of the expensive equipment is shared through a Research Support Division. We pursue partnerships and collaboration to extend and enhance our research capabilities and to share our knowledge and facilities.

Education: We deliver an individualized graduate program that trains students to produce pioneering research and to be able to think, act, solve problems and become leaders in their chosen field.

Our PhD includes two years of course work and research training and a written thesis proposal that is examined at the end of the second year, followed by three years of research leading to the thesis and examination at the end of the fifth year. While there are certain core courses and academic themes, the aim is to tailor coursework to suit each student's needs. During the first year, each student completes four-month rotations in different laboratories, at least one of which is out-of-field (for example, in life

sciences for a physical sciences student). The aim is to educate a generation of research leaders who are both experts in their chosen disciplines and who have a working knowledge of other disciplines, encouraging cross-disciplinary working and thinking and an international network of contacts.

Innovation: We pursue technology-transfer and innovation to promote the growth of Okinawa and deliver benefits to Japan and the wider world.

In establishing OIST, the Japanese government emphasized the sustainable development of Okinawa and the benefits to the Japanese and global economies. OIST encourages innovation and, when exploitable ideas are developed, protects intellectual property rights. OIST also encourages entrepreneurship, not only by supporting current faculty, researchers and students, but by welcoming external entrepreneurs to campus to access and use OIST technology.

Administration: We prioritize an administrative system that is efficient, effective and responsive in order to support OIST's growth as a research university.

Our administration is a full partner in achieving our goals. The administrative system that underpins the research, education and innovation activities strives to be flexible, streamlined and compliant with all legal requirements. It prioritizes the use of best practice and state-of-the-art technology with sound data analytics to improve efficiency and effectiveness. It also measures its performance in all administrative and executive departments including communications, human resources and financial accountability.

Partnerships: We partner with other academic, commercial and social organizations in Okinawa, Japan and the wider world to create a vibrant innovation hub in Southeast Asia.

As part of the local, national and international research environment, we partner with other institutions to develop ideas and foster collaboration. We look for commercial partners to work with us to develop new technologies and bring them to market. We believe that such partnerships are mutually beneficial, enhancing capabilities and enriching lives, and we enable our graduate students and postdoctoral scholars to develop an international network of contacts as they pursue their chosen careers.

Community: We develop programs that contribute to the cultural and social life of Okinawa

From our beautiful location overlooking Tancha Bay in Onna Village, we work with the local communities to protect and promote the heritage of Okinawa, to promote the health and well-being of the local community and to use our own diversity to contribute to the rich local culture. We wish to be good neighbors.

Chapter 3.

Delivering World-Leading Research and Education

Strategic Goals

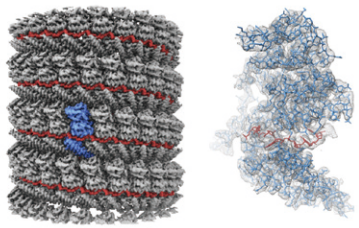
1. *To become a world-leading university, we will create a critical mass of researchers conducting cutting-edge cross-disciplinary research by using our state-of-the-art facilities and by continuing to develop as a local, national, regional and international research hub.*

2. *To deliver exceptional graduate training, we will provide a world-class PhD program in science and comprehensive support to a diverse group of students with the most promising talents.*

Research and education are the core functions of any university and, if we are to be recognized as one of the world's best, we need to be outstanding in both. At OIST, we have the opportunity to create something different with new ways of organizing and fostering research and innovative ways of training the next generation of science leaders. We set out below clear strategies supported by ambitious goals, by continuing to provide the appropriate environment for conducting world-leading research, with exceptional facilities, infrastructure and organization, and excellent support and investment in the training and well-being of students and staff.

3.1 Delivering World-Leading Research

The driving force of a top-ranked research university is the quality and range of its research, which underpins the major contributions of the university to society at large – the advancement of knowledge, the education of the next generation of outstanding researchers, and the innovations that lead to improvements in human well-being. At OIST our remit is to deliver world-leading research in all aspects of science and technology. This culture of research excellence provides an ideal environment in which to train future world-leading scientists and engineers. The fruits of our research can also be translated into economic and educational benefits to Okinawa, to Japan and to the world. The international research ethos of OIST has a double benefit – a cadre of international graduates will be trained who are knowledgeable about Japan, and a similar cadre of Japanese graduate students will be trained in English, the international language of science, able to compete globally. The presence of an internationally recognized center of excellence for science and technology will promote Okinawa as an intellectual hub in Southeast Asia, making Okinawa an aspirational destination for some of the world's best scientists and engineers and acting as a magnet for ambitious prospective students and postdoctoral scholars.



Ebola Virus Nucleocapsid:RNA Complex at 3.6Å. This is the highest resolution structure of a key component of the Ebola Virus acquired and visualized by using single-particle cryo-EM 3D reconstruction at OIST. An OIST research team led by an assistant professor acquired images of the Ebola virus nucleocapsids on state-of-the-art electron microscopes and analyzed large datasets by using high-performance computing clusters at OIST. In collaboration with virologists and biochemists from the University of Kyoto and the University of Tokyo, this research revealed the structure of the Ebola virus and its Achilles heel to the world. Left: ribonucleic acid (RNA) and nucleoprotein (NP) are colored in red and grey, respectively; a single NP molecule is highlighted in blue. Right: An atomic model of a single NP molecule with the RNA in the complex, superposed with the cryo-EM map in a polygon mesh representation.

Delivery of this program requires the recruitment of the most talented faculty members, researchers, research support staff and students from around the world. The individual research programs of the faculty members must be supported by substantial high-trust funding, so that they can undertake long-

term, high-risk, high-potential projects. In addition, the university should deliver more than the sum of their individual research programs. The environment must encourage cross-disciplinary collaboration among faculty members, researchers and students from different scientific disciplines. Shared research support facilities, with the most advanced scientific instrumentation, will be further developed to support faculty members, researchers and students who wish to employ new techniques. Research units and research facilities will continue to be subject to rigorous peer review from international experts to provide quality assurance. In a similar way, PhD students will be trained to ask substantial research questions, to challenge, to present their work at international meetings and to defend their theses with international experts. It is by following these principles that we have been able to accomplish so much in the short time since our inauguration as a university.

An important component of our research environment is the Science and Technology Associates, a small group – just a dozen in 2018 – of excellent young researchers pursuing their own programs either independently or in collaboration with one of the faculty units. These associates have been very successful at obtaining external funding to support their programs, which are subject to rigorous periodic review. As well as extending the range of our research portfolio, this supports our recruitment strategy as it enables us to accommodate dual-career couples in a way that would not otherwise be possible because of the relative isolation of OIST.

The high expectations that OIST holds for our faculty members, researchers and students require that we provide efficient and supportive administration, buildings, facilities and services. The training and mentoring of junior faculty members and researchers is vital, as is the further development of a challenging but supportive education program for our students. Finally, the location of this university in Okinawa provides many opportunities, such as the study of the local marine and terrestrial environment, but also presents challenges for the recruitment and retention of international scholars. The mechanisms by which to support the research and daily life of our community are described in Chapter 8.

3.1.1 Reaching Critical Mass

This Strategic Plan envisions growth to 300 faculty units by the mid-2040s, at which time we will be large enough to join the ranks of the world's highest-rated research universities. Initially, we plan to grow to approximately 100 faculty units by 2023 and closer to 200 faculty units by 2033. Our primary criterion for recruitment has thus far been excellence, rather than any particular scientific discipline. This has resulted in remarkably high-quality and high-impact output as measured by the ratio of the Nature Index group of journal publications over all peer-reviewed journal publications per research faculty member, where even today OIST leads Japan (see Figure 3-1).

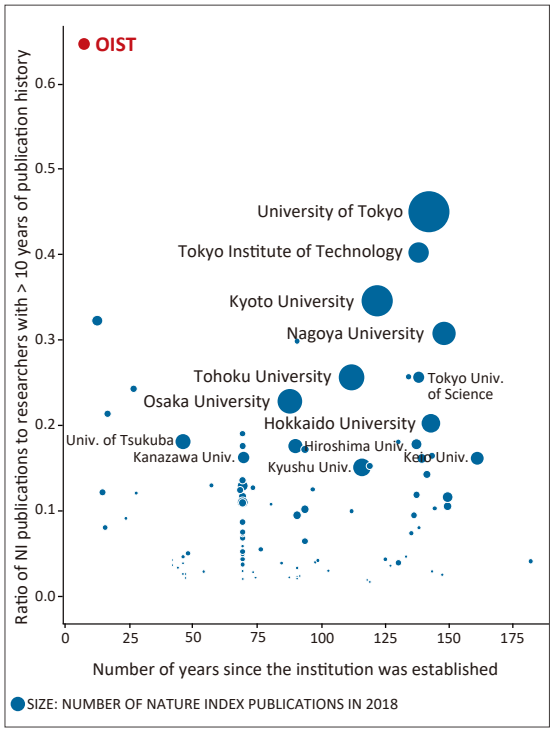


Figure 3-1 Comparison of the number of publications per research faculty (researchers active for at least 10 years) in the Nature Index group of journals for OIST (red text) and all research universities in Japan, plotted against the number of years since the university was established. © Digital Science and Research Ltd.

Although we have consistently generated high-quality publications and citation impact (see Figure 3-2) while steadily increasing the number of faculty-led research units through recruitment, international peer review and financial packages, we must grow rapidly to reach critical mass (Figure 3-3) and continuously develop our research and growth strategy toward joining the world's best research universities (see Figure 3-4 and Perspective Council in 3.1.4).

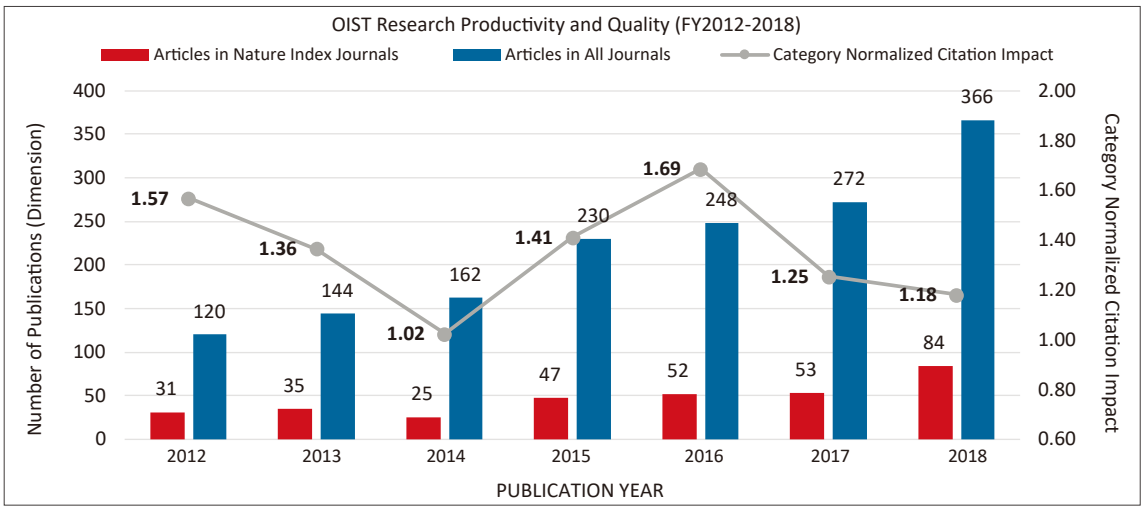


Figure 3-2 OIST productivity as a function of year since 2012 for Nature Index Journals and all Web of Science Journals and the Category Normalized Citation Impact (CNCI) where the CNCI is the average of the number of citations for each paper published divided by the average (or expected) number of citations in that field. A CNCI of greater than one means that the paper is cited more frequently than papers typical of the field.

After the Perspective Council deliberations in late 2017 (see Section 3.1.4), we have continued to recruit in areas of existing strength at OIST (e.g. neuroscience, physics) while expanding areas that are small or not represented (e.g. marine science, mathematics, computer science, chemistry, engineering). OIST is an increasingly popular destination; we received over 1,500 applications for 10 faculty positions in FY2019. This recruitment program, based on the Perspective Council recommendations, will continue through FY2022 with a focus on quality appointments in these disciplines. Quality and a balance between the recommended broad disciplines, rather than any focus on detailed sub-disciplines, will drive our choice of appointments. We aim to recruit a mixture of senior faculty with an established international reputation, more female faculty and some younger researchers with a significant record of achievement and a demonstrated potential to become world leaders in their fields.

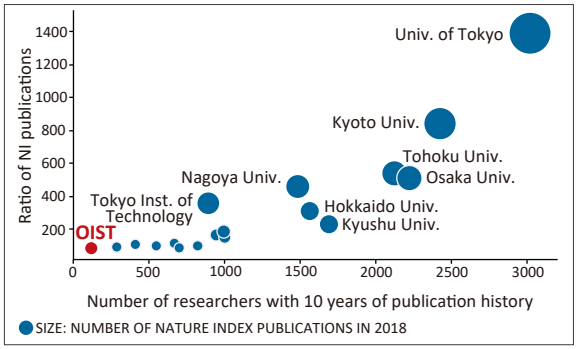


Figure 3-3 High-quality research output from a Japanese research university increases as the pool of researchers increases in size. The critical mass or step size to advance to the next tier of research output is approximately 750 research faculty including all researchers with over 10 years of publication history. © Digital Science and Research Ltd.

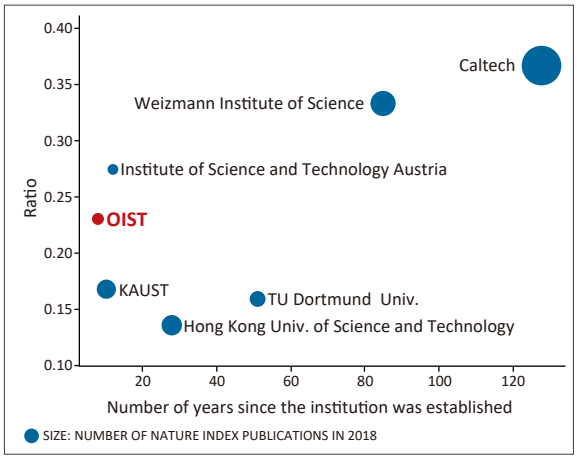


Figure 3-4 A comparison between OIST and a select group of the world's young and well-established smaller research universities. The ratio of publications in Nature Index Journals and all Web of Science Journals between 2012 and 2018 is plotted against the years since the institution was established. © Digital Science and Research Ltd.

Between 2022 and 2032 we plan to grow the number of faculty units from 100 to 200. We provide new faculty members with an initial package of resources necessary to start up the research unit quickly so that they can recruit excellent personnel, acquire the necessary specialized equipment, produce outstanding research results and apply for external funding. The level of support varies depending on the research field, availability of existing

research equipment at OIST and career stage of the faculty member (see Table 3-1). Additional researchers will be funded by external academic or industrial grants. Each faculty unit will also require an operating budget of up to five million yen per person per year (at FY2019 costs) depending on the discipline. Along with the other faculty, they also need the opportunity each year to request new, dedicated research equipment, which is estimated to require one billion yen per year (see Chapter 11).

In pursuit of research excellence, we need to attract exceptional post-doctoral scholars to OIST. We intend to establish three-year OIST Fellowships open to candidates with significant early achievements and demonstrated promise in scientific research who are expected to go on to become leaders in their fields. The candidates will be selected on merit by a newly established committee, taking the imperatives of diversity into account, based on an interview and a short research proposal. They will receive a higher salary and more importantly have a degree of independence to pursue their own research program. They may apply for internal funding to support their program and will be encouraged to apply for external grants as well. These fellowships will be advertised externally and we will explore ways of extending this program with external funding (see Chapter 11).

Table 3-1 Startup packages for newly-appointed faculty

Faculty	Research Staff	Operational Expenses* (Yen)	Capital Equipment** (Yen)
Assistant Professor	Up to 4	7 – 60 M	0 – 300 M
Associate Professor	Up to 6		
Professor	Up to 8		

** The annual amount per unit is 5-10M of additional funds for basic lab setup in the initial 2 years*
*** Initial equipment costing 3M yen or more depending on the availability of research equipment in core facilities*

One way of looking at the research portfolio is to construct a research network diagram (see Figure 3-5). For each OIST researcher with more than ten years of publication history, the characteristics of the journals in which their articles appear is used to determine their field of study, and this determines their position on the "map." Lines connect them to their OIST co-authors. The resulting map shows the concentrations of researchers (nodes) and the collaboration patterns, with the size of the node representing research strength. Compared with our principal competitors, we need more and stronger nodes to become a world-leading research university; that is, we need greater depth and breadth.[1] This is also needed to stimulate the economic vitality and development of Okinawa and Japan by connecting basic, curiosity-driven research to applied socially motivated science and engineering, which is better attained with the high trust funding model than with the traditional project-based funding model. OIST faculty and researchers have creative energy and collaborate with internal and external partners who use complementary process and methodology that unite disciplines to tackle a common research theme or problem.

To foster a collaborative cross-disciplinary culture, each OIST laboratory building will house about 20 faculty units from a range of disciplines. Coordination and governance of research will present new challenges as OIST grows to 200 faculty units and beyond. An academic lead, a senior faculty member who will be supported by a building administrator and a building laboratory manager will coordinate each building. These teams will oversee local research safety, supported by a central team of health and safety experts. They will also be responsible for local research governance and ethics. A campus-wide framework will include compulsory research ethics and integrity training for all researchers and students, supported by central archiving of all published datasets, and a whistle-blowing procedure controlled by the central Faculty Affairs Office. Other building matters, for example local space allocation, social and scientific events to promote interaction and coordination of research unit administrators to improve research unit support, will also be managed at the building level.

1 A world-leading university such as Caltech or the Weizmann Institute typically has fifteen or more strong nodes, with many internal and external connections.

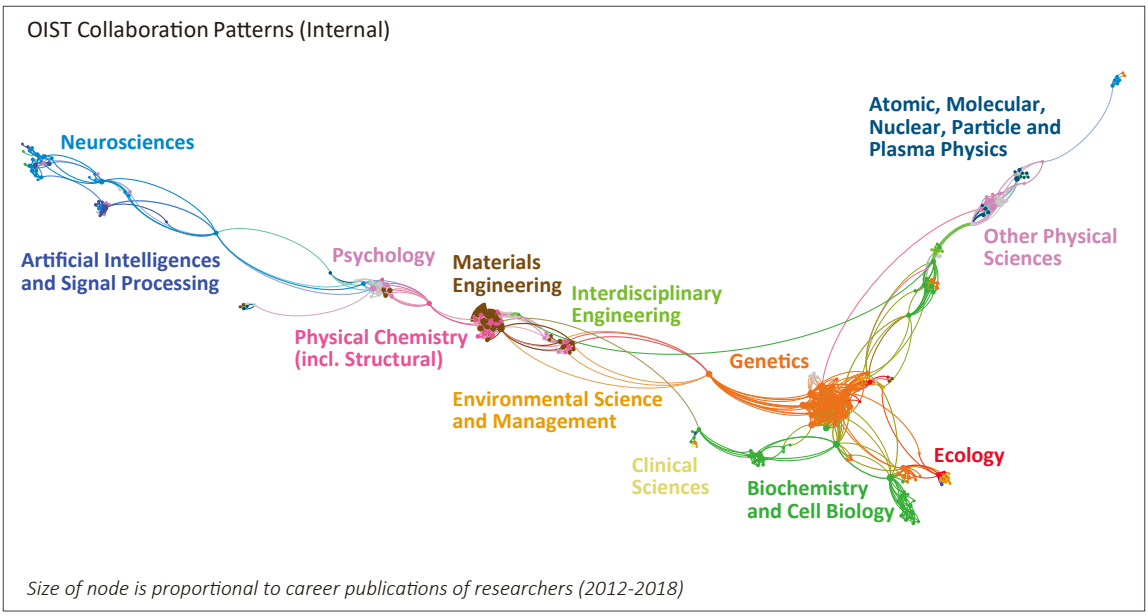


Figure 3-5 OIST collaboration patterns, clearly showing genetics, followed by biochemistry and cell biology, neurosciences and other physical sciences, reflecting the development of the faculty since its foundation as a research institute in 2004. © Digital Science and Research Ltd.

In addition to this functional research support and governance by the building team, we propose a flexible suite of research themes to provide intellectual drive and leadership and further encourage collaboration. Faculty units, research support sections and individual researchers and students will be identified by several self-defined research tags that describe their interests. We have initiated this process and have compiled a list of more than 500 proposed tags that include research topics and research methods. Using tags to construct a set of research themes, the OIST website will enhance student, faculty member and researcher recruitment. Themes will be flexible in that they can be assembled and disassembled regularly and quickly; individuals can belong to any number of themes. Tags will also enhance internal OIST communications so that seminars and workshops can be advertised to particular interest groups. As a result, OIST will be better able to pursue larger funding applications. Research themes are summarized in Figure 3-6.

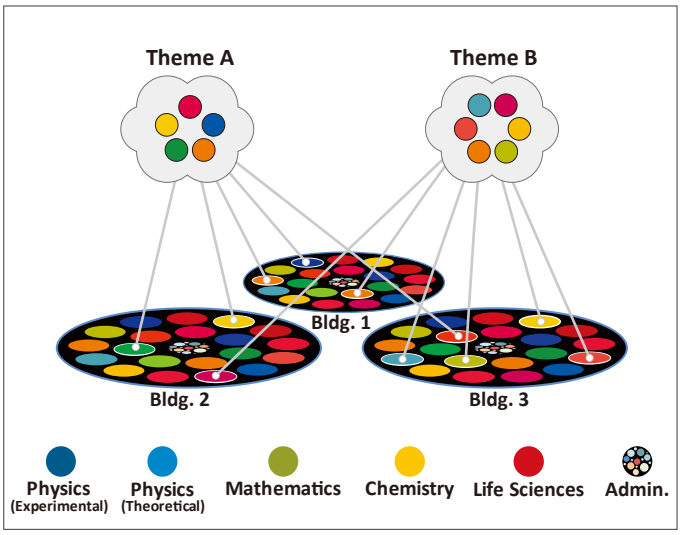


Figure 3-6 The relationship between building administration and research themes. Buildings, represented by the black ovals, contain about 20 faculty-led research units in several disciplines (here five) and a local administration. Themes, represented by the two structures above, connect research units within and between buildings and are dynamically created across the campus by those units interested in a particular research topic, with administrative support provided by the units.

It should be noted that the complementary structures of building-level administrative support and virtual, flexible research themes are scalable, enabling OIST to be governed the same way even with more than 200 faculty units. This combination of flexible themes captures the intellectual vibrancy of OIST, and a building-based administrative structure provides continuity and the assurance of high standards to uniquely position OIST to respond quickly to new ideas and

opportunities and to avoid the time-consuming bureaucratic processes usually required to create or dissolve departments or research centers.

3.1.2 World-Class Research Support Staff and Facilities

State-of-the-art research facilities are a feature of the present OIST (see Figure 3-7). Common research equipment is operated either by dedicated research support staff or is open for use by trained faculty members, researchers and students. This allows our researchers economical and efficient access to state-of-the-art equipment. Each research facility section leader is responsible for scheduling regular user meetings and for preparing a prioritized list of new common research equipment each year. While new faculty conducting experimental science receive substantial startup funds to establish their units, equipment usually has a relatively short life (two or three years) and needs to be upgraded or replaced. The ability to purchase new equipment annually is critical for the continuing health of OIST; a budget of approximately one billion yen per year is necessary at present to upgrade common equipment and install cutting-edge technology as it becomes available. As OIST grows, research facilities need to expand, and further research facilities will be developed. Therefore, the common equipment budget must increase in proportion to the number of faculty units.

From FY2015 to FY2019, OIST completed several international peer reviews of each section of our core research facility to validate the quality of our services and to inform future planning. Without exception the panels have praised the skill and dedication of OIST research support staff, while recommending that each section increase staff numbers and provide further specialized training to existing research support staff. Research support staff have undertaken both technical and leadership training, and two staff members have already been promoted to research facility section leaders. This program of training, retention and promotion will continue. We will also develop new facilities, a terrestrial ecology observation network in FY2019 and an electronics workshop in FY2020. Plans are being developed for the following years to bring us in line with the world's best cross-disciplinary universities and to support a wide range of new faculty units (e.g. with transgenic and gene-edited mouse services, vacuum and low-temperature physics support, marine science sample collection, engineering manufacturing and test space).

Figure 3-7 The OIST Research Support Division maintains on- and off-campus research facilities and manages user access and research support services, such as user training and technical seminars. Please see their website for further details about the research equipment and other services: https://groups.oist.jp/rsd.

At present most research facilities are housed within the research laboratory buildings (labs), many in Lab 1. In addition, a marine station was opened at Seragaki (five kilometers from campus) in FY2015, and a dedicated engineering workshop in the Engineering Building was opened in FY2016. We plan to construct a greenhouse for transgenic plant research, and the completion of Lab 5 will bring a large, state-of-the-art animal facility, occupying 30% of the building, and a new cleanroom. During the development of new campus buildings between 2022 and 2032 it will be necessary to plan the location of new research facilities. Some may be best located in research laboratory buildings, while others may require further dedicated buildings.

The OIST research facilities are critical for both education and innovation. Our students can be trained by the facility staff to undertake experiments that may be beyond the technical expertise available in the faculty unit, allowing students to design a challenging project free from technical constraints. The research facilities also run advanced training courses. For example, in February 2019 OIST hosted a national training course in cryogenic-transmission electron microscopy, a field in which we are among the world's best. We are also funding researchers from around Japan to use OIST research facilities if there is spare capacity, which enhances the skills and knowledge of the research support staff, promotes the reputation of OIST and contributes to the research capabilities of our partner universities. Research facility section managers can also arrange for OIST students and researchers to visit external core research facilities. Success of the OIST incubator facilities will depend on tenants having access to core research facilities and top technical expertise in, for example, high-performance computing, lab health and safety management, and advanced instrumentation.

3.1.3 A Local, National, Regional and International Research Hub

The primary measure of success in research reputation is high-impact publications. As a result, one highly significant measure of global reputation is the number and quality of collaborative research publications. In a relatively short time OIST has established a wide local, national and international network of collaborations with over 95 research institutions as demonstrated by the number of collaborative publications from the Web of Science (see Figure 3-8).

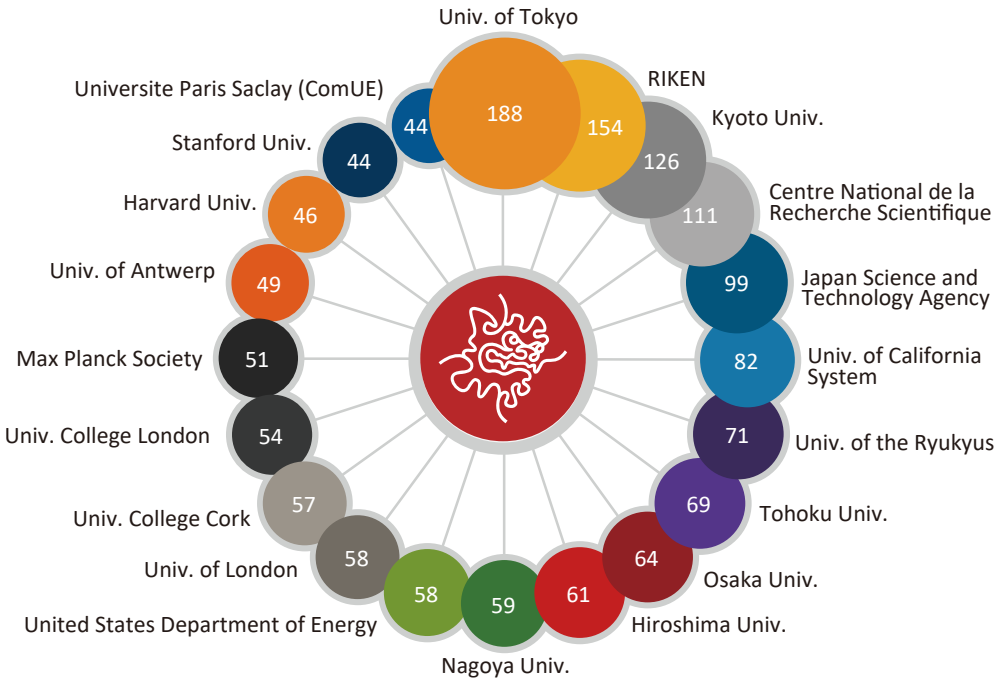


Figure 3-8 Collaborative papers to March 2019

This network has been facilitated by several strategic initiatives. First, OIST runs an extensive program of scientific workshops and hosts international conferences (see Chapter 6) that foster scientific collaborations and introduce potential researchers or faculty member applicants to OIST. This program, which will be expanded, creates many ambassadors for OIST who can communicate to their colleagues the opportunities available for potential faculty, researchers and students. This is particularly important for the graduate students, enabling them to build an international network of contacts that will help them develop their subsequent research careers. Well-established and popular annual workshops, such as the Developmental Neurobiology Course, will continue. We will also host workshops in areas that OIST wishes to expand, such as computer science, and a visiting scholar program in mathematics. We have also invited marine researchers to work at our marine station.

In June 2019, we were part of a consortium of advanced research institutes[1] that founded the Basic Research Institutions Delivering Graduate Education (BRIDGE) network to strengthen excellence in scientific research and education through collaboration and exchange. This provides a basis for sharing best practice between members, combining expertise in the management and administration of research institutes and graduate universities for the benefit of science and society. The aims include advocating common values, in particular excellence in research and graduate education, internationality, research ethics, responsible leadership and mentorship, autonomy, openness and diversity; promoting successful organizational models for research and graduate education; promoting standards for the evaluation of scientific institutes and graduate universities; addressing issues of common concern; and developing common positions toward third parties (national and international).

We have also launched several other measures to foster collaborations. A small grants program (10-million yen per year for up to two years) awarded to individual professors has allowed the initiation of new collaborations targeted at external national and international bodies. We will assess the success of this initiative in terms of collaborative publications and further funding. We have also arranged joint symposia with several regional partners (University of the Ryukyus, Institute for Basic Science Korea, Osaka University and Academia Sinica) to introduce OIST professors, researchers, and students to their regional counterparts in the hope of fostering further collaborations. Again, we will assess the success of these meetings and use our experience to develop new programs. There may be opportunities to develop collaborations in particular with the University of the Ryukyus Medical School and University Hospital in clinical research fields such as biomedical research, immunology, cancer research and neuroscience.

Cultivating our open collaborative environment provides the opportunity to address technological or societal issues of national or international importance through targeted programs. The flexible structure of the research sector described above means that initiatives can be quickly established using existing space and facilities once funding becomes available allowing progress to be made rapidly while longer-term investment is planned and implemented. Some of these opportunities will occur when there are emerging threats (for example from new pathogens), evolving environmental or technological challenges, or consequences from rapidly developing fields where the pace of change can exceed the ability of society to adapt quickly enough (e.g. such as the "internet of things," surveillance society and cybersecurity).

3.1.4 Developing Our Research Program

The world's leading universities are flexible, able to respond quickly to new opportunities and new directions in science, guided by updated advice from internationally renowned research leaders to validate their focus and direction. We are convinced that the only reliable way to judge the quality of scientific research is through independent peer review, particularly for a

1 The Rockefeller University (USA), the Francis Crick Institute (UK), the Weizmann Institute of Science (Israel), the Okinawa Institute of Science and Technology Graduate University (Japan) and the Institute of Science and Technology Austria (IST Austria).

young and rapidly growing institution with great ambition. The Perspective Council meeting of 2017 (which included four Nobel Laureates from three countries – see Table 3-2) reviewed our existing research program, and its report, which identified our strengths and weaknesses, is guiding our hiring strategy until FY2022. By 2022, we will initiate a new external review to help us develop the scientific strategy for the following five years. This new plan will take into consideration the strengths and weaknesses of the faculty unit composition at OIST in 2022, the future educational needs of OIST students after 2022 and the international scientific landscape in 2022. A subsequent, similar process will be undertaken around 2027 to plan toward 2032.

Table 3-2 The perspective council (= Nobel laureate)*

External Council Members	Internal Council Members
Eric Betzig* University of California, Berkeley	Kenji Doya Neural Computation Unit
Tobias Bonhoeffer Max Planck Institute of Neurobiology	Evan Economo Biodiversity and Biocomplexity Unit
Steven Chu* Stanford University	Ichiro Maruyama Information Processing Biology Unit
Anthony Hyman Max Planck Institute of Molecular Cell Biology and Genetics	Síle Nic Chormaic Light-Matter Interactions for Quantum Technologies Unit
Ryoji Noyori* Nagoya University	Amy Shen Micro/Bio/Nanofluidics Unit
Ada Yonath* Weizmann Institute of Science	Yohei Yokobayashi Nucleic Acid Chemistry and Engineering Unit

3.2 Delivering World-Leading Education

3.2.1 Recruiting Outstanding Students

To develop future scientific leaders, OIST will recruit a diverse cohort of outstanding students with great potential locally and globally – see Figure 3-9. As can be seen, about 15% of today's students come from Japan. The OIST Graduate School currently runs two admissions workshops per year to recruit new PhD students (see Table 3-2). There are about 200 PhD students at various points in their expected five-year educational program.

To further increase the number of accepted PhD students to match faculty growth, the OIST Graduate School is developing a pipeline from research internship to PhD matriculation. In the Research Internship (RI) Program, undergraduates and master's students from around the world spend one to six months at OIST on an internship in a faculty unit. A successful research intern whose potential for PhD work has been recognized can be nominated by the professor at OIST and reviewed by a committee for direct entry to the PhD program. Because the timing and frequencies of such student nominations are different from those of the admissions workshops, the RI-PhD pipeline is expected to reach different potential PhD-student candidates. This new pipeline will allow us to target specific students for recruitment in our areas of focus and should reach excellent students, particularly in Japan. We will continue to develop partnerships with leading Japanese research universities, offering their students the opportunity to strengthen their education and career potential through undertaking internships and PhD study at OIST in an international, English-language environment.

The climate for science graduate student recruitment worldwide is changing fast in response to the rapidly evolving skill demands. The Graduate School will adjust our recruitment strategies based upon the data from previous rounds in order to attract recruits from Japan and abroad who are best fit to our research and education strengths.

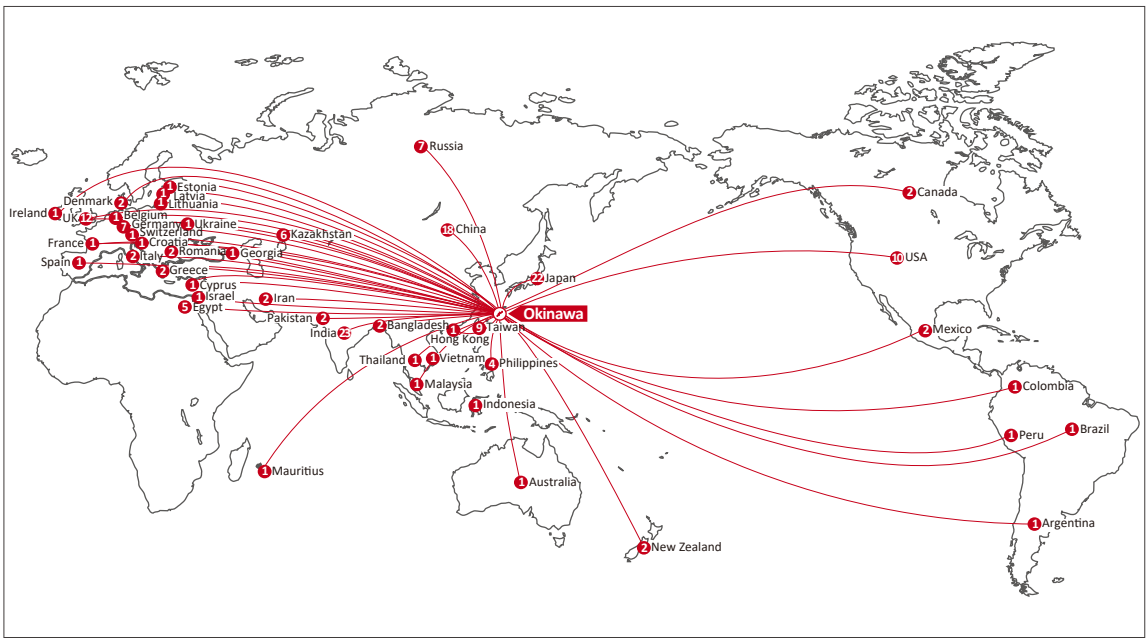


Figure 3-9 Number of students from around the globe (as of May 2019)

Table 3-3 PhD recruitment statistics 2012-2018

(Academic Year Runs September - August)	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19
Applied	208	398	231	294	441	386	502
Interviewed	80	72	71	86	88	82	114
Offered	49	41	40	54	56	48	60
Enrolled	34	20	27	24	35	37	34
Graduates	-	-	-	-	7	13	-

3.2.2 A Challenging Research-Based Education Program

PhD education is one of the three cornerstones of the OIST mission: *We do research that bridges disciplines to explore new frontiers of scientific knowledge. We educate a new generation of scientific leaders. We are a catalyst for an Innovation Hub in Okinawa.* We will continue to provide a challenging research-based education program with opportunities to work across disciplinary boundaries so that students develop their own pathways to knowledge and discovery in science and technology. It is increasingly important to develop scientists who can take advantage of the new frontiers of modern science by virtue of their adaptability, creativity and confidence in their ability to thrive in new disciplines and new techniques as they arise.

OIST was accredited as a university in November 1, 2011, and the OIST Graduate School accepted its first students on September 1, 2012 (see Table 3-4). The role of the Graduate School is to serve as an efficient administrative body to manage student and academic affairs as well as to provide comprehensive support for the student life-cycle at OIST. The Graduate School will continue to serve both OIST PhD students and our many Special Students including Special Research Students, Research Interns, Visiting Research Students, Visiting Students as well as Junior Research Fellows and Science Communication Fellows.

To join the ranks of the top research universities in the world, the Graduate School will continue to develop and improve our PhD program.

Table 3-4 Enrollment numbers of all student types from 2012-2018

Academic Year	2012	2013	2014	2015	2016	2017	2018	Total
PhD Student	34	20	27	24	35	37	34	211
Special Research Student	28	4	2	2	4	8	7	55
Research Intern	53	61	73	81	79	88	59	494
Visiting Research Student	-	-	-	-	10	29	14	53
Visiting Student	-	-	4	9	-	-	8	21
Total	115	85	106	116	128	162	122	834

The overall policy for the Graduate School, which we plan to maintain, has been to enable an average 1:3 ratio of faculty to PhD students (see Figure 3-11). The Graduate School will continue to adapt its organization and processes to accommodate a growing number of students while maintaining the efficiency and quality of student research and education.

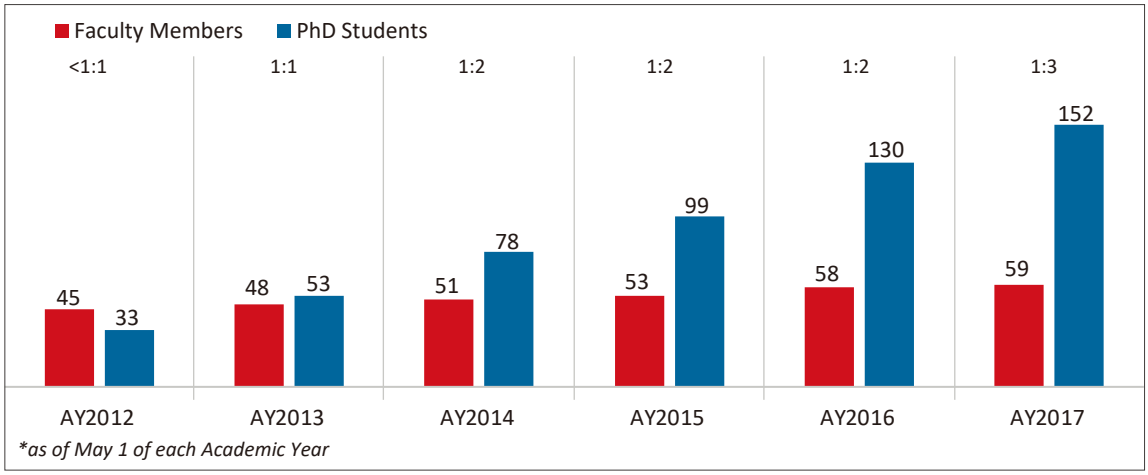


Figure 3-10 Historic faculty to student ratio

Research: To sustain world-leading research, OIST students will continue to receive a world-class education while being important collaborators in high-quality research and co-authors in published scientific articles (see Figure 3-11). Co-authorship highlights OIST student involvement in excellent research and their competitiveness when pursuing future career opportunities. We expect the number and quality of student research papers to increase from what we have already seen.

