Progress Plan for Maintaining Academy Center Certification
World Premier International Research Center Initiative (WPI)

Host Institution	Osaka University
Research Center	Immunology Frontier Research Center
Host Institution Head	NISHIO Shojiro
Center Director	TAKEDA Kiyoshi
Administrative Director	

Please prepare this Progress plan based on your application for WPI Academy. Summarize the Center's future plans with regard to the following 8 items **within five A-4 pages**. (Also fill out the appendices at the end of this form.)

1. Overall Image of Your Center

* Describe the Center's overall image including its identity.

Osaka University Immunology Frontier Research Center (IFReC) conducts interdisciplinary research in immunology, imaging, and informatics and has produced world-class research results. Its achievements are highly regarded and have led to comprehensive collaboration agreements with Chugai Pharmaceutical Co., Ltd. and Otsuka Pharmaceutical Co., Ltd. for 10 years starting in April 2017. In the collaborations, IFReC researchers are guaranteed the freedom to pursue curiosity-driven basic research, and by disclosing their latest research results directly to the companies, they are able to smoothly conduct joint research activities. Therefore, through the agreements, IFReC has secured a financial base for its operation in place of WPI funding. A number of joint research projects based on the basic research results of IFReC began from the comprehensive cooperation. In July 2019, Dr. TAKEDA Kiyoshi succeeded Dr. AKIRA Shizuo as director. Under his strong leadership, the new director has set a goal of contributing to society through the results of IFReC's basic research based on the current industry-academia collaboration system, in addition to promoting interdisciplinary research. In order to contribute to society, the director has set the following policies for the next five years.

Promotion of human immunology

IFReC promotes human immunology, which studies the human immune system related to human diseases, by purchasing and upgrading instruments for common use and establishing an organized support system.

Nurture of the next generation of researchers

A generational change will be promoted under the new director. IFReC supports the international circulation of young postdoctoral researchers, and established a Young Lead Researcher (YLR) system, in which promising young researchers are appointed as PIs. For young PIs including YLRs, IFReC continues to provide competitive research funding to foster them into core IFReC researchers. Furthermore, IFReC requires senior PIs to actively contribute as mentors to the development of next-generation researchers.

Internationalization

Strengthening collaboration with leading overseas research institutions is necessary to ensure diversity in research and to cultivate new research fields, and will also strengthen the function of the center as a hub for the international circulation of young researchers. In particular, IFReC enhances its collaboration with ImmunoSensation at the University of Bonn in Germany and University College London (UCL) in the United Kingdom, a Global Knowledge Partner of Osaka University, by conducting ongoing research exchanges, such as holding regular joint symposiums.

*Because of the global pandemic of COVID-19, the international circulation of young researchers and the outreach activities are expected to be greatly reduced in FY2020.

2. Mid- to Long-term Research Objectives and Strategies

* Describe new challenges in the Center's research objectives and plans after FY 2020.
* Describe your future research strategy and plans and research organization including your line-up of Principal Investigators, and your outlook for fostering and securing the next generation of researchers.

Challenges for human immunology

Through the use of genetic manipulation and molecular biological techniques, immunology has, to date, elucidated the immune mechanisms of animal models with homogeneous genetic backgrounds. However, in practice, humans and animal models (mice) have different immune mechanisms. Human immunology aims to comprehensively understand the human immune system involved in human diseases, and is the ultimate goal of the current research at IFReC. In particular, it is essential to understand the diversity of individuals, which has been excluded in conventional studies using animal models, and a major breakthrough in current immunology is required. The understanding of the human immune system will provide a basis for elucidating the mechanism of disease and developing methods to control it. Therefore, it is a challenging endeavor with a possibility of extremely high social impact that has the potential to positively transform human life. Since human immunology research requires a substantial amount of facility investment, the accumulation of advanced technologies, and the establishment of a support system to operate them, IFReC needs to deal with these in an organized manner. Advancing human immunology is a significant challenge for IFReC in order to maintain and further improve world-class research standards in the future.

Human immunology requires multifaceted analysis, including genomic and gene expression analysis, which are different from conventional analytic methods. When conducting research on human subjects, genetic manipulations as used in animal models are not permitted. Moreover, the samples collected during the course of diagnosis and treatment and available for research is limited to a very small amount. These have hindered the progress of immunology with human subjects. However, innovative advances in genetic analysis and single cell analysis technologies have made it possible to analyze even very small amounts of samples. Recent advances in informatics have made it possible to analyze a variety of immune functions, thereby creating an environment for human immunology research. In addition, in collaboration with the PIs concurrently affiliated with Osaka University Hospital, IFReC has access to rare human samples, which can be utilized at IFReC. Since the established research methods for animal models are also effective, the current research using animal models will be further promoted, and the results will be fed back to human immunology.