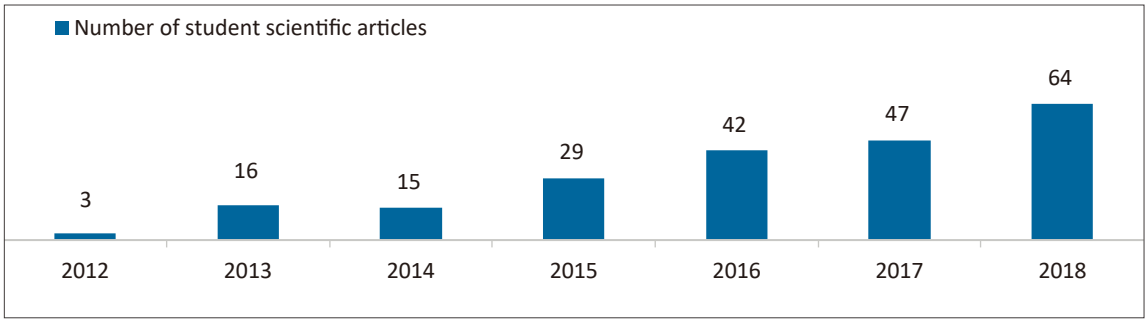


Figure 3-11 The number of publications by students

Education: OIST aspires to provide individualized PhD education to our students in several ways: the outstanding faculty who design and deliver the courses, the state-of-the-art resources available to students (including classroom and laboratory facilities and equipment and support for research and computing), access through the library to a broad range of textbooks and

research journals (necessary for leading-edge research, learning and scholarship), supervision and mentoring from our faculty who have an established gateway to an international research network and incredible intellectual freedom to allow them to develop as creative, adaptable and independent researchers.

The Graduate School manages the delivery of academic courses to students in the PhD and research intern programs. All faculty offer at least one elective course per year and can teach what they are most interested in. The courses available at OIST provide an excellent preparation for our PhD students to succeed in their research. We have no traditional academic departments and thus no majors with defined structures that block opportunities for students to combine subjects across disciplinary boundaries. Students can choose the combination of courses that most benefits them and are encouraged to take courses that complement their main research interests to broaden their education, enhancing the possibilities for students to work on new research ideas that cover more than one discipline. Students can also receive credit for undertaking external courses, online or off-campus, opening a vast array of specialist course options we are currently unable to provide. To increase research options and to broaden their general knowledge about science, all PhD students rotate through different research labs in the first year, rather than being specifically recruited to a single faculty unit from the beginning (see Figure 3-12).

Typical PhD student work pattern in Years 1 and 2

Year One			Year Two		
Term 1	Term 2	Term 3	Term 1	Term 2	Term 3
Course 1	Course 3	Course 5	Course 7	Course 8	Course 9
Course 2	Course 4	Course 6			
Lab Rotation 1	Lab Rotation 2	Lab Rotation 3	Thesis Research		
Professional Development 1			Professional Development 2		

Figure 3-12 Overview of curriculum that includes subject courses, internships and professional development streams. In the typical PhD student work pattern during years 1 and 2, BSc entry students do nine courses that include at least two out-of-field courses (indicated in blue) and possibly three laboratory rotations before choosing their thesis lab. Each term comprises 15 to 16 weeks. Laboratory and course work each comprise 20 hours per week in the first year, and any external courses completed for OIST credit require a workload that is at least equivalent to OIST for similar credit (about 20 hours for lecture based credits and about 40 hours for laboratory-based or workshop credits).

3.2.3 Student Support Services

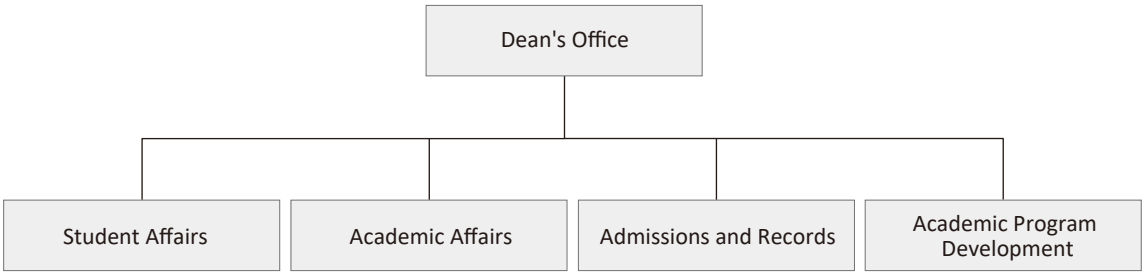


Figure 3-13 The structure of the Graduate School as of 2019 with its five sections

The OIST Graduate School provides comprehensive support to our students for the entire graduate life-cycle so they have the best opportunity to undertake their research, graduate successfully and cope with pressures and restrictions that may hinder students in other university programs. All students in the PhD program at OIST have the talent and capacity to complete a PhD to our high standards. They come from a range of different educational, academic and cultural backgrounds. The Graduate School is organized to respond to these differences, to monitor the performance of students and to provide necessary academic support when it is needed in a timely manner, benefiting both students and OIST and leading to more completions, fewer failures and better graduate satisfaction (see Figure 3-13).

PhD students are assigned an academic mentor for the duration of the PhD. Initially advising on the choice of elective courses and laboratory rotations, the mentor is responsible for the academic development of the student. A thesis supervisor, who is the head of the laboratory chosen in the second year, serves with the mentor and any co-supervisor on a thesis supervisory committee to monitor the student's research progress. Students demonstrate their progress according to the completion of a set of academic milestones. Students who fail expected milestones are drawn to the attention of a Student Early Intervention Coordinator who works with them and their committees to find solutions to the situation.

If courses are not available from the range of elective courses offered at OIST, we provide options: We allow some credit to be awarded for external courses (online or in-person at another university, summer schools or workshops). We offer direct, individualized, one-on-one teaching sessions as independent study in which students work on a topic of their own choice with appropriate faculty. We offer additional not-for-credit teaching in a range of necessary areas, such as the Skill Pills Program. We provide a venue for OIST visitors to deliver short, one-off courses for credit under the special topics course. Finally, we have remedial language programs to raise a student's English proficiency, available before the student officially enrolls in the PhD program.

We provide services related to visas, housing, daily welfare, financial support, external scholarship/fellowship and travel. OIST University Community Services Division also welcomes students to seek cultural and linguistic support from the Resource Center, take part in the sporting and recreational services and while the emotional, psychological and physical health services on campus (see Chapter 8). All student records are kept in a student database so that students can access their individual timelines, academic records and leave and travel records.

3.2.4 Alumni Relations

Building relationships with alumni is underway. Since the graduation of our first PhD class in 2018, the majority started post-doctoral research positions in Japan and abroad. In the private sector, one graduate joined a global communication technology company, one a global medical device/consumer products company and one an editorial position in Nature Publishing (see Figure 3-14). The Graduate School will track graduates and will involve alumni in improving the academic program and student life. We will also work with Institutional Development, Public Relations and other offices in OIST to foster alumni engagement and pride and cultivate sustained relationships with OIST for philanthropic giving (see Chapters 10 and 11).

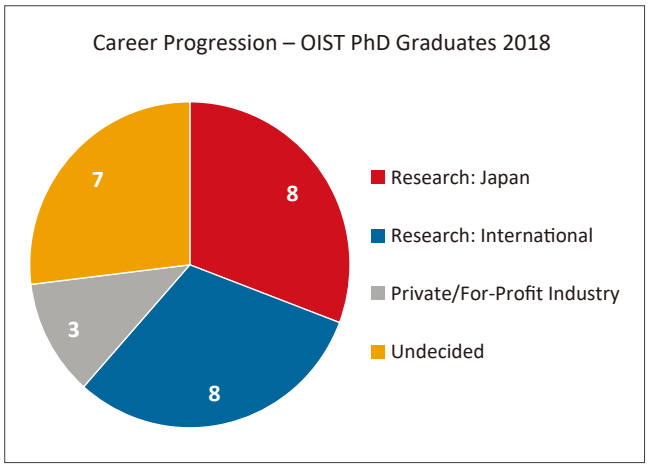


Figure 3-14 First employment sector for the 2018 OIST graduates

3.2.5 Professional Development

We offer professional development opportunities that enable students to achieve their potential in pursuing meaningful careers and becoming inspirational leaders in global society.

The PhD students at OIST take mandatory classes in professional development covering several areas: research practices and conduct, communication skills development, the practice of science as a professional and career preparation. In research practices and conduct, we include such topics as laboratory safety, animal use in experimental research, research misconduct, ethics and plagiarism, scientific article writing, research grant proposal writing and research record keeping.

We help students to understand the research networks in their specialties, where relevant groups are conducting their research and what industries are relevant in their areas. The OIST Graduate School funds PhD students to attend important conferences so they are exposed to key results and are able to meet colleagues in their fields in an international setting.

The professional development education augments students' awareness of peripheral topics relevant to their PhD and prepares them for both academic and non-academic career options, since less than 10% of science PhDs are likely to end up in academia beyond postdoctoral positions. At the same time, the range of industries and startups that attract science PhDs is widening. The Graduate School will grow our professional development options to prepare our students for a range of career options, including teaching, R&D in industry, entrepreneurship, policy, communications and business. The Graduate School is partnering with other sections of OIST to coordinate professional-development workshops and provide employment information to all levels of students and researchers.

3.2.6 Working with Other OIST Divisions

The Graduate School coordinates with the Offices of the Provost and Deans, Communication and Public Relations, Buildings and Facilities Management, University Community Services, other administrative sections and representative bodies such as the Student Council and Faculty Assembly to ensure that the academic program's goals can be achieved in harmony with the other goals of the university.

3.3 A Cybersecurity Initiative

Our commitment to flexibility in both research and education allows us to respond quickly to new opportunities. For example, we are currently evaluating an initiative in cybersecurity to develop mechanisms to defend digital information and the computers, servers, mobile devices, electronic systems and networks that enable the storage and transmission of such information.

This is an increasingly important area: The consequences of a failure to defend critical systems and data from malicious attack can be severe, from harmful effects on an individual to devastating impacts upon an economy. Targeted attacks against large companies and government offices as well as financial institutions, including virtual currency exchanges, are becoming more diverse and sophisticated and urgently require research into new methods, training a new generation of cybersecurity professionals and advancing the development of new cybersecurity software and systems. OIST has the relevant expertise and a proven ability to recruit faculty and students internationally in a highly competitive market. For this initiative our focus would be on making conventional, public-key encryption more secure in the quantum-computer age and studying new approaches such as quantum cryptography based on principles of fundamental science. Four areas of fundamental research at OIST would be involved: quantum physics, mathematics, computer science and quantum hardware.

Chapter 4.

Delivering Transformative Technology through Innovation

Strategic Goals

3. *To encourage and develop new ideas and innovation, we will create an environment that recognizes the value of risk-taking in the pursuit of knowledge and ensures that resources are available to translate discovery into impact.*

4. *To contribute to the societal and economic well-being of Okinawa and to seed a local innovation ecosystem, we will develop synergistic relationships with the wider Okinawan community to create an environment that nurtures entrepreneurship and entrepreneurial thinking, and we will build strategic partnerships with national and international universities, industry and the Japanese government.*

We have established over 60 research units, sophisticated laboratory facilities, an interdisciplinary graduate school program and state-of-the-art equipment. OIST is now positioned to become a dynamic and key player of research and development (R&D) in the region. President Peter Gruss, in a meeting with Prime Minister Shinzo Abe in 2017, expressed his vision for OIST to, "realize an innovation ecosystem in Okinawa that can take ideas to production and marketing and provide the basis for future jobs."

A major challenge for OIST is to seed an innovation ecosystem that will transform Okinawa into an environment where entrepreneurs and investors can establish sustainable business enterprises that are competitive in the Japanese and global markets. This will require OIST to work closely with governments about policy planning, connect with industry and support researchers, students and businesses to take risks to meet local and global needs.

Innovation at OIST

We have built a solid foundation to transform discoveries in the research laboratories into innovation for societal benefit. The OIST Technology Development and Innovation Center (TDIC) was established in 2014 as a consolidated center to implement such innovation. TDIC focuses on three strategic areas: intellectual property, technology development research, and entrepreneurship/business development. Intellectual property includes patenting and the transfer of patents to industry through licensing. Technology development research includes proof-of-concept research and co-development of technologies with industry partners. Entrepreneurship/business development promotes the development of an innovation ecosystem around OIST through entrepreneurship education, support of startups and collaboration with public and private partners.

TDIC has worked with faculty, researchers and students to manage a portfolio of projects and other activities (see Table 4-1).

Table 4-1 The TDIC portfolio

Projects and other activities	Numbers
Patent applications	370
Awarded patents	111
Startup companies created from OIST intellectual property or with OIST support	5
New invention disclosures annually	12-20
Industry-sponsored research collaborations	20-25
Proof-of-concept (POC) projects	15-20
Seminars, workshops and events reaching over 600 participants	Over 15

Participation in technology development and innovation programs at OIST is expanding. The Lean Startup Entrepreneurship Workshop has grown from 10 participants in 2012 to 40 in 2018. POC projects expanded from five in 2016 to 17 in 2018. Researchers expressing an interest in collaborating with industry and starting companies are also increasing. OIST is expanding its effort to include members of the extended OIST community such as alumni and local university students. With this rapid growth of R&D capability, many people inside and outside OIST are unaware of the full extent of the innovation programs and services OIST has to offer. Targeted promotion and better reporting are being developed to communicate the full range of OIST innovation initiatives.

4.1 Enhancing the Delivery of Innovation

4.1.1 Create an Environment that Recognizes the Value of Risk-Taking in the Pursuit of Knowledge

University policies strongly influence innovative behavior among researchers. High-trust funding for OIST research units encourages pioneering cross-disciplinary research with substantial potential. Similar incentives will encourage the pursuit of high-risk/high-reward collaboration with industry to launch startups. For example, royalty-sharing policies at OIST are competitive with and in some cases surpass those at peer institutions.

Given the critical role that faculty plays in technology development and innovation, OIST will explore ways to acknowledge inventorship and entrepreneurial behaviors. Examples of such policies include listing patents with publications, supporting interactions with corporate partners (such as industry-sponsored research or consultations with industry) and recognizing licensing and startup activity as positive measures of achievement.

To enhance the culture of entrepreneurship at OIST, inventorship and technology-transfer activities can be recognized not only in performance evaluations but also through awards and media exposure. The development of prizes and incentives will also encourage staff at all levels to be creative and innovative. We will also provide students and researchers with diverse opportunities to engage in technology development and innovation as part of their research and training, such as courses in entrepreneurship and internships with companies.

4.1.2 Ensure That Resources Are Available to Develop Advanced Technologies and Innovation Arising From Our Research Discoveries

Outcomes of basic research generally require additional developmental research before they are sufficiently mature for licensing and commercialization. Referred to as proof-of-concept or POC research, this phase of advanced technology development transforms and refines ideas generated in the lab into practical applications. POC research demonstrates functional applications or develops prototypes and requires dedicated resources specific to the relevant research area, such as genomics, materials science, chemistry and other areas. To support this phase of technology development, OIST established the Proof-of-Concept (POC) Program in 2016 to enable impact-driven research. Separate funding equal to 5% of OIST's total research budget was allocated to operate the program. Over its first three years, the POC program has advanced OIST technologies and made them more attractive for industry investment.

Key Result: To maintain momentum and prepare for the growth of the university, OIST will continue to allocate an amount equal to 5% of its research budget to develop advanced technologies and innovation.

4.1.3 Aim to Be a Leading Knowledge and Technology-Transfer Organization in Japan

As a leading knowledge and technology-transfer organization in Japan, we will widely disseminate our research output, innovation and human talents for social and economic benefit.

University technology-transfer in Japan lags behind the United States and Europe in part because the Japanese version of the US Bayh-Dole Act of 1980, which allowed universities to control the

rights to inventions supported by government funds, was not adopted until 1999, almost 20 years later. Innovation is often the product of cumulative research advances involving the flow of ideas and people back and forth across the boundaries of academia and industry. TDIC plays a central role in managing this challenging process at OIST.

As the university expands from 60 to 200 research units, new innovation programs and the expansion of existing programs are necessary to meet the professional development needs of these emerging scientific leaders, many of whom arrive at OIST with a strong desire to make a positive social, economic and cultural impact through their research. Inventions, patents, POC projects, etc., will increase in proportion to the expansion of the research population at OIST. New methods for funding and managing programs, new licensing schemes to move technologies to industry and new opportunities and incentives for faculty, students and researchers to participate in technology-transfer will be needed in the coming years. For example, programs such as the Technology Pioneers Program will provide students and postdoctoral fellows who have completed their academic education/training with an opportunity to pursue the commercialization of their inventions and gain professional experience in industry research and development. As an international university, we are well-positioned to introduce effective global technology-transfer practices in Japan. And as a new university that is unencumbered by history and tradition, we can also be flexible and nimble in our approach to providing broad access to research discoveries.

Key Results: 25% of faculty units engaged in innovation activities such as developing intellectual property, participating in POC projects, collaborating with industry partners or incubating startup companies; 10% of our intellectual property licensed and being developed by the private sector; industry sponsoring 5% of our research budget.

4.2 Innovation in Okinawa

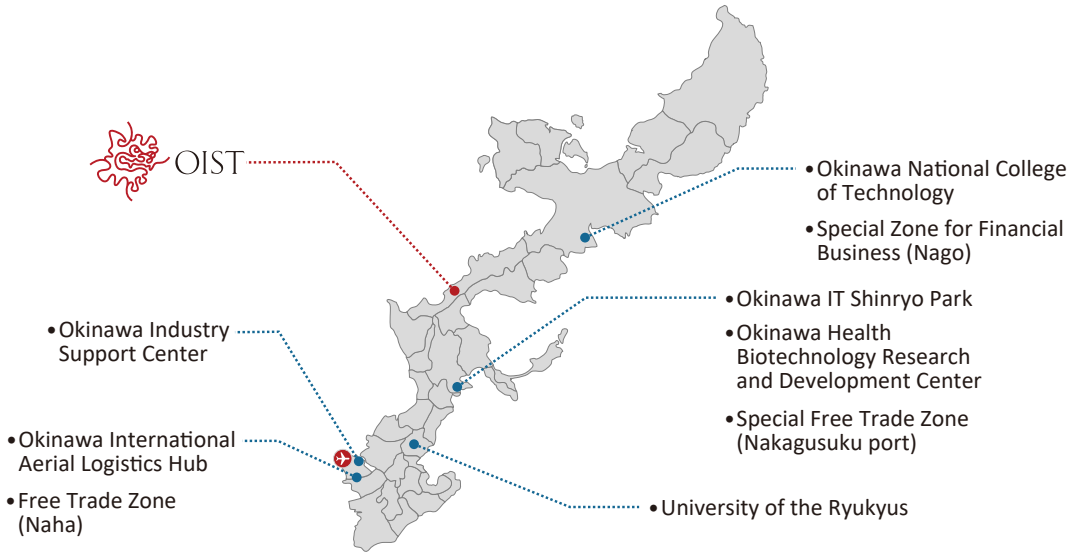


Figure 4-1 R&D resources in Okinawa

The existence of an outstanding basic-research institution such as OIST is now well-known to be an essential element of a thriving regional innovation ecosystem. However, no single institution acting alone can achieve global excellence and realize the full benefits of its activities. In Okinawa, OIST; other universities; and colleges, industry and local government must work together to support the social and economic well-being of the region (Figure 4-1). Long-term investment, linked to coordinated and collaborative efforts by major stakeholders, is needed for the innovation ecosystem to grow and prosper. OIST can play a leading role by building partnerships that increase the mutual understanding of the distinct roles academic research, industrial development and government policy play in spurring innovation and self-sustaining economic growth.

4.2.1 Build Strategic Partnerships with Other Universities, Industry and the Government

Successful innovation ecosystems around the world include a mix of strong research universities, major R&D companies and startups. In view of the limited R&D resources in Okinawa, it is essential to attract R&D companies to locate near the OIST campus. This effort is underway in cooperation with the Keidanren (Japan Business Federation) and Keizai Doyukai (Japan Association of Corporate Executives). The goal is to establish corporate research laboratories that serve the interests of the companies, OIST and Okinawa Prefecture.

We will build research areas of excellence to attract these R&D companies as well as other investors and donors. Examples of research areas in which OIST is gaining strength include sustainable living (energy, next-generation batteries, health and aging), nanotechnology (sensors, nanomaterials, microfluidics, lab-on-a-chip), neuroscience (molecular, cellular, systems), imaging (cryo-transmission electron microscope [cryo-TEM], environmental TEM, cellular and sub-cellular localization), genomics (sequencing, analysis, transgenics) and high-performance scientific computing (modeling of biological and physical processes).

We will also work in partnership with local and national government to inform public policy and help shape the research, education and innovation agenda. OIST will continue building on its strong relationship with the Okinawa prefectural government to advance research of mutual interest that addresses local needs (see Chapter 6). We will work at the national level to advocate for OIST and Okinawa (see Chapter 10). We will also commit institutional support for encouraging and engaging faculty who wish to serve on local and national advisory boards as thought-leaders on the societal impact of science and technology.

4.2.2 Develop the Research, Educational and Physical Environment to Nurture and Support Entrepreneurship and Entrepreneurial Thinking and Seed an Innovation Ecosystem

Recent benchmarking showed universities worldwide are taking significant steps to support entrepreneurship, thereby striving to serve the university community and the region. Universities are also expanding their local entrepreneurial community by attracting startups from outside the region through incentives such as funding, space, educational seminars and connections to mentors, customers and investors. Such efforts are often called accelerator programs.

Entrepreneurs create a self-perpetuating cycle of entrepreneurship, whereby one successful startup often facilitates the next wave of startups. Entrepreneurship is not confined to starting companies; it is also a mindset that includes taking risks to create new advances in the broader research environment. OIST is committed to promoting entrepreneurship, internally and externally, to advance high-growth venture creation in Okinawa.

Entrepreneurial Education

We view entrepreneurship as an important part of the broader research and educational experience. Exposure to entrepreneurship will enhance how aware students and researchers are of the wide range of ways to contribute to society.

At present, OIST provides a number of workshops and seminars that introduce faculty, students and researchers to innovation and entrepreneurship. These include the Lean Startup Entrepreneurship Workshop, a three-week crash course in entrepreneurship held annually at OIST since 2012, and the Innovation Seminar Series, invited talks by serial inventors and entrepreneurs from around the world. These and other related events have reached several thousand participants over the last seven years. As OIST research matures, and the university expands in size, more formal and diverse educational offerings will be developed.

We will introduce additional educational opportunities in entrepreneurship that meet all interest levels of students and researchers, from those merely curious about entrepreneurship to active entrepreneurs with an idea, a technology and a team. We will develop diverse offerings, ranging

from extracurricular seminars, workshops and boot-camps, to curricular courses on innovation and entrepreneurship offered for credit (see Figure 4-2).

Learning by doing is also an important component of entrepreneurship education. Experiential (hands-on) opportunities offer the best way for students and researchers to experience transforming their ideas into practical solutions. We plan to build opportunities such as startup competitions and internships in startup companies.

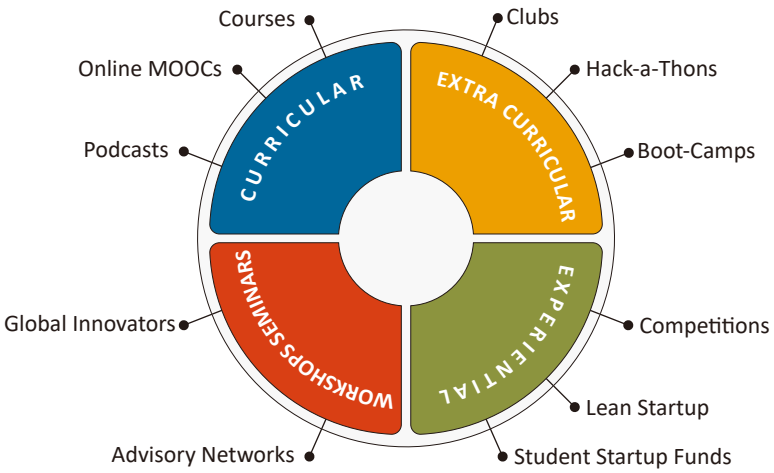


Figure 4-2 Educational opportunities for entrepreneurship

Entrepreneurial Acceleration

Innovation initiatives to drive technology development and startups based on OIST intellectual property are already bearing fruit. The POC Program is bridging the gap between laboratory discoveries and commercialization, which is leading to increased interest from industry in licensing and collaboration. TDIC support to promote entrepreneurship has resulted in two startups based on OIST technologies and has contributed to the establishment of three others.

OIST technologies will continue to generate startup companies in numbers consistent with its faculty size. Based on benchmarks of peer research universities, we expect the number of OIST startups annually to be proportional to about 1% of the number of faculty. In order to develop a dynamic innovation ecosystem in Okinawa, OIST must also attract people, ideas and technologies from elsewhere. Startup acceleration programs aimed at incentivizing and attracting talented entrepreneurs to relocate to Okinawa from other regions in Japan and from around the world are critical.

An attractive feature of acceleration programs for entrepreneurs is that they provide an opportunity to build startups in close collaboration with OIST. The advantage for OIST is that these programs expand the skills and expertise available to OIST researchers. For Okinawa, attracting global entrepreneurs will build the startup ecosystem by increasing the number and quality of technology-driven startups and subsequently the number of knowledge-based jobs. Without such a structured accelerator program, and without incentives and support such as funding and access to OIST shared facilities, it is much less likely that outstanding global entrepreneurs will be willing to move to Okinawa.

In FY2018, OIST piloted the first global startup accelerator program in Okinawa with 15 million yen external funding from the Okinawa prefectural government. The program leverages OIST to attract innovative entrepreneurs from around in the world to incubate their startup ideas in Okinawa. The key features of the program are: (1) funding to transform promising ideas into a startup company; (2) access to space and state-of-the-art equipment at OIST; (3) courses and events to strengthen business, customer and market strategy; (4) an international soft landing to

help foreign entrepreneurs with bilingual assistance on IP, taxes, visas, HR, etc., in Japan; and (5) access to the OIST network of academic, government and industry partners to help startups find venture financing, mentoring, collaborators, customers and marketing channels.

Key result: Between 2020-2030, we aim to recruit and accelerate three to five entrepreneurial teams per year, expanding the number of startups established in Okinawa on a scale beyond that which can be realized from OIST-derived startups alone. To support these teams, we will aim to raise 30 to 75 million yen annually in external funds from public and private sources for research, prototyping and business-planning costs related to commercializing the teams' startup ideas. We will also provide incubator space to accommodate the teams as they go through the accelerator program and spin off as startup companies.

Table 4-2 Entrepreneurial incubation

What is possible in 10 years?
13 Startups
7 Companies co-located near OIST
40 High-skilled jobs created
200 Additional local jobs created*
80 Community outreach events attended
Increase industry collaboration private, investment and technology transfer (licenses)
Conditions strengthened for successful startup IPO and M&A exists

Entrepreneurial Incubation

Physical space to build a community of startups and hold entrepreneurship events is critical. As an expanding institution, OIST labs are of necessity fully occupied. Therefore, separate incubator space is needed for OIST startups and for entrepreneurs recruited into the Startup Accelerator Program. Separate incubation space is a hallmark of successful university innovation facilities.

To realize this vision, the incubator will need to be a space not only for OIST startups, but also for entrepreneurs from Japan and around the world to locate in Okinawa as a valuable place to seed their ventures. Established industry partners will need to be part of the ecosystem to support startups as strategic collaborators and potential customers.

A thriving incubator facility will also serve as a magnet to retain talent in Okinawa. OIST now trains hundreds of researchers, and each year more than 100 complete their work and seek new job opportunities. At present, essentially all these well-trained scientists leave Okinawa because the available jobs here are limited. Incubators, and the surrounding innovation ecosystem that will be created, will provide opportunities for entrepreneurial researchers to continue pursuing their ideas and careers in Okinawa. Importantly, not only will talented people be retained in Okinawa but, with the success of startups, new job opportunities will be created for Okinawan residents, creating a continuous cycle of innovation and growth.

Based on extensive benchmarking and guided by recommendations from the OIST Incubator Task Force (July 2017), we constructed the Innovation Square Incubator (I^2), a 500m^2 facility on the west side of the campus to nurture seed-stage startup companies (see Figure 4-3). The conceptual design of I^2 is unique, even compared to incubators at peer universities: (1) It is available to startups from OIST and to accelerator projects from anywhere in the world; (2) it is open to established companies collaborating with OIST researchers; (3) it includes both engineering makers space and biotechnology wet lab space under one roof; (4) it contains open co-working labs as well as private lab suites for those who need it; and (5) it is linked to the core facilities and equipment on the main campus.

Figure 4-3 Innovation Square Incubator

Another distinguishing feature of the OIST incubator concept is the range of services it provides to nurture entrepreneurs and startups. This includes both on-site advice and a connection to a network of external experts.

Business and Legal Services: The I^2 Incubator will provide basic office facilities on site and will offer access to external business and legal experts for professional services.

Mentorship: The Technology Development and Innovation Center has established a pool of external entrepreneurship/startup mentors, and additional mentors will be added as needed by subject area. Mentors provide guidance and advice, both for business and for individual career development. This includes business plans, milestones, fund-raising, market research, personnel hiring and individual training.

Courses and Events: OIST offers courses, lectures, workshops and symposia that are available to incubator tenants. In addition, incubator staff will provide information on local and international programs on innovation, pitch events and outreach strategies.

Core Resources: A critical resource at many other successful university incubators is access to instruments and core services on campus. In cooperation with the OIST Research Support Division, procedures have been established for tenants of the incubator to have access to shared equipment and services managed by OIST. Access will be balanced with the needs of the basic research units at OIST, and the costs for access will be determined based on standard rates determined by the category of user, including academics, startups and established companies.

The Innovation Square Incubator can house up to ten startups with a maximum capacity of about 25 people. As the number of OIST startups increase, additional space is essential (see “Innovation Area on Campus”).

Entrepreneurial Investments

Private-sector investment is necessary to increase the number of high-growth startups in Okinawa so that they can be well-positioned to compete in the global market and experience successful Initial Public Offering (IPO) and Merger and Acquisition (M&A) exits. Private-sector investment available for startups in Japan is expanding but remains limited and is virtually non-

existent in Okinawa. For Japan to develop a healthy innovation ecosystem, it is imperative to develop a venture-capital market and to expand IPO and M&A activities. To support high-growth ventures that will seed an innovation ecosystem in Okinawa, OIST must strengthen relationships with venture-capital companies and angel-investment groups in Japan and internationally. This will involve organizing meetings, pitch events and demo days to provide opportunities for OIST researchers and startup accelerator teams to present their technologies.

OIST will also explore the establishment of a university-managed venture fund that makes seed-level investments directly into startups. Initial capital to support the fund would be sought from public sources, but the fund will generate its own capital in the future. The venture fund will be set up to provide investment in return for equity or convertible notes, which, depending on the success of the startups, can sustain the fund in future years. The fund will be managed by experienced venture-capital experts who will follow market-based investment criteria.

Innovation Area on Campus

A thriving innovation ecosystem attracts entrepreneurs, innovative startups, visionary investors and world-class industries from around the world. This is necessarily a very long-term strategy. To remain competitive, OIST must encourage and accommodate the growth of networks and infrastructure that allows it to connect with non-academic partners who will help it carry out its research, education and innovation mission and enhance its impact on Okinawa and the world.

Universities located in large metropolitan areas have the advantage of a surrounding community that can complement programs, facilities and resources. For OIST, however, the limited innovation ecosystem in Okinawa means that OIST, the Okinawa prefectural government and the Japanese government must play a bigger role in seeding and supporting the growth of the ecosystem. This additional role will require space and staff.

In the Campus Master Plan for the development of the university, an area in the main campus was allocated for an “Innovation District” to bridge OIST research-to-industry and industry-to-OIST research. The first building constructed is the Innovation Square Incubator (see Figure 4-3). A larger district, called the Economic Zone, is envisioned as a public-private initiative and can readily accommodate several large buildings adjacent to a large area earmarked for future housing (see Figure 4-4)

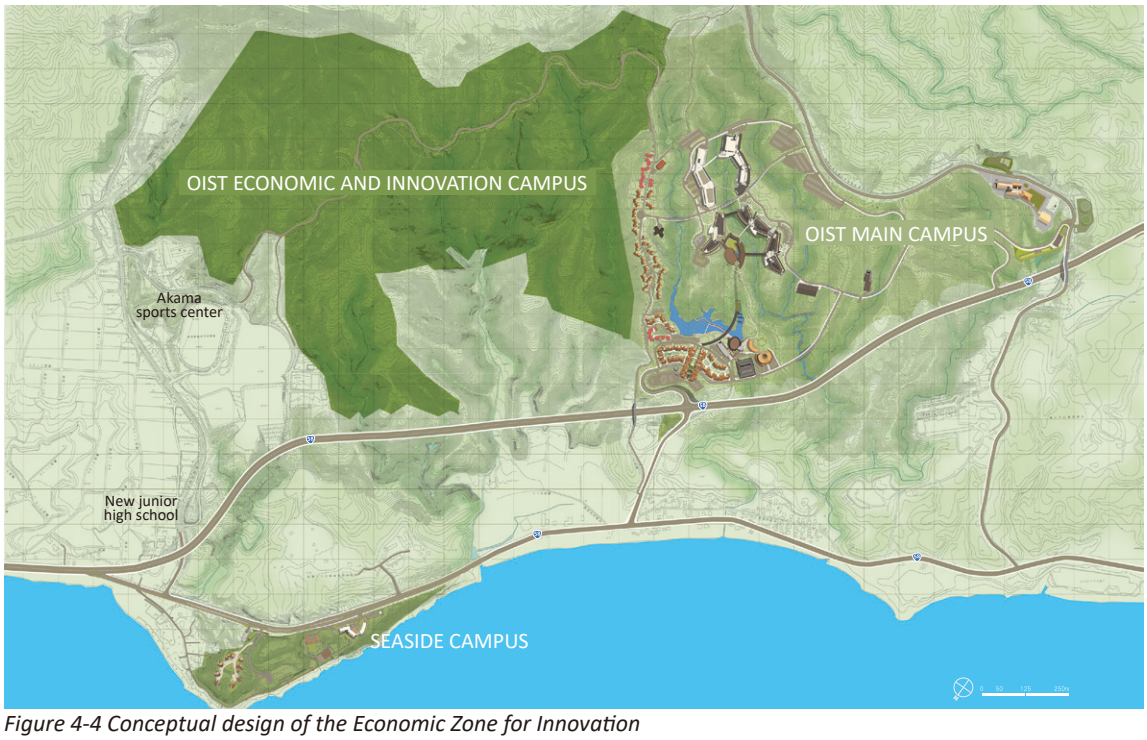


Figure 4-4 Conceptual design of the Economic Zone for Innovation

As startups mature and grow beyond the initial incubator facility, diverse types of facilities can be added, ranging from single- to multi-tenant buildings in a clustered setting. OIST can also attract world-class R&D companies as anchor tenants. These large, established companies can act as partners and investors to startups in the incubator and as employers of OIST graduates. Along with OIST, the presence of large companies drives employment and economic growth and brands the region as a world-class research destination.

The addition of corporate anchor R&D companies on campus cannot be accommodated in the current Incubation Zone. For this, it will be essential to develop the North Campus. Discussions are in progress with Onna Village to consider the development of a multi-use zone on the North Campus site that would house such corporate laboratories and the necessary infrastructure and support facilities (see Chapter 9). To infuse our vibrant international research university culture, talented and diverse workforce, technology transfer and innovation spirit into seeding the innovation ecosystem in Okinawa, we actively seek partnerships with Onna Village, the Okinawa prefectural and the Japanese government to create this mixed-use "Onna/OIST Economic Zone" on the North Campus.

In contrast to business parks, R&D clusters and start-up areas around the world, we will lead with a "Live-Work-Learn-Innovate-Play" concept and a university culture. Innovation will live beyond the walls of research labs in people who create and embrace innovative design and technology into school classrooms, hotel and conferences venues, community and learning centers for all generations, open media and innovation space, interactive museums with schools, retail parks, recreational and tourist facilities and housing for a highly digitally connected future.

Chapter 5.

Promoting Excellence in Governance and Efficient Administration

Strategic Goals

5. *To ensure that OIST operates with high international standards of governance, we will continue to refine internal and external governance processes as we grow and to recruit outstanding individuals to membership on our Board of Governors and Board of Councilors to reflect diversity, equity and inclusiveness and, through periodic self-analysis, high levels of effectiveness.*

6. *To create an efficient administration for a growing university, we will ensure effective structure, processes and tools, and skilled and highly motivated, customer-oriented and accountable professionals.*

OIST's goal is that internal and external governance meets the highest international standards consistent with evolving best practice and our values of transparency, accountability and excellence.

5.1 External Governance

OIST's external governance is provided by a Board of Governors, advised by a Board of Councilors, both of which provide oversight, guidance and accountability through the President and CEO who is an ex officio member of the Board of Governors (see Figure 5-1). This governance follows the Okinawa Institute of Science and Technology School Corporation (OIST SC), established to operate the OIST Graduate University.

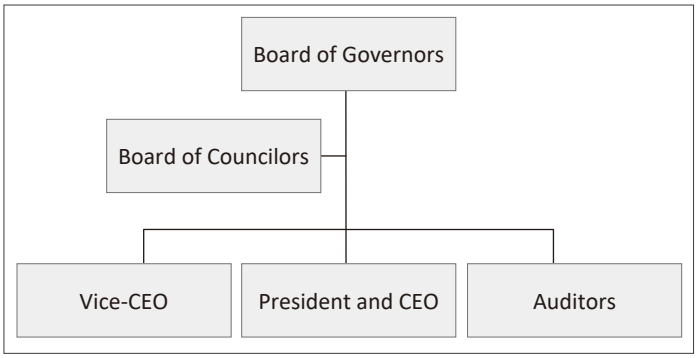


Figure 5-1 The top-level governance structure of OIST

The Board of Governors is made up of 19 members, including the president, who are outstanding scientists or distinguished individuals with a deep knowledge of Okinawa and experience in the management of universities or other organizations. It includes a member of the Board of Councilors and a senior executive from OIST. The larger Board of Councilors consists of distinguished individuals representing OIST employees, alumni, the Okinawan economy and culture, the leadership and management of universities and other public organizations and, until there are enough alumni, distinguished international scientists.

There are four Nobel laureates serving on the boards in 2019. The term of membership of both boards is three years, and appointment may be renewed.

The Board of Governors, which meets three times annually, has ultimate responsibility for the activities and affairs of the university, exercised either by the board or delegated through the president by direction of the board. The Board of Governors is advised by the Board of Councilors, which meets twice annually and comments on certain matters such as the Annual Business Plan and the Performance Review. Both boards have committees that focus on specific issues of importance to the university. Both boards are updated by the president and OIST senior executives on all important matters concerning the university, and the boards regularly meet with faculty, students, researchers and other staff members.

The OIST auditors report annually to the Board of Governors to ensure that risk management, control and governance procedures are effective and that accounting and compliance procedures are robust.

This high-level governance structure, supported by preparations of the president and senior executives, has served OIST well due to the wealth of experience and commitment of the board members.

There are three actions by the boards that need to be undertaken as we implement the Strategic Plan.

1. Self-Assessment of Roles and Board Effectiveness: The boards will conduct a self-assessment at least every two years to evaluate their effectiveness, to ensure relevant expertise and to identify any weaknesses or emerging issues that might require attention.
2. Board Terms: The current three-year renewable term results in slow turnover of board membership, due primarily to retirement. It is vital that, as board members retire, they are replaced with individuals of equivalent standing and expertise.
3. Board Orientation: We need to develop an orientation scheme for new board members to ensure that they understand the governance principles under which OIST operates, as a general introduction to OIST.

5.2 Internal Governance

Internal governance processes and goals are established by the Board of Governors and directed by the president, who works with the Executive Committee (see Figure 5-2) to implement the goals and ensure accountability.