In order to enhance research capabilities for this new challenge of promoting human immunology, it is important to stimulate academic exchange with leading overseas research institutes and to promote the international circulation of researchers.

3. Management System of the Research Organization

* Describe the system of organizational management via which the Center will execute the above-described research strategy and plans.
* In Appendix 1-3, list the Principal Investigators, enter the number of Center personnel (researchers, research-support staff, and administrative staff), and provide a diagram of the Center's organizational management system.

In order to implement the research strategy described above and to improve IFReC's research capabilities over the long-term, the following efforts will be made.

Nurture and utilization of young researchers

IFReC has added 10 PIs in the last three years and now has of a total of 34 research groups. IFReC promotes the international circulation of young researchers by continuing the Advanced Postdoc and other programs. Three to five associate professor-level researchers will be appointed as Young Lead Researchers (YLRs), and each of them will run an independent research group as PIs of IFReC. An open laboratory with all the necessary equipment will be set up and shared by multiple YLRs so that the YLRs can start their research immediately after taking up their positions. Competitive research funds (7 million yen per year for 3 years) will be provided through the Grant Program for Next Generation PIs. Senior researchers will also serve as mentors and contribute to their development. In addition, the Human Immunology Lab plays a central role in training graduate students and young postdoctoral researchers to acquire cutting-edge technologies, such as single cell analysis, so that they can advance fundamental research in human immunology.

Promotion of human immunology

A working group was established to formulate a policy for promoting research in human immunology, set up instruments for common use, and create an organizational management system. In FY2020, IFReC

will add more servers to enhance informatics research and begin to provide IFReC researchers with financial support for using this state-of-the-art technology. IFReC will also strengthen ethical compliance for handling human samples including information management, establish measurement and analysis methods by standardizing protocols, and construct IFReC's original single immune cell database by collecting data for effective utilization. Since it is especially necessary to enhance informatics in order to promote human immunology, it is essential to develop and recruit human resources in this field through collaboration with leading overseas research institutions and through the international circulation of young researchers.

Promotion of industry-academia collaboration relevant to comprehensive collaboration agreement

Within the framework of comprehensive cooperation with pharmaceutical companies, IFReC promotes world-class basic research and the application of research results utilizing the strengths of the companies. This comprehensive cooperation provides the financial base for the stable operation of IFReC. In order to maintain this, it is important to strongly promote human immunology as basic research that contributes to society and to produce excellent research achievements.

Enhancement of research support system

In addition to the research management to date, industry-academia collaboration and intellectual property management, which are becoming increasingly complicated and sophisticated, and information management and research support to promote human immunology will be required. IFReC is also planning to strengthen its public relations and outreach activities to promote international cooperation and international circulation of young researchers. IFReC continues to nurture and utilize professional research management personnel with capabilities in various fields and to further enhance its support system.

4. Plan for Promoting the International Circulation of World's Best Brains

* Describe your policy and concrete plan for promoting the international circulation of the world's best brains, which is an important function of the WPI Academy.

The international circulation of young researchers will greatly contribute to the improvement of research capabilities by the revitalization of IFReC research and ensuring diversity. Since the success of young researchers at IFReC will attract more internationally active young researchers to IFReC, IFReC promotes continuous international circulation of the young researchers from a long-term perspective.

Promotion of international brain circulation of young researchers

IFReC supports young researchers in their overseas research activities through the Program for International Circulation of Young Talented Researchers and promotes the recruitment of excellent young researchers both in Japan and overseas through the Advanced Postdoc Program, which provides up to 1.3 times the salary of a regular postdoc and 3 million yen per year in research funds. IFReC continues to organize the Winter School, which is highly regarded as a place to build a network of outstanding next-generation researchers. As it has become difficult for the Singapore Immunology Network to continue to co-host the Winter School, IFReC will continue to host the school either independently or with a new partner institution.

Collaboration with leading overseas research institutions

In order to strengthen existing fields, to cultivate new fields, and to promote the international circulation of young researchers, IFReC promotes cooperation with leading overseas institutions having excellent technical and research capabilities. IFReC promotes individual joint research and the mutual exchange of researchers by holding regular joint symposia, in particular with ImmunoSensation at the University of Bonn since FY2018, and with University College London (UCL), one of the Global Knowledge Partners of Osaka University. The international research network cultivated at IFReC will be further developed and utilized for the development of research.

5. Plan for Disseminating the WPI Program Achievements

* Describe your policy and concrete plan for disseminating WPI center achievements both within the host institution and to other universities, especially their experience and know-how accumulated on establishing top world research institute and advancing system reforms.

Dissemination outside Osaka University

IFReC continues to actively disseminate its efforts to support foreign researchers, to recruit talented researchers, and to manage industry-academia collaboration including comprehensive collaboration

outside Osaka University. IFReC plays a central role in organizing events with other institutions and WPI centers to expand the target audience and reach out to new audiences.

Dissemination to Osaka University

Osaka University is planning to establish an international research center for quantum information and quantum life science at the International Advanced Research Institute, which IFReC belongs to, and set up an office in preparation to establish the center. In order to make this center an internationally renowned research center comparable to IFReC, the experience and know-how at IFReC will be applied.

IFReC is making efforts for advanced industry-academia collaboration including comprehensive cooperation and has accumulated operational know-how. By sharing know-how with the Co-Creation Bureau of Osaka University, IFReC helps to develop new comprehensive collaboration agreements and to advance industry-academia collaboration. IFReC also cooperates with the Co-Creation Bureau by sharing know-how regarding fundraising activities. IFReC has so far prepared a considerable amount of materials to support international researchers. IFReC provides these materials for use at the other departments for the international students and researchers. Osaka University has established a university-wide network of university research administrators (URA). Research management personnel belonging to the Research Planning and Management Office of IFReC collaborates with them to disseminate experiences and know-how at IFReC with regard to outreach or research promotion to the other departments.

6. Plan for Sustaining the WPI Brand

* Describe your plan for sustaining and enhancing the WPI brand.

Enhancement international public relations and outreach activities

IFReC will continue its activities to disseminate research results to researchers in Japan and abroad, such as at international symposia. With the aim of promoting the international circulation of young researchers, IFReC diversifies its outreach methods to target young researchers such as by enhancing activities abroad to directly access the international research community, using English-Japanese websites and SNS, and posting its main webpages in multiple languages. The activities will be validated and improved using the number of applications to the Advanced Postdoc and Winter School as an indicator.

Outreach to high school and university students

IFReC will actively work to raise the awareness of IFReC among high school and university students who will be responsible for the future of science. In addition to providing opportunities to interact directly with students, outreach activities to create and publish on-demand content through the Internet and to create connections with teachers, who are the influencers closest to high school students, will be planned.

Branding for WPI

The joint WPI outreach activities were limited to WPI-led events. IFReC will lead the joint outreach activities with other WPI centers and develop voluntary activities to emphasize the WPI brand.

Promotion of fundraising activities

IFReC continues to conduct outreach activities for the general public. IFReC promotes fundraising activities where the public's understanding at the outreach activities is developed into support as tangible donations. IFReC aims to gain supporters for its activities over the long-term through validation and improvement of its activities using the number and amount of donations as indicators.

7. Support by Host Institution

* Describe measures that the host institution is and will take to support and sustain your Center.

Osaka University has requested IFReC to continue as a world-leading research center in Japan under the WPI philosophy, to take on the challenge of creating new fields while inheriting the fine tradition of immunology at Osaka University, and to make advanced efforts to improve the research environment, and to internationalize and enhance industry-academia collaboration in order to influence the other departments of the university. To this end, Osaka University welcomes the strong leadership of the director in the management of IFReC and provides the following support.

Support for human resource

Osaka University continues to implement measures such as the allocation of tenured posts (two professors, two associate professors, and two assistant professors) and the preferential allocation of bilingual administrative staff. The shortage of tenured positions has made it difficult to hire new faculty for the core of IFReC. Most of the faculty and staff at IFReC are employed for a fixed-term. Because of the

revised labor Contract Act Law enacted in 2013, many experienced technical and administrative staff have already left IFReC, and many middle and senior researchers will be forced to leave in FY2023. This outflow of capable human resources is a serious problem for IFReC. Osaka University has requested the relevant ministries and agencies to take measures to prevent this and considers a flexible approach to the employment terms of fixed-term faculty and staff.

Financial support

In the comprehensive collaboration agreement with Chugai Pharmaceutical Co., Ltd., the entire budget for all indirect costs that was allocated to the head office was specially allocated back to IFReC, and the entire amount received (1 billion yen/year) was made available to IFReC. This has continued to date.