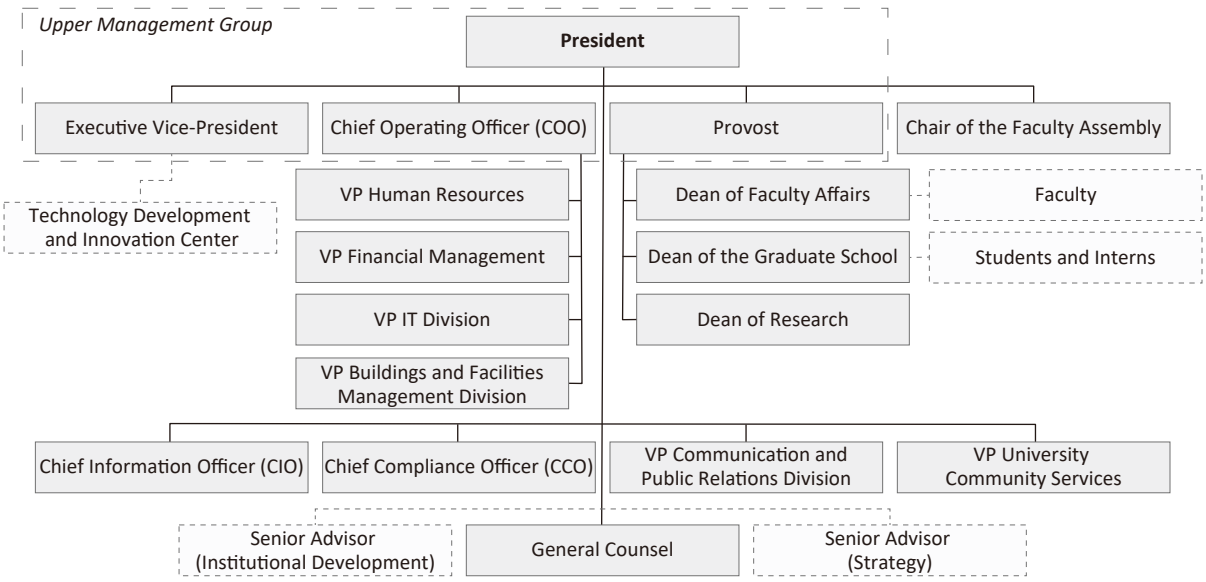


Figure 5-2 The internal governance structure of OIST. Members of the Executive Committee are in solid boxes.

From the outset, the vision for OIST was to build a top-ranking international university in Okinawa that could be a model for change in the administration of universities in Japan and the world. Our unique characteristics (including cross-disciplinarity, internationality, location, high-trust core funding and English language) have created ongoing challenges – particularly in administration – that are described in this section and that we seek to overcome in a continuing focus on excellence. We will annually review laws, policies and processes and make recommendations to the Japanese government for changes or exemptions that will enable us to be more efficient and streamlined with no sacrifice of accountability and transparency.

Faculty members are represented by the Faculty Assembly, which advises the president and which elects an executive committee – the Faculty Council. Students and researchers have their own representative bodies, whose representatives attend the Faculty Assembly.

The administration is led by the chief operating officer and consists of the vice presidents of the four operational divisions – the Finance, Human Resources, Information Technology, and Buildings and

Facility Management Divisions. The Technology Development and Innovation Center is a separate division under the executive vice president and is charged with implementing the strategy for our contribution to the economic development of Okinawa and our promotion of the benefits of our research in Japan and throughout the world.

5.3 Efficient Administration

We were charged from the beginning to build an English-language university able to compete successfully with the world's best research universities that, through collaboration with other universities in Japan and around the world, could serve as a model that others could emulate.

Our aim is for administration to be world-class in all operational areas including the quality of service; the motivation and skills of its staff; accountability; safety; the working environment; the policies, rules and procedures; and tools. To be excellent, we must develop, attract and retain the best people and engender a sustainable structure, environment and culture that fosters outstanding performance as we grow. We are addressing specific challenges to accomplish more while remaining a lean organization: staff productivity and work style; lack of English proficiency among members of the administration; specialized skills we need in human resources, finance, legal and other areas; increased computer efficiency in all administrative processes; and mechanisms to continuously improve administrative efficiency, effectiveness and business alignment. We will maintain the highest standards of governance and administration consistent with best practice and with our values of transparency, accountability and excellence. Our membership within the BRIDGE network of advanced research institutes (see Chapter 3) will be invaluable in sharing the experience of best practice amongst similar organizations.

5.3.1 Efficiency, Accountability and Effectiveness

The leadership of OIST has regularly reviewed the structure of the administration to ensure that it can serve a growing university. This process of periodic review will continue and become ever more critical as we approach key milestones in the growth of the organization, such as the growth of OIST to 100 research units and more by 2023.

The administration, currently conveniently located in the Center Building, will need to address its physical location as we grow from 100 faculty units to 300 faculty units, to ensure that it remains near the geographical center of the campus. To do so, we will specify the medium- and long-term plans for a new Administrative Center as part of campus planning, including its own building by the end of this strategic planning period (see Chapter 9).

The administration will improve the documentation and communication of Policies, Rules and Procedures (PRP) in a timely way, using social media and digital technology to address the volume and rate of change in policies and procedures as we grow, avoiding unnecessary overlap or duplication among business areas. The University Administration Review Committee (ARC) will identify essential functions and roles as well as newly emerging needs, garnering feedback from users, with the aim of improving customer satisfaction. The Enterprise Applications Working Group, established in FY2018, makes recommendations on enterprise applications at OIST, which is fundamental to an efficient and effective administration. It will identify shortfalls in the coverage or functionality of existing enterprise applications with the goal of enhancing business productivity and efficiency and of identifying opportunities for digital transformation to streamline operations and services. Internal and external audit will verify that our operational procedures are robust and that our audit trail is complete.

We will continuously address delegation and the decentralization of authority to the lowest level appropriate to ensure administrative resilience.

In support of all our efforts, we will ensure administrative staff have the right tools. Process visualization, for example, is a key tool in developing a new operational structure and in standardizing and improving administrative efficiency, as well as developing enterprise

applications. We will initiate process-visualization training in FY2019, focusing initially on travel and procurement processes and, in FY 2020, a variety of other administrative processes.

Another example is business intelligence, which comprises the strategies and technologies used by enterprises for the data analysis of business information, enabling informed decision making. We will introduce business intelligence techniques in a structured way and will work with representatives from each division to establish a business-intelligence governance group to discuss recommendations for the rollout of business intelligence to enable us to make decisions based on reliable and reproducible data and forecasting.

We will adopt the following principles to deliver an efficient and effective administrative system:

- We will continue to review and align the organizational structure in step with the growth of our research, education and innovation programs.
- We will continue to ensure the performance and business alignment of our administrative functions through the regular review and clear communication of policy, process and system; clear delegations of authority; and the clarity of roles.
- We will delegate and decentralize authority, empowering those most capable and informed to make appropriate decisions locally and ensuring the efficient interaction between the academic and administration professionals.
- We will continue to provide administrators with the right tools such as advanced information technology and data analytics.
- We will promote cross-divisional information sharing and joint projects at all levels to foster a professional university administration.

5.3.2 User Engagement

It is important that the focus on administrative efficiency takes into account the costs to both requester and provider, and that there is regular feedback through satisfaction surveys and frequent coordination meetings with users. We need to ensure that users are involved in the evolution of the rules and procedures, with the aim of achieving a consistently high-quality level of service, leading to both job and user satisfaction.

5.3.3 Skilled and Highly Motivated Professionals

Just as we have attracted highly qualified faculty, researchers and students, we will have a similar focus on administration and staff. Our goals will include excellence in recruiting; a focus on current employees and their development, including training and promotion; and an ability to address concerns and dissatisfaction.

All employees are given the opportunity for skill development through on-the-job training and dedicated training programs consistent with their career development plans or career paths (see Chapter 7). We will ensure that appraisal and promotion systems are more transparent, with constructive feedback given to encourage employees' career advancement. Expectations of business capability, knowledge and skills will be standardized across the organization for each job grade. Work ethic, attitudes and a positive influence on colleagues will be given due weight in appraisal and promotion. The respectful-workplace policy will always be upheld.

In FY2019, standardized appraisal and promotion guidelines will be introduced in the Research Support Division as a pilot program to improve the transparency of the system. The system will be supplemented by individualized career-development programs. The impact of those programs will be reviewed after three years with an annual progress review thereafter.

We have overcome many challenges in our first decade and made significant advances which have enabled us to attract and retain individuals who strive for excellence. The establishment of the on-campus Child Development Center with bilingual teachers has made a significant impact on our recruitment successes. Challenges to staff retention remain, with concerns about the school-age education system that pose a real risk to hiring and retention (see Chapter 8).

We will ensure that the administrative staff embrace the OIST Mission, Vision and Values through the development of divisional statements, missions and codes of conduct. We will develop job descriptions based on a transparent job competency schema for each job grade. We will establish professional teams by developing and implementing individual career development programs, professional hiring systems and transparent appraisal and promotion schemes. We will accelerate organization-wide capability growth by monitoring the organization's health, developing a talent database, and implementing organizational development and talent management. For example, these efforts will highlight places where the authority to approve is separated from the information upon which that approval should be based, allowing us to respond to changes in work style brought about through digital transformation. We will periodically review and openly communicate each staff member's responsibilities, ensuring they are clear, appropriate and allow for staff mobility and freedom.

5.3.4 Health and Safety

The health and safety of our personnel is of vital importance, particularly in an area where there are occasional environmental emergencies such as typhoons, earthquakes, tsunamis and an increasing number of epidemics, for example measles. Health and safety are the responsibility of the president, with operational authority delegated through the provost to the Occupational Health and Safety Section, whose leader is the university's safety officer. The Health and Safety Committee is chaired by the provost and has representatives from all sectors of the university. Our policy is to meet or exceed all legal and regulatory requirements regarding safety, health and environmental protection (SHEP). Each member of the university is expected to comply with the university's policies, rules and procedures regarding safety (including disaster preparedness), health and environmental protection in addition to complying with all relevant Japanese legal requirements. General workplace safety training, including mandatory training, is available for everyone in several forms, including web-based instruction, group instruction or one-on-one sessions (see Section 7.3). Specific training in laboratory safety is provided, and the on-site Emergency (Bosai) Center operates throughout the year, able to respond in English and Japanese. We will enhance our emergency-management and communication systems in both languages.

5.3.5 Information Security

Information-security incidents (breaches, phishing scams, etc.) are increasingly common, and pose a serious risk of fiscal and reputational loss to any organization. The chief information security officer (CISO) has made great strides in improving information security policy, awareness and processes at OIST. Information asset managers are accountable for defining the classification level of, authorizing access to, and ensuring an appropriate permission scheme for the information assets within their remit, in accordance with any and all relevant laws, rules and regulations. In most cases, the information asset manager is the head of a research unit or administrative division handling the information assets.

Information security at OIST is reinforced through a range of mechanisms. The CISO has is responsible for developing and auditing information-security training. The CISO, working with the compliance section, works to audit the storage and handling of OIST information assets. The CISO also manages a range of monitoring services that provide real-time threat and event analysis, escalating issues to service owners. Lastly the CISO conducts annual drills to test the readiness of OIST members to respond to information-security threats, such as phishing emails or other social-engineering attacks. These activities will continue and will be supplemented.

5.3.6 Integrity in Research and Research Ethics

Research-integrity training is provided by both the Research Support Division, for researchers, and the Graduate School, for students. Internal or external complaints regarding research integrity are handled by the dean of faculty affairs, who establishes an appropriate panel to investigate when necessary.

In the future, we will archive all datasets generated at OIST that contribute to research publications. This will allow robust investigation of those research-integrity questions that can arise many years after publication.

5.3.7 Ongoing Challenges

There are some management challenges for which we have not yet found a satisfactory solution.

Despite the Japanese government's extraordinary support for OIST, we annually face concerns about the unpredictability of our budget, which is negotiated each year. Regardless of OIST performance, there is no guarantee for base operating and investment funding, nor any multi-year funding except in special circumstances such as the construction budget. The earliest we learn of the next year's budget is three to four months before the end of the fiscal year. This unpredictability puts OIST at financial risk and reduces our international competitiveness. It complicates making needed long-term commitments in areas such as hosting international events, where commitments are required one or two years in advance, and in the purchase of long-lead-time research equipment that, through no fault of OIST, might not be delivered prior to the budget subsidy expiration date despite being startup purchases critical for newly joining faculty. For tenure-track faculty members with deadlines for their tenure portfolio, they lose critical time due to this unavailability of equipment.

Under the single-year subsidy system, advance approval of the government is required for any carryover of the budget to the next fiscal year, which takes four to five months with no guarantees. Unpredictability of the budget also makes staff planning and recruiting difficult because recruiting excellent researchers, research support staff and administrative staff often takes several months.

Maintaining international competitiveness in research, education and innovation requires a financial system that allows flexibly and carryover to the next fiscal year, with no sacrifice in accountability. Without this, we will be severely limited in our ability to recruit the outstanding faculty and researchers we need to compete on equal terms with top research universities worldwide. We will implement internal multi-year budget planning to help the government understand these issues and to make the case for a multi-year or block-grant system following the current fiscal year.

5.3.8 A Trusting and Open Working Environment

In a collaborative and open university environment, each voice counts. Our goal is an environment that facilitates internal information sharing and helps individual groups to have constructive discussions with OIST about challenges before they become big problems. As we grow, our community will become more diverse and the challenges we face will become more complex. Our success in research, education and innovation depends on an effective internal communications program that incorporates written, audio, video and social media platforms. We will take advantage of existing groups within OIST, such as the Faculty and Student Assemblies and the OIST Researcher Community, as well as new groups that may be formed to help us understand how OIST can best develop an effective internal communication program.

Chapter 6.
Delivering the Benefits Locally, Nationally and Globally

Strategic Goals

7. *To promote the intellectual life of Okinawa, we will deepen our relationships with all generations of the Okinawan community through cultural, educational, sports and career-development activities and will ensure Okinawan students are provided new opportunities to achieve their potential in global society.*

8. *To strengthen the benefits of Japan's investment in OIST, we will establish an Innovation Hub and create an entrepreneurial culture; strengthen our ties with Japanese universities and businesses to be an integral part of the Japanese research, higher-education and innovation systems; and extend our strategic partnerships with other universities, research institutes, industry and government, locally and globally.*

When OIST was established, we not only focused on research and education programs that would push the frontiers of knowledge to benefit humanity, we wanted the benefits to be realized in Okinawa and Japan. Our Strategic Plan highlights our early impacts and maximizes the benefits of our cross-disciplinary research toward the sustainable development of Okinawa.

In doing so, we are focused on the following:

- Research of direct relevance to Okinawa and Okinawan cultural heritage
- Bridging Okinawa and the world of science through educational outreach
- Attracting researchers, students, entrepreneurs and knowledge-intensive industry for inward investment in Okinawa

Successful implementation of this strategy will make a major contribution to solving some of the issues affecting Okinawa. For example, Okinawa had a higher rate of unemployment (4.4%), a poorer record on the National Achievement Test and a lower proportion of young people pursuing higher education (36%) than the rest of Japan,[1] even though the local unemployment rate has very recently fallen to the national average or below. There is also a higher rate of child poverty in Okinawa compared with the rest of Japan.[1] The local economy of central Okinawa is heavily dependent upon tourism, agriculture and the presence of the US military.[2]

OIST cannot resolve these issues alone, but we can contribute directly to their resolution in several ways in partnership with the Okinawa prefectural government and the Japanese government. Establishing a reputation for excellence and a vibrant innovation atmosphere that benefits Okinawa requires sustained investment by all. Together, we have made an impressive start, but we need to continue to invest to realize OIST and Okinawa's potential.

Our founders aimed for even more: They saw OIST as a catalyst for the Japanese university system in terms of internationality, cross-disciplinarity, diversity, innovation and a streamlined administration. We strongly believe in these principles and are proving their value through our success in research, education and

1 https://www.japantimes.co.jp/news/2016/03/02/national/japan-child-rearing-homes-living-poverty-doubled-20-years-1-46-million-researcher/#.XIzCVExuJGw

2 From the Japan External Trade Organization JETRO and other sources, tourism brought in 690 billion JPY (2018), telecom-related 409.9 billion JPY (2016), US Military Bases 171.7 billion (2017), and Agriculture/Animal Husbandry 88.5 billion (2014) to the Okinawa economy.

innovation. We believe that, in cooperation with Japanese and international universities, we strive to achieve both of our purposes: serving as catalyst by being closely interconnected with Japanese universities and companies and adding to the sustainable development of Okinawa.

In doing so, we are focused on the following:

- Strengthening our ties with Japanese universities and businesses to be an integral part of the Japanese research, higher-education and innovation systems
- Connecting Japanese and Okinawan prefectural governments, our partner universities and companies to nurture the research and innovation ecosystem in Okinawa.

6.1 Delivering the Benefits Locally

6.1.1 Research and Technology Relevant to Okinawa and Okinawan Cultural Heritage

The rich and diverse environment of Okinawa provides opportunities to perform cutting-edge science research that also addresses some important local issues (see Appendix D):

- Okinawa's coral reefs provide a wealth of opportunities, from decoding the genomes of important organisms in the marine biosphere to better understand how to protect the reefs from predators, climate change and other man-made influences (see Figure 6-1) to understanding how reefs are affected by strong climate events such as typhoons.
- The power of the seas around the islands and the abundant sunlight can be used to generate electricity.
- Okinawa's rich agriculture and local climate are well-suited to studying new strains of rice that can resist being catabolized into glucose to avoid lifestyle-related diseases such as diabetes and obesity.
- Okinawans are renowned for their longevity, which makes this an ideal place to study factors that can influence life expectancy and to develop markers for early detection of diseases to improve health outcomes.
- The rich ecosystem on land is both precious and fragile, with natural and man-made threats, and we have two projects which address these issues: OKEON, a community project to measure and monitor the local environment at 24 locations around the island and a project for early detection of invasions of the red imported fire ant, which can devastate crops and cause further economic damage.
- Technology can be used to address strictly local issues such as wastewater from local industry (for example, awamori distilleries and pig farms), using advanced bio-electrochemical systems.
- The Children's Research Center is partnering with local education boards to enhance training opportunities for parents of children with attention deficit hyperactivity disorder, their teachers and behavioral specialists with an expected improvement in outcomes for children, a more highly skilled workforce and an increased service provision in Okinawa.

We can also use our science to help protect the culture and environment of Okinawa:

- Bashofu is a traditional material prepared from the fibers from a banana tree (itobasho) used for making kimonos that are remarkably cool in the humidity of summer. Detailed analysis shows how the remarkable properties of the microstructure of the itobasho fibers contribute to this cooling effect, which could lead to a new range of smart textiles.
- Using our advanced equipment, we can discover the composition of long-established clay mixes and glazes and rediscover old pot-making techniques to protect Okinawa's long tradition of pottery and ceramics, handed down from one generation to another.

- We can also use our advanced scientific equipment for the research and conservation of important Okinawan cultural objects such as pottery, lacquerware and musical instruments in association with local museums through our Art Conservation Program.
- As a sustainable university, we pump and supply 200-300 tons of seawater per day not only for use by the OIST Marine Science Facility but also to supply the local umi budo cultivation plant at Seragaki.

Figure 6-1 President Gruss planting coral on Coral Day (March 5, 2019) as part of the Save the Coral Program, to which OIST researchers have lent their expertise, alongside the Onna Fisheries Cooperative Association, to explore ways to seed reefs with hand-grown corals to rebuild damaged reefs and ensure their survival.

6.1.2 Bridging the World of Science and Okinawan Communities through Educational Outreach

In Okinawa, fewer 18 year olds go on to university than in the rest of Japan, and of them fewer focus on science subjects at university. We want to increase opportunities for Okinawan students for two reasons:

First, we are committed to making an impact on Okinawan students and teachers at the elementary, junior high and senior high levels through a range of high-quality educational programs that will accomplish the following:

- Inspire Okinawan students to study science and technology and to become future OIST graduate students
- Assist local educators in meeting the 2020 MEXT educational guidelines that emphasize active learning for future society focusing on such topics as programming and computer skills, STEM, and the encouragement of a multidisciplinary approach to education
- Increase the options for English-language education in Okinawa, encouraging more students to pursue a college education.

Second, as we grow there will be a growing local need for a scientifically literate workforce for the planned high-technology industrial and innovation hub around OIST. In Chapter 8, we discuss plans for a new K-12 school serving both OIST and the local community. Such a school, with a strong STEM (science, technology, engineering and mathematics) program taught in English and with access to university laboratories, would prepare local children to become global citizens, able to contribute to and benefit from the entrepreneurial opportunities that will be created in Okinawa. A school with international accreditation would open many more doors to higher education for the most gifted. With our focus on diversity, it would offer an opportunity to encourage girls to develop a passion for and create a pathway to careers in science. It would provide teacher-training opportunities for science teachers at all levels and help develop new teaching ideas and practices. It would make Onna Village attractive to Japanese researchers and entrepreneurs living abroad who wish to return to Japan and attract inward investment. And it would answer a need voiced by our faculty, staff and students.

Outreach Programs: OIST currently runs a range of small educational outreach programs for Okinawan students with the generous sponsorship from the Okinawa prefectural government, Japan Science and Technology Agency (JST), US Consulate in Naha, Daikin Foundation in Okinawa and other private donors (see Figures 6-2 and 6-3). These have a direct impact on local students' skills and interest in science as well as on the local education ecosystem. During the next ten years we will expand these programs, working with multiple partners. To ensure program quality and support, we will also explore creating a centralized educational outreach office to connect OIST to the community through programs for students and teachers in Okinawa.

For elementary school students:

- Onna/OIST Children's School of Science
- Science Demonstrations in the Outer Islands of Okinawa (Miyako and Ishigaki)

For junior high school and senior high school students:

- Science Project for Ryukyu Girls
- SCORE! (**Sc**ience in **O**kinawa: **R**esearch for **E**nterprise)
- Okinawa Science Mentoring Program
- Science Job Experience Program
- Onna/OIST Children's School of Science Junior Science Program

Figure 6-2 Children's School of Science (upper left), Science Demonstration Trips to the Outer Islands (upper right), Science Job Experience Program (lower left and right)

For university students:

- Research internships[1] and collaborative experimental design and analytics[2] programs are open to Japanese and international undergraduate students.

1 https://admissions.oist.jp/oist-research-internship-program-description

2 https://groups.oist.jp/eda/collaborative-experimental-design-and-analytics-ceda-2018

For science teachers:

- OKEON Biodiversity Project for biology teachers

Figure 6-3 Children's School of Science (left), Science Festival visitors (right)

For the general public (25,000 – 40,000 total visits annually):

- OIST Science Festival (annually 5000+ participants)
- School Visits Program
- Nerd Nite in Café Esperazza
- A series of science talks at Junkudo Bookstore

Since our educational outreach programs and popular science lectures are a magnet for students, teachers and families to learn more about science, we have an open access policy for educational content. We take into consideration equality of access to these programs in the advertisement, promotion and selection of applications locally and nationally.

Here are descriptions of some of our programs:

Onna/OIST Children's School of Science and the Junior Science Program: A five-day program for children in elementary school grades one to six, conducted annually in August since 2010 to spark an early interest in science, this program welcomes approximately 120 children to campus to conduct hands-on science experiments led by over 40 scholars from the OIST community who volunteer to administer the program. The Junior Science Program for children in junior high school grades one to three, started in 2013.

Science Demonstrations Trips in the Outer Islands of Okinawa: OIST conducts three science trips annually to outer islands in Okinawa. Recent trips have brought OIST scholars to Ishigaki and Miyako Islands where they interacted with hundreds of local school students (over 450 students attended the most recent event in Ishigaki) to excite them about science, inspire them about education generally and encourage them to consider OIST in their long-range educational plans. Such trips engage local teachers in learning about new scientific approaches and discoveries, thereby encouraging them to stay updated on recent trends.

Science Project for Ryukyu Girls: Jointly conducted with the University of the Ryukyus with funding from the Okinawan prefectural government, this program – in its eighth year – competitively selects middle- and high-school girls from throughout the prefecture for an intensive two-day science camp conducted in English that inspires them to continue to study science and exposes them to cutting-edge scientific methodology. Led by scholars at OIST and the University of the Ryukyus, these young women engage in hands-on science experiments, meet with PhD students from around the world and have a chance to interact with girls from various Okinawan islands. For the first time in 2018, the program received funding support from Japan Science and Technology Agency (JST) to accept applications from girls enrolled in Department of Defense (DoD) schools on US military bases or other international schools in Okinawa, regardless of nationality, to share their common interest in science.

SCORE! (Science in Okinawa: Research for Enterprise): This is a science contest for high school students that is conducted jointly by OIST and the American Consulate General in Naha to create the next generation of scientists, engineers and entrepreneurs. All senior high school students in Okinawa are eligible, and the seventh annual program was held in December 2018 with 12 teams of students from eight high schools. Winners may receive an internship at OIST or a chance to visit the United States. Co-supported by the Okinawa Prefectural Board of Education and the Okinawa Association of English Education, the program also helps local youth improve their English-speaking abilities.

Okinawa Science Mentoring Program: The OIST mentoring program is open to 25 local high school students each summer. Accepted students meet with their PhD student mentor every Friday for several hours during the summer months to learn about new areas of scientific discovery at OIST and to build on students' interest in the sciences.

Internship Program for University Students: OIST offers opportunities for undergraduate students from local universities to engage in short-term internships to help them learn about OIST and to consider it as an option for a graduate education.

Teacher Professional Development: OIST's Biodiversity and Biocomplexity Unit, along with the OKEON project, engages with local biology teachers in activities that help develop their teaching ability and enable them to learn about leading research in biology, benefitting them and their students.

OIST Science Festival: Since 2012, OIST has annually invited all local students to directly interact with OIST scholars, post-docs and students and see science in action. The most recent event attracted over 5,000 people to the OIST campus. Students who attend this program often return to OIST to engage in other programs, and it also offers the community a chance to learn more about the types of research taking place at OIST.

School Visits Program: An open campus, OIST invites local schools to visit. Through organized tours that include interaction with OIST scholars, students have a chance to engage in science education at OIST along with their fellow students and teachers. This program currently attracts over 5,000 students annually.

All these programs are a magnet for students, teachers and families to visit OIST to learn about science. As well as providing a stimulating experience, they encourage students to pursue their scientific interests. For example, in September 2017, a team from the Okinawa AMICUS School won first prize at the World Robot Olympiad held in Tokyo, and one of the winning team members commented, "I became interested in robots since I saw robots at OIST." These initiatives contribute directly to the UN's Sustainable Development Goals 4 (Quality Education) and 5 (Gender Equality). These innovative programs are an essential part of our educational outreach aimed at encouraging students to study science. We will continue to work with local partners to develop them further, helping to connect OIST to the local community of students and teachers in Okinawa.

6.2 Attracting Researchers, Students, Entrepreneurs and Knowledge-Intensive Industry for Inward Investment in Okinawa and Japan

We are a vibrant science center, with more than 500 faculty, researchers and students in more than 65 groups, located at the center of a highly dynamic region in terms of economy, science and technology. We are about two hours by air from Tokyo, Osaka, Kyoto, Taipei, Hong Kong, Manila and Seoul and a little further from Beijing, Singapore and Shanghai, all major commercial and scientific centers. Naha has been an international gateway for centuries, and today is a major container port. Establishing Okinawa as a science and innovation hub means that we need to attract people from science and business from all over the world and connect ourselves as a strong partner.

Even when knowledge travels over the networks at the speed of light, the geographical distance of Okinawa from other regional science centers and international science centers around the world is a barrier to the informal collaborations and chance meetings that spark new research and innovation. As OIST's visibility and networks grow, they will play a significant role in establishing an innovation ecosystem and the rich educational opportunities that will serve the Okinawan people well.

6.2.1 Current Economic Impact on Okinawa

We have both a direct and indirect impact on the Okinawan economy. We offer high-quality jobs in an exciting and important area – science and technology. One quarter of our staff are Okinawans today, with planned growth to 1,000, making OIST one of the larger employers in Okinawa. In addition, there are more employed at OIST as vendors and contractors. For example, 10% of the staff of the security and maintenance company come from Onna Village with most of the rest from Okinawa.

In FY2022, when we reach 100 faculty units, a recent study[1] showed that the total economic impact of OIST will generate about 19.8 billion yen for the Okinawan economy (equivalent to 0.6% of prefectural GDP in 2018) and 38.2 billion yen for Japan (see Figure 6-4). The study also showed that the additional economic activity from expenditure through OIST (the economic multiplier) is 1.63 in Okinawa and 2.28 in Japan. This creates jobs, especially in the service sector for businesses like hotels, restaurants, shops, housing and schools. In 2023 when OIST reaches 100 faculty units, there will be 1,400 employees, about 350 of whom will be Okinawans. In 2033 at 200 faculty units, OIST will reach 2,600 employees with 650 from Okinawa. While these will be mostly high-skill professional jobs, requiring degree-level qualifications and English proficiency, the larger number of related jobs created by other commercial activity will be at all skill levels (see Table 6-1). Opportunities for vendors and contractors will expand from the 40 construction and maintenance companies in Onna Village who have contracts today – a vital local impact.

Table 6-1 The impact of OIST on the local economy and employment

Type of impact	2022	2033
Economic impact on Okinawa	¥19.8B	>¥38B
Economic impact on Japan	¥38.2B	>¥76B
Okinawans directly employed by OIST in high-skilled positions	350	650
Okinawans employed in related commercial activity at all skill levels	>500	>1000

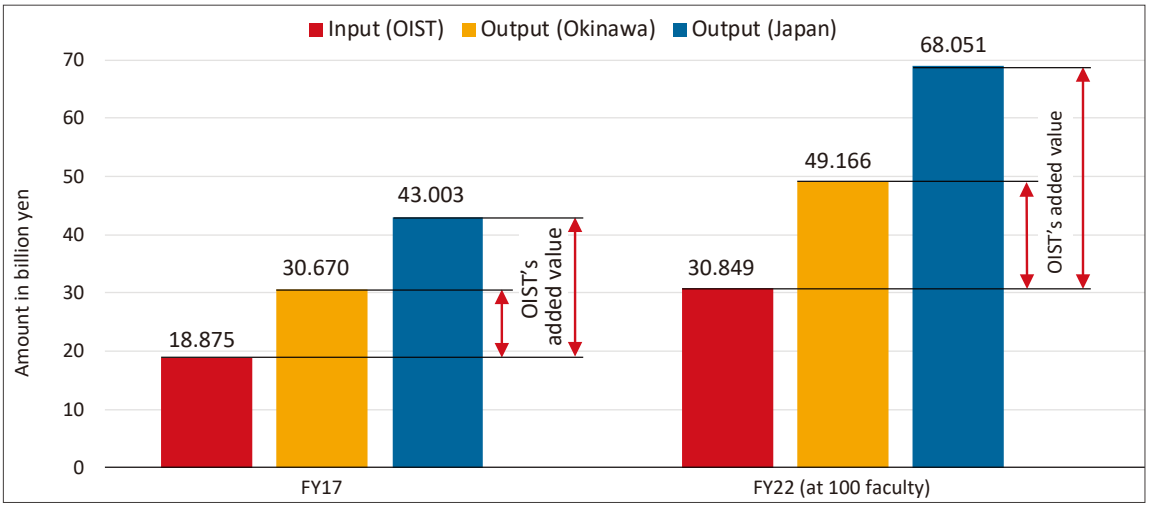


Figure 6-4 Economic impact of OIST expenditure (red) on Okinawa (orange) and Japan (blue)

1 Report from Investigation service on impact of OIST to the economic society of Okinawa and Japan, Okigin Economic Research Institute (March 2019)

These jobs are guaranteed, given the investment in OIST. However, there is a much greater potential for job and wealth creation through the innovation agenda. Most startups are small, employing a few highly qualified people, but again we can expect the same multiplier effect extending into the local economy. The impact on jobs and the local economy is even greater if one or two of these startups develops into larger successful business or if some of the major established companies decide to locate one of their research or manufacturing facilities in Okinawa. This is harder to predict and relies on establishing OIST (and Okinawa) as a flourishing enterprise location, but there are numerous examples from other countries (e.g. UK [Cambridge – Cambridge Science Park], the US [Boston – Kendall Square, California – Silicon Valley, Chicago – the I-88 corridor, North Carolina – the Research Triangle Park], and South Korea [KAIST – Innopolis]) that show that having an internationally leading university campus provides the nucleus around which pioneering industries can cluster and grow. The catalyst is the ready access to knowledge and expertise.

6.2.2 International Conferences and Workshops

In 2018, our research units hosted more than 200 speakers at seminars and colloquia, presenting their work to and discussing their work with our students and researchers and growing OIST's international network of contacts. We inaugurated the Presidential Lecture Series in which internationally renowned scientists with fundamental discoveries in new research fields or in new disruptive technologies come to inspire all our staff with their passion for science and their vision of the future. People who visit OIST leave as eloquent ambassadors for OIST and Okinawa.

OIST's growing reputation for scientific excellence gives us the ability to attract even the most distinguished and highly sought-after world-leading experts. Visitors to OIST see firsthand that the Japanese government is willing to invest in the future, to create an innovative new university doing pioneering research in a unique scientific and cultural environment. They experience the enthusiasm of our faculty, students, researchers and staff; appreciate the intellectual dynamism of our cross-disciplinary environment; and experience the natural beauty of Okinawa and a warm welcome in local hotels and restaurants.

Facilities: Our magnificent auditorium can accommodate up to 500 delegates, and we have several other lecture theatres that can accommodate 60-150 delegates as well as many smaller rooms available for parallel and breakout sessions. For small workshops and summer schools our Seaside House is ideal. Large local hotels offer first-class accommodation with breathtaking views of the reefs and the sea.

Partnerships with Local Hotels: Our success in hosting conferences will eventually position us to host significant international conferences of 1,000 delegates or more and will play an important role in developing Okinawa as a science and technology hub where people congregate to exchange ideas and do business. The fact that Okinawa is a wonderful tourism destination with a rich and diverse culture and a beautiful natural environment means that it is also a great destination for accompanying family members. The budget for a major international conference can be around 100 million yen, most of which is spent locally, and the total benefits approximately double when the direct spending by participants is included.

The creation of the US-based OIST Foundation that promotes OIST and Okinawa encourages influential people to visit OIST and to engage with us, helping to raise the profile of OIST to US foundations and US-based Japanese companies as well as government entities such as the US National Science Foundation.

Impact of OIST Translating Science into Innovation and Technology

We want to use our knowledge and facilities to address national and international priorities, and we have pursued an ambitious set of strategies to promote Okinawa as a go-to destination for entrepreneurs (see Chapter 4). Moreover, the economic impact of turning successful

breakthrough innovations into thriving companies is unlimited. For example, in San Diego, university professors launched the wireless telecommunications revolution and an iconic company, Qualcomm, which has spun out dozens of companies and investments in new companies.[1] Qualcomm's economic impact on San Diego is 4.9 billion dollars today, with 13,000 local jobs (more than 36,000 jobs including indirect impact), and every dollar generated by Qualcomm added 2 dollars to the gross regional product. Even discoveries with less historic impact can change Okinawa if it becomes an innovation ecosystem.

Translating Science into Innovation and Innovation into Technology: Our Technology Development and Innovation Center (TDIC) concentrates our efforts to translate discovery into technology and commercialization. We have been awarded more than 110 patents, and we ensure that promising ideas can be further developed through our Proof-of-Concept (POC) Program, along with licensing and startups, to bring such ideas to market. See Figure 6-5 for the research sectors where we have been awarded patents. Energy and the environment are emerging as growth areas, and both are relevant to Okinawa (see Chapter 4).

Encouraging Entrepreneurship: Entrepreneurs create a self-perpetuating cycle of entrepreneurship whereby one successful startup often facilitates the next wave of startups. Entrepreneurship is not confined to starting companies; it is also a mindset that includes taking risks to create new advances in the broader research environment. OIST is committed to promoting entrepreneurship, internally and externally, to advance high-growth venture creation in Okinawa. We have an extensive program that includes introductory education for entrepreneurs, Lean Startup Workshops and an accelerator and incubator for embryonic and very early startup companies (see Chapter 4).

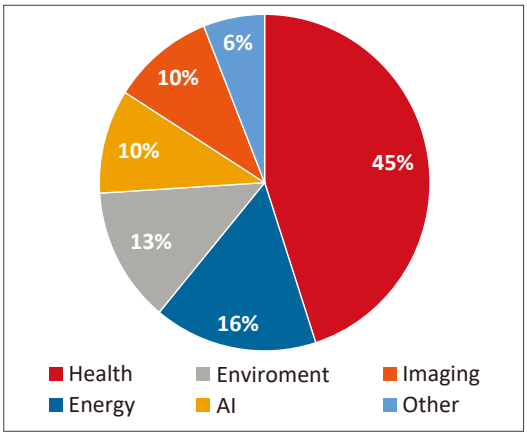


Figure 6-5 Distribution of patents granted among the research sectors

To facilitate the knowledge exchange with investors, professional services and recruiting firms and to increase the chances of a good match for local entrepreneurs and aspiring entrepreneurs, we hosted and co-hosted pitch, industry matching and student entrepreneurial club events with other key players such as Okinawa Startup Program[2] and the Okinawa prefectural government, in the promotion of an innovation ecosystem in the Okinawa. Our annual OIST Forum in Tokyo and biennial Okinawa Innovation and Entrepreneurship Summit[3] also attracted 150-500 participants and 20-25 speakers per event. We will continue to actively encourage entrepreneurship locally and nationally though our programs and public events.

The development of an international entrepreneurial ecosystem in Okinawa requires the attraction and retention of outstanding international workers who will be central to the leadership and workforce of this community. Without the international participants, Okinawa cannot build such an ecosystem. OIST plans to support the development of international talent in the OIST Innovation Square Incubator and Startup Accelerator Program with incentives like the OIST Technology Pioneers Program, as mentioned in Chapter 4. However, development of a broader international entrepreneurial ecosystem in Okinawa will require the participation and support of

1 See https://www.sandiegobusiness.org/blog/qualcomm-creating-technology-and-an-economy-san-diego-loves/

2 http://okinawa-startup.com

3 https://groups.oist.jp/tdic/okinawa-innovation-and-entrepreneurship-summit-2018

the local community in Onna-son, Okinawa Prefecture and the central government. Private sector companies and labor organizations must also join in this effort. Effective new programs are needed to entice and keep international entrepreneurs and R&D researchers in Okinawa. OIST will take a leadership role in building this collaborative effort.

6.3 Delivering the Benefits Internationally as a Global Science and Technology Hub

6.3.1 Building and Strengthening Strategic Partnerships

We are a bold experiment in Japan in creating a new university with the explicit aim of competing with the best in the world in a very short time. To support this noble aim, we have a special funding model different from all other Japanese higher-education institutions. However, we can only achieve our aims if we are, and are seen to be, an integral part of the Japanese higher education system. The unique role envisioned for OIST by its founders, and enshrined in the Schools Corporation Act, means that we are complementary to the other higher-education institutes in Japan, offering something that is qualitatively different – an international, English-language university in Japan, established explicitly to attract and retain the world's best scientists, students and postdoctoral scholars from Japan and around the world to work together to produce outstanding research and technology.

Japanese and Global Universities

Our ability to deliver on this bold vision is enhanced enormously by working in mutually beneficial ways with the rest of the Japanese higher-education infrastructure. In this way, we can be one of the gateways through which the rest of the world can interact with Japan and through which Japan can interact with the rest of the world. While we have no monopoly on scientific excellence and innovation, we do believe in gene pool theories of ideas in which the greater the mix of people, culture and backgrounds the greater the chance of making transformative discoveries. We believe that the best way of securing humanity's long-term future is through education and innovation, and it requires cooperation and collaboration at all scales.

The research collaboration patterns (see Chapter 3) and the geographical distribution of joint research publications (see Table 6-2) show that we have already established some very productive collaborations across all OIST research fields with many Japanese researchers.

Table 6-2 Geographical distribution of research publications

Category	Japan	USA	UK	Germany	France	China	Australia	Ireland	India
Neuroscience	267	72	30	21	14	3	6	1	4
Biochemistry and Molecular Biology	220	64	40	30	10	11	17	1	8
Materials Science	144	57	20	19	16	12	2	0	14
Physics, Applied	141	34	24	20	19	15	1	15	14
Optics	118	29	14	14	17	18	1	44	10
Genetics and Heredity	113	35	20	12	9	7	21	2	4
Cell Biology	106	23	16	9	11	4	6	1	6
Ecology	91	46	16	11	11	8	19	1	0
Physics, Multidisciplinary	88	34	18	7	18	3	5	7	5
Physics, Condensed Matter	70	18	18	15	12	5	0	1	7

Shows the geographical distribution of collaborative research publications (Web of Science) from OIST and the collaborating universities and research institutions in Japan and other parts of the world.