Support for international collaboration

Osaka University promotes international collaboration by using grants established by Osaka University for international conferences and international joint research. In particular, Osaka University has taken the lead in promoting collaboration with UCL as a Global Knowledge Partner.

Support for industry-academia collaboration

At IFReC, the number of joint research agreements and patent applications as a result of the comprehensive cooperation has been increasing, and is expected to further increase in the future. Therefore, industry-academia collaboration is becoming more complex and sophisticated, and the Co-Creation Bureau plans to continue to provide sufficient support.

8. Resource Allocation Plan

* Describe your plans over a 5-year period for allocating resources acquired from the host institution (e.g., financial resources and positions) and from external research funding to use in carrying out the Center's functions and activities described above.
* In Appendix 4, enter concrete numbers in the Resource Allocation Plan.

IFReC anticipates the following resource measures. For the time being, IFReC is expected to operate in a stable manner with grants from the comprehensive collaboration agreements. However, because it is necessary to use the grants to produce research results that are paid for by the grants, there may be cases where it is inappropriate to use part of the grants for purposes that should be handled by the university, such as educational activities, contributing to society in a broad sense, and promoting internationalization, and for purposes featuring WPI, such as research support, public relations, and outreach activities. In order for IFReC to continue to fulfill its mission as a WPI Academy center and contribute to society, continuous financial support from the host institution, Osaka University, and MEXT is very important.

Industry-academia collaboration

In addition to the grants received under the comprehensive collaboration agreements, the amount of research grants received under the joint research agreements is expected to increase. However, with regard to securing the management of IFReC in the future, it is necessary to sufficiently consider the continuation or restructuring of the comprehensive cooperation, the support from the host organization, and the diversification of financial resources of IFReC.

Host institution

Osaka University will continue the current tenured positions and financial support and will continue to consider increasing the number of tenured positions in the future. Osaka University supports the promotion of international cooperation by providing grants for international conferences and joint research.

External research grants

Because IFReC researchers need to obtain their own research funding as in the other WPI centers, it is important to obtain external funding for research. In particular, IFReC facilitates the acquisition of large external funding, led by IFReC researchers, to promote human immunology.

WPI Academy (Program to Accelerate and Expand International Circulation of Young Researcher)

Using the WPI Academy grants, IFReC enhances cooperation with leading overseas institutions and the international circulation of young researchers to raise IFReC's visibility and brand and to improve research capabilities.

The Program for Promoting the Enhancement of Research Universities

Research management personnel have been employed through the program expense budget since FY2017. Since this program is scheduled to end in FY2022, it is desirable that a budget to cover the employment costs of the personnel be secured through public funds or the support of the host institution in order for IFReC to continue its activities as a WPI Academy center.

List of Principal Investigators

・ If the number of principal investigators exceeds 10, add columns as appropriate.

・ Give age as of 1 April 2020

・ For investigators who will not participate in the Center project at the time of submission of this Progress Plan, indicate the time that their participation will start in the "Notes" column.

	Name	Age	Affiliation (Position title, department, organization)	Academic degree, Specialty	Effort (%)*	(Notes) Enter "new" or "ongoing"
1	Center director TAKEDA Kiyoshi	53	Director and Professor, WPI Immunology Frontier Research Center, and, Graduate School of Medicine, Osaka University	MD, PhD (Immunology)	100	ongoing
2	AKIRA Shizuo	67	Professor, WPI Immunology Frontier Research Center, Osaka University	MD, PhD (Immunology)	15	ongoing
3	KUROSAKI Tomohiro	64	Deputy Director and Professor, WPI Immunology Frontier Research Center, Osaka University	MD, PhD (Immunology and molecular biology)	80	ongoing
4	ARASE Hisashi	54	Deputy Director and Professor, WPI Immunology Frontier Research Center, Osaka University	MD, PhD (Immunology)	40	ongoing
5	KUMANOGOH Atsushi	53	Professor, Graduate School of Medicine, WPI Immunology Frontier Research Center, Osaka University	MD, PhD (Immunology)	25	ongoing
6	ISHII Ken J.	51	Professor The Institute of Medical Science, The University of Tokyo Professor, Guest Professor WPI Immunology Frontier Research Center, Osaka University	MD, PhD (Immunology, Vaccine Science)	5	ongoing
7	Cevayir COBAN	47	Professor, The Institute of Medical Science, The University of Tokyo, Guest Professor WPI Immunology Frontier Research Center, Osaka University	MD (Clinical Microbiology specialty)	2	ongoing
8	SUZUKI Kazuhiro	44	Professor, WPI Immunology Frontier Research Center, Osaka University	MD, PhD (Immune cell dynamics)	90	ongoing
9	YAMAMOTO Masahiro	41	Professor, Research Institute for Microbial Diseases, WPI Immunology Frontier Research Center,Osaka University	PhD (Immunology)	45	ongoing
10	Benjamin John SEYMOUR	47	NICT Invited Executive Researcher and Wellcome Trust Intermediate Clinical Fellow (Cambridge University)	PhD (Neurological Science)	10	ongoing
11	HATAZAWA Jun	66	Professor, Research Center for Nuclear Physics, Guest Professor WPI Immunology Frontier Research Center, Osaka University	MD, PhD (Nuclear Medicine)	5	ongoing
12	KIKUCHI Kazuya	54	Professor, Graduate School of Engineering, WPI Immunology Frontier Research Center, Osaka University	PhD (Chemical Biology)	10	ongoing
13	ISHII Masaru	46	Professor, Graduate School of Frontier Biosciences, WPI Immunology Frontier Research Center,Osaka University	MD, PhD (Bioimaging)	10	ongoing