For example, our recent and highly impactful Ebola viral-research paper in Nature (see page 25) resulted from a collaboration with multiple researchers at the University of Tokyo, which began shortly after a new assistant professor from abroad joined OIST to lead a new research unit and start the project less than five years ago. Our evolutionary genomics and biodiversity research

with the University of Ryukyus synergistically boosted the visibility (Altmetric Attention Score > 60) and research impact of the topic in less than 5 years for both universities.

To promote the creation and strengthening research partnerships, we will provide not only financial incentives for individual faculty and researchers but also cultivate 15-20 institute-to-institute partnerships with Japanese and global universities by 2030 to co-fund and co-develop research-collaboration and academic-exchange programs (see Chapter 3). The OIST Foundation plans to join JUNBA, the Japanese Universities of the Bay Area, which through this network of US-based affiliates of Japanese universities, can also help promote partnerships.

Japanese and Global Businesses

We aim to become a key partner with R&D companies for the development of new technologies and as a source of trained personnel. Although industry collaborations only account for 2.6% of our research output, we will pursue an ambitious strategy to cultivate new and strengthen existing industry partnerships to achieve the following by 2030:

- 10% of OIST intellectual property is licensed and being developed by the private sector.
- 25% of OIST research units and researchers are incentivized and facilitated to participate in the development of intellectual property.
- Industry sponsors 5% of OIST R&D expenditures and invests in research instrumentation or infrastructure within a research cluster/platform for large commissioned research projects.
- Return on investment (ROI) from OIST startups makes an important contribution to our annual budget and has an economic impact on Okinawa.
- OIST graduates and trainees are employed in leading companies and startups.

Please see Chapter 4 for more details about the professional training modules and business development activities, industry sponsorship and joint and commissioned research in OIST.

6.3.2 Connecting Japanese and Okinawan Prefectural Government, Our Partner Universities and Companies to Nurture the Research and Innovation Ecosystem in Okinawa

While building networks of contacts is vital for the vibrancy of the academic environment and its ability to generate new ideas, the great economic impact to Okinawa, Japan and the world is from turning those ideas into new companies and industries. It requires partnership – forging the essential links between expertise that can turn a back-of-the-envelope sketch into a marketable product. Transformative technology impacts require the combination of knowledge from many sources (e.g. physics, chemistry, biology, computer science, electronics) and skills from many sectors (e.g. IP curation, finance, engineering, marketing, capital). If we are to deliver the benefits of our research, we need to build strategic partnerships with like-minded institutions in Japan and globally, providing not only expert advice on a specific scientific or technical domain but also a neutral forum for science, technology and innovation (STI) and STEM-education-related policy debates to engage all key stakeholders in creating the research and innovation ecosystem. Recent examples include a TEDx Conference organized at OIST on October 13, 2018, and the 11th HOPE Meeting with Nobel Laureates in March 2019, organized by JSPS.

6.3.3 Disseminating Knowledge, Innovation and Human Talents

The primary products of a university are knowledge, scholarship and highly educated people, in itself a benefit to society. We aim to be an exemplar – pursuing, adopting and developing best-practice in order to become a partner of choice locally, nationally, regionally and internationally.

Knowledge Transfer: Something known only to an individual or to a small group is essentially unknown. Society does not benefit. The first commitment then is to ensure that our research and our inventions are publicly available, either in reputable academic journals or as publicly listed patents. We strongly support and encourage our staff (faculty, students, researchers and administrators) to present their work at national and international conferences and workshops.

But more must be done to have an impact: Our discoveries need to be actively promoted, which requires a robust communications strategy (see Chapter 10) and a proactive approach to knowledge and technology-transfer.

Innovation and Technology-Transfer: Technology-transfer presents a different set of challenges of emerging importance in academia worldwide. Academia must balance openness with the needs for commercial confidentiality when developing new products and processes. Our Technology Development and Innovation Center oversees and manages the identification, development and exploitation of promising ideas and serves as a center for the encouragement of entrepreneurship – of OIST members and others – as our contribution to the promotion and economic development of Okinawa and the world.

Human Talents and Talent Mobility: Our graduates go out into society in a variety of roles. Some will continue in academia and pursue successful careers in research; others will take their place as leaders in different walks of life – such as education, industry, commerce or public service. Society will benefit tangibly from their endeavors.

Society expects more for its investment, and we must willingly respond to these expectations and develop robust strategies for ensuring that society as whole benefits from the investment. A central theme of our Purpose[1] is to "contribute to the promotion and the autonomous development of Okinawa and to the development of science and technology worldwide." We at OIST recognize and welcome this obligation and have established appropriate procedures to ensure that it happens. While real benefits do flow from the investment in research and education, it is difficult to plan strategically on assumptions about those benefits, and trying to will most likely lead to incremental improvements rather than revolutionary ideas. In our short existence we have delivered on this goal, but there is still much more to do. As part of the OIST Strategic Plan, we will enhance our current commitments so that the full range of benefits to Okinawa, Japan and the world can be realized.

1 Okinawa Institute of Science and Technology Schools Corporation Act (2009)

Chapter 7.

Developing Individual Potential to Achieve Our Common Goals

Strategic Goal

9. *To achieve our ambitions to become a world-leading international research university, we aim to attract the best talents across the university to create an environment in which diversity is valued and people are encouraged to achieve their full potential through opportunities for personal and professional growth.*

Scientific research and education performed on the international stage is evolving faster than ever because the challenges that science faces are more diverse, global and urgent. Institutions of higher education need to keep up with these rapidly changing demands. The impact of artificial intelligence, technology and innovation on the future of work in the higher-education sector need to be evaluated and addressed. We need to embrace change and to develop the agility and creativity to use new technologies to our advantage.

The tools required in research, education and management are changing at a similarly fast pace. We aim to be internationally competitive from a relatively geographically remote island. Attracting and retaining international talent under such conditions comes with extra complexity and warrants a priority focus. A critical component in such efforts is the commitment to the professional development of our administrative and support staff as well as of our researchers and faculty. Attracting the best talents, keeping skills up to date in each profession in the workforce and maintaining high morale among existing employees are acknowledged best practice for developing individual potential to achieve common goals. These qualities are encapsulated in our Vision, Values and Mission (see Chapter 2), and we will ensure that they are firmly embedded, implemented and applied consistently.

7.1 Attracting the Best Talent

Since most academic institutions, as well as many technology companies, believe human resources are their most important asset, the worldwide competition to attract and retain talent has become intense over the past couple of decades. Our future as a world-leading institution depends upon being able to recruit and retain the world's best who are also being targeted by other competing institutions who are ready and able to provide them with high salaries, housing, scientific freedom, funding, an inspiring environment and often a metropolitan blend of cultural and social attractions. This group of people, not only scientists, can choose to go wherever they find the best environment and conditions for their careers as well as the best quality of life for themselves and their families. We need to attract them to Okinawa. Our recruitment and retention strategy is built around three pillars.

7.1.1 Recruitment and Screening

We will develop standardized fair recruitment and screening processes appropriate for each job class that focus on excellence and lead to the creation of a diverse and highly qualified workforce. Our institutional and professional development resources will be highlighted, and our salaries and benefit schemes will continue to be competitive. Specific examples such as the Child Development Centre and School-Aged Program will be prominently featured in our recruitment literature. We will emphasize the opportunities for individuals to develop professionally while having the freedom to pursue their own research or other career goals within an innovative and creative environment.

7.1.2 Achieving our Potential through Professional Development

We will focus on individual career development, supported by a mentorship network, access to

appropriate professional development opportunities, and recognition through career advancement and promotion, using special incentives such as titles (e.g. distinguished postdoctoral fellow, science entrepreneur or teaching fellow), travel awards and other honors. We will provide clear, transparent explanations of contracts so that employees can make informed decisions about their long-term career plans. For postdoctoral scholars, we will build a vibrant community supported by the administration and the faculty, fostering career development by developing internal career tracks such as non-tenured staff scientist, lecturer, etc. Similarly, we need to offer project, time, resource and personnel management skills across all levels as appropriate and to provide training and professional development opportunities for faculty, research and administrative staff to enhance operational and management effectiveness.

We are committed to nurturing the best scientific talent and outstanding research support, comparable to the top universities worldwide, augmented by excellent administrative support (see Chapter 5). We aspire to create a common culture of engagement, acknowledge individual excellence and support the drive for personal growth for all staff members independent of their career stages and job descriptions.

Individual Development Plans:
We will ensure that individual development plans are incorporated into the employee evaluation system. We will encourage researchers and administration members to pursue professional-development opportunities and will establish standard policies to enable employees to participate in such activities, including curated external or online training programs, to advance their skills. We will create a reimbursement mechanism for certifications, renewals, professional membership and language test fees and with develop ways to recognize teams with an outstanding commitment to professional development and career advancement.

Continuing Professional Development:
As detailed in Chapter 5, we are committed to continuous improvement in our administrative processes, aiming to be an exemplar in providing professional and accountable services to the rest of the university within an open and trusting working environment in which its members take pride. To achieve this, our administrative staff need the opportunity to acquire and develop the skills necessary to enable and empower them to make informed decisions and to maintaining and enhance their professional expertise; this is an essential component of a comprehensive organizational development and talent-management system. Continuous improvement relies on feedback, from the end-user as well as from fellow members of the administration; we need to invest more in gathering appropriate information, responding to user feedback and promoting information-sharing among the administrative services while ensuring privacy and confidentiality. Finally, there are life-long learning opportunities for everyone such as the Presidential Lecture Series, public lectures and cultural events (see Chapter 6).

Building Teams:
While we each have an individual contribution to make and have personal goals and ambitions, we all belong to teams of one sort or another (sections, divisions, units, etc.) that have team goals building upon the organizational mission. Creating the right team spirit is an important component of the workplace environment and makes an essential contribution to general well-being. To promote efficiency, there needs to be good collaboration among the different parts of OIST – we need to be cross-disciplinary in everything.

7.1.3 Remuneration and Evaluation

We will develop a transparent, progressive and fair evaluation system for all and continue to ensure that the tenure and promotion system for faculty is fairly implemented in accordance with clear guidelines and standards. We will ensure that we talk to candidates clearly, candidly and well in advance so that there are clear expectations on both sides, and we will further develop the

remuneration, performance evaluation and promotion schemes so that they motivate individuals, reward performance, recognize achievement, and offer personal professional development and other contributions to OIST.

7.1.4 The Career Center (C-Hub)

One component of such a culture is to offer ample opportunities for professional development and lifelong learning. To create these, we will build a centralized and well-coordinated career center (C-Hub, see Figure 7-1), providing professional development and individual career support for everyone on campus and potentially offering a service to others in the local community. Through partnering with other parts of OIST and international universities, the C-Hub will become a single source where students, researchers, technical staff, faculty, administrators and family members can find easily accessible resources and receive career counseling and coaching. The C-Hub will include an employee-relationship component that provides job-placement opportunities and will become partially self-funding by hosting regular career fairs and other industry-related events for employees and external guests. We also intend to use alumni as examples for career guidance and involve some of them in mentoring and training.

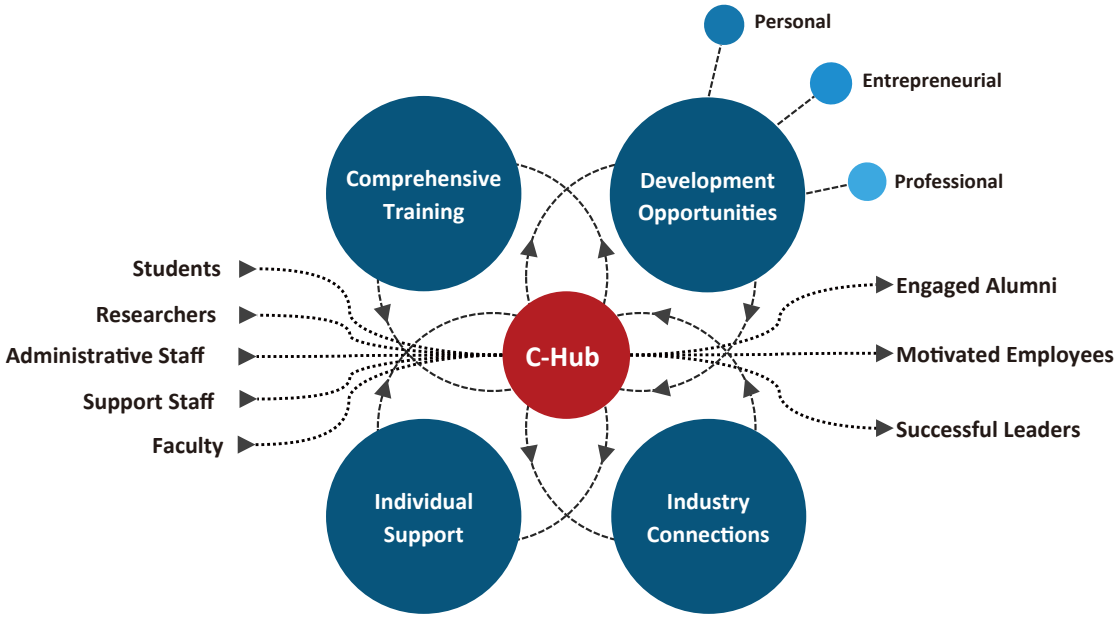


Figure 7-1 The C-Hub conceptual framework

From its inception, the C-Hub will promote professional development at all levels of employment by increasing awareness of continuous-education opportunities through a campus-wide educational campaign. The importance of professional development and personal growth within our diverse international environment will be highlighted during new employee on-boarding, and supervisors and managers will be educated about the importance of professional development and shown how to support team members' growth. We will record the number of people and length of time involved in professional development activities and monitor participation and satisfaction rates.

Using best practice, the C-Hub will provide relevant and evidence-based professional-development training and individualized career support for everyone. It will identify professional-development programs and services to fit our needs and consolidate current professional and career-development resources for maximum benefit to individuals and to OIST. We will create an all-inclusive training center to offer a variety of training opportunities,

educational services and career support to all employees. We will use Kirkpatrick's four-level model[1] to assess engagement, learning, behavioral outcomes and overall impact on organization and to track professional outcomes and job placements. Where possible, we will promote professional development that leads to accreditation.

The C-Hub will also build strong industry connections and promote OIST as a recruitment place for the best scientific talent. It will strive to become a bridge between OIST, industry and Japanese higher education. It will ensure worldwide, best practice and resource exchange, through relationships with domestic and international industry and universities. We will foster internships and exchange programs to facilitate staff and knowledge exchange and to make OIST resources and training accessible to the Okinawan community and to Japanese educators. We will monitor the number of partnerships, staff exchanges, external guests and social and other media appearances that highlight professional development.

7.1.5 Outcomes for Postdoctoral Scholars

Since September 2017, the postdoctoral career advisor has conducted interviews with postdoctoral scholars at the end of their contracts; we have information about the destination for about two-thirds (48) of those who have left. Sixteen have gone on to a postdoctoral position elsewhere, twelve have gone on to more senior staff-scientist positions (including two internally promoted), nine have gone on to faculty positions, eight have gone into industry (mostly in non-research positions, but three have research appointments), two have left without a firm position and one has entered government service (see Figure 7-2).

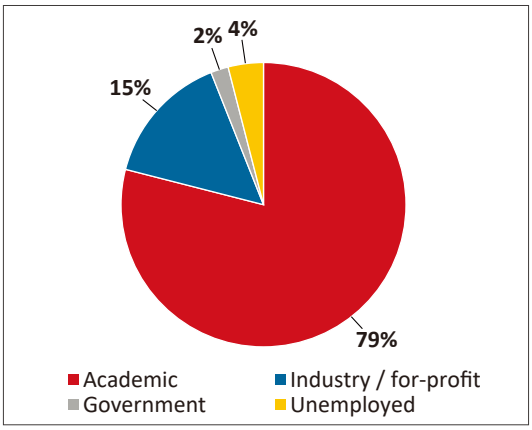


Figure 7-2 Destination of postdocs upon leaving OIST

7.2 A Culture of Engagement

Once we have attracted the best talents to OIST, we need not only to support their professional development but also to engage with them continuously to promote their personal development leading to employment success. The important components in strengthening engagement are having clear and regular communications about the university's strategy and policy direction and creating an environment that nurtures pride in the organization, including diversity and inclusion, respect for the individual and social responsibility. A culture of openness needs to be reinforced; for example, by holding open office days where members of OIST and their families can appreciate the work and can understand the challenges and achievements of the administration, fostering a sense of affinity, belonging and pride for all in the university. Similarly, science for administrators visits to research units would enable administrators to share the enthusiasm of the researchers and become knowledgeable about OIST's research.

7.2.1 Clear and Consistent Communications

Clear internal communication, policies, and procedures will lead to increased institutional engagement, higher job satisfaction and better employee retention rates (see Chapter 10). In order to achieve this, we will develop a clear plan in open consultation to build upon and embed our core values into our policies and procedures. When there are significant changes, we will

1 According to Donald Kirkpatrick (University of Wisconsin), there are four levels of training evaluation: reaction (what did the participants think of the training), learning (what increase in knowledge or skills or what change in attitude occurred), behavior (how effective was the transfer from the classroom to the work environment) and results (how did the organization benefit from the investment in the training).

develop ways of communicating them to avoid ambiguity or confusion, since such confusion can lead to dissatisfaction or underperformance in employees.

To ensure transparency, we will disseminate clear policies and procedures on hiring, remuneration, employment contacts, performance evaluation and promotion online. In order to increase employee satisfaction and engagement, we will foster a culture of continuous improvement and recognize employee achievements through appropriate internal awards. We will create a task force or standing committee reporting to the president to review the status of institutional engagement and to seek suggestions on how to improve it. We will institute periodic externally managed comprehensive surveys to assess levels of satisfaction, with smaller-scale surveys in between to track trends. The results of the surveys and the planned management response will be communicated internally.

7.2.2 A Diverse and Inclusive Environment

We are by design an international university, which means that we have a diverse, multi-cultural community across all parts of the university. Diversity is one of our core values, and we respect each person for who they are and what they can contribute. We are committed to enabling them to achieve their potential. While we are a diverse community, we share common goals and communicate in a common language: English. We believe that everyone at OIST has a valued contribution to make towards the overall success of the university within a culture of mutual respect. The goal of our recruitment, retention, evaluation and remuneration policies to reflects this commitment.

We are committed to the creation of a working environment that is attractive to, and supportive of, all staff irrespective of gender, age or family status, with an aim to achieve gender balance, defined as at least 30% women, in all job categories and at all levels by 2020. In order to encourage a culture of gender equality, we have hosted the Distinguished Speaker Series, inviting women who are acknowledged leaders in science to share their research, career story, and tips for success. We also organize seminars and workshops with invited speakers to promote women's professional development at OIST. In addition, there are monthly networking lunches for administrative staff (with topics like effective management of work, potential career paths in academic administration, techniques for supporting female colleagues and more) and for research staff and graduate students (discussing topics such as leveraging academic networks, navigating career changes inside and outside of academia and overcoming impostor syndrome).

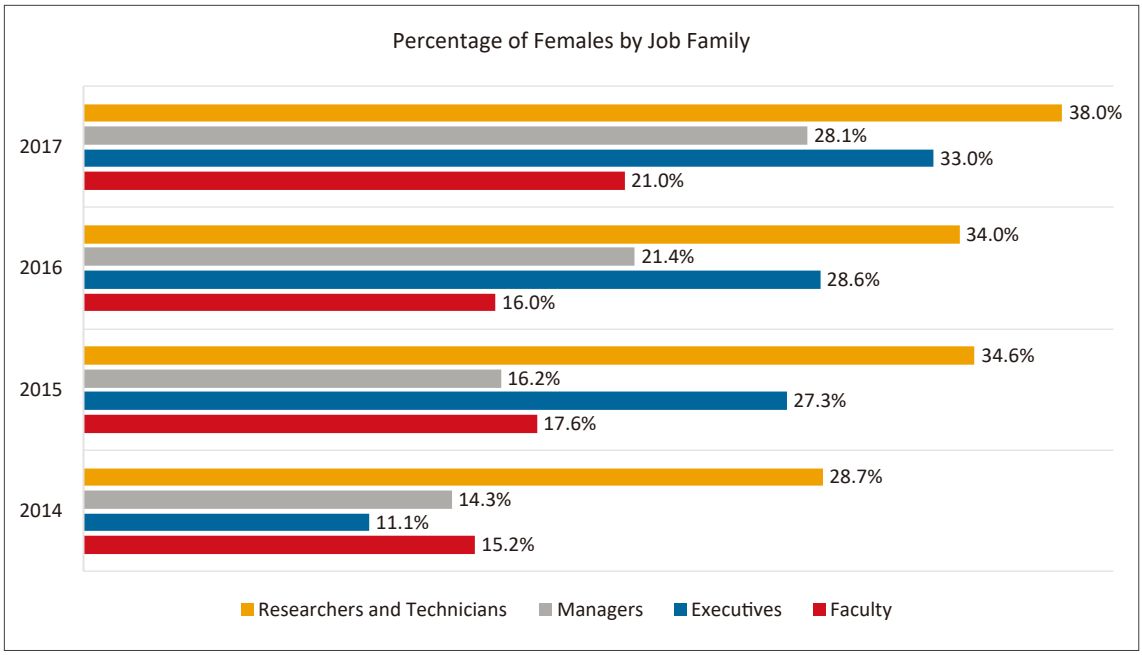


Figure 7-3 Progress with gender equality from 2014-2017

Several OIST initiatives address gender equality issues. Since 2015, OIST and Kyushu University have organized the joint annual Women Scientists Networking Workshops alternatively at OIST and Kyushu University, connecting female researchers from both universities and promoting and supporting research collaboration. In May 2017, OIST co-hosted the Gender Summit 10 Satellite Conference in Okinawa, an official satellite event of the Gender Summit 10 held in Tokyo, bringing together 86 participants from across Japan and 11 other countries. In 2018, we supported the Japanese Cabinet Office's Gender Equality Bureau's annual Gender Equality Week, with informal lunchtime events addressing work-life balance issues and other activities.

We will improve our support for family members to integrate into life at OIST and in Okinawa (see Chapter 8). We need to ensure that new employees, their families and others coming to OIST for an extended period are integrated quickly and effectively into our special environment. There are many advantages in having a broad cultural diversity but, especially for those for whom this is a new experience, it can also be challenging. We are developing a comprehensive and welcoming introduction and orientation program for new employees and a similar program for families; we need to ensure that the professional environment is equally welcoming.

We recognize that, for some employees, the commitment to OIST's success can lead to stress and a poor work-life balance. As discussed in Chapter 8, we have established the Ganjuu Well-being Center to promote well-being and psychological health throughout OIST. This center provides confidential counseling to any member of the OIST community. It also organizes workshops and offers advice on developing skills to increase well-being and productivity in the workplace, as well as to provide a range of resources including leaflets, online materials and other useful information supporting well-being.

7.2.3 The Ombuds Office

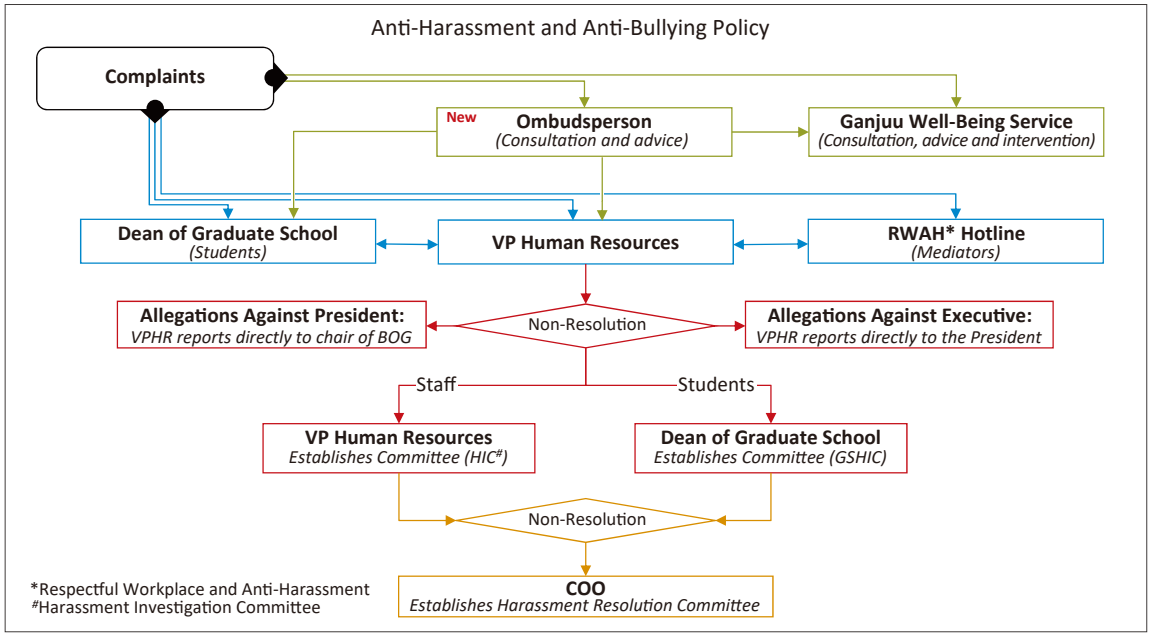


Figure 7-4 Resolving complaints and disputes

The objective in creating this culture of engagement and openness is to develop an environment in which people flourish, delivering benefit to OIST and themselves with job satisfaction. Nevertheless, some people may experience dissatisfaction or have grievances, sometimes with justification. It is important that there are responsive, transparent and confidential mechanisms through which such complaints are reported and handled. Experience indicates that there is a need for several channels to which people can express their concerns and, if necessary, appeal if they feel aggrieved. The information about the available channels and their appropriate use

needs to be clear. While serious allegations require a formal inquiry and response, in many cases there is a need for mediation before the situation reaches this stage. We will therefore create an Ombuds Office to assist with the resolution of complaints by guiding employees to the appropriate policies and procedures (see Figure 7-4). We will monitor service effectiveness by analyzing quantitatively and qualitatively the data on cases managed.

7.3 Training Programs

Many of the training courses, including all the mandatory courses, are available in an interactive online learning system, which maintains a record of attendance and performance.

Some of these courses, mostly online, are mandatory to ensure that everyone is aware of OIST's standards. They fall into three categories:

For All Employees and Students, Refreshed Annually: Japanese Law, Sexual Harassment Prevention, Information Security, Personal Information Protection and Basics of Health and Safety

For All Employees: Compliance (Proper Use of Public Funds), refreshed annually, and New Employee Orientation (not online)

For Employees and Students Working in Laboratories, Refreshed Every Five Years: Responsible Conduct of Research, Update Session on Research Safety and Research Ethics, Principles and Basic Knowledge for the Safe Conduct of Experiments, Laboratory Waste, Personal Protective Equipment, Import and Export of Items and Information and High-Pressure Gas Safety.

At the dawn of the age where Artificial Intelligence (AI) will have a transformative impact on many areas of employment, job content and structure are likely to change radically. We need to ensure that all employees are aware of these changes and appreciate the imperative of keeping their skills up-to-date. OIST needs to invest in skills training for all employees to enable them to be effective, recognizing that this will increase their market value. Given the research interests in AI, there may be opportunities for innovation in this area.

Chapter 8.
Developing Our Community

Strategic Goal

10. To enrich our staff, students' and family members' experience, we will build an inclusive and welcoming university community with quality on- and off-campus housing, sporting, recreation and community activities and will further develop appropriate child care, educational facilities and other services.

Excellence in science, education and entrepreneurship depends on attracting and retaining talented academic, research and administrative staff and students in a highly competitive market. Major universities in Japan and elsewhere in Asia, North America and Europe recruit from the same talent pool. To fulfill our mission, we must provide a work environment and a broader community that allows its members, including family members, to flourish. While Okinawa provides a unique and beautiful setting for the university and the Japanese government provides strong financial support for research, we compete with universities in major cities like San Francisco, Boston, London, Berlin, Munich, Paris, Shanghai and Tokyo where international schools and career opportunities for spouses present few difficulties. In addition, we are physically distant from research hubs in Japan and the rest of the world.

As an international campus, we have dozens of languages spoken even as people communicate in OIST's official language, English. Outside the campus, however, Japanese is the language of daily life. As we grow, we will need to expand the services that we provide to connect our people to the local community. We also need to develop a broader social environment beyond the laboratory, connecting with and complementing that which is available locally. There is an urgent need to develop additional recreation and sporting facilities, medical services and educational opportunities for school-aged children. These services are needed for staff, students, faculty and their families, many of whom have left established support networks at home and who may require assistance in developing new networks. This is especially challenging because of the diverse and multicultural nature of OIST.

Since its inception, the Board of Governors and senior management have understood the challenges that accompany the significant benefits of working and studying at OIST, for both non-Japanese and Japanese families alike, and have supported innovative programs like the Child Development Center. These initiatives must grow and expand as OIST grows.

8.1 Serving the Needs of a Growing OIST Community

The Okinawa Prefecture and the local villages in Okinawa have warmly welcomed our faculty, staff and students. However, many local services are not readily accessible, especially for those whose Japanese language skills are limited and who are new to Okinawa. OIST has identified, established and managed several services to meet their needs and often serves as an interface to services provided by the prefectural government or local agencies. This is a dynamic situation that requires continuous and timely improvement as local services evolve and new services are developed and implemented.

As our community has grown, we have consolidated university-wide services under a University Community Services Division in mid-2018, which is responsible for the development and oversight of the following:

Resource Center: This service provides information about living in Okinawa and provides an interface to local services (see the types of inquiries and frequency in Table 8-1).

Ganjuu[1] Well-Being Service: This service supports the physical health and psychological well-being of the members of the OIST community as they live and work in a new environment and deal with family and social relationships; life events; and pressure coming from the focus on excellence, skills and experience – all of which can influence our well-being and our ability to thrive.

Child Development Center (CDC or Tedako[2]): This is a cooperative pre-school at the university for OIST employees and their families to foster happy, healthy, compassionate and socially confident children ready to learn and thrive, which also provides after-school and holiday programs for school-aged children so that working parents of young children can focus on their jobs, confident that their children are well cared for.

Language Programs: This has been a feature of OIST since the university was established to provide intensive Japanese instruction to help new staff and their families integrate into the local community and intensive English-language instruction to help new staff (both Japanese and non-English-speaking, international staff and their families) to integrate and thrive at OIST.

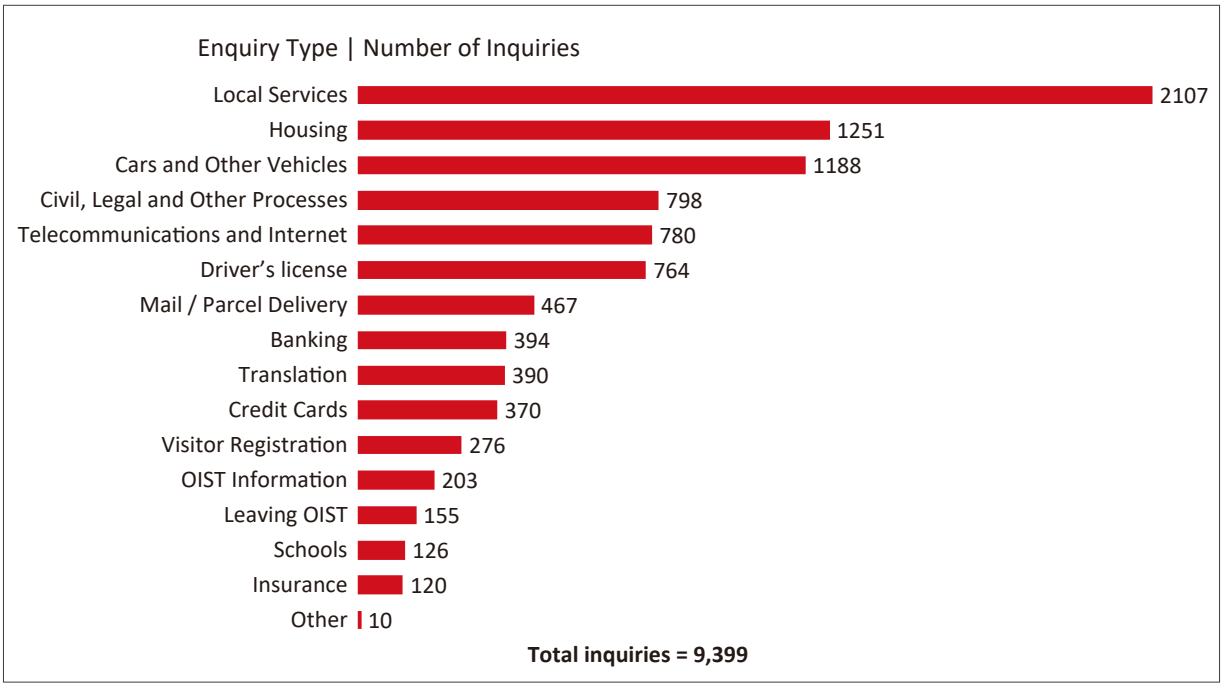


Figure 8-1 Resource Center usage from January 2018-February 2019

We will maintain and, in some cases, enhance the following services to meet the needs of the growing OIST community.

8.1.1 Medical Services

We have a clinic on campus to provide health consultations, referral services to local clinics and hospitals and a limited set of tests, vaccinations and treatment procedures for our community by appointment. The bilingual English and Japanese language support for non-Japanese speakers enables them to inquire and access appropriate medical care.

With OIST's continued growth we will expand the size and capacity of the clinic, which could include extending the services beyond the immediate OIST community to local residents. Additional medical needs that must be considered include on-campus visits by a bilingual psychiatrist, improved health literacy and the development of on-site allied health services such as physiotherapy.

1 Ganjuu is an Okinawan word meaning "good, well, strong, healthy"

2 Tedako is an Okinawan word that means "child of the sun"

8.1.2 Psychological Well-Being

The psychological well-being of our community is a priority. The Ganjuu Well-Being Service provides individual counseling services and works closely with the Graduate School and other sectors of our university to support the general well-being of our community. The service is staffed by two licensed English-speaking clinical psychologists, a bilingual counselor and a receptionist, and it currently operates at full capacity. There is a well-documented need for service expansion to allow for more proactive and preventative work and for the development of peer-support models within the wider community. The need for well-being services are not met by existing services in Okinawa.

8.1.3 Sport and Recreational Facilities

Sport and recreational facilities build and maintain mental and physical health, and we encourage everyone to engage in a range of sporting and cultural activities both on campus and in the local communities. Indeed, sport provides a strong promotional image for major universities and engages local communities to interact with university athletes and take pride in their achievements: The Oxford and Cambridge Boat Race, college football in the United States and the Seven Universities Athletic Meet (7-Univ) in Japan are some well-known and highly anticipated annual events. Improved transportation for and promotion of OIST's events is needed to increase participation. We will partner with the local villages to host events and establish shared facilities. We recently formed a Recreation Services Section to facilitate clubs, sporting and other recreational activities. This service will be expanded as the university grows, together with investment in buildings, infrastructure and staff to support its activities.

8.1.4 Language Training

We are an international English-language institution embedded in a Japanese environment with many members (including family members) whose first language is neither English nor Japanese. Japanese language training for non-Japanese speakers is needed to help people in their daily lives and to communicate within and outside OIST. While English is the common language of science, it is not necessarily the language of those engaged in, or supporting, science, and so we provide a range of English-language courses for scientists, research support staff and administrative staff. In keeping with our commitment to our broader OIST community, these courses are available to OIST staff, students and family members. Language training services will need to grow along with OIST. A survey of existing and future language training needs, including more flexible teaching schedules and increased program offerings, will be undertaken.

8.1.5 Family Support Services

We strive to create a safe and nurturing environment for members of OIST and their families. We will conduct a survey of family support needs to gauge satisfaction as well as the need for new or improved services. We will further develop a comprehensive on-boarding process for family members similar to that offered to staff and students and will introduce an early-inclusion program for families of individuals accepting positions at OIST prior to their relocation. We will establish a network of family ambassadors to support new families and to help with the identification of work opportunities for spouses and partners. We will conduct continuing assessments through satisfaction surveys, service use and service documentation.

8.1.6 Issues with Dependents of OIST Personnel and Students

There have been significant changes in social attitudes over the past few decades, particularly around the institution of marriage. In many societies today, especially in those which host some of our leading competitor universities, the definition of marriage has been changed and other forms of long-term commitment have been recognized. In this area, Japan has changed more slowly, and this can be a cause of concern for some highly qualified people (students, researchers, faculty and others) who choose to follow an alternative path and who hesitate to come to OIST

because their partner is ineligible for a dependent's visa. For all interested in OIST with spouses or partners, the issue of dual-career couples is important. There are limited job opportunities within OIST and in the surrounding economy, and for professional people there is also the issue of accreditation; even voluntary work is difficult to find for non-Japanese speakers. While this is not unique to OIST, it becomes more difficult to address here because of the distance between Okinawa and the main Japanese cities where such opportunities are more common. As we grow, this will become more urgent as the few opportunities that do exist are filled. We are developing guidance and information services, and we will work with the local and national governments to find ways to alleviate difficulties and resolve problems.

8.2 Connecting with Local Communities

OIST was established to be an outstanding international research university as well as an integral part of the local Okinawa society, contributing to its economic, social and cultural life. We will increase our communication and cooperation with local villages and the wider Okinawan communities. The Community Relations Section has established a growing portfolio of activities designed to introduce the people of Okinawa to our science and our scientists and to educate our members about the culture, history and customs of Okinawa through shared experiences and understanding. Our campus-wide intranet and media outlets raise cultural awareness and promote opportunities for participation in local events (see Chapter 6 and 10). As OIST grows, we will continue to cultivate the relationship between the university and the Okinawan communities.

Figure 8-2 Examples of community activities

Our goal is to share the excitement of science and real-life working experience in knowledge and innovation industries, particularly with the children and young people of Okinawa, through personal engagement. We will further develop our science outreach and mentoring programs and encourage our scientists and students to participate leading, among other things, to a greater engagement with Okinawan society and to their support for incorporating OIST's research and innovation agenda into the future of Okinawa (see Chapter 6 and Appendix D). As an example, the OKEON project (see Appendix D8) is a community project to measure and monitor the ecosystems of Okinawa.

8.3 Housing

To recruit and retain highly qualified staff in all sectors of the university and to attract highly motivated students, we must offer suitable, affordable housing on- and off-campus as do many of our international competitors. Universities are communities of scholars living on or near campus for easy access to the research facilities and services provided by the university. The layout of our campus and its housing is designed to foster this sense of community, creating a shared space for faculty, researchers and students. At the same time, we do not want to create a cloistered community, and we are focused on a balance of

on- and off-campus housing. Providing off-campus housing is a challenge in the vibrant local housing market where vacation rentals offer a better return on investment. On-campus housing is popular, and demand exceeds availability reflecting its quality and convenience. We require new students to live on campus and there are others, for example short-term visitors and research interns, for whom campus housing is desirable.

We are currently building additional on-campus houses and apartments in public-private partnerships (PPP) or through a private finance initiative (PFI), with plans for further housing developments (see Table 8-1 and Chapter 9). These initiatives will increase housing capacity but will not meet demand, necessitating further off-campus housing options. We also need to support those who prefer to live in, and be part of, the local villages, reinforcing the message that OIST too is a part of the local community. A detailed and long-term housing plan will be completed to identify and source enough quality affordable housing. OIST will also plan for improved transportation networks as the university grows beyond five laboratories to increase the range of acceptable locations and connections between on- and off-campus shuttle stops, to provide support for transitioning to off-campus housing and to cultivate working relationships with developers and housing agents.

Table 8-1 Number of existing and future on-campus housing units

Phase of Housing	Location	Type	# Bedrooms	# Units	Total 1	Total 2	Total 3	Grand Total
Existing housing (phase 1)	Village Center	Apartment	1 BR.	39	**72**	**186**	**216** (232)*	**385** (487)*
			2 BR.	33				
	West Court	Apartment	2 BR.	12	**36**			
			2 BR.+Study	8				
			3 BR.	16				
	East Court	Apartment	1 BR.	19	**54**			
			2 BR.	13				
			2 BR.+Study	13				
			3 BR.+Study	9				
	South Hill	Apartment	1 BR.	24	**24**			
	Hillside	House	2 BR.	16	**22**	**30**		
			3 BR.	6				
	Seaside	House	2 BR.	2	**8**			
			3 BR.	6				
Future housing (phase 2.0)	South Hill 2	Apartment	1 BR.	16	**23**	**29**	**29** (43)*	
			3 BR.	7				
	Hillside 2	House	2 BR.	4	**6**			
			3 BR.	2				
Future housing (phase 2.1)	New PFI housing	Apartment	1 BR.	30	**140**	**140**	**140** (212)*	
			2 BR.	32				
			3 BR.	30				
			2 Rm. share	24				
			3 Rm. share	24				

**Number of lease holders*

In addition to increasing the number of housing units, we must develop the infrastructure to support the daily living needs of those working, studying and living at OIST. The campus itself, though beautiful and surrounded by nature, is nevertheless rather isolated – for example, the nearest supermarket, apart from the small convenience store on campus, is ten minutes away by car, and there is very little recreation or entertainment within a twenty-minute walk. We need to plan and develop common spaces for recreation, meetings and sports participation and food services. Within existing and future housing developments, we need to provide safe indoor and outdoor areas for children and for pets.

Given the importance of housing, we will regularly conduct housing satisfaction surveys, and we will incorporate questions about housing in exit interviews. We will also monitor the housing demand and keep a balance between the current and new housing on- or off-campus and the housing provided through the rental market.

8.4 Sporting and Recreational Facilities

Our campus offers an attractive work environment, state-of-the-art scientific facilities and attractive housing options, but dedicated space for sport, recreation and community activities is extremely limited. Currently available space is under increasing pressure as the university grows. Accessing off-campus facilities is challenging for many OIST members due to language barriers and lack of public transportation options.

Establishing opportunities, infrastructure and facilities such as gyms, tennis courts and swimming pools to increase physical and community activities is an important goal for OIST. An effective and productive research environment is improved by a physically active workforce, and participation is enhanced when activities are nearby. Some faculty, research and administrative staff, and students lead sedentary work lives and are under constant pressure to compete with other outstanding research teams from all around the world, leading to weight gain, lack of physical fitness and flexibility, work-related injuries and dissatisfaction about the lack of social life. Recreational sport brings people from different parts of the university together and builds camaraderie. The competitive spirit and work-related stress can be channeled through physical exercises into better fitness and a balanced mind.

Several complementary initiatives are underway including the development of a calendar of social events, the creation of community meeting spaces at the Seaside House and the identification of sporting and recreation facilities in Onna Village and nearby. However, these are at best interim solutions, and we need to find ways to raise funds for sporting facilities and equipment and a campus recreational building that could include a community health and wellness center. Given our beautiful location, it would be good to create running and walking paths around the campus that are open to residents of local villages.

8.5 Child Development and Educational Services

Our Child Development Center (CDC) is an international model that is very popular with Japanese and international families and as an important factor in recruitment and retention. It has certainly been a factor in attracting younger faculty, researchers and other staff to come to OIST. The CDC must grow as OIST grows. In addition, a recent survey of parents and parents-to-be showed two primary populations in need of childcare services and educational options for their children:

1. Young children (preschool, kindergarten and elementary school): Their parents are largely postdoctoral scholars, students and junior administrative staff who acquire marketable skills while at OIST, spending a few years at OIST and then moving elsewhere in Japan or abroad.
2. Older children (junior and senior high school): Their parents have long-term positions at OIST, and whose children will aspire to go on to a university either in Japan or abroad.

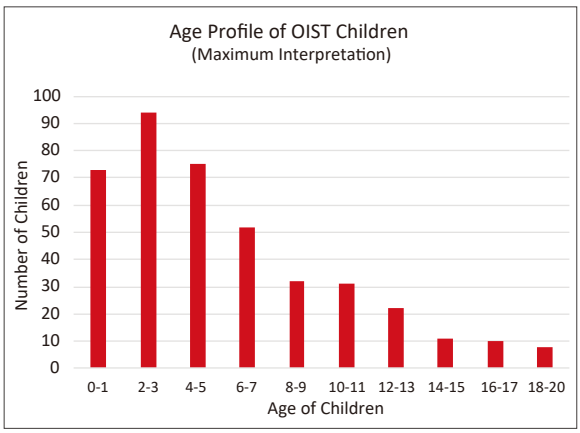


Figure 8-3 Age distribution of the children of current OIST staff and students, as determined by a March 2019 survey, showing clearly that OIST is an attractive option for the parents of young children, in part because of the Child Development Center.

Figure 8-3 shows the age distribution of the children of current staff and students who participate in the survey. The steep drop, especially after elementary

school, reflects the larger number of parents in the first group identified above, amplified by those parents in more senior positions who leave OIST to make other career moves who may also be concerned about the secondary and post-secondary options for their children.

Figure 8-4 shows the distribution of the respondents to the questionnaire by employment category and the preferred language for their child's education after OIST – either primary or secondary school for those at OIST for a limited period or post-secondary education for those at OIST long-term.

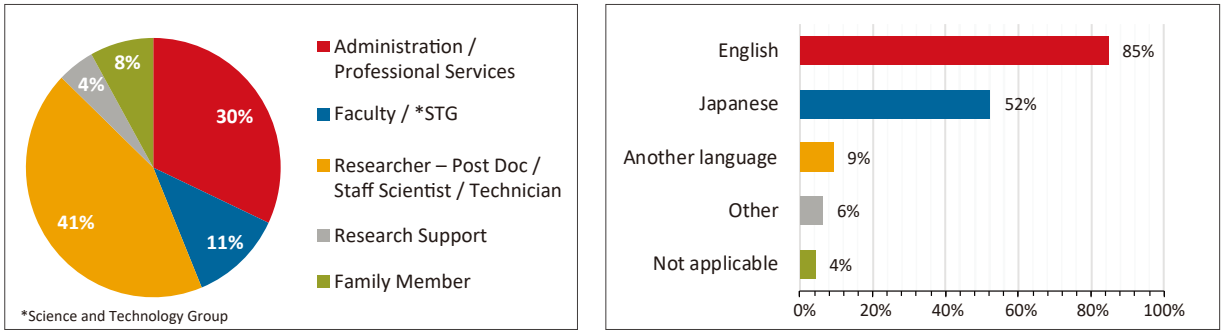


Figure 8-4 The pie chart shows the respondents' category. The bar chart shows the preferred language for children's continued education after leaving OIST or graduating from high school (blue is Japanese, red is English, yellow is another language and gray and green are non-specific).

Meeting the legitimate expectations of parents in this environment is challenging and will require OIST to be engaged in finding solutions. We have already made significant progress.

The Child Development Center was established with the strong support of the Board of Governors and the Cabinet Office to provide quality, bilingual (Japanese and English) day care for the children of staff and students (see Figure 8-5). The CDC (2019) occupies two purpose-built structures and provides care for more than 130 children from two months to six years of age. In conjunction with the CDC, the university also operates a School Age Program (SAP) providing after-school and holiday programs for more than 30 six- to twelve-year-old children. Demand for places in both the CDC and SAP programs continues to increase as the university grows and its faculty; students; and research, support and administrative staff have children. Figure 8-6 shows the employment category of the parents of children in the CDC. Planning for a third-phase CDC building and the expansion of the SAP space is a priority. Outdoor space for the CDC and the SAP is currently shared although time-tabled separately, but this is not ideal; this will be an important consideration in the design of the next phase.

Figure 8-5 Child Development Center classroom

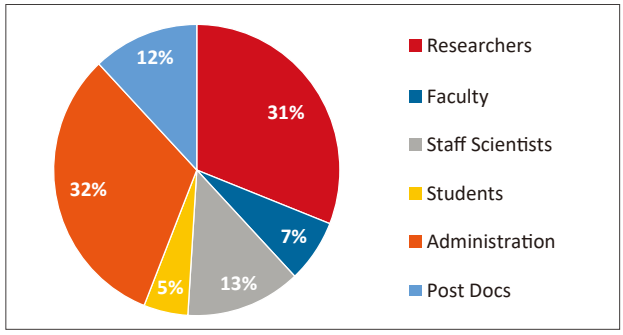


Figure 8-6 OIST employment category of the CDC and SAP parents. When both parents (34) work at OIST, they are each entered with half-weight.

We believe that children are competent, curious and resourceful learners. All activities and materials in the CDC are designed to provoke creativity and wonder, encourage cooperation, strengthen relationships and build the confidence essential to becoming an independent learner. We know that these programs are a significant factor in persuading younger faculty, researchers, students and administrative and support staff to come to OIST: 40% of those who responded to the survey identified the CDC as a critical factor in their decision to come to OIST, and another third said that it was a consideration.

Because the CDC is bilingual, it prepares children for entry into available local elementary schools, which teach in Japanese, English or a combination. However, there is a significant and ongoing concern from both Japanese and international parents about the options available, in particular the limited availability of affordable, secular, internationally accredited schools teaching in English. This issue has led to some declined employment offers and early departures.

At the elementary school level, we have partnered with the Onna Village Board of Education and Onna Elementary School to provide a native English-speaking teacher (certified in their home country) to volunteer in the school's International Classroom, with the primary function of preparing non-native Japanese speakers to be educated in Japanese, as well as to offer a limited language arts program for these children. However, with the continued expansion of OIST, we are reaching the capacity of the local school's ability to deal with the growing numbers of children whose first language is neither Japanese nor English. The only current option for those wishing to have their children educated in English is private, fee-paying schools but there are a limited the number of places available in these schools, some do not have a senior high school option and the fees are too expensive for most families.

There is a real need for the creation of a new K-12 English-language school meeting the highest international standards with appropriate accreditation. Because of OIST, it would be natural if this school had an emphasis on science teaching alongside an exceptional general education. OIST could be one of the sponsors for the school, which might make it an attractive option for Okinawan families with an interest in science and technology teaching in English (see Chapter 6). A new school would complement other local school options.

The demand from OIST is at least 150 students at the junior and senior high school level and at least 300 students at the elementary school level by 2030, meaning that this is a major undertaking. There is no information yet about non-OIST demand, but a top school will create strong demand in Okinawa and Japan.

This issue has become more urgent as some of the early graduates from the CDC approach their junior and senior high school years, and their parents consider their options. Creating an accredited K-12 school with a commitment to excellence and innovation in education similar to OIST's commitment to research, education and innovation would be a real asset and a significant catalyst to recruitment and retention at all levels. Developing such a proposal will require continued support from the Okinawa prefectural government, the Onna Village Board of Education, the Onna Village Office, the Cabinet Office and MEXT.

8.6 An Environmentally Friendly Campus

As discussed in Chapter 9, the university campus has been developed to protect and maintain Okinawa's natural environment. We have an obligation to inhabit it in a sustainable way. Encouraged by the efforts of the OIST Eco Club, the president is supporting the establishment of the Sustainability task force to encourage the adoption of environmentally friendly best practice across the university. The Task Force will develop standards for on-campus events (e.g., no plastic bottles or utensils, returnable and reusable name tags, digital schedules and stainless steel OIST cups distributed to vendors for use at events), reduce plastics use by OIST and its vendors and increase recycling and repurposing of materials and equipment. Sustainability and environmental protection could add and strengthen our local links and social engagement through joint activities. Specific goals and the means to record progress will be developed by the Sustainability Task Force. Establishing new policies and practices will be the responsibility of relevant internal divisions of OIST.

Chapter 9.
Developing Our Campus

Strategic Goals

11. To support our world-leading research programs, facilitate research across disciplinary boundaries and enable all members of our community to meet and communicate easily with each other, we will design an interconnected campus with modern, attractive, state-of-the-art buildings that promote interaction and cooperation among different research teams. We will ensure that our administrative, research support and education centers evolve with our growth.

12. To promote responsible stewardship of the environment, we will reduce CO_2 emissions using the latest sustainable methods for our environmentally friendly buildings. Furthermore, as part of our development of facilities we will conduct thorough environmental assessments, protect local plants and animals and encourage the development of environmentally sound work practices.

If we consider the construction of facilities and infrastructure for the 100 research unit (100 RU) model as the first phase of the growth of OIST, this chapter focuses on the methodology for planning the buildings and infrastructure for the future growth of OIST beyond this phase in accordance with the original principles established by the founders of OIST and based on the goals set out in other chapters of this document.

9.1 Principles for Developing our Campus

The announcement for the establishment of OIST by the Japanese government was made in June 2001. Two years later, in April 2003, Onna Village was selected as the site for the campus. The following goal is quoted from the framework of the university, dated November 26, 2003, and written before the design and construction of any facility on the campus had begun.

"A major challenge for the architects will be to design the campus and facilities in such a way that interactions among researchers are encouraged to the maximum extent, while the surrounding nature of the campus site is preserved as much as possible."

Proposed Framework of the University, 2003

An aerial view of the OIST campus before construction of buildings and the 58 bypass road is shown in Figure 9-1. In 2005, consultants comprised of a joint venture of the firms Nikken Sekkei (mainland Japan), Kornberg Associates (USA) and Kuniken (Okinawa) proposed the solution shown in Figure 9-2. In this proposal, the laboratory buildings are located on top of hills and are connected by a network of bridges passing over the valleys between the hills as shown in Figure 9-3.

Construction began in March 2007; from March 2010, the use of the first completed buildings, Center Building and Lab 1, commenced. The design and construction of the buildings and infrastructure have been continuing since then with utmost respect to the principles that the founders of OIST established. We are committed to following the same principles in the future.

Figure 9-1 An aerial view of the OIST Campus at the time of the lease of the land in 2003

In November 2011, 10 years after the initial announcement of the establishment of OIST, the accreditation certificate for the Okinawa Institute of Science and Technology School Corporation was issued, which marked the beginning of OIST as a graduate school. Since then, OIST has been growing based on five key characteristics, which were set in 2003 as follows:

- Best in the World
- International
- Flexible
- Globally Networked
- Collaboration with Industry

The above characteristics apply to all the operations and activities of OIST. They are an essential part of the goals for the research, education and innovation mission of the university. The first three characteristics are also highly relevant to the quality and architectural characteristics of the buildings. OIST facilities have been designed to be among the best in the world, to be at an international level meeting the highest international standards and to be flexible. These characteristics will continue to be the basis for the design of all future facilities.

Figure 9-2 The original master plan proposed by the consultants in 2005

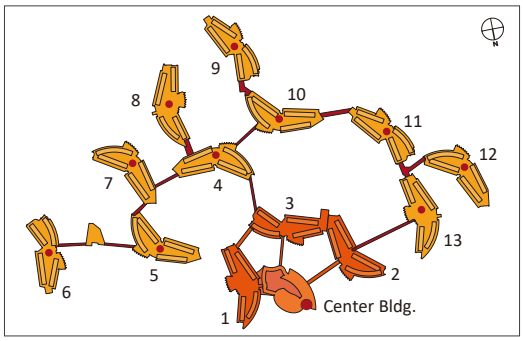


Figure 9-3 The configuration of the buildings and the network of bridges connecting them

9.2 Protecting the Environment

The site of the OIST campus is deeply wooded and cut transversely by a series of short, steep ravines that drain the seasonal heavy rainfalls to the sea. There is little land on which to build between these ravines. The site is, in effect, a repeating series of steep ridges and valleys aligned, for the most part, perpendicularly to the coast. These ridges and valleys have become the habitat of several protected flora and fauna. Figure 9-4 shows the main streams of water in the valleys that eventually connect to the sea through two rivers.

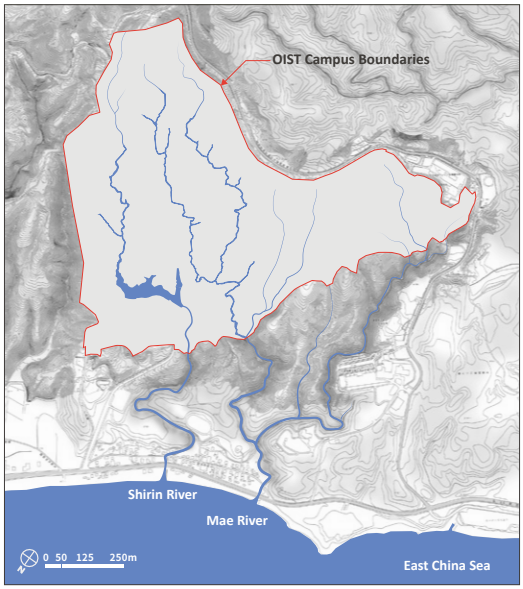


Figure 9-4 The branches of two streams of water called Shirin-kawa and Mae-kawa

An environmental impact assessment completed before the development of OIST identified many areas of the site that cannot be disturbed by construction. In particular, the streams running in the valleys are the habitat of an endangered species of newt. As a result, the stipulation for campus development was that these streams be left undisturbed. OIST has maintained an annual contract with environmental assessment consultants for the continuous monitoring of any impact on the environment. Every site considered for development is carefully examined during various seasons, and these sites will not be authorized for use if any of the protected species are found to be in danger. While construction is taking place, extra care is used to prevent any soil from running into the sea during rainfalls. We will continue our commitment to the protection of the environment in all future developments.

9.3 Core Disciplines in OIST Laboratory Buildings

At the time it was established, OIST decided to concentrate its research initially on the following core disciplines to promote excellence (alphabetically listed):

Chemistry: Examples of this discipline include advanced basic chemistry, surface and interface chemistry and chemical biology.

Computer Science and Mathematics: Examples of this discipline include mathematics, parallel and distributed computing, media and interface computing and computation for biology.

Materials and Systems Engineering: Examples of this discipline include designing and devices, materials processing and systems engineering.

Life Sciences: Examples of this discipline include molecular networks, cellular networks, interactive biosciences and systems, neuroscience, biometrics and bioengineering.

Physics: Examples of this discipline include basic physics, interface physics, condensed-matter physics, biophysics and theoretical astrophysics.

OIST began without departments in order to promote cross-disciplinary fields of research among the core disciplines instead. The foundational model for the design of cross-disciplinary laboratory buildings at OIST, shown in Figure 9-5, has the flexibility to be used by any of the core disciplines or the cross-disciplinary disciplines among the core disciplines. This model has been incorporated into all existing lab buildings and will continue to remain the model for the future buildings, with necessary adjustments or improvements made to reflect advancements in OIST's fields of research or in the design of laboratory buildings worldwide.

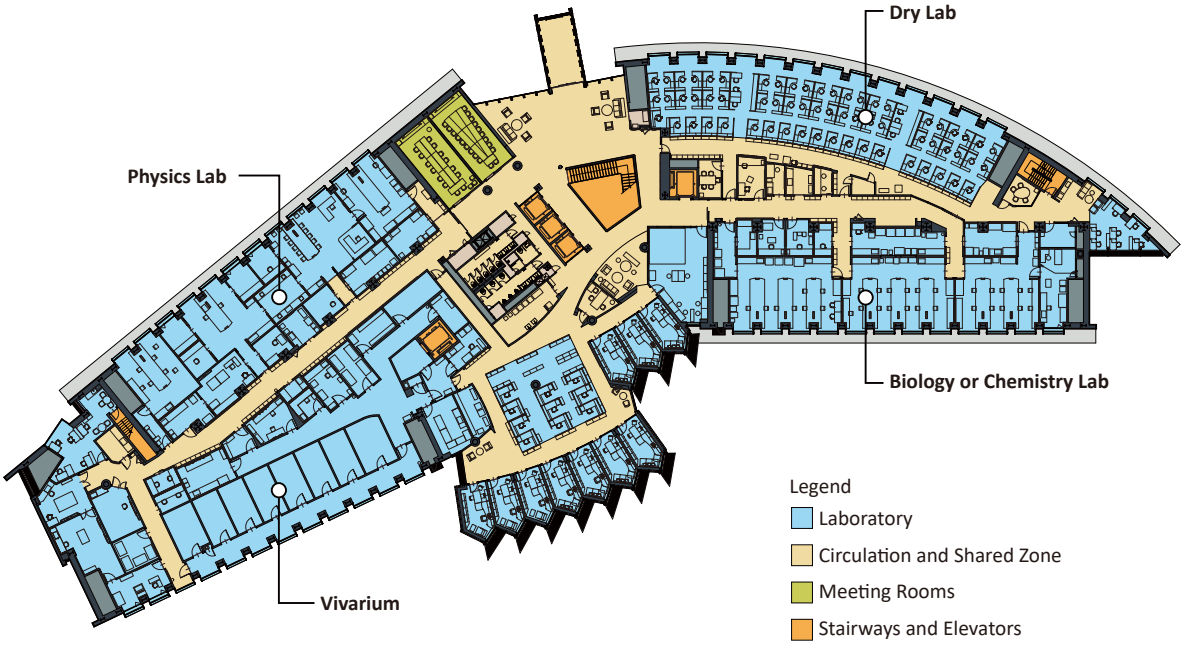


Figure 9-5 The foundational model for the design of cross-disciplinary laboratory buildings at OIST

9.4 Configuration of Research Units

We grouped the existing units into roughly five categories for analysis: life sciences, chemistry, math and two categories of physics (experimental and theoretical). The intention was to formulate a realistic approximation of the number of fields of research and their distribution. Each of the five categories includes various cross-disciplinary units.

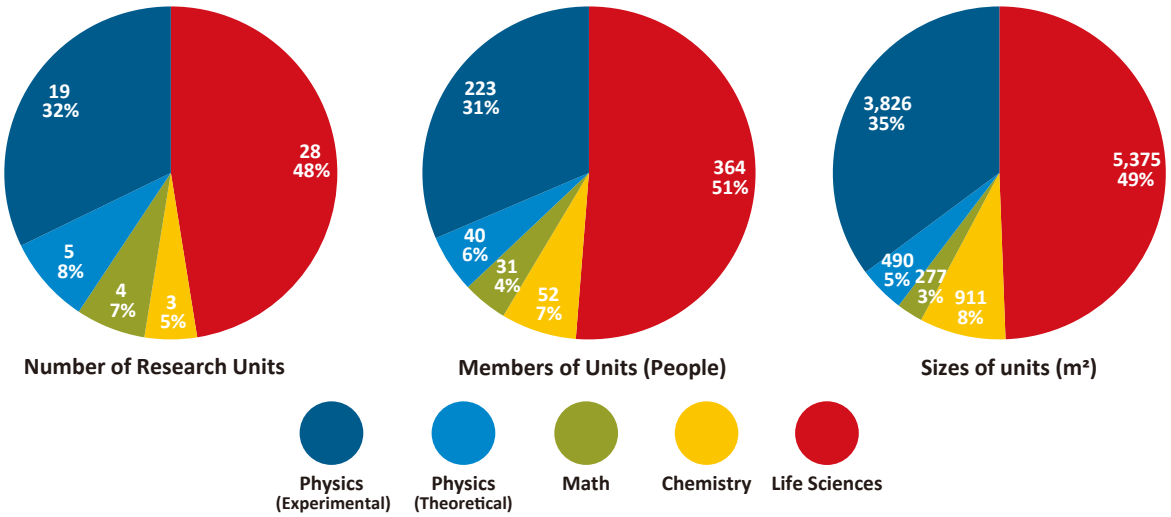


Figure 9-6 The current research units

The pie charts in Figure 9-6 summarize the statistics at 59 research units in 2018. The result indicated that 48% of the units are conducting research within the life sciences. Of the 710 staff members within all the units, 51% belonged to life sciences. Physics was the next largest field with 40% of the research members and then chemistry with 7%. Mathematics had the lowest number of units (four), occupying 3% of all research space and having 4% of the total number of research members. The result is summarized in Table 9-1.

Table 9-1 Summary of statistics related to the first 59 research units

General Fields of Research	Number of Units (RU's)	Number of Members (People)	Total Floor Area (m^2)	Average Size per Unit (m^2)
1. Life Sciences	28 Units	364	5,375 m^2	192 m^2
2. Chemistry	5 Units	52	911 m^2	182 m^2
3. Physics (Experimental)	19 Units	223	3,826 m^2	201 m^2
4. Physics (Theoretical)	4 Units	40	490 m^2	123 m^2
5. Mathematics	3 Units	31	277 m^2	92 m^2
Total	59 Units	710	10,879 m^2	Average: 185 m^2

Note: The average size of a unit is assumed to be about 12 consistent with the above survey. An average unit consists of one faculty member leading the group, three students and six postdoctoral researchers, and technicians. Research unit Administrators (RUAs) are also included in the above estimate. Units share RUAs; as a result, the number of RUAs will be less than the number of faculty leading the groups. We also assume an average floor area of 200 m^2 for each unit when planning new laboratory buildings, although the sizes of units vary widely. The average from the above survey is 185 m^2.

9.5 Development of a Model for Future Lab Buildings

Based on our analysis of the existing data, we developed the following model as the basic standard for future lab buildings:

- 20 research units
- 60 students (three students per unit)
- 240 total unit staff (12 members per unit including students, post-docs, etc.)
- 72 administrative staff, increasing the total unit staff per lab building by 30% (not all located in the lab building)
- 12 administrative staff working in the lab building for daily support

- 332 people added to the total OIST population per lab building, including administrative staff in other buildings
- 272 people working in each lab building
- ±10,000 m^2 of floor area per lab building including the work area, common area, circulation and machine rooms

In this model, a typical future laboratory building shown in Figure 9-7 will mainly house the research units and will include 20 cross-disciplinary units and additional support administration (all administration members will not necessarily be physically located in the laboratory building).

The planning of the existing facilities is based on a group of 100 research units; as a result, all common research, education or shared facilities such as a library, restaurants, classrooms, administration facilities and a vivarium, have been distributed within the Center Building and the five laboratory buildings. This model will not be possible in the future unless OIST is divided into three 100-RU groups. To avoid this, all future laboratory buildings will mainly house the research units and a small number of administrative staff. This will simplify the planning of the building, reduce the size of the building and make the budgeting and construction of the building more manageable.

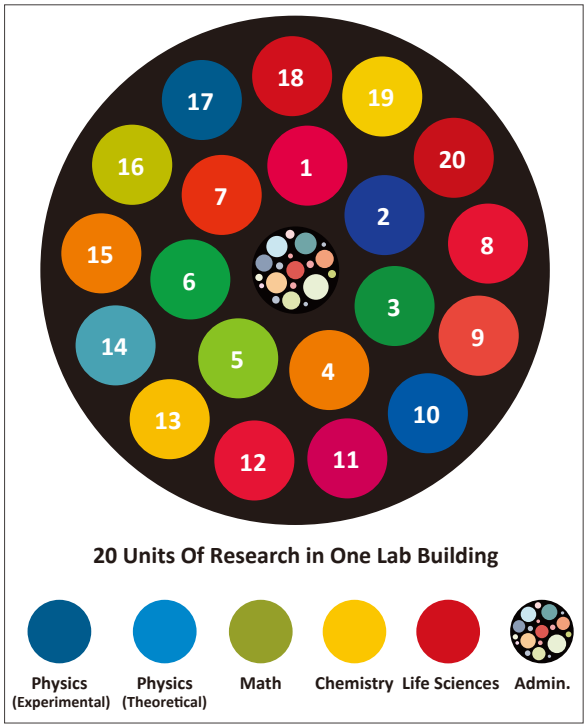


Figure 9-7 A typical future laboratory building

9.6 A Modern State-of-the-Art Campus

At the time of its establishment, OIST was driven by the major goal of providing research conditions that would attract international faculty and students to do work of the highest caliber. As a result, the design of OIST facilities was developed based on international standards with concepts that address the goals and practices achieved by model institutions. To develop a program for the design of OIST facilities, the architects and engineers started with a review and analysis of existing, successful research institutions. The purpose was to try to learn the attributes of these institutions that might be useful in setting up and designing OIST, not to be imitative but to be progressive in the structuring the new campus. Today, the existing facilities are proof that the original planners and architects achieved their goals and created models of laboratories unique for OIST.

Among the special features of the laboratory buildings at OIST are interstitial spaces (ISS), which are technical floors constructed above every lab space; double power-supply sources; and efficient back-up power generation, which have enabled OIST to continue operation without interruption.

Another major achievement by the architects and engineers of the laboratory buildings at OIST has been designing highly sustainable and energy-efficient buildings, even though laboratories are very energy-intensive. In 2013, OIST received a Silver LEED Certificate for the Lab 2 Building. All other laboratory buildings at OIST are at the same or higher level of sustainability as the Lab 2 Building and would easily be eligible for receipt of the same certificate if applied for. In 2018, in collaboration with the Okinawa Electric Company, an energy supply system was built on campus for Lab 4 and Lab 5 which will reduce emissions of carbon dioxide considerably. We intend to follow and enhance the above principles in the design of our future facilities and will maintain the high standards we have already achieved.

9.7 An Open Campus Promoting Interaction and Cooperation

"One of the earliest concepts that was addressed to determine the make-up of the institute was the importance of making the teaching and the research program multidisciplinary. OIST wants to be at the forefront of the discoveries that emerge from the integrations of its core disciplines. So, one major requirement for the architects was to design the facility to combine the activities of physicists, biologists, chemists, computer scientists, mathematicians and engineers in an environment that best enables their talents and achievements to benefit the entire institute."

Program for Design of OIST Buildings
Nikken Sekkei and Kornberg Associates
October 15, 2005

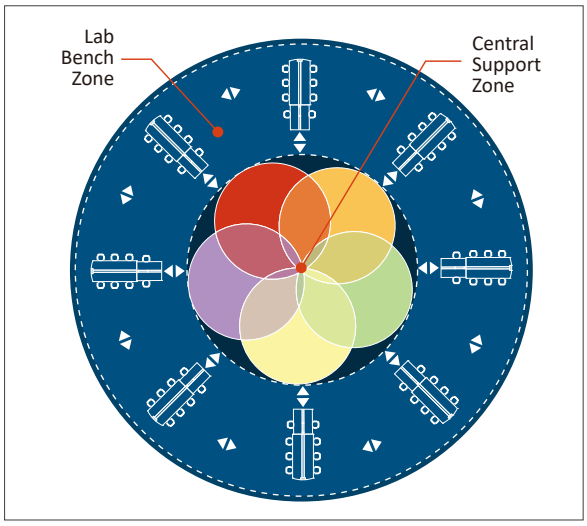


Figure 9-8 Planning principle for the floors of labs

The above concept was successfully implemented (see Figure 9-8 and 9-9). The proof is reflected in the expertise and research interests of the current faculty and the configuration of the three laboratory buildings that, combined, function as one building with all disciplines distributed within its research and workspaces. Each floor acts as a neighborhood for groups of research units who work together and share their space. In each laboratory building, centralized research support facilities and open-style laboratories promote communication and encourage collaboration, making for a more efficient and productive work environment in the interdisciplinary laboratory.

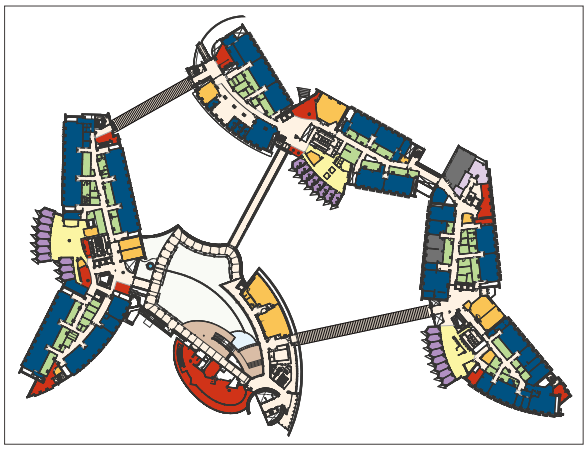


Figure 9-9 The configuration of current buildings and the network of bridges

In the social structure of OIST, the planners of the current facilities likened the units of research function to families in the way they work together, help each other, share resources and provide encouragement and motivation. Members of the family are familiar with each other's research work; they can potentially share their equipment and space and they get together regularly to talk about their research. Each family is a faculty-led research unit, an assembly of post-doctoral fellows, graduate students and technicians. Families work in neighborhoods, which are a building or floors of a building. Interaction among research units in these neighborhoods leads to collaborations that generate new interdisciplinary fields of research. Currently we have over 60 units who are sharing over 40,000 square meters of interdisciplinary research space. After the completion of the Lab 4 and Lab 5 buildings, the number of units will reach 100. For the next 100 units, we may have to modify the distribution of common facilities; however, the basic concepts of interdisciplinary research structure and promotion of interaction among research teams will remain and be enhanced.

The extreme topography of the OIST campus site is a challenge for the connectivity of the buildings. Building Platforms are limited in size for the environmental reasons described in Section 9.2. Despite these restrictions, we have been able to connect the existing three laboratory buildings and the Center Building directly when they are adjacent, or by bridges when they are separated by valleys. Figure 9-10 shows an aerial view of the complex of three lab buildings that houses 60 research units. The administration building in the center is at capacity and will not be enough for 100 units. Lab 4 and Lab 5 will be connected to the existing buildings by underground corridors and to each other by bridges.

A long tunnel and tall elevator shaft connect the entrance parking area to the Center Building. After entering any of the buildings, all other buildings will be accessible without going outside. This is necessary for the promotion of interdisciplinary research and the creation of opportunities for the research community to meet and exchange ideas. It is also needed to take the local climate into account. It provides flexibility in space allocation and is needed to provide access to common facilities such as research equipment rooms, classrooms and lecture halls. We intend to maintain this connectivity for future facilities.

Figure 9-10 An aerial view of existing lab buildings

The model of the first 100 research units shown in Figure 9-11 includes an administration building at the center. This model can no longer be used for the next 100 research units. Figure 9-12 shows the growth of OIST facilities beyond 100 research units on the OIST Campus. Each circle represents one laboratory building for 20 research units. Yellow lines between buildings indicate connections by either bridges over valleys or corridors between the buildings. The development of incubator facilities, shown as the Research and Development Zone, is also among the important goals for the future growth of OIST.

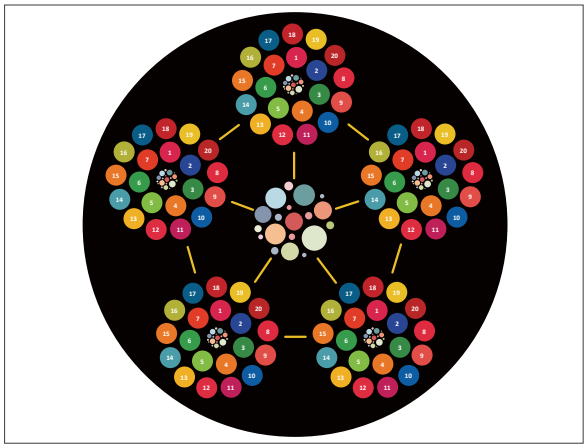


Figure 9-11 A model of the first 100-RU structure

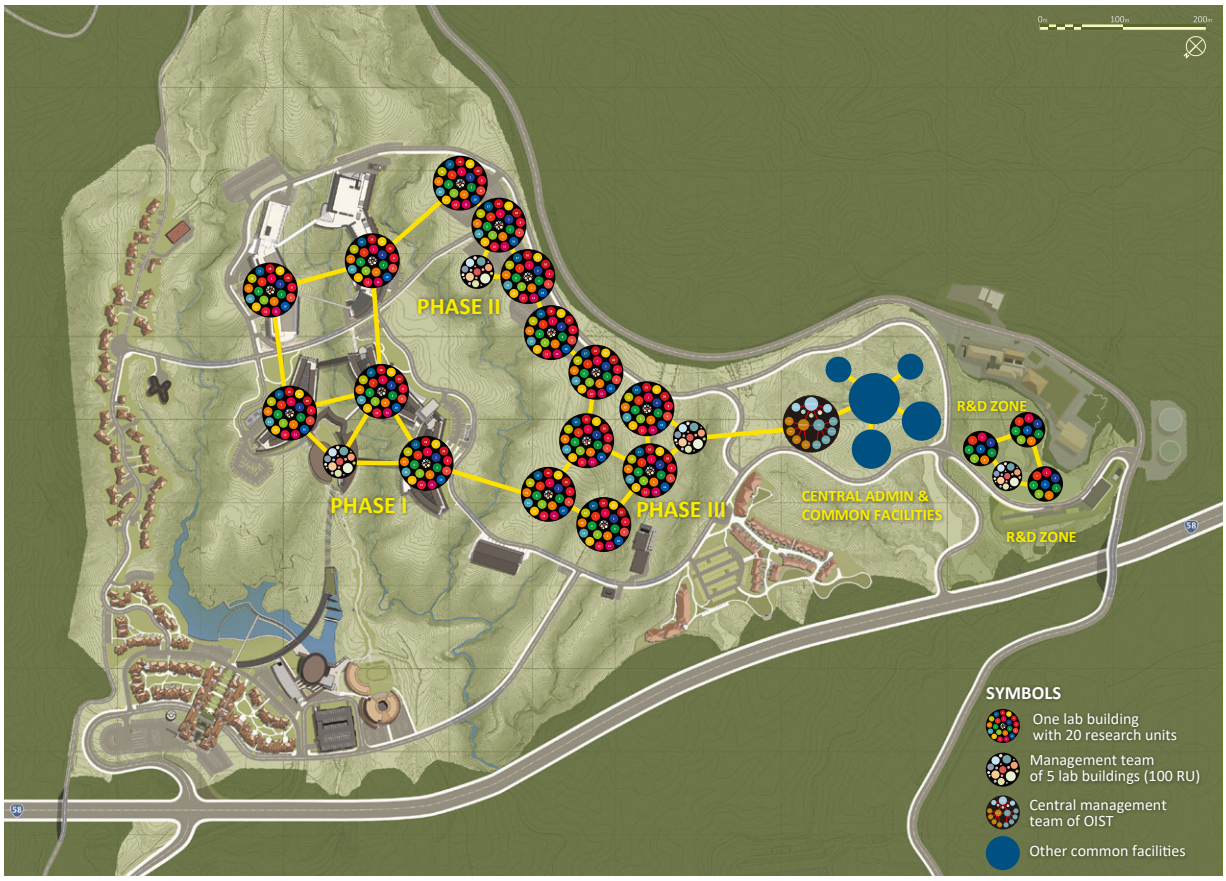


Figure 9-12 A diagrammatic site plan shows the growth of OIST facilities beyond the 100-RU phase

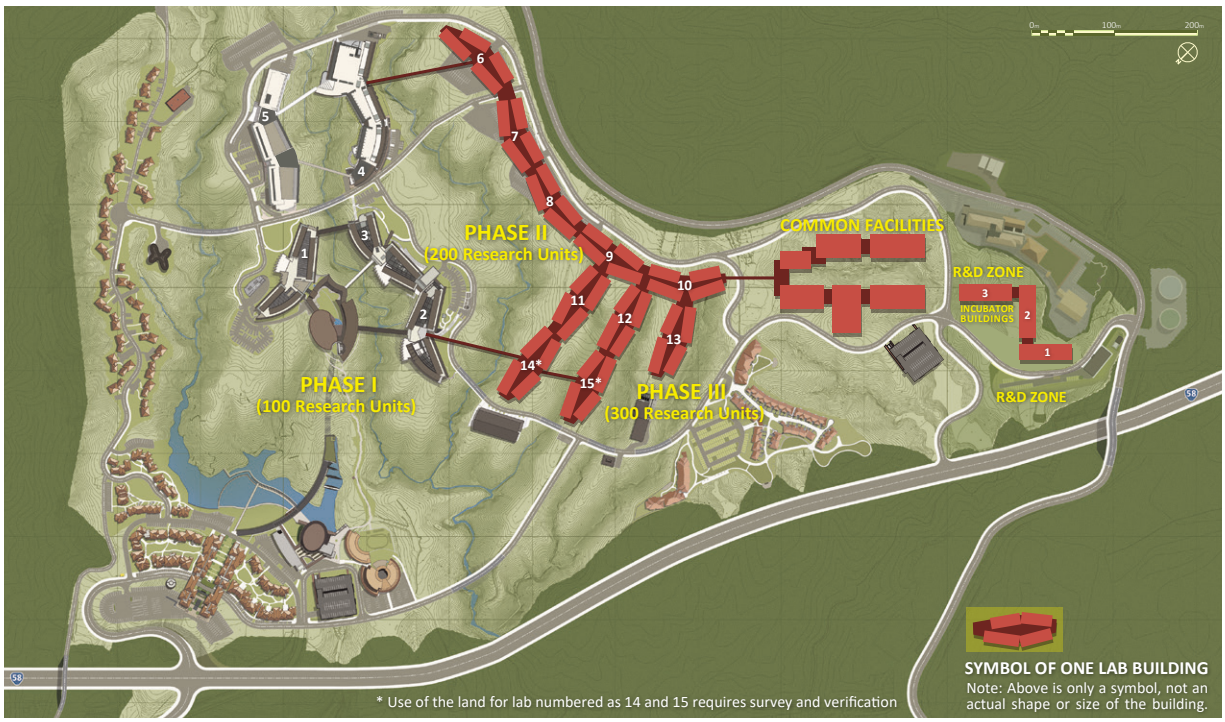


Figure 9-13 A conceptual layout of lab buildings based on the diagrammatic model Figure 9-12. Please note this is a conceptual diagram and not a site plan.

One possible conceptual layout of lab buildings based on this diagrammatic model is shown in Figure 9-13.The images of the buildings are representative diagrams, not the actual layout of the buildings to scale. In this scheme, all central shared and common facilities are shown in one location as a concept. The final distribution of buildings will be different, and the common buildings may be distributed within the site.

9.8 Building Costs

The specifications and environmental protections outlined above each come with cost implications for the construction of the laboratories. There is no flat land or basic infrastructure on the site, and access is very difficult. Before starting construction, the site must be cleared, levelled and equipped with new roads, bridges and utilities, all without polluting the coral lagoon with red soil run-off, and the buildings themselves must withstand seasonal typhoons and other natural hazards. The laboratories are necessarily more expensive to construct than most university laboratory buildings because of the requirements of multi-disciplinarity and comparability with the best science universities in world. Finally, laboratory construction costs are higher in Okinawa than mainland Japan because few major consultants and general contractors are qualified to do this work, none of which are local, which means that their specialist design and construction staff come from the mainland. In addition, there is a local construction boom in Okinawa, partly driven by the prefectural government's strategic investment in infrastructure to boost tourism and the local economy, leading to serious shortages of labor in basic construction trades like concrete formwork and reinforcement.

9.9 Meeting the Needs of an Expanding University

Currently the OIST administration is primarily in the Center Building with other parts scattered throughout the laboratory buildings and the Village Center. Research support facilities and classrooms are also distributed within the existing lab buildings. This interspersed arrangement may be possible for up to 100 units, but it will not be practical when OIST expands beyond 100 units. Our estimates (see Table 9-2 and Appendix C) indicate that when OIST houses 200 units, the total population will exceed 3,500 people, and about a quarter responsible for the management of OIST, which will then include ten laboratory buildings located on the various buildable areas of the site – in some cases several hundred meters apart.

Table 9-2 Estimated growth data of OIST from 100 to 300 faculty research units

OIST Cumulative Growth Data	Number of Faculty Research Units										
	100	200					300				
Lab Buildings	1-5	6	7	8	9	10	11	12	13	14	15
Research Units	100	120	140	160	180	200	220	240	260	280	300
Number of Research Staff	928	1,093	1,261	1,429	1,597	1,757	1,918	1,078	2,239	2,399	2,559
Number of Admin. Staff	322	354	384	413	443	480	517	553	590	627	664
Number of Students (all)	337	403	470	437	603	669	736	802	869	935	1,002
Total Population	1,687	1,970	2,254	2,439	2,823	3,106	3,390	3,674	3,958	4,241	4,525
On-campus Housing Tenants	557	650	744	805	931	1,025	1,118	1,212	1,306	1,399	1,493
Pre-school Children at the CDC	181	211	241	261	302	332	363	393	423	453	484

Beyond 100 units, we will need a central, core administration facility to oversee the entire campus, with smaller administration teams stationed in each laboratory building to respond to the daily needs of the users in these buildings. Other common areas, such as research support facilities and classrooms, will also have to be centralized and accessible to all.

The following is a list of administrative and other common facilities that will require alternative planning models compared with the existing models used during the 100-RU stage.

Administration Facilities: One building will likely house the entire central administrative staff of OIST, including upper management, executives, deans and the core members of each division. A smaller number of administrative staff may be located in each laboratory building.

Education Facilities: Classrooms, lecture halls and other education facilities would preferably be located centrally, providing opportunities for the students and research members to meet.

Special Research Laboratories: Animal facilities and other common laboratories such as nuclear magnetic resonance imaging will be outside the unit lab buildings, preferably with the education facilities when possible.

Central Library: A central library, which might not be a traditional library, will be accessible to all members of OIST. This library could be combined with an OIST museum and a welcome center. It is also possible to combine this facility with the central administration to avoid separating the administrative staff necessary for the management of this facility.

Auditorium: The current auditorium, with a capacity of 500 seats, will not be able to respond to the needs of OIST beyond the stage of 100 research units. A larger auditorium will be necessary soon after the completion of Lab 6 when the total population of OIST may reach 2,000 or more.

Child Development Center and Other Education Facilities for the Children of OIST Staff: The CDC at its current location, with some additions, may be able to respond to the needs of OIST parents until the 120-RU stage; however, an alternate location will be necessary beyond this stage. Future elementary and high school facilities will also require a location.

On-Campus Housing: Existing housing units, plus the additional units planned for construction on the land allocated for possible housing on the main campus, will only be able to respond to the needs of OIST until the full occupancy of the Lab 4 building. Alternative plans will be necessary for any housing beyond Lab 4 (see Section 9.10).

Sports, Recreation and Community Center Facilities: Currently, OIST lacks any such facilities, but they will be increasingly necessary as the population of OIST continues to grow. Due to the lack of buildable plots on the main campus, other properties, such as the Seaside House, the North Campus or off-campus sites shall be considered.

9.10 The North Campus and the Economic Zone for Innovation

When we have created a science and technology ecosystem around OIST, we will need space for an economic zone to host small and medium-sized innovative enterprises (see Chapter 4), which is not available on the current site. In addition, there will be a need for more housing, a location for a school (see Chapter 8) as well as other recreational and sports facilities that are beyond the capacity of the current site. It should be noted that there is a serious shortage of housing in the vicinity of OIST and costs are increasing due to the growth of the tourist industry in the region. These factors make it urgent for OIST to secure land for on-campus as well as off-campus housing. The present campus can accommodate growth to 300 faculty units together with the associated administrative and technical support infrastructure, the library, the auditorium, some housing and a small R&D zone for incubators and small startups, but not more. There is also an excellent location for a school close to the new Onna Junior High with potentially good access to the Expressway at Yaka, which is also important for the Economic Zone. There is a need for investment in infrastructure (roads and utilities) before the site can be developed, and the road between the main campus and the Akama Sports Center would need substantial improvement to allow good connectivity between the two sites. There is therefore a strong interest in developing the North Campus (see Figure 9-14) as a mixed zone (housing, industry, recreation and a school) as soon as possible. Figure 9-15 shows an artist's impression of the North Campus layout.

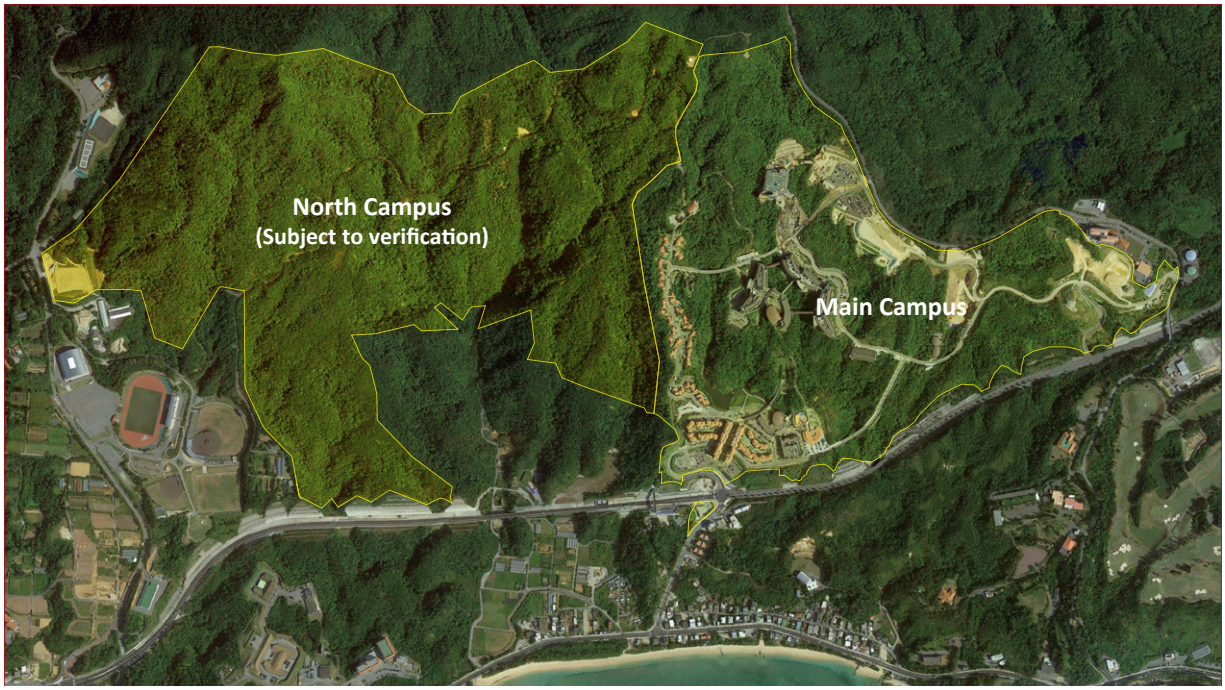


Figure 9-14 Map showing the location of the North Campus and the Economic Zone. Map data: Google, TerraMetrics.

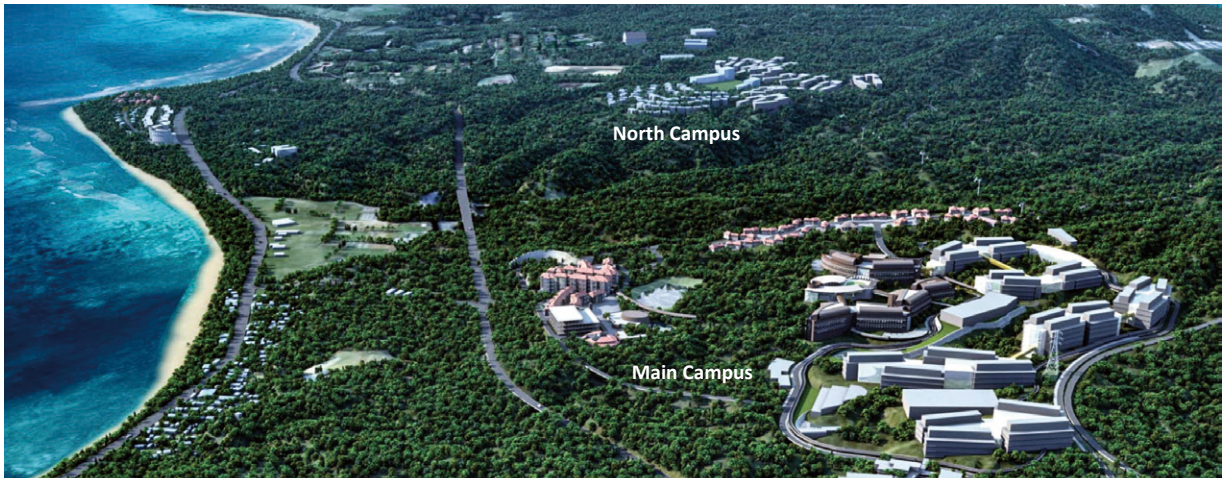


Figure 9-15 Artist's impression of the layout of the North Campus showing the Economic Zone and "university town"

Chapter 10.
Developing Our Communications

Strategic Goals

13. *To advance the OIST brand and our international reputation in research, education and innovation, we will broaden the communication of our achievements locally, nationally and globally. We will strengthen our communications with our former students and colleagues through an alumni-relations team and develop an integrated, high-impact communication strategy to support fundraising.*

14. *To strengthen our internal communications, we will develop an open culture that embraces and values diversity, promotes harmony and well-being and allows everyone to express concerns or opinions freely.*

OIST has made outstanding progress since it was founded in 2011. We have rapidly become a research university that attracts some of the best graduate students, researchers and faculty from across the globe. At this stage in our history, the quantity and quality of OIST's scientific output compare very favorably with some of the top research universities across the world as reported in Nature Index in 2019.[1] Further growth in researchers, students, administrative staff, infrastructure and financial support is essential if we are to build upon this success and become a global university for research, education and innovation. We must continue to establish and nurture relationships with the public and private sectors, explore and introduce ways to generate alternative sources of funding and create new employment opportunities.

The university must be promoted to a broad audience if we are to achieve our ambitious goals. This requires global recognition for our world-leading research, education and innovation. We also need to be the partner of choice if we want to foster innovation and promote entrepreneurship. Increased visibility is essential if we are to promote economic growth in Okinawa and bring benefits to Japan and the rest of the world.

All of this requires a communication strategy and brand that is firmly grounded in the university's strategic priorities. This communication strategy must clearly differentiate OIST from its competitors and raise the visibility of the university nationally and internationally. It must also meet the expectations of all employees, partners and other stakeholders.

10.1 An Integrated High-Impact Strategy

The university will double in size in ten years. This growth will only be accomplished by significantly increasing faculty, staff, infrastructure and resources in a way that continues to deliver world-class research. As the university grows, there is an opportunity to widen financial support for certain activities from public and private sources. Our assets must therefore be promoted to a diverse audience that includes scientists, funding agencies, government, companies, philanthropic groups, high-net-worth individuals and others. Central to this effort is the need to communicate the value of OIST to all audiences in a way that is easy to understand and compelling. Critically, all communications must support the culture of OIST in a way that is fair, transparent and credible.

There are many opportunities to define messaging that will strengthen awareness of the university in Okinawa, Japan and across the globe. The communication strategy will reflect the outcomes of the strategic planning process and support the identity and branding of the university. In addition to its existing focus on communications, new and emerging audiences will be part of this effort for including alumni; a wider public interested in OIST merchandise; a wider community served by a new

1 https://www.natureindex.com/annual-tables/2019/institution/academic-normalized

library, archive and other planned OIST facilities; as well as scientists interested in the future of the Conferences and Workshops Program. This will complement the established communication priorities in research, education and innovation.

All communication projects will be carefully aligned with the strategic direction of the university (see Figure 10-1). Some of the key initiatives include providing the financial security needed to grow OIST, converting scientific discovery to commercial value, delivering the services needed for the OIST scientific community and attracting and training the next generation of scientists.

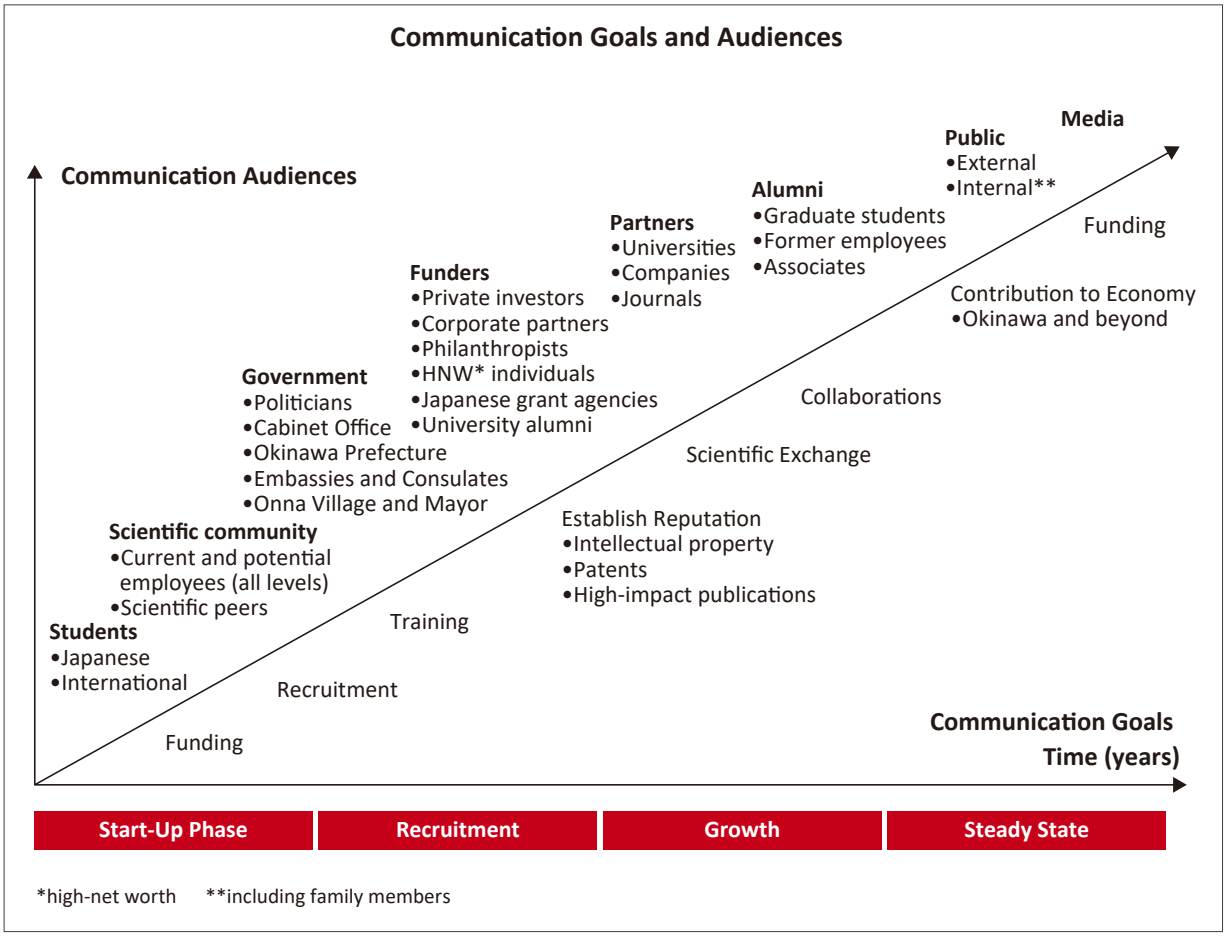


Figure 10-1 Key audiences for OIST communications

The target audiences for OIST's communication and branding can be divided into three broad groups, with some overlap among the three: (a) national and international audiences, (b) Okinawa and the local community and (c) OIST staff. National and international audiences include philanthropists, high-net-worth individuals, high-risk/high-value innovative funders, Japanese funding agencies, Japanese government, the global business community, university alumni, grant agencies, corporate partners (biotech companies, pharma companies and IT companies), individuals in the scientific domain (scientists at other universities, institutes, not-for-profit organizations and private-sector companies), national educational organizations, the student population, future employees, the general public, the media, OIST ambassadors and others.

Local stakeholders include the Okinawa Prefecture, the Okinawan community, schools in Okinawa, local universities, the American Consulate, the OIST Foundation, Onna Village and the Mayor's Office. OIST staff include all employees working in administrative, education and research positions at OIST.

OIST has achieved much since it was founded in 2011 and will continue to advance research, education and innovation for the benefit of society. It is important that the achievements are effectively communicated to its audiences.

Some of the major priorities for OIST and its communications going forward are as follows:

- Make the achievements of OIST more visible to the Okinawan community
- Make the achievements of OIST more visible to Tokyo, mainland Japan and the Cabinet Office
- Promote OIST achievements in technology development and innovation
- Support new opportunities for diversified financial support, philanthropy and a future endowment

In Okinawa, OIST has been developing its community relations activities for some time. Each year more than 20,000 visitors from Okinawa come to the university. One of the most popular events in the year is the OIST Science Festival, which receives around 5,000 visitors during this one-day event. In the next ten years, we need to build on this success. One priority will be to develop hands-on science activities that allow students from Okinawan schools to learn in depth about specific science projects relevant to OIST research and to develop ideas that may be suitable for an entrepreneurial environment. At larger universities, STEM activities are often built in components of grant applications by faculty to funding agencies. Such projects may have planning and implementation phases that span three years. OIST needs to transition its outreach activities to longer-term initiatives. This will lead to more engagement with STEM activities for Okinawan school children and help inspire the next generation of scientists. The university recently launched a series of science talks that take place in Naha, which have proved very popular. We will consider more outreach activities that involve OIST staff participating in activities held outside OIST since this strengthens ties with the Okinawan community. Collaboration between OIST and the Ryukyu Shimpo newspaper attracted around 600 school children to a scientific talk in Naha given by Professor Shinya Yamanaka. The university plans to build on this partnership with the Okinawan media to hold similar high-profile events in the years ahead. A more detailed description of OIST outreach events is included in Section 6.1.

OIST is located in Onna Village. A crucial part of communicating OIST's achievements and the value of its work to Okinawa is increasing interaction with the Office of the Mayor of Onna. Our president recently presented before the Onna Assembly, and we plan to have more frequent meetings to complement the shared activities such as the Science Festival that are already in place. This will include updates on OIST research achievements as well as plans for the future expansion of the campus.

OIST needs to be more visible in Tokyo and mainland Japan, and its achievements and needs must be visible and communicated to the Cabinet Office. To raise the visibility of OIST among these audiences, the university has opened an office in downtown Tokyo as a pilot project. The goal of this office is to enhance OIST's visibility and collaboration with industry and academic institutions. The Tokyo Office will provide meeting and working space for networking with industry and universities, be a forum for the dissemination of information about OIST, permit student recruitment in the Tokyo area and serve as a liaison office for fundraising activities. The office will also serve as a forum to communicate OIST's initiatives and achievements in technology development and innovation to politicians in Tokyo. Funds for the Tokyo Office are part of the FY2020 budget request.

OIST wants to serve as a hub for research, education and innovation in Southeast Asia. This is essential if it is to attract talent and investments to support entrepreneurial activities. Conferences and workshops have served OIST well in raising the visibility of the university around the globe. Jointly held conferences and workshops can also serve the university well as it looks to build relationships and partners in Southeast Asia. The conference held jointly with Academia Sinica in 2019 is a good example of what can be achieved for academic partnerships. Faculty give presentations that serve to identify areas of mutual interest. Relationships can be established that may lead to new research projects and potential joint appointments. This type of event also serves a purpose for the entrepreneurial activities of OIST. The OIST Forum, which in 2019 focused on Deep Tech and was held in Tokyo, helps raise the visibility of OIST in the startup community. Careful selection of the media partners for such larger events can help enormously in positioning OIST as a preferred partner for innovation. The Conferences

and Workshops Section of the Communications and Public Relations Division will explore ways to integrate these types of events into its annual program.

Over the years, OIST has established contacts with journalists in many countries. The Media Section works to foster relationships with these journalists and publications, which helps achieve visibility for future OIST research. Knowing the expertise and beats of the writers across the globe covering the topics linked to OIST research is a big asset when pitching new stories and achieving coverage.

Developing and improving all the communications tools available to the Communication and Public Relations Division will be crucial for success (see Figure 10-2). The communication group will also have to expand its expertise to match emerging needs in digital communications, social media and content generation. The strategy for improvement and acceleration of activities entails some reorganization of the communications group and changes in priorities. In particular, this includes the strengthening of content and publication output in digital and print formats.

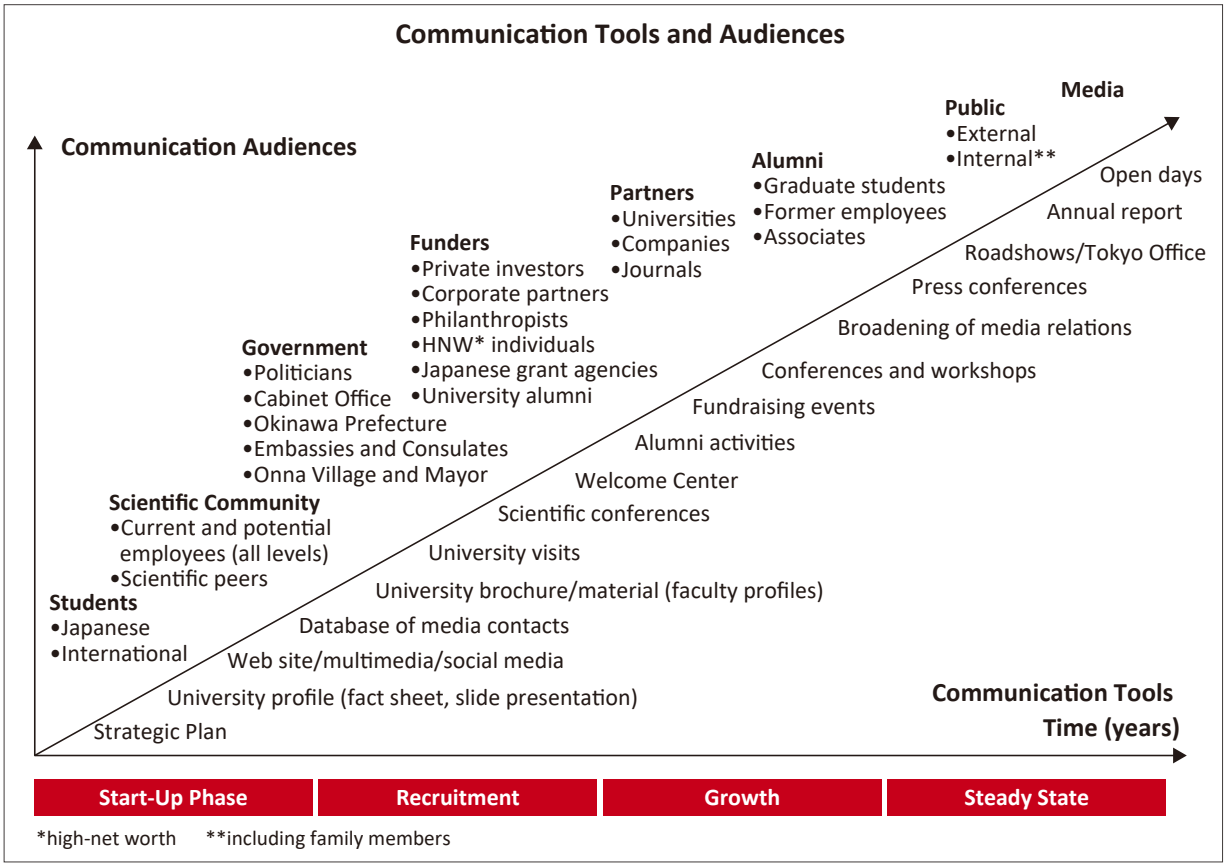


Figure 10-2 Key communication tools for OIST communications

Japan is a unique environment for newspapers and the media. Print newspapers still hold influence and have a wide readership, more so than in Europe and the United States where the shift to online publications has been dramatic and, in many cases, detrimental to the quality of news reporting. There is therefore considerable value in building targeted relationships with the leading Japanese newspapers and journalists, including the Asahi Shimbun, Mainichi Shimbun, Yomiuri Shimbun, Sankei Shimbun and Nikkei Shimbun as well as The Japan Times. The bilingual nature of OIST communications needs to be reflected in staffing in key positions including media relations. Communicating the scientific achievements of OIST to the global research community also brings value and can help with recruitment, collaboration and partnerships.

Cross-disciplinary science is not new and can be found in many universities and research organizations. OIST does however have unique attributes that when fitted together can serve to differentiate the university. Okinawa is certainly a one-of-a-kind location. We make direct contributions to the Okinawan

community and enjoy close relationships and many shared activities with the local community. It is also an inspiration for research and shared projects in areas like marine biology, conservation, energy and ageing. We have strong assets that can help advance the international reputation of the university. Our researchers benefit from high-trust funding, work in a cross-disciplinary environment and are given freedom to pursue scientific excellence. Our scientific community has access to outstanding equipment and facilities. OIST employees comprise a group of diverse international staff from around the world. There is a diversity of talent in administration, education and research who enjoy an exceptional quality of life in an attractive and inspirational setting. OIST is significantly different from any other research university in Japan in terms of the diversity of its staff. All these features are important messages to support our communication strategy.

10.2 Internal Communication Strategy

As part of the strategic planning for 2020-2030, OIST has established a core set of values for its community. These values include excellence, respectfulness, responsibility, transparency, sustainability, diversity, courage and freedom. If OIST is to be successful, we need to hold ourselves accountable to the highest ethical standards and uphold these core values. A crucial part of ensuring that we do not lose sight of these goals is to have regular internal communications that remind everyone of this commitment. We also need to provide regular opportunities for discussion about how we are doing in our efforts in all of these areas.

As we continue to grow over the next ten years, internal communications will need to be strengthened to help the development of a cohesive campus and community. Improvements to internal communications can be made at many levels, including information, tools and activities. All improvements will be targeted toward ensuring the further development of a friendly, inclusive and productive culture based on respect and an appreciation for diversity.

Informal opportunities exist across the growing campus for new internal communication strategies. Opportunities will be encouraged for face-to-face interaction. The currently successful OIST clubs and teatime events will be nurtured and expanded as the campus grows, the number of buildings increases and the number of employees becomes larger. It would be beneficial to develop more meetings and social events that promote the interaction of scientists with administrative staff. This becomes more critical as new buildings arise and new communities linked to these new buildings develop.

Internal seminars at OIST cover a wide range of topics of interest to many staff at the university. As these activities scale, it will be important to communicate effectively across the OIST campus in a timely manner about topics, speakers and location. A weekly email will summarize what is in store with customized options available for different staff members to notify themselves about relevant topics. We will consider having a dedicated team responsible for the coordination and communication of campus-wide events and publishing a master calendar with the appropriate support of information technology resources. This is a feature of the strategic communications group at Caltech and other universities.

New opportunities exist for joint social events, the expansion of language-education courses, the redistribution of staff among buildings and research groups, information sessions as well as the communication of the university's Mission, Vision and Values and Code of Conduct.

Once we have attracted the best talents to OIST, we need to not only support their professional development but also to engage with them continuously. Clear internal communications, policies, and procedures will lead to institutional engagement and higher job satisfaction and employee retention. A clear set of core values and commitments is a critical starting point for engagement and can be achieved through long-term strategic plans. With this Strategic Plan, values and annual goals were discussed and developed with input from all employees to promote ownership and engagement.

In Chapter 7, we outlined how OIST plans to develop individual potential to achieve its common goals. Critically OIST will have to build new communication channels to support the internal communications

needed for these activities on a growing campus. This will include having more opportunities for the Executive Committee to communicate directly with OIST staff, defining regular speaking events for OIST management, and having informal gatherings to allow more direct communication with the president and other leaders. The Strategic Plan itself serves as a valuable tool for internal communications and a plan will be implemented to regularly communicate the OIST Purpose, Vision, Values and Mission as well as the Core Values of the university. Messages can be cascaded through the university to build the OIST culture. Employees should regularly receive publications, have access to digital communications and be able to attend events supporting these efforts.

While the main focus of improving internal communication will be people, OIST will take advantage of new communication tools to support its improvements. One goal will be to develop and strengthen high-impact, scalable digital technologies, including the internal and external websites, to improve communication within the rapidly growing OIST community. A longer-term goal is to build a new enterprise-wide intranet that serves as a workspace and source of news to inform the growing OIST community. In time, all OIST events and talks should be recorded and made publicly available.

Every voice counts at OIST. As we grow, our community will become more diverse and the challenges we face will become more complex. Our success in research, education and innovation will be enhanced by proper internal communication channels with all groups as we build forward-looking relationships across the university. This should help to build the culture of OIST in the years ahead.

10.3 Alumni Relations

In 2011, the OIST Graduate University received accreditation from the Japanese government and the first graduate students started classes in 2012. Six years later, OIST held its first graduation ceremony and celebrated the outstanding achievements of the inaugural class of PhD students.

Currently, approximately 200 graduate students are at OIST, and the number of alumni from the graduate school will grow by around 30 to 40 graduates each year. In the next 10 years, the number of alumni will reach some 500 highly skilled individuals who will pursue a wide range of professional occupations across the globe.

Our alumni are a diverse group of individuals – not only students but also past employees from all parts of the university. In a wider sense, alumni can also include associates who may not have had a role at OIST but who may wish to make important contributions to the university. Alumni interact with different communities that include OIST staff as well as employers, potential new staff and other individuals in their personal networks.

Alumni are crucial to the success of the university. They serve as ambassadors for OIST all over the world and may contribute to progress at the university once attended. Crucially, they can also provide valuable guidance, increase awareness of OIST and eventually provide financial contributions. Most larger universities have an alumni relations staff whose goal is to engage their alumni community. As we graduate our second class of PhD students, we are strengthening communications, introducing a Career Development Program for current graduate students, mentoring alumni, establishing an alumni-relations team and helping to foster institutional pride.

Engagement will be built over time into a systematic alumni relation program. We provide an OIST email address for all graduates and staff who leave the university, which is one way to keep in touch with the growing community. While alumni may subscribe to the OIST newsletter, only limited targeted communications have been sent to these individuals.

10.3.1 Strengthen Communications

The success of engagement with OIST alumni depends to a large extent on strengthening communications with this audience. Much of this outreach can be achieved through digital communications, which may require collaboration with the Information Technology Division to support existing efforts and to create new ways to engage the community. In the next three

years, we will implement a customer relationship management (CRM) system that will serve as an online platform to keep track of the growing alumni community and automate some of the tasks associated with effective engagement. We have a significant opportunity to improve our web content and outreach to the alumni community, which could include more videos, the use of newsfeeds as well as protected access to a directory of current alumni. A website contact form that is managed by OIST staff in the alumni group will be introduced to provide responses to inquiries. Digital outreach will be complemented by regular contact through mailings of an official alumni magazine that also summarizes an annual calendar of events for alumni activities. The regular news from the OIST Communication and Public Relations Division, including the intranet and external website, will also include feature stories about alumni and their achievements to strengthen ties between all OIST staff and former employees.

Communication and public relations at OIST will communicate more alumni stories as the number of alumni increases. In addition to in-person events, we will also plan for virtual activities that build a sense of community. Other leading research universities steadily increase the engagement with alumni once they have left their organizations. Typically, it is best practice to start to arrange events that are more focused on potential donations in a timeframe of three to five years post-graduation. For OIST these activities will be put in place within three years.

10.3.2 Establish a Career Development Program

Graduate students and alumni from all parts of the university share much in common, including the need for career guidance for different stages of their professional lives. They are lifetime learners who benefit from contact with career advisors, mentors and potential employers. Such activities need to be integrated into the OIST alumni program. The information gathering that can occur from this type of support needs to be continually channeled into an operational alumni database that can serve as a significant source of leads for potential fundraising.

10.3.3 Establish a Mentorship Program

An internationally competitive alumni program requires an effective mentorship program that can be introduced incrementally. As a first step, OIST Graduate School staff can establish relationships with OIST alumni, forming a community where the alumni-relations group could have regular in-person contact. A goal will be set for the number of alumni who could have a mentor. For example, a starting point could be three alumni per mentor or another agreed-upon target. Researchers staff members and other alumni will also be encouraged to participate.

10.3.4 Build an Alumni Team at OIST

Initial staffing projections for an alumni team include one full-time employee as a program coordinator, one full-time employee for information technology support (for digital tools such as the customer relationship management platform) and one full-time employee for career development. Staffing needs will be coordinated with the staffing requirements for alumni outreach in the Graduate School to prevent any redundancies.

10.3.5 Build Institutional Pride

A successful alumni-relations program helps to build institutional pride but also requires effective engagement. We can build on the success of existing activities and create new opportunities to strengthen engagement virtually. We will build on the Communication and Public Relations Division's expertise in digital services and audio-visual support to livestream all OIST events and lectures and produce webinars of interest to the wider scientific community where many alumni will be employed. Alumni events can be held at different locations across the world that are known to be close to where OIST alumni reside or attend scientific meetings. These events can be primarily informal social gatherings that allow for networking. We will also consider holding scientific speaking events specifically targeted at the alumni community.

In time, the OIST Foundation office in the United States and the OIST Tokyo Office will be suitable locations for speaker events targeting alumni. To make these activities successful, it is essential that contact is maintained with all alumni worldwide.

10.3.6 The Future of OIST Alumni Relations

Alumni events can be organized wherever past students and alumni of OIST attend meetings, including luncheons and dinners; go on trips with OIST staff; and interact socially on other occasions, such as holidays. Discovery weekends at OIST or another suitable venue could be part of the immersion of OIST alumni where they get to experience OIST science and students first-hand. In time, alumni relations at OIST will be part of several fundraising groups at OIST. Alumni relations will work in parallel with the activities of annual giving and other programs put in place for fundraising and will help toward building an endowment. A fully staffed alumni group at OIST would probably be around seven people.

10.4 Promoting the OIST Brand Through Merchandise

Most larger universities have developed ways to provide attractive merchandise to the broad audience interested in these items. This is one of several opportunities for OIST to secure additional funds to support university activities.

The audience for such merchandise includes OIST staff and family members, invited guests, individuals who have no immediate connection with the university but are excited by its mission (including local and international tourists) and other ambassadors of the university. A goal for OIST is to establish a permanent outlet and resource for high-quality attractive merchandise that generates funds for university activities and promotes the OIST brand to visitors, staff and anyone interested in the university.

Currently OIST produces a limited selection of merchandise that is available to the OIST community from the convenience store on campus. The sale of these items does not generate revenue for the university but does serve to promote the OIST brand on a small scale. Merchandise is currently limited to clothing, stationery and cups, but expansion of the offerings has not been systematically considered. Access to these items is also restricted, and they are not available from other locations on campus.

Some items are available from the Communication and Public Relations Division and the Graduate School, which are used as promotional materials, but which are not made widely available to the OIST community and beyond. There are many options for environmentally friendly merchandise, such as cups, lunch boxes, reusable straws and bags, which could be sold at a profit. In addition, we can expand the range of merchandise to include different types of clothing, sportswear, gifts, toys, science museum-style gifts and other branded items. A market survey of OIST staff will be conducted to see which items could be included in the first phase of the expansion of merchandise. A wider range of merchandise could be made available via an on-line OIST store that would be complemented by a small- to medium-sized physical shop on the OIST campus. A future visitor center would be an ideal location for a shop. In addition, we will consider making merchandise available at high-traffic locations, for example at Naha Airport or some of the local hotels. In the latter cases, an agreement could be made with existing vendors to include some OIST-branded merchandise in their offerings.

The Conferences and Workshops Program is also an excellent venue for the sale of merchandise that has the potential for global reach. Many scientists attend these events and can return to their home countries or countries of residence with OIST branded merchandise.

If we are to make the step from providing merchandise at no cost to it becoming a commercial enterprise, official permission is needed for OIST to engage in a revenue-generating business and for this to be stipulated in the bylaws of OIST, requiring approval from both the Board of Governors and the Cabinet Office. It also requires prior approval from (MEXT). These steps will be initiated at the earliest opportunity.

10.4.1 Strengthening the OIST Brand Through Merchandising

The sale of OIST merchandise is an opportunity to expand the reach of the OIST brand. Branded articles sold at high-traffic venues have the potential to reach the general public in Okinawa and countries around the globe where ambassadors of OIST visit or live. It is possible to market OIST through social-media posts of individuals wearing or using OIST-branded merchandise. Such reach is international and a low-cost way of promoting the university to a wider public.

Both an online presence and physical stores will allow OIST to track products sold to project future growth of commercial offerings and stock the most popular products.

OIST employees and staff will have more options to acquire high-quality merchandise. The sale of a wider range of merchandise will also have an impact on the external communications and visibility of OIST. It serves as good publicity for the university and can be used in public-facing venues and events. OIST logo pins can be worn by OIST people at meetings and conferences and at media events. This is a small but effective way to contribute to the visibility and reputation of the university. In Okinawa shops, OIST-branded bags will send a positive message about sustainability and the environment. The inclusion of OIST-branded gifts such as omiyage offers an opportunity to increase awareness of the university in Japan and Asia.

The availability of OIST-branded clothing builds community within the university. OIST staff could be asked to help design some of the merchandise offerings giving them the opportunity to be creative outside of their scientific or administrative duties, strengthening engagement while benefiting the university. In Okinawa, beach-cleaning efforts, environmental club activities, OIST dance events and musical evenings all offer opportunities for promotion of the university. Events and activities at OIST are great talking points for visitors about the merits of the university, translating into enthusiasm for merchandise and the propagation of the OIST brand. The OIST alumni community will also be interested in OIST merchandise as ambassadors for OIST.

In time, funds from the sale of merchandise can be used to support selected OIST activities.

10.5 The OIST Library

Libraries are critical to the success of a modern university. They provide access to information that supports education and research, offer a welcoming learning environment and cater to an increasing number of activities that support the advancement of knowledge. A modern library provides access to printed and online materials, reading areas as well as public access to computer resources. As part of our promotion of Okinawa we will make the library a vehicle for professional and social enrichment by expanding its cultural scope as well as developing an institutional archive.

The traditional roles of libraries have been rapidly changing as new technologies have impacted learning, offering new opportunities for the modern library to consider. The OIST Library supports scientists looking for information to advance their research and students looking to further their studies for their graduate work. Increasingly scientists and students have online access to research articles published in journals which means that they spend less time going to the library. However, libraries still maintain print copies of journals should researchers want to consult and use them. They have also evolved to include staff who provide guidance to scientists and researchers on the best way to search and access online papers, on open-access policies and on copyright issues.

As we increase in size, the library can assume new roles that will assist the development of the university. Until now OIST has encouraged staff to submit their publications and data to the library archive. OIST graduates are required to submit copies of their PhD theses to the library upon completion, and researchers are required to submit their latest publications to help build the OIST repository of scientific publications. More active follow-up to ensure that authors actively submit their publications for inclusion is needed in order to create a comprehensive institutional repository that reflects the historical output of the university.

The OIST Institutional Archive will not only include scientific papers and books; it will also include a catalogue of holdings, oral histories, historic documents and objects of interest. It will also be the custodian of OIST's history by preserving and sharing archival materials that help tell the OIST story. In this way, the library is responsible for and provides access to the intellectual output of the university. It can also help to fulfill the university's mission of making its work freely available to society through open-access publication.

The OIST library offers significant opportunities for community engagement and could expand to become a cultural center for the university and Okinawa. It could also attract people to campus who might be interested in OIST merchandise. By expanding the cultural scope of the library, OIST could take a major step toward serving the needs of the wider Okinawan community. The venue could become a hub for the many existing associations, clubs and other OIST groups as well as for future activities that entertain, engage and educate audiences in a way that is consistent with the mission and social needs of a growing university. Such an expansion of the services and engagement activities of the library may require changes to the existing infrastructure and building to accommodate visitors who would attend cultural activities integrated into the program of the library.

10.6 Conferences and Workshops

Since it was started in 2005 in the era of the OIST Promotion Corporation, the Conferences and Workshops Program at OIST has played an important role in building awareness of OIST within the wider scientific community.

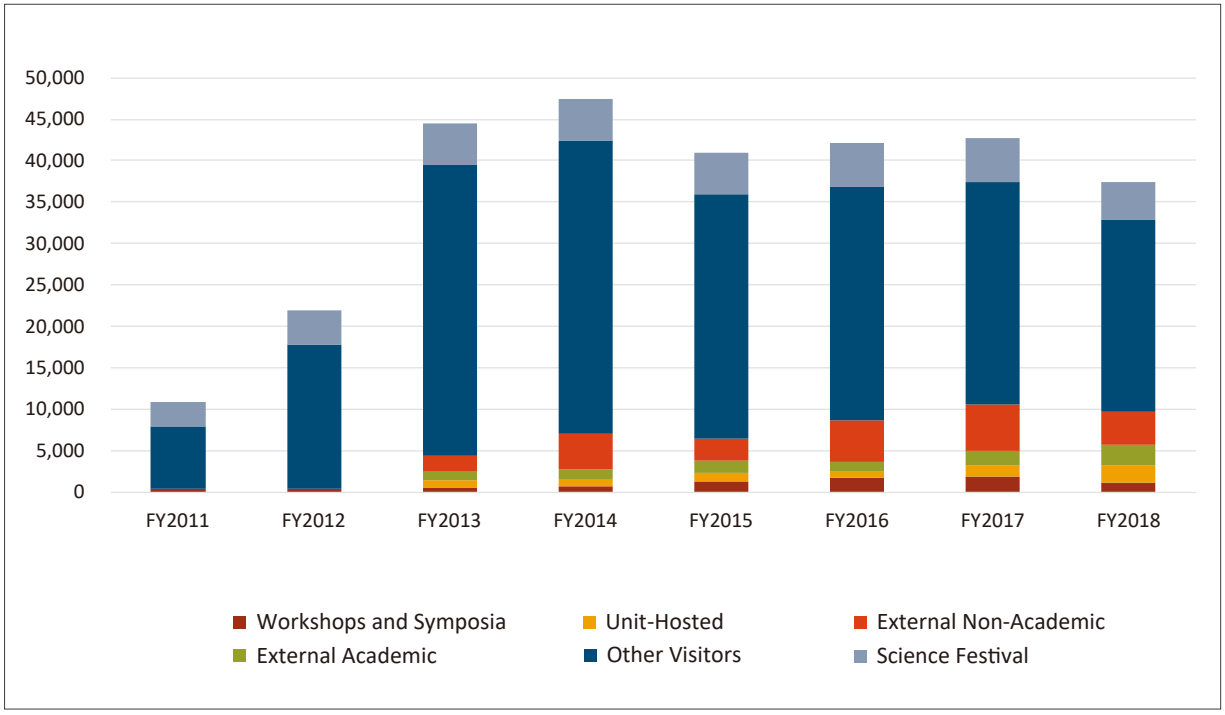


Figure 10-3 Number of visitors to OIST campus 2011-2018 for conferences and workshops and community relations activities

It has brought a wide range of scientists to the university where they can hear about the latest developments in research in their areas of expertise (see Figure 10-3). The program has been an excellent introduction of the external scientific community to the university and has helped immeasurably in the recruitment of faculty and staff to OIST. While the program has grown to offer world-class conferences and events that attract some of the leading experts in fields of interest to OIST, there are areas for improvement. It is essential to improve the experience of participants in OIST conferences and workshops programs and to introduce an easily scalable and sustainable system for the design, planning and organization of events.

The Conferences and Workshops Program caters to students, researchers and the wider public. It is an international undertaking that serves leading scientists from OIST, Japan and the rest of the world. The organizers of these events are some of the leading experts in their fields, and their contributions help to attract sponsors and partners from all over the world. The faculty of OIST play an important role in selecting the topics for workshops and ensuring that the program maintains its high level of quality and relevance to the scientific community. Sponsors include government, industry, partner universities and other research institutes and organizations.

Currently the program is supported by an internal conferences and workshops team that helps organize the annual program at OIST. This team assists in making travel arrangements, reserving meeting space and assisting the faculty of OIST in the day-to-day operations of the Conference and Workshops Program. They have been able to meet the needs of the program as it has grown at OIST. As OIST expands its range of research with new faculty, the Conferences and Workshops Program will need to be strengthened to accommodate the projected increase in activities in the coming years.

Some of the constraints on current activities include the lack of a structured plan for OIST conferences and workshops that has a longer-term strategic outlook. In some cases, activities are constrained by the lack of availability of lodging, dining and transportation. Seaside House is an attractive venue to host events but not sufficient to meet the needs of the program as it expands. We have an opportunity to provide further venues for conferences and workshops in a very attractive setting.

We will ensure an effective cost-recovery strategy is established that ensures the sustainable growth of the program, including financial support through sponsorships, advertising to increase attendance, an annual plan for posters, active promotion by OIST scientists in presentations at leading scientific meetings and digital marketing.

The regular selection of conference and workshop themes will help build OIST's presence as a geographic hub for research, education and innovation. Holding joint conferences on particular scientific areas in partnership with leading Asian and Japanese institutions, international universities and other organizations will build the reputation of OIST as the partner of choice in the region.

As the Conferences and Workshops Program grows, OIST will invest in a centralized customer relationship management tool that permits easy access to data on participants to measure impact and improve future events. This system will provide easy access to information on the numbers of conferences, workshops and courses held each year and the number of participants, the usage rates of different venues and facilities as well as the cost-effectiveness of the different events. It will also permit a master calendar of events to be generated and easily shared.

10.6.1 Scaling Up

As the Conferences and Workshops Program expands it will need further resources to complement what is currently available on the OIST campus. The expansion of the campus with new laboratory buildings will include conference space for 200 to 300 people, provide space for poster sessions and have opportunities for dining or the sustainable delivery of meals for conference participants. All these events require efficient transportation solutions that could be facilitated by having a travel agency on campus. This return on investment would include greater visibility of OIST locally, nationally and internationally.

Chapter 11.
Resource Requirements and Funding Strategy

Strategic Goals

15. *To build on our outstanding research and education achievements and to plan efficiently for growth over the next decade, we will work with the Cabinet Office to evolve our current high-trust funding model into long-term stable funding and reasonable multi-year projections for both the baseline and investment budgets to enable our scientists to pursue ambitious and challenging frontier research across disciplinary boundaries.*

16. *To complement the baseline funding, we are committed to generating additional resources through external grants, sponsorships and philanthropy by providing attractive opportunities for collaboration in areas of mutual interest, without compromising our autonomy, scientific freedom or ethical principles.*

The Japanese government made a courageous decision in 2004 to invest in a new type of university in Okinawa with the explicit aim of rapidly becoming one of the world's leading cross-disciplinary universities. We have shown that this dream is achievable based on our accomplishments to date in only eight years as a graduate university. We have built a well-designed and attractive campus that promotes collaborative research, which is proving to be a magnet for the international scientific community, creating an intellectual scientific hub in Okinawa and benefiting the Southeast Asia region. We have already had an impact upon the local economy.

This Strategic Plan lays out an ambitious but realistic roadmap to grow to the 300 research units envisioned by our founders to join the ranks of the world's best universities. To achieve this goal requires further investment and long-term, stable, high-trust funding. While this funding model is relatively rare, it is used by other prestigious institutions such as the Max Planck Society and IST Austria. High-trust funding is provided up-front, and the results undergo robust peer review afterward; the model is very efficient in encouraging exploration of new ideas and new methods, especially when compared with more traditional, grant-based funding models that are often limited in impact because of the innate conservatism and risk aversion of peer-review panels, not to mention the diversion of precious time to find appropriate funding schemes and write grant applications.

The previous chapters have set out a bold and ambitious Strategic Plan to realize the dream of the founders of OIST, namely to create in Okinawa a world-leading graduate university doing outstanding research, producing exceptional graduate students and promoting sustainable development for the benefit of humanity. The resources required to support these ambitions are presented here with a detailed budget projection and funding strategy to take us to the next major milestone – 200 research units and 600 graduate students by the early 2030s.

11.1 Expenditure

When OIST was established, it was assumed that the fully loaded cost would be about 200 million yen per faculty unit, resulting in a baseline budget of about 14.6 billion yen for 73 faculty in 2019 (before correction for 4% inflation over 15 years[1]). There are good reasons why the budget is larger than the rather rough estimates made in 2004. First, this estimate includes only research costs and not the necessary additional costs (education, technology-transfer, the costs associated with being an English-language institution embedded in a Japanese society and with dealing with the relative isolation of

1 This is an underestimate, since equipment and operational research costs have risen historically at a faster rate than general inflation in Japan

Okinawa from the rest of Japan and Southeast Asia). Second, OIST is a relatively small university but must provide all the administrative functions of a larger university, meaning that the relative cost of the administration is currently higher than most of our competitor universities.[1] If OIST is to grow as foreseen when it was created, the budget needs to increase.

The OIST budget can be analyzed in two ways.

1. By Category of Expenditure: This includes personnel (PEREX), operations (OPEX), routine capital equipment (CAPEX), major items of capital equipment such as high-performance computing upgrades, construction and infrastructure.
2. By expenditure sector: This includes research, education, computing and IT, facilities and buildings maintenance, administration, technology-transfer and innovation, university services, construction and infrastructure.

The total budget shows the resources required for the research and educational programs; the infrastructure, support and administrative services needed to sustain them; the recurring investments in the innovation and technology-transfer program; and the university services needed to recruit, provide for and retain staff and students, shown in Figure 11-1.

The baseline budget includes research, education, computing and IT, facilities and buildings maintenance and administration and their associated personnel costs. This baseline budget projection is based upon a staffing model (see Appendix C) for the PEREX contributions and the current model for the allocation of OPEX and CAPEX in research and other sectors (agreed upon by the Resource Allocation Committee). These projections are directly tied to the number of faculty and students, the total number of researchers, the total number of OIST employees and the size of the campus.

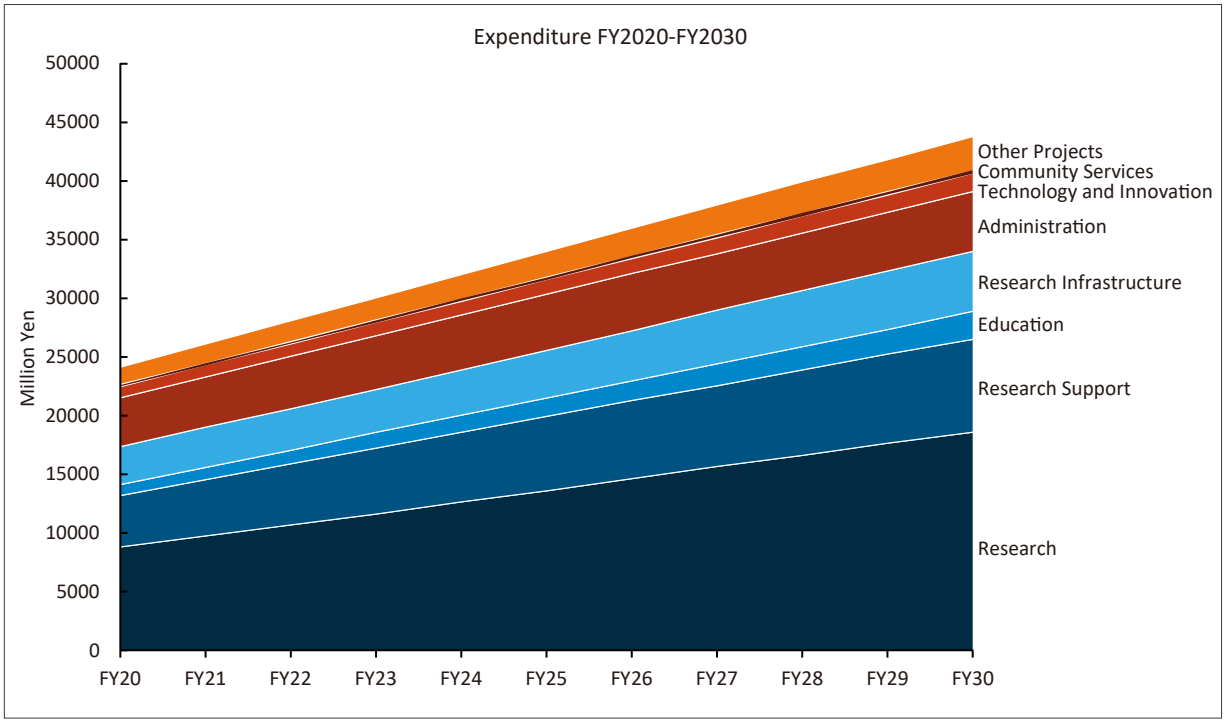


Figure 11-1 Total budget evolution from FY2020 to FY2030

Faculty units will grow at a rate of about ten per year for the next decade, an aggressive and ambitious goal that can be achieved with careful planning. The typical recruitment cycle is 18 months to two years, from defining the recruitment strategy to welcoming the last new member into the faculty. We

1 This can be understood since a university needs only one president, provost, chief operating office and the complement of deans and other vice-presidents and their offices. The number of staff required for a university with no faculty, researchers or students but with the capability of having them is not zero.

will open a new laboratory building every two years to accommodate the new faculty units based on the assumption that each building accommodates 20 faculty units as well as central support and administrative services (the Research Support Division, Provost and Deans' Offices).

Table 11-1 Optimized design and construction schedule of lab buildings for 200 units

LAB NO.	FY2020	FY2021	FY2022	FY2023	FY2024	FY2025	FY2026	FY2027	FY2028	FY2029	FY2030	FY2031
LAB 6	Budget	Design	Construction									
LAB 7			Budget	Design	Construction							
LAB 8					Budget	Design	Construction					
LAB 9							Budget	Design	Construction			
LAB 10									Budget	Design	Construction	

The five-year gap between the opening of Lab 3 and Lab 4 has been a serious limitation to hiring new faculty, which we will correct. As shown in Table 11-1, the timeline for the construction of a new lab building covers four financial years, from budget preparation through design and construction to occupancy, necessitating long-term funding commitments. A similar challenge exists in the procurement of major scientific equipment costing more than 500 million yen as well as the high-performance computing upgrades that are essential if OIST is to remain internationally competitive. These long-term building and major equipment expenditures would be much more easily and efficiently managed within a multi-year rolling budget that provides flexibility to manage construction and capital purchases across fiscal year-end boundaries. The investment profile for the construction of the laboratory buildings, associated other buildings (new central administration, research support building, library, etc.) and large-scale capital equipment investment is shown in Figure 11-2.

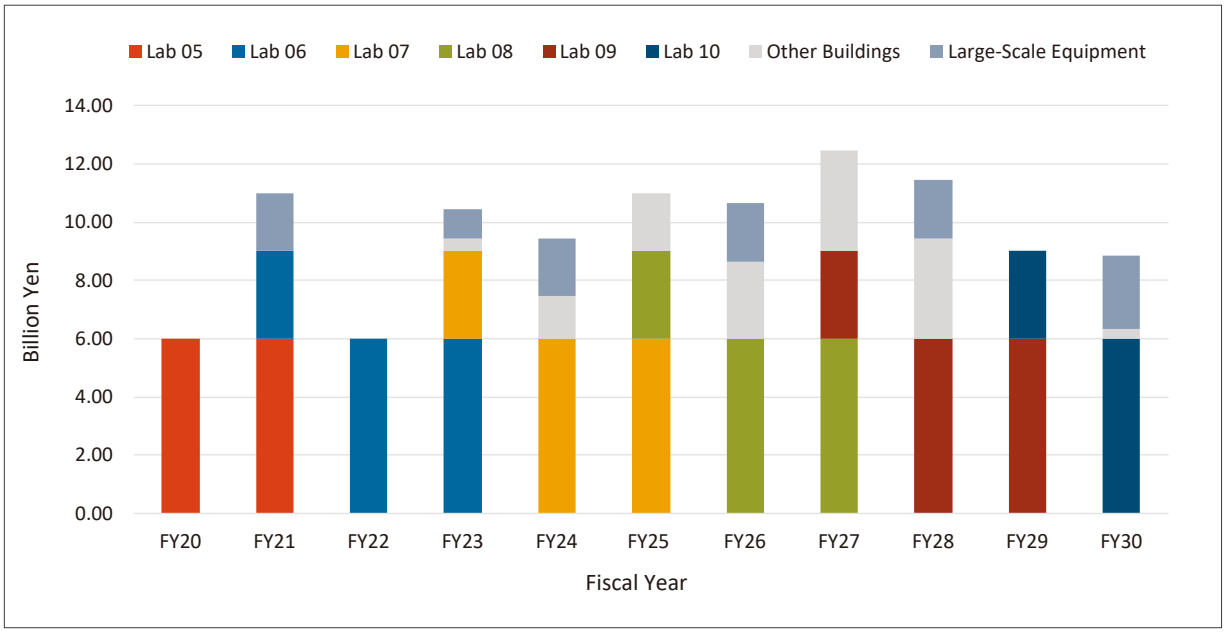


Figure 11-2 Construction and large-scale equipment costs from FY2020 to FY2030

11.2 Funding Model

To join the ranks of the world's top universities, most experts agree that OIST must reach 300 faculty units, the size envisioned by our founders.[1] The primary source of income is, and will continue to be,

1 The "Blueprint for the New Graduate University" (July 30, 2008) stated that "the ideal size ultimately pursued by the university in the long term is around 300 PIs...".

subsidy funding from the Japanese government. In due course, we may be able to replace some central funding with endowment and other income but, like our principal competitors, we will still need significant support from public funding through a mechanism that provides multi-year continuity.

To accommodate our planned growth, we need to develop with the government a stable funding model that provides the basic income needed to reach 300 faculty units by the mid-2040s

Over the past eight years, the high-trust funding model has been invaluable, encouraging faculty to pursue pioneering research and to respond quickly to new opportunities for research (see Section 1.1). The high-trust funding model relies on a robust system of ex post peer review, as described in the External Review Committee Handbook,[1] rather than the ex ante peer review used in grant funding. The work of tenured faculty members and their units is reviewed every five years to determine the following five-year budget; the work of the untenured faculty and their unit is similarly reviewed during their tenure evaluation as described in the Tenure Review Evaluation Committee Handbook[2] and measured against the highest international standards. Those failing to reach that standard leave.

The high-trust funding model is particularly important in the kind of cross-disciplinary university that our founders envisioned. Any change in this model would require OIST to narrow its focus and would limit its ability – as a relatively young research university even in 2040 – to join the ranks of the world's best.

We are continuing to develop strategies to increase our third-party income for cost recovery and to enhance our visibility and capacity to deliver the benefits locally, nationally and globally. We aim to achieve a target commensurate with about 10% of our baseline budget. Note that since the baseline budget is expected to increase by around 9% per annum, this implies a strong equivalent growth in income from third-party sources. Each source requires its own strategy, and most require some investment before they can be successful. The main sources of third-party income are discussed below.

11.2.1 Grants and Awards

Grants and awards serve a very important role in a research university. Awards may not include money but show the quality of the research work done at OIST. Grants show that OIST research proposals are competitive.

We have invested significantly in providing support to faculty and particularly young researchers to write grant applications, with increasing success rates particularly for KAKENHI, which is now at more than 30%. We will continue with our current incentives, and we expect that our grant income will grow in proportion to the increase in the number of faculty units, at about 2% of the baseline budget.

Our incentives encourage faculty and researchers to apply for grants, which lead to additional research capability and thus cannot be used to replace baseline funding, expect perhaps for a small contribution through overheads. Some of these actions are discussed below.

Peer-Review Workshop for KAKENHI Applications

We recruit some researchers internally and externally who are well-experienced in the KAKENHI application and its review (grant facilitators). OIST researchers who applied for KAKENHI can then make presentations to these grant facilitators and receive direct feedback including tips on how to complete the application forms to maximize the chances of success and how to increase their visibility in the Japanese academic system. We also provide external consultants to some OIST researchers to improve their KAKENHI proposals.

1 External Review Committee Handbook (PRP 3.2.7)

2 Tenure Review Evaluation Committee Handbook (PRP 3.2.5.2.1)

Incentive Program for Post-Docs to Apply for Grants
We provide 300,000 yen per application to encourage young researchers to apply for KAKENHI to support their research activities and the career development of post-docs. This was enhanced in FY2017 after the arrival of a new grant manager and has been further tailored to meet applicants' needs and increase their success rate.

Targeted Programs
When we identify a unique opportunity for OIST to compete for major funding for which we believe we have a competitive advantage, we can provide strong support to applicants. As an example, in 2016 we targeted the "Basis for Supporting Innovative Drug Discovery and Life Science Research (BINDS)" program because our state-of-the-art cryomicroscopes and experienced researchers enabled us to analyze the three-dimensional structure of proteins. The dean of research and the Grants and Research Collaborations Section (GRC) worked with the researchers on their proposal, "Protein structural analysis by cryo-microscope – Construction of the best support system," and they were awarded 30 million yen over five years.

Facilitation of Cross-Disciplinary Research
We encourage cross-disciplinary research both within the university and with external researchers. Our facilities and organizational plans are designed to facilitate communications that identify new research areas. As we complete Lab 4, we will increase the number of research support staff to operate the cutting-edge research equipment and increase available machine time and special expertise to maximize performance. In FY2021 we will develop a new program to provide machine time for cross-disciplinary research collaboration with external researchers.

The Kicks Program (OIST Kick-Start Fund), introduced in 2018, is an internal competitive-funding program that supports new collaborative research projects between OIST research units and research partners in Japan and overseas. Researchers who receive awards can kick-start a cross-disciplinary collaboration. This program is designed to increase opportunities for OIST research units to compete successfully for external grants in collaboration with other research partners, especially as principal investigators or project managers on large-scale collaborative grants such as HFSP, WPI, CREST, and KAKENHI, in the Scientific Research (S), (A) and Innovative Areas Categories.

Other Initiatives
We have taken the following additional actions to encourage grant applications.

1. We have introduced a salary incentive for faculty members of 2% of the amount of the award, similar to incentive programs in other Japanese universities, to increase our percentage of larger external research grants.
2. We have introduced internal competitive grants of up to 10 million yen to support new collaborative research projects between our research units and research partners in Japan and overseas, increasing the opportunities to submit joint grant applications or to receive grants as co-researchers.
3. When we make an offer of a faculty position to Japanese researchers who are currently working outside of Japan, we provide support to apply for a specific KAKENHI program designed for Japanese researchers returning to Japan, which not only assists their research unit start-up at OIST but also allows them to accelerate international research collaborations leading to more international grants.

We have also studied how other institutes (e.g. the Weizmann Institute and IST Austria) allocate the base budget to new research units and how they encourage applications for external funding. While each of these institutes has a different approach, there are common ideas that can be

adapted regarding the level of funding and the size of research units depending upon research domain and faculty seniority. Our goal is to introduce more consistency in the multi-year base budget allocation for new faculty until they receive their first external review after five years.

These activities will help OIST compete for large institutional grants. To prepare for such grants, we have followed the current discussions about science and technology policy to plan for the design of future research and development programs. By being aware of researchers' requirements and capabilities, we can match their needs to open calls for grants and provide them with the information they need to make a successful application. Researchers and research administrators are building a global network of universities and research institutions to support applications for large, collaborative grants.

The proportion of grant income from various sources (averaged over FY2017 and FY2018) is shown in Figure 11-3.

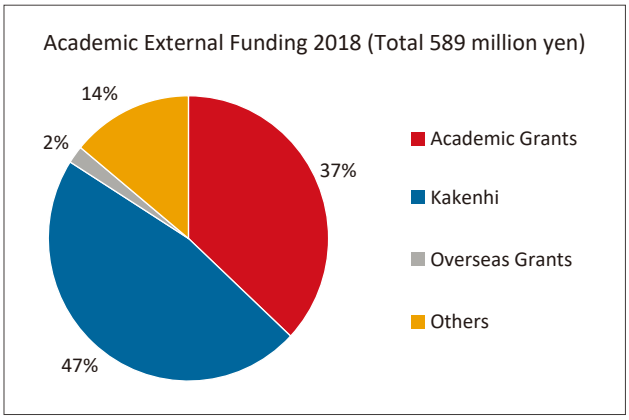


Figure 11-3 Grant income by source (FY2018)

11.2.2 Contracts

The Technology Development and Innovation Center (TDIC) was established in July 2014 to lead technology-transfer activities at OIST, including business development. Since that time, TDIC has exceeded external funding forecasts proposed in the "OIST Medium-Term Strategy for External Funding," primarily due to the quality of the research by OIST faculty, which has produced many high-quality opportunities for technology development and commercialization, due in part to OIST support for unique, cross-disciplinary research and well-managed access to cutting-edge research equipment. TDIC also has systematically identified industrial partners and funding opportunities in part by attending major industry conferences and monitoring funding opportunities from the local government, national and private sector.

OIST facilities and its proactive efforts to work with industry are key strengths that are not substantially present at other leading universities, particularly in Japan.

Our success in attracting potential partners to the opportunities at OIST include the folllowing:

- Participating in domestic and international exhibitions and technology showcases to promote OIST research and intellectual property to industry
- Hosting company visits and tours of the OIST campus for approximately 50 companies per year to expand our network with potential industry collaborators
- Arranging one-on-one meetings between faculty and companies to stimulate collaboration
- Holding regular meetings with local and national government funding agencies to explore technology development and research commercialization opportunities
- Providing information to faculty and researchers on opportunities for industry grants from private and corporate foundations
- Supporting the advancement of new technologies toward commercialization through the Proof-of-Concept Program, an internal competitive grant and industry-mentorship program
- Conducting market research to identify potential licensees of OIST intellectual property and promote them proactively
- Promoting and supporting grants to commercialize OIST intellectual property through startup companies (e.g., JST START grants)

- Working closely with the OIST General Counsel to standardize legal agreements such as NDAs, MOUs, license agreements and collaboration agreements to make negotiations with industry partners more efficient
- Organizing internal seminars and events to educate researchers on topics related to the commercialization of research results and working with industry, such as intellectual property, industry research and entrepreneurship
- Supporting startups and industry collaborations through the Startup Incubator Facility and the Startup Accelerator Program

The Startup Incubator Facility

We have constructed a 500m^2 facility campus to incubate startups spinning out of OIST, which is the first phase of an incubator facility that will be able to house up to ten seed-stage startup companies. In addition to startup companies from OIST, the incubator will also be open to startup companies from Okinawa, Japan and other countries and can serve as a platform for more established companies that are collaborating with OIST researchers to have a base close to campus. A key advantage of the incubator facility is its proximity to our core facilities and equipment on the main campus. We aim to leverage the incubator facility to seed an innovation ecosystem with research, startups and established companies collaborating and doing business in Okinawa. While the primary goal of the incubator facility is to promote the growth and success of startup companies, there will be opportunities to collect modest rent income and other external funding starting in FY2019.

Startup Accelerator Program

Startup accelerator programs at universities around the world are proactive efforts to support seed-stage startups through funding, educational courses and business and market mentorship. We are piloting Okinawa's first global startup accelerator program to attract innovative entrepreneurs from anywhere in the world to incubate their venture businesses in Okinawa and at OIST. This program features (1) funding to transform ideas into a startup; (2) access to space and state-of-the-art equipment at OIST (including in the incubator facility); (3) courses and events to strengthen business, customer, and market strategies; (4) an international soft landing to help foreign entrepreneurs with bilingual assistance on issues like IP, taxes, visas and HR in Japan; and (5) access to OIST's network of academic, government, and industry partners to help startups find venture financing, mentoring, collaborators, customers and marketing channels. The Startup Accelerator Program is also an opportunity for OIST to raise external funding from government grants and investment from the private sector to support entrepreneurs and startups as well as program services.

11.2.3 Access Charges

Our core research facilities are operated by experts in the Research Support Division (RSD), who are continually challenged to keep up with the advancement of technologies while doing research and continuing to provide high-quality research support services, leaving little time to provide a service to external fee-paying users. Nevertheless, they will continue to enable external users to access spare machine time in core facilities, including access by fees, although total utilization will always be at a low level because of the priority given to internal users. Our facilities are free to OIST users and their collaborators with a few exceptions such as sequencing reagent. We charge on a cost-recovery basis for external academic users, although we have grant schemes to lessen the burden for some users. Commercial users pay the full costs.

Over the next few years it will be more challenging to generate available machine time due to the increase in the number of researchers and research areas in OIST following the completion of new laboratory buildings. RSD's strategy during this phase is to add more support staff and make available a small number of popular facilities for external use to minimize the administrative

workload. The Office of the Provost will provide coordination for the access charges for the use of core facilities to reduce further the administrative workload on the research support sections.

11.2.4 Fees

All students pay an annual tuition fee amounting to 540,000 yen, which primarily provides relocation support for students' travel to OIST, financial support during their first two years at OIST when they are not yet associated with a research unit and support for some student activities. The rest is used to look after the well-being of our students, which is an important factor in their road to success and for the development of goal-oriented student activities.

11.2.5 Philanthropy and Donations

The world's best universities benefit from significant philanthropy and have well-resourced fundraising operations that have built relationships over decades. Past fundraising efforts at OIST ignored the need for up-front investment in building a program and were not successful. Research shows that a 1 billion yen (10 million dollar) donation can take as much as 25 years of an engaged relationship to materialize.

We will develop the flexible funding, rich networks, ideas, expectations and connections that are features of philanthropic partnerships by investing in a strong fundraising operation to build a network of people and organizations who will fund OIST, including staffing a core team of eight people, along with research, professional development and other fundraising resources. This up-front investment will include research to identify potential donors, cultivation and relationship-building by key leaders, and a fundraising staff that will nurture potential funders to obtain major philanthropic gifts.

OIST can become a model for philanthropy in the academic sector in Japan, which is under-developed even as major Japanese companies invest significantly in overseas universities. It is also under-developed when compared with leading US universities that enjoy large endowments and substantial support from high-net-worth individuals who receive tax benefits for their philanthropy. Our fundraising strategy will focus not only on Japan, but also heavily on the United States where there is a strong culture of philanthropy as well as in the broader Asia-Pacific region.

While philanthropy can be said to be its own reward, generosity should be acknowledged and we need to develop appropriate policies like those in many major US universities such as naming buildings, laboratories, endowed professorships or OIST fellowships (see Chapter 3).

Since OIST is located in an area of deep significance to US-Japan relations and many people with Okinawan ancestry reside in the US, OIST has established the US-based OIST Foundation, responsible for building an expanded network and hosting activities in the United States to familiarize Okinawans, US-based Japanese companies and other philanthropists with OIST's accomplishments and great potential.

Philanthropic investment in OIST is not only about funding, but also about building social and cultural capital. Such partnerships 1) enable universities to chart their own course, build on their strengths, extend research programs and build environments in which people can excel; 2) are both drivers of excellence and evidence of excellent institutional vision, leadership, culture, communication and performance; 3) build networks of supporters and ambassadors who contribute their influence, networks, expertise, advocacy, profile and passion to the future success of the university; 4) help a university to build positive relationships within their local communities and to more easily demonstrate their impact, creating a virtuous cycle that makes diaspora fundraising possible; and 5) drive progress by creating a positive tension that pushes institutions to be efficient and effective and demands that they define and communicate their mission and priorities and build internal confidence to pursue big, world-changing ideas.

While philanthropic funding is not expected to be a major source of income in the next few years, it will be firmly embedded in our financial model so that the seeds for more significant future support are firmly planted now, including investment in building the program.

Building and maintaining an engaged alumni community (see Chapter 10) is an important part of this strategy, but we also need to reach out to other sectors of the local, national and international communities with options for engagement. We will cultivate large (multi-million or -billion yen) donations but also create a culture of smaller, perhaps regular, donations and devise ways of ensuring that these are valued and recognized via a suite of incentives to encourage philanthropy at all levels. We will support a strong donor stewardship plan to maintain relationships with current and future funders. Our program will be focused on specific projects that may be of interest to funders, so rather than replacing baseline funding, donations will help OIST increase capabilities or fund important initiatives disallowed by the Japanese government.

To accomplish this we will take the following actions.

Invest in a High-Performing Team and Strategic Development Programs

We will establish a Development Department of around eight people (up from the current two) by 2023 and will set a goal to secure the first 100 million yen donation within ten years. To ensure best practice and to network, we will join leading higher-education fundraising organizations like the Council for the Advancement and Support of Education (CASE), the Japan Fundraising Association and the Japanese Universities of the Bay Area (JUNBA). Like other Japanese universities, we will strategically site offices. We have already established the US-based OIST Foundation office and a pilot project in Tokyo providing a physical presence to serve as a small but dynamic office, performing the daily institutional development work needed to build long-term support.

The OIST Development team will engage in a multitude of key activities from prospect research to front-line fundraising, annual giving campaigns and stewarding relationships that lead to financial support over time. It will also work closely with the Research Division and TDIC to build new networks with corporations and foundations.

Research and experience consistently show that investing time in long-term donor relationships yields bigger and more regular donations and delivers a better return on investment than investment in seeking new donors. Even though our initial focus is on identifying and cultivating new donors, we must eventually work hard to maintain long-term relationships with donors. As an example of long-term cultivation, Michael Bloomberg's first gift to John's Hopkins University was 5 dollars but it developed a relationship that culminated in a recent gift of 1.8 billion dollars. Similarly, Dr. Donald Othmer, a chemical engineer, gave an initial gift of 50 dollars to the Japan ICU Foundation. Through maintaining a good relationship with the Othmers, the family ultimately left a bequest in their will of over 30 million dollars to the Japan ICU Foundation. OIST needs a long-term focus on philanthropic support and an investment in the tools of philanthropy in order to capture such gifts that can insure long-term institutional success.

Fundraising also requires programmatic capability to help raise the visibility of OIST as well as to highlight investment opportunities. OIST will therefore support activities that engage scholars in round tables and meetings in Japan, the US and Southeast Asia to help connect potential donors with the work of OIST. OIST will also offer on-campus programmatic opportunities for donors to interact with the institution.

Develop Strategic Programs for Cultivating Prospective Major Donors, Connecting with Alumni and Supporters, and Stewarding and Advancing Relationships with Donors

Through intensive network-building activities ranging from one-on-one meetings to round tables to major events, OIST will build an engaged community of supporters who contribute their networks, expertise, influence, advocacy and passion toward OIST's success. Such philanthropic

partnerships contribute not only financial capital but also social and cultural capital. The best educational institutions excel due to ties that help raise institutional visibility and build connections relevant to all aspects of the university.

We will adopt a globally inclusive approach to network-building for philanthropy. This includes focusing on three core groups of individuals with a strong emphasis on identifying supporters in Japan, the United States and the wider Southeast Asia region. The three core groups comprise 1) people with strong ties to Okinawa including those of Okinawan ancestry, as well as people who lived, worked or went to school in Okinawa; 2) individuals with a deep interest in cutting-edge scientific research; and 3) entrepreneurs and venture capitalists with an interest in innovation. This corresponds with three aspects of OIST: 1) OIST's social and cultural outreach to improve the lives of Okinawans through educational activities, 2) OIST's world-class scientific research to improve the lives of all humanity and 3) OIST's aim to cultivate a knowledge economy in Okinawa through developing an innovation ecosystem.

To balance delivering large gifts in the short and medium terms with building for the future and to maximize the return on the investment of the effort, OIST will focus fundraising efforts on two mutually reinforcing value levels that occupy the two extremes of the donor pyramid: high-value (but low-volume) and participation giving (of lower financial value). OIST also plans to engage major stakeholders as partners in philanthropy with the support of the Japanese government, local government and industry to encourage donations to the university.

OIST's research is globally relevant and should be of interest to foundations not only in Japan, but especially in the United States where some of the world's most well-known and respected foundations are based. These include the Bill & Melinda Gates Foundation, The Rockefeller Foundation, the Dalio Foundation, the Gordon and Betty Moore Foundation, the Kavli Foundation, the Henry Luce Foundation, Bloomberg Philanthropies and the Ford Foundation, among others. OIST will also aim to be a key partner of R&D companies for the development of new technologies with support from industry.

OIST must explore support from its own community, including current members as well as alumni, which we define broadly to include not only PhD graduates but also those who have conducted research at OIST, have held a post-doc at OIST or who used to work at OIST. Support from alumni is a major percentage of philanthropic giving to higher-education institutions, but as a young university it will take time for OIST to cultivate such support by planting the seeds now to create a culture of giving back regularly as their capacity increases. As with other areas of philanthropy, these relationships are more than financial. By giving back OIST alumni send a signal to other funders that the institution has had an impact, which raises OIST's visibility and cultural capital and makes it an institution in which others want to invest. The OIST Foundation will play a vital role in cultivating relationships with alumni in the United States.

Develop a Comprehensive and Effective Case for Support Communication Tool for Potential Donors to Make Educated Decisions on Philanthropic Investment Opportunities

Philanthropic donations tend to be driven by powerful stories that capture the power and purpose of institutions, and therefore OIST will develop a series of cases that highlight these stories that can become part of the fundraising messaging. Such stories will include 1) a powerful core message as to why donors should invest in OIST, 2) a menu of specific projects to engage and attract donors and 3) stories of success.

The OIST case for investment will likely have three levels:

Top-Level Narrative: This is the inspiring vision that sets out the ambition and ideas of OIST, the scope and scale of the challenge, why this needs to be addressed, the OIST solution, why OIST is the organization to achieve this and the role donors can play.

Co-Creation Themes: This will set out the three or four thematic priorities of OIST, the strategic spaces within which OIST is seeking to establish transformational partnerships. “Okinawa – intellectual, economic and social progress,” “Women in Science,” “Marine Science” and “Sustainable Life” are examples of such themes that will be developed.

Priority Project Examples: These are the identified priority projects within the themes above for which funding will be sought at different levels (e.g. high-value and participation levels).

Working in close partnership with the Communication and Public Relations Division, the fundraising team will assist in the development of literature and social-media messaging that captures and advertises these opportunities. The OIST Foundation in the United States will focus its efforts on messages that resonate with the key cases developed by OIST. Furthermore, funding opportunities will be matched with the global prospect list that OIST develops in order to develop a strategic approach to fundraising activities.

11.2.6 Funding Profile

The overall funding profile is shown in Figure 11-4.

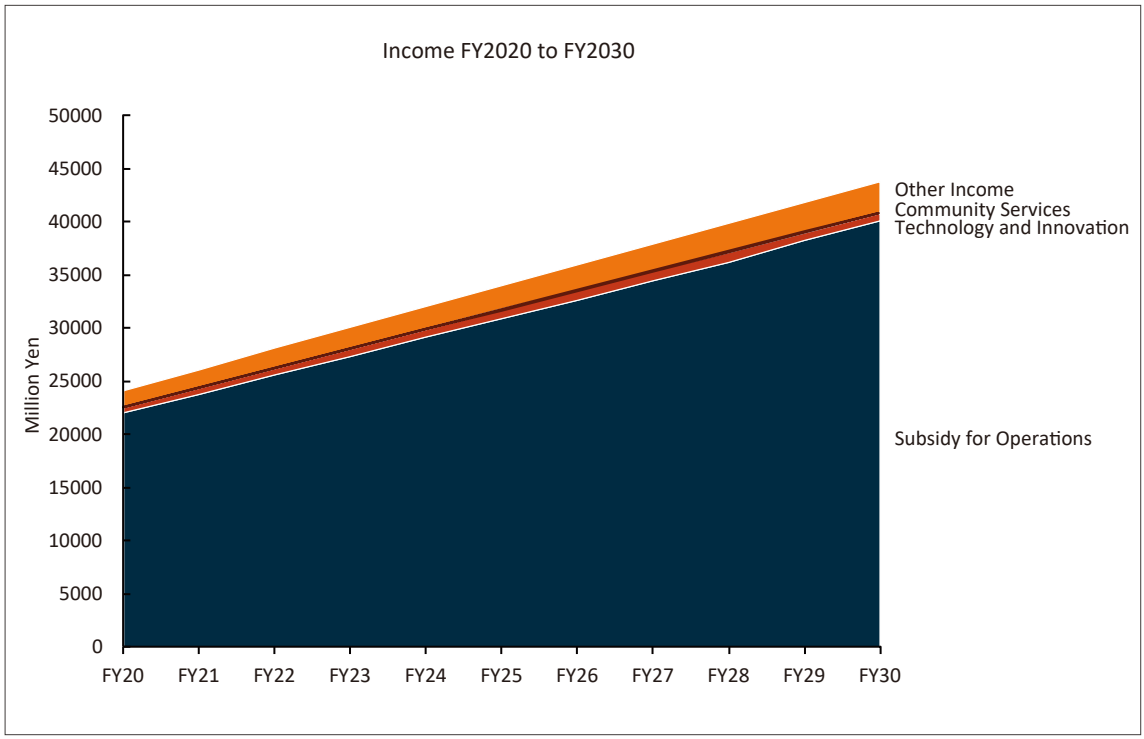


Figure 11-4 Funding profile for FY2020 to FY2030

In constructing this projection, it has been assumed that fees and other income contribute about one-third to the University Community Services Division costs and about one-fifth to the Technology Development and Innovation Centre costs. Third-party income (other projects) is assumed to be about 10% of the baseline income, including research grants, donations, fees, charges and other income; note that because of the rate of expansion of the university, this implies increasing this income by around 10% per annum. The subsidy for operations is then the balancing item required to meet the expenditure requirements.

11.3 Summary

The Okinawa Institute of Science and Technology Graduate University is a bold and ambitious initiative by the Japanese government to build a new type of university in Okinawa with the aim of joining the world’s elite universities. In the eight and a half years since our inauguration we have made significant progress toward realizing the vision of our founders.

We have built an impressive campus with three outstanding multi-disciplinary laboratory buildings, a fourth under construction and a fifth on the drawing board. We have recruited more than 70 excellent faculty to lead independent research units in an environment that encourages cross-disciplinary research. We have recruited about 200 well-qualified graduate students from more than 40 countries, 33 of whom have graduated. We have established all the administrative and support functions needed to run a modern university. And we have started to make an impact upon Okinawa economically and culturally, making Okinawa and OIST a destination of choice for those with a pioneering spirit and a thirst to do research and be educated, all with innovation and technology at the forefront.

However, there is much more to do if we are to join the ranks of the elite. At our present size we are just too small to be competitive with the world's best. Figure 3-2 shows that we have impressive visibility in high-impact journals considering our small size and that we compare favorably with universities in Japan. Figure 3-4 shows that, in terms of total volume, we do not. Figure 3-5 shows that, while we have a higher proportion of our output in high-impact journals compared with some comparable, longer-established universities, we are still a long way from being able to compete with, for example, Caltech, the Weizmann Institute of Science and the Max Planck Society.

We are determined to be excellent at everything that we do, and we are succeeding. While we do not have departments, those who rank universities and research institutes will examine our output by research area (see Figure 3-6) to make comparisons. If we wish to be considered excellent in a scientific field, we need to have enough established researchers in that field for several reasons: With only a small number of researchers, there is only a small number of publications in high-impact journals each year, and the timing of a single publication can have a major impact upon the relative ranking, either boosting or suppressing the ranking disproportionately; with a greater volume of publications, this effect is greatly diminished. There is also a major contribution from the intellectual environment that a large group of people working in closely related fields create. All of this points to having enough depth in each broad research area that we support.

We also need to cover a broad range of research areas, again for several reasons: We need to offer a broadly based education to our graduate students. The focus on cross-disciplinary research requires a wide range of disciplines to generate opportunities for new research directions offering the potential for great discoveries or emerging technologies. We must be broad-based to become a science and technology hub in Southeast Asia, where people come to learn, seek solutions to problems and exchange ideas.

We have written this Strategic Plan based on guiding principles and strategic goals through which we will achieve the vision of our founders and deliver on the purpose for which we were established. We will complete the first phase of OIST (100 faculty units) by 2023 but have written this Strategic Plan with a goal to grow to 200 faculty units by 2033. To become one of the world's best graduate research universities envisioned in this plan, we need the continued support of the Japanese, prefectural and local governments, the dedication of our staff and students and their families and the guidance of the Board of Governors and the Board of Councilors. Together we can build a university that can take its place among the best in the world.

"Many have gone on to do important scientific work, but all remember those wonderful times when we and our science were young and our excitement in meeting new challenges knew no bounds"

Sydney Brenner (1927-2019)
President, the Okinawa Institute of Science and Technology Promotion Corporation (2004-2011)

Appendix A.

List of Figures and Tables

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Chapter 2. Purpose, Vision, Values and Mission

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Chapter 5. Promoting Excellence in Governance and Efficient Administration

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Appendix B. Estimated Expenditure and Income

Appendix C. Staffing Model

Appendix D. OIST Research that Benefits Okinawa

Appendix B.

Estimated Expenditure and Income

B.1 Estimated Expenditure and Income from FY2020 to FY2030 (see Figures 11-1 and 11-4)

Table B-1 Estimated operational expenditure from FY2020 to FY2030

OIST Expenditure Budget from FY2020 to FY2030 in Millions of Yen											
	FY20	FY21	FY22	FY23	FY24	FY25	FY26	FY27	FY28	FY29	FY30
Research	8,791	9,747	10,690	11,658	12,649	13,641	14,632	15,624	16,615	17,606	18,598
Research Support	4,426	4,823	5,219	5,616	5,946	6,276	6,607	6,937	7,267	7,598	7,928
Education	921	1,040	1,160	1,280	1,428	1,576	1,724	1,871	2,019	2,167	2,315
Research Infrastructure	3,230	3,377	3,524	3,671	3,880	4,090	4,300	4,510	4,719	4,929	5,139
Administration	4,159	4,304	4,449	4,594	4,663	4,732	4,801	4,870	4,940	5,009	5,078
Technology and Innovation	932	985	1,050	1,107	1,171	1,234	1,298	1,362	1,425	1,489	1,553
Community Services	130	147	163	180	193	206	219	232	245	258	271
Other Projects	1,546	1,691	1,823	1,965	2,097	2,230	2,363	2,495	2,628	2,760	2,893
Baseline Budget	21,527	23,291	25,043	26,818	28,567	30,315	32,064	33,812	35,561	37,309	39,057
Total Operational Budget	22,589	24,423	26,256	28,105	29,930	31,755	33,580	35,405	37,230	39,056	40,881
Total Budget	24,136	26,114	28,079	30,070	32,028	33,985	35,943	37,901	39,858	41,816	43,773
Faculty	83	92	100	110	120	130	140	150	160	170	180
	projected, no adjustments made for inflation										

Table B-2 Estimated income from FY2020 to FY2030

OIST Income from FY2020 to FY2030 in Millions of Yen											
	FY20	FY21	FY22	FY23	FY24	FY25	FY26	FY27	FY28	FY29	FY30
Subsidy for Operations	22,006	23,791	25,563	27,360	29,125	30,891	32,657	34,423	36,188	38,252	40,031
Technology and Innovation	541	583	639	686	741	796	851	906	961	718	761
Community Services	43	48	54	59	64	68	72	76	81	85	89
Other Income	1,546	1,691	1,823	1,965	2,097	2,230	2,363	2,495	2,628	2,760	2,893
Faculty	83	92	100	110	120	130	140	150	160	170	180
Baseline Income	22,006	23,791	25,563	27,360	29,125	30,891	32,657	34,423	36,188	38,252	40,031
Total Income	24,136	26,114	28,079	30,070	32,028	33,985	35,943	37,901	39,858	41,816	43,773

B.2 Estimated Construction and Large-Scale Equipment Costs in Millions of Yen (see Figures 11-2)

Table B-3 Estimated construction and large equipment costs from FY2020 to FY2030

	FY20	FY21	FY22	FY23	FY24	FY25	FY26	FY27	FY28	FY29	FY30
Lab 05	6,000	6,000									
Lab 06		3,000	6,000	6,000							
Lab 07				3,000	6,000	6,000					
Lab 08						3,000	6,000	6,000			
Lab 09								3,000	6,000	6,000	
Lab 10										3,000	6,000
Other Buildings				424	1,456	1,990	2,644	3,448	3,448		346
Large-Scale Equipment		2,000		1,000	2,000		2,000		2,000		2,500
Total	6,000	11,000	6,000	10,424	9,456	10,990	10,644	12,448	11,448	9,000	8,846

Appendix C.

Staffing Model

We developed a parameter-driven model to project the population growth of OIST employees and students to 200 faculty research units (OIST 200), based on data from September 2017 to September 2018 converted to the number of full-time equivalent staff. Staff job classes and member categorization are in accordance with the definitions used by HR.

As of September 2018, OIST comprises 24.7% faculty and researchers, 13.7% students, 12.4% technical staff, 5.7% executives and governing board and council members, 4.3% community support staff, 3.6% RUAs and 27.9% core administrative staff. Charts on this page show OIST staffing structure by functions and the growth projection from now (2018), OIST 100 faculty units (2023) and OIST 200 faculty units (2033). We expect the percentage of core administration to decrease to about 18.5% as OIST expands in research.

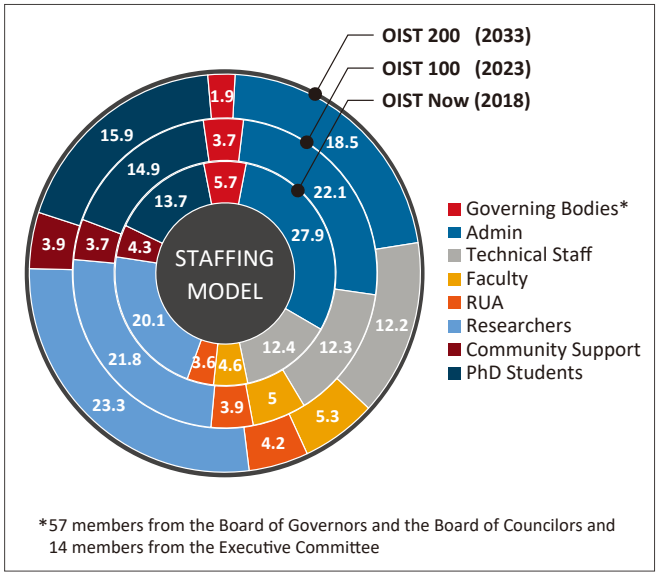

Figure C-1 The population growth and projection by administrative divisions and research units. The total number of full-time equivalent OIST employees represents the minimum of the total headcount of the OIST population.

OIST ratios for benchmarking with other research institutes are 1:3 faculty to students, 1:4.4 faculty to researcher, 1:7.3 faculty to research staff and 1:9.4 RUA to research unit staff. The key drivers for growth are the number of faculty, students and total employees.

Figure C-2 shows the projected growth as a function of division from 2018 to 2030, and Table C-1 shows the growth by category for 2018, 2023 and 2033.

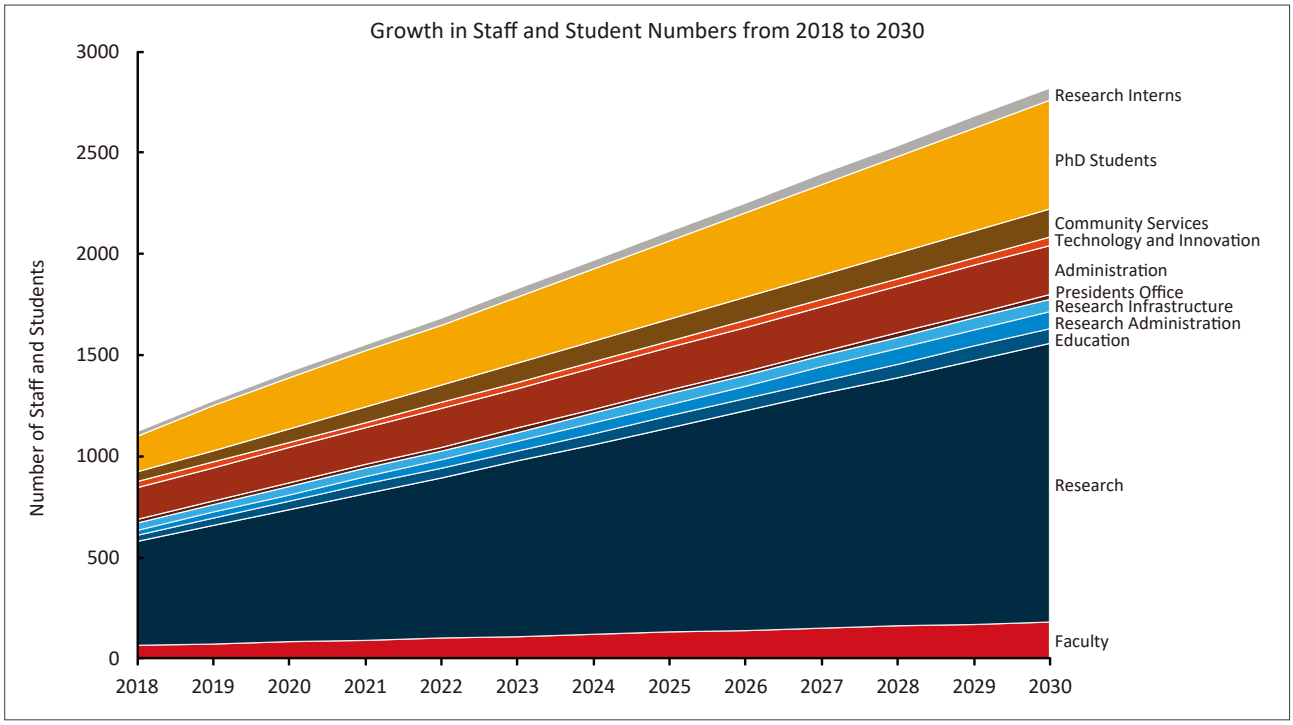

Figure C-2 Staffing projections from 2018 to 2030

Table C-1 OIST staffing structure and growth projection by functions

Staffing Category	2018	2023	2030	
Upper Management	4	4	4	president, EVP, provost, COO
Faculty	65	110	180	
Research Staff	511	866	1377	research unit staff including research unit administrators, Science and Technology Group, and the Research Support Division
Administrative Staff	267	355	482	President's Office, research administration, administration
Technology Development and Innovation Center (TDIC)	25	30	37	
Community Services	50	93	140	
Total Number of Employees	922	1458	2220	
Students	199	370	603	PhD students, special students, research interns
Boards of Governors and Counselors	43	43	43	

Appendix D.

OIST Research that Benefits Okinawa

Since our founding in 2011, we have made several important contributions to issues that address the current and future needs for island sustainability and support the OPG's drive for businesses to take account of the relevant UN Sustainable Development Goals, summarized below; more details can be found in the annual reports (see https://www.oist.jp/oist-publications-reports).

D.1 Marine Genomics Research in Okinawa

The Marine Genomics Unit applies the techniques of DNA sequencing to decode the genomes of organisms in the marine biosphere, particularly species important for Okinawa. They have so far decoded the genomes of one of the main species of coral on the Okinawa reefs, of algae that live in a symbiotic relationship with the coral and, importantly, of the crown-of-thorns starfish, which is a voracious coral predator. They have also decoded the genome of three types of seaweed of economic importance to Okinawa, the pearl oyster (important especially for Ishigaki) and the Okinawa habu, including the genes responsible for producing venom, which could lead to novel therapies for cancer, cardiovascular disease and other conditions. This research has many practical applications for Okinawa including, for example, demonstrating the viability of farmed coral for maintaining and regenerating reefs (see Figure D-1).

Figure D-1 A coral nursery in Maeganeku, Okinawa. Corals are maintained on metal posts.

D.2 Marine Science

Okinawa is an ideal location to study coral biology since coral reefs are readily accessible for research work, compared to other major reefs. The resilience of coral reef ecosystems in responding to future climate changes can be foreseen from the consequences of the severe intra- and inter-annual climatic variability in this region. Okinawa is also located close to hydrothermal vent fields that release water heated to around 400°C, which can support ecosystems of endemic species that do not depend on photosynthesis. Okinawa provides a dynamic platform to develop testable hypotheses concerning fundamental ecology and evolutionary biology. We are studying the extent to which we can we account for the biogeography of marine species, given the spatio-temporal patterns of ocean circulation in the past, present and future and how the structure and function of marine ecosystems are altered by brief but powerful disturbances such as typhoons, which are likely to become even more violent as a result of climate change. Figure D-2 shows a picture of the marine observatory that we have developed to monitor the effects of typhoons.

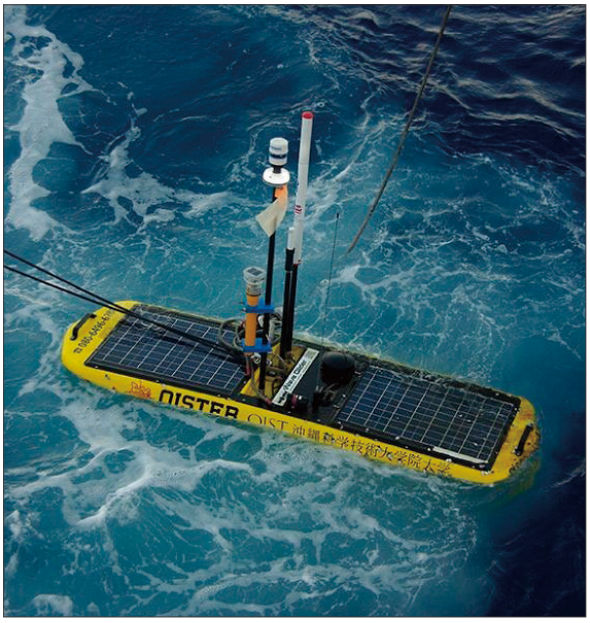

Figure D-2 The OIST Typhoon Observation Station

D.3 Wave Energy Power Plant

Figure D-3 OIST Wave energy converter on the north shore of Yonaguni in the Yaeyama Islands

Okinawa consists of 113 islands, the archipelago of the Ryukyus, of which 26 islands are inhabited. Except the main Okinawa Island, Ishigaki and Miyako, most of the islands are small and thus their electric power is not connected to a large grid network. They are independently supplied by diesel engine generators, which emit more CO_2 due to lower power efficiency, and the electricity cost is high. We need a more renewable energy system on these islands (see Figure D-3). The OIST Wave Energy Project is now testing our original Wave Energy Technology at the Island of the Maldives under an MOU (memo of understanding) between the Ministry of Environment of the Maldives, Kokyo Tatemono Company Limited and OIST, which started in February 2018. We use the surf-wave at the reef edge as the energy source. In Okinawa, steady swells arrive from the Pacific Ocean throughout the year, thus the east side of each island is suitable for a wave energy plant. In winter, the western coast has powerful waves also. Our wave energy converter is not big: a 1.5m x 1.5m x 2.5m concrete block in which we have a spinning turbine driven by the breaking waves. The electricity generation is roughly 10 kW from each wave of a height of 1m or higher. If we use a 30m-wide beach (300 units), we may supply 300 kW of power to the island (enough for the small islands), which drastically reduces the petroleum consumption of the diesel generator. The big advantage is that the wave power runs at night, thus a battery is not necessary, unlike solar power. OIST Wave Energy Technology will be ready for public use in five years.

D.4 Advanced Solar Cells

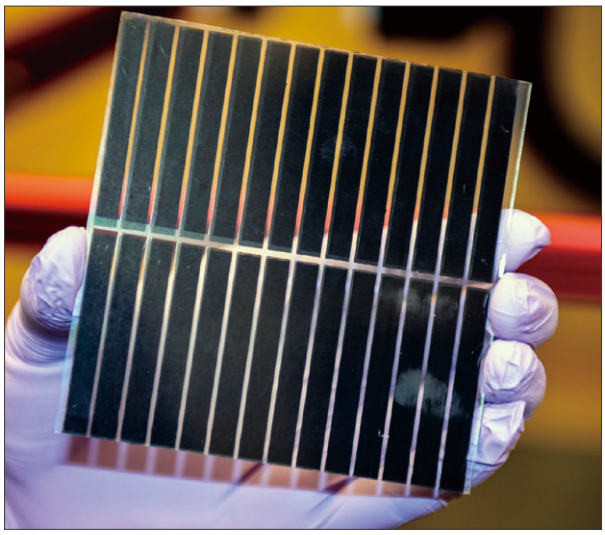

Figure D-4 Perovskite solar cell

Okinawa is heavily dependent on thermal power to provide more than 80% of its electricity, but it also has abundant sun light, even in winter, to run solar cells, making it an ideal place to utilize solar cell technology. The sustainability and environmental friendliness of solar cell technology can help harmonize the societal need of economic development with environmental preservation, which is vital given Okinawa's natural beauty. The Energy Materials and Surface Sciences Unit has developed novel functional materials such as metal halide perovskites as suitable materials for solar cells (see Figure D-4). We are using surface science and advanced characterization techniques to investigate the structure-property relationships in perovskite materials and devices, aiming at obtaining a fundamental understanding that will accelerate the development of high-efficiency, long-lifetime perovskite solar cells. This is important not only for Okinawa but also globally – currently more than 80% of the world's energy generation is from fossil fuels (coal, oil, natural gas, etc.), which produces sizable CO_2 emission as a by-product. The associated side effects including pollution, climate change and global warming have raised public awareness of the need to find alternative green energy sources. Among the various renewable energy resources (sunlight, wind, rain, tides, waves and geothermal heat), solar energy has unique advantages (e.g., sustainable, no or little environmental effects, relatively low cost as compared to other resources, inexhaustible).

D.5 Integrated Open Systems

Like any island in the middle of the ocean, resource independence is of major interest to Okinawa. The protection of its natural wealth while protecting the inhabitants from phenomena such as the yearly typhoons is central in this quest. The Integrated Open Systems Unit is interested in the design and facilitation of a sustainable living architecture (SLA) built around artificial intelligence and the "internet of things". While such work is usually associated with the environment, the sustainability of our solutions also focuses on social and economic factors. The prototype of such a concept (see Figure D-5) has been realized over the last few years on the OIST campus in close collaboration with industrial partners from Okinawa (OES, Okisoko, Okinawa Denryoku, etc.) and mainland Japan (Sony CSL, PUES). It encompasses a micro-grid system with energy transfer options between the houses and accommodates the charging of micro-EVs with exchangeable batteries (MIGEX). We are currently working on the automatic optimization of the energy and battery management in this system.

Figure D-5 Integrated open systems can support sustainable living and be built, for example, around artificial intelligence and the "internet of things". They can help to improve many areas impacting everyday life including the self-sufficiency of solar-powered houses connected on microgrids for energy transfer or battery management systems serving electric vehicles.

D.6 Okinawa Functional Rice Project

Since 2012, we have been working on the Functional Rice Project in Okinawa, supported by the Research and Development Cluster Program of Okinawa Prefecture, and the Proof-of-Concept Program at OIST. The rice strain, Amiromochi, accumulates digestion-resistant starch that is not readily catabolized to glucose. This trait could be useful for improvement or prevention of life-style-related diseases, such as obesity and diabetes, which are increasingly serious problems in Okinawa. We have successfully raised a new strain and are now evaluating its traits and amplifying seeds in the field in a collaboration between OIST and Onna Village (see Figure D-6). In parallel, we are conducting animal experiments and developing new food products containing resistant starch in collaboration with the University of the Ryukyus Medical School and local industries. We are expecting registration of the rice strain as a new variety with official approval by the Ministry of Agriculture, Forestry and Fisheries.

Figure D-6 New functional OIST rice growing in the field of Onna Village, Okinawa (July 2018)

D.7 Metabolomic Monitoring and Improving Health and Longevity in Okinawa

The G0 Cell Unit has developed metabolomic technology for human health, identifying 86 aging-linked metabolites in blood, saliva and urine. We also investigated metabolomics of lifestyle-related diseases such as diabetes. We wish to investigate the metabolomic profiles of four groups of Okinawan people (children, youth, middle-aged and elderly people) and to discover issues critical for healthy life in Okinawa to contribute to the improvement of the health and longevity of Okinawans. Okinawan health and longevity are thought to be in crisis; for example, the rate of death for those from 20 to 64 years old in Okinawa prefecture is the worst in Japan for both men and women. Frequencies of obesity are rather high; half of 40- to 50-year-old men in Okinawa are obese, and diabetes, colon cancer and alcoholic liver disease are prevalent. More primary school children in Okinawa tend to be obese than the national average, and it may be necessary to reduce this early childhood risk (see Figure D-7). We currently conduct analysis of metabolites characteristic to obesity and lean type 2 diabetes in collaboration with the University of the Ryukyus Medical School. By introducing PCA (principal component analysis), we can dissect health states in detail, possibly characterizing 'mibyo' (pre-symptomatic) disease. Our analysis based on metabolomics may be able to predict future body conditions to differentiate between healthy, pre-symptomatic and disease states.

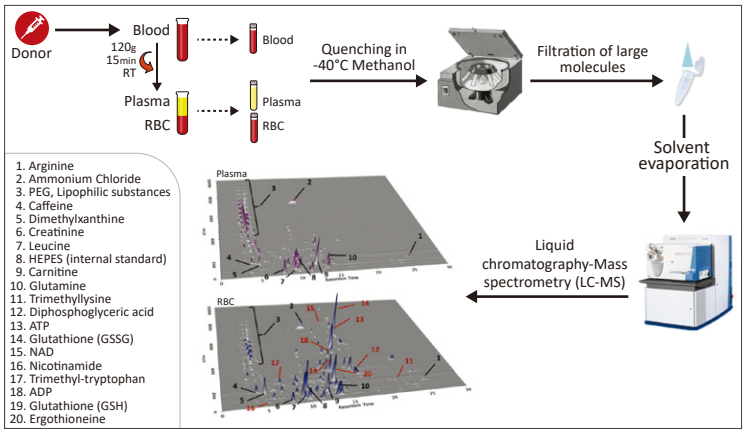

Figure D-7 Human blood metabolite extraction and detection

D.8 OKinawa Environmental Observation Network (OKEON)

The OKEON Churamori[1] Project is a community collaboration between OIST scientists and the local community to measure and monitor the Okinawan ecosystems (see Figure D-8). OIST leads a field monitoring program including continuous sampling at 24 sites across the island, generating space-time data to understand short- and long-term ecological dynamics and trends. We have established a network of more than 150 partners on the island, including universities, government entities, high schools, museums and local citizen scientists. Okinawa is an island microcosm where all major threats to ecosystems globally can be observed and studied, including climate change, habitat degradation and the human-mediated spread of invasive species, providing information about the local environments while allowing the investigation of general questions of global significance. In addition to data collection, we work with museum curators to hold outreach events and educational activities relevant to local communities and provide high school teachers and students training on insect collection methods, which the students use to design their own projects. This helps the promotion of the sustainable development of Okinawa by enhancing STEM education and outreach and building human capital on the island. The research outcomes will assist Okinawa's goals of responsible development of the land while preserving Okinawa's natural heritage.

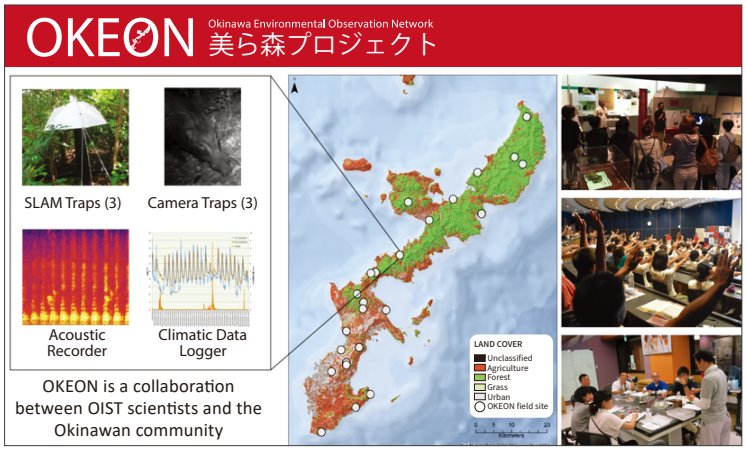

Figure D-8 The OKEON network of monitoring sites

1 *"beautiful forest" in the Okinawan dialect*

D.9 Fire Ant Surveillance and Counter-Measures Project

Figure D-9 The Red Imported Fire Ant (Solenopsis invicta) are a public health threat, as well as damaging crops and livestock.

The Red Imported Fire Ant (RIFA, Solenopsis invicta, see Figure D-9) is one of the world's worst invasive species. Originally from Argentina, it has been spread unintentionally around the world where it causes tens of billions of dollars of damage annually to crops and livestock and is a health hazard to humans. The USA, China, Taiwan and Australia have been severely affected, but the species has not yet established in Japan. We have partnered with the Okinawa prefectural government and the Japan Ministry of the Environment to create a surveillance network and education program to develop a system for detecting and eradicating the species soon after it arrives. Early detection is critical because once established it is nearly impossible to reverse. We have a network of detection sites including ports all over the prefecture, and we regularly hold trainings for government officials and other relevant personnel. In the summer of 2017, soon after the start of this project, RIFA was detected in cargo coming from China at several ports in mainland Japan leading to a national emergency where the ant invasion was discussed nightly on the news and became the subject of a special cabinet meeting. Our project was considered a model for Japan.

D.10 Wastewater Treatment Using Biotechnology

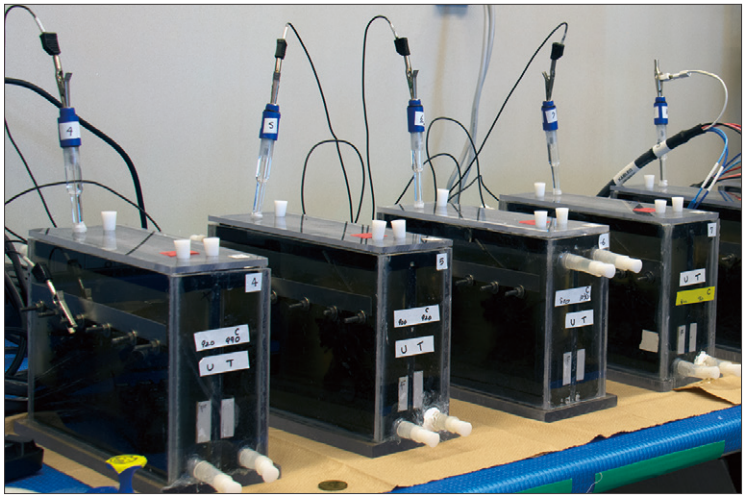

Figure D-10 Swine wastewater treatment system using BES technology

We have been actively developing scalable bioelectrochemical system (BES) technology for wastewater treatment applications. BES systems apply complex interactions between microbial populations and electrodes to remove organics and generate electricity. The Biological System Unit first tried to understand the wastewater issues held by various industries and then determine a way of treating the wastewater with BES so it is clean enough to discharge. This is especially important for small islands like Okinawa that have limited space for wastewater treatment. By utilizing biological, chemical, engineering and bioinformatics approaches, we seek to improve the system for better treatment efficiencies and electricity generation by understanding and building ideal microbial communities and developing cost-effective materials for their commercialization. Among the number of projects in food and agricultural wastewater treatment systems, the local Mizuho Awamori Distillery company has worked with us for the past seven years to treat rice wash and distillery wastewater and have recently deployed a scaled-up volume for the 1.7 m^3 reactor. In collaboration with local companies and the Okinawa Livestock Research Center, we are developing systems to remove nitrate and phosphorous from swine wastewater (see Figure D-10), one of the urgent issues in Okinawa. In addition, we are investigating use of BES to clean petroleum-contaminated groundwater for the future return of military bases to the local people.

D.11 Helping Children with Attention Deficit Hyperactivity Disorder and Their Parents

Figure D-11 Working with children at the OIST Children's Research Center

International practice guidelines recommend the inclusion of psychosocial interventions, including parent management training, in the comprehensive management of Attention Deficit Hyperactivity Disorder (ADHD, see Figure D-11). Currently in Japan, the availability of non-pharmacological interventions for ADHD is limited. There is also a shortage of specialists trained in the provision of evidence-based psychosocial treatments. In response to these needs we have developed a comprehensive, group-delivered parenting intervention for the mothers of Japanese children with ADHD that targets both parenting skills and the mothers' psychological well-being. A group format was chosen in response to the shortage of skilled therapists. Three studies have been completed in Okinawa: an initial pilot study, a proof of concept study, and a randomized control trial. Results indicate participation in the program leads to reductions in mothers' parenting stress, in reports of children's ADHD symptoms and aggression as well as improvements in reported and observed parenting practices and parenting confidence. We are extending this research to evaluate the program's effectiveness in community and school settings, its longer-term benefits and its cost effectiveness.

D.12 Culture (Bringing in the Arts, Humanities and Sciences)

We are an intimate part of the local Okinawan society and culture from which we benefit and to which we must contribute. We can use our superb technical facilities to illuminate features of traditional Okinawan crafts and artifacts, some example of which are given below.

D.12.1 Bashofu

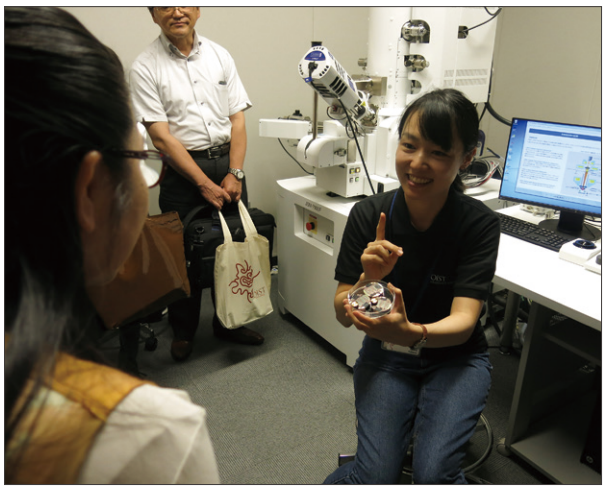

Figure D-12 Participants in a bashofu symposium hosted at OIST visit one of the university's electron microscope facilities. Microscopic observations of bashofu were used to reveal the structure of the textile's fibers.

Bashofu is a traditional Okinawan textile made from the banana plant Itobasho and is still produced on a small scale in the northern part of Okinawa Island where the economic development lags behind the rest of the island. Historically, bashofu kimonos were very popular in the humid summer seasons in old Okinawa (Ryukyu). We revealed why bashofu was comfortable to wear during the very humid Okinawan summer. Microscopic observations of bashofu materials showed that the fiber contains hexagonal itobasho cells with many voids (J. Fiber Sci. Technol., 73 (11), 317-326, 2017). This microstructure of the fiber is expected to contribute to the lowering of the humidity near the human skin surface and to the crisp texture of the textile that is preferred in summer. This research is actively being pursued in close collaboration with the University of the Ryukyus and others. We hope our research on this classical Okinawan smart textile will lead to new and innovative materials and contribute to the economic development in the Northern Okinawa region while conserving the traditional craft (see Figure D-12). OIST also participates in the Okinawa prefectural project Raw Material Conservation of Okinawan Traditional Crafts.

D.12.2 Ceramics

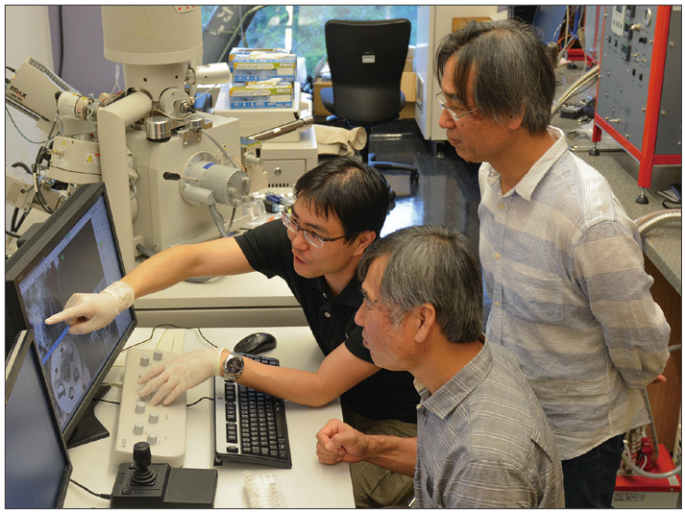

Figure D-13 Clay analysis using scanning electron microscopy (from right to left order: Master Kyoshi Matsuda, Master Yoneshi Matsuda, Dr. Kenichi Sajiki)

Okinawa has a long history of unique and colorful pottery. Its secret recipes were passed on by word of mouth from masters to apprentices. Since the recipes for the clay, glazes and firing were not written down, there is always a risk that it will be lost if this craft is no longer practiced. Also, due to the rapid land development in Okinawa, closure of white clay sites has resulted in a serious shortage of native white clay. In order to record the traditional recipes and to raise awareness of the need to conserve traditional Okinawan pottery, an OIST team worked with Kitagama, a traditional Okinawan pottery collective, to analyze their methods using high-technology instruments like an electron microscope (see Figure D-13). There was an art exhibition titled Kitagama x OIST: Tradition and Science at OIST from May 18 – July 31, 2015, where the composition of long-established precious clay mixes and glazes, the scientific rationalization of traditional pot-making techniques and important by-products like community ties were revealed. Those who visited the exhibition came to appreciate the long history of these works and why they should be preserved.

D.12.3 Art Conservation

Figure D-14 Lacquerware decorated boxes from the Yomitan Museum of History and Folklore before (left) and after (right) conservation. Reproduced with permission from the Yuntanza Museum (Formerly the Yomitan Museum of History and Folklore). © Yuntanza Museum

The Art Conservation Program began in November 2011, conserving Okinawan artifacts such as pottery musical instruments, lacquerware and basketry. Access to our advanced scientific equipment (such as X-ray diffractometers, mass spectrometers and electron microscopes) enables us to enhance our understanding of the origins of Okinawan artifacts, help with their preservation and solve historical mysteries. Current conservation and research projects include characterizing Okinawan pottery from the 17th and 18th centuries in close collaboration with the Naha Municipal Tsuboya Pottery Museum, using cross-section microscopy to decipher layered lacquer structures. We have also used X-ray fluorescence spectroscopy on lacquer pigment for identification and on two early 20th century sanshins to identify the unusual skin covering them before conservation. Then they can be safely exhibited. Figure D-14 shows a decorated lacquerware box before and after conservation.

These programs address important topics within the United Nations Sustainable Development Goals SDG 3: Good Health and Well-being (D 6, 7, 11), SDG 6: Clean Water and Sanitation (D 10), SDG 7: Affordable and Clean Energy (D 3, 4, 5), SDG 14: Life below Water (D 1, 2) and SDG 15: Life on Land (D 8, 9).

Our Vision

The advancement of knowledge for the benefit of humanity.

Our Values

We abide by a core set of values that underpin everything that we do: Excellence, Respectfulness, Responsibility, Transparency, Sustainability, Diversity, Courage and Freedom.

Our Mission

We are a pioneering graduate university. We conduct research that bridges disciplines to explore new frontiers of scientific knowledge. We educate a new generation of scientific leaders. We are a catalyst for an innovation hub in Okinawa.

The OIST Strategic Plan 2020-2030
January 2020

Website
www.oist.jp

Email
contact@oist.jp

Phone
+81-98-966-8711

Address
Okinawa Institute of Science and Technology Graduate University
1919-1 Tancha, Onna-son, Kunigami-gun
Okinawa, Japan 904-0495