14	Nicholas Isaac SMITH	45	Associate Professor, WPI Immunology Frontier Research Center, Osaka University	PhD Engineering/ Applied Physics)	100	ongoing
15	Daron M.STANDLEY	52	Professor, Research Institute for Microbial Diseases, WPI Immunology Frontier Research Center, Osaka University	PhD (Bioinformatics)	15	ongoing
16	NAGATA Shigekazu	70	Professor, WPI Immunology Frontier Research Center, Osaka University	PhD (Molecular/Cell Biology)	80	ongoing
17	KINOSHITA Taroh	68	Endowed Chair Professor, Research Institute for Microbial Diseases, WPI Immunology Frontier Research Center, Osaka University	PhD (Immunology, Biochemistry)	70	ongoing
18	SAKAGUCHI Shimon	69	Professor, WPI Immunology Frontier Research Center, Osaka University	MD, PhD (Immunology)	70	ongoing
19	SAITO Takashi	69	Team leader, RIKEN, Research Center for Integrative Medical Sciences, Professor, WPI Immunology Frontier Research Center, Osaka University	PhD (Immunology)	10	ongoing
20	KIKUTANI Hitoshi	69	Professor, WPI Immunology Frontier Research Center, Osaka University	MD, PhD (Immunology)	100	ongoing
21	KISHIMOTO Tadamitsu	80	Professor, WPI Immunology Frontier Research Center, Osaka University	MD, PhD (Immunology)	80	ongoing
22	Fritz MELCHERS	83	Max Planck Fellow	PhD (Immunology)	10	ongoing
23	YANAGIDA Toshio	73	Professor, Graduate School of Frontier Biosciences, WPI Immunology Frontier Research Center, Osaka University	PhD (Molecular Imaging)	10	ongoing
24	OKADA Yukinori	39	Professor, Graduate School of Medicine, WPI Immunology Frontier Research Center, Osaka University	MD, PhD (Bioinformatics)	5	ongoing
25	YAMASHITA Toshihide	55	Professor, Graduate School of Medicine, WPI Immunology Frontier Research Center, Osaka University	MD, PhD (Neurological Science)	10	ongoing
26	NAGASAWA Takashi	58	Professor, Graduate School of Frontier Biosciences, WPI Immunology Frontier Research Center, Osaka University	MD, PhD (Immunology)	36	ongoing
27	YAMASAKI Sho	51	Deputy Director and Professor, WPI Immunology Frontier Research Center, and Research Institute for Microbial Diseases, Osaka University	PhD (Immunology)	80	ongoing
28	OKADA Masato	62	Professor, Research Institute for Microbial Diseases, WPI Immunology Frontier Research Center, Osaka University	PhD(Science)	15	ongoing
29	HARA Eiji	55	Professor, Research Institute for Microbial Diseases, WPI Immunology Frontier Research Center, Osaka University	PhD (Molecular Biology)	5	ongoing
30	TAKAKURA Nobuyuki	57	Professor, Research Institute for Microbial Diseases, WPI Immunology Frontier Research Center, Osaka University	MD,PhD(Vascular and Stem Cell Biology)	15	ongoing
31	FUJIMOTO Manabu	53	Professor, Graduate School of Medicine, WPI Immunology Frontier Research Center, Osaka University	MD.PhD. (Dermatology)	15	ongoing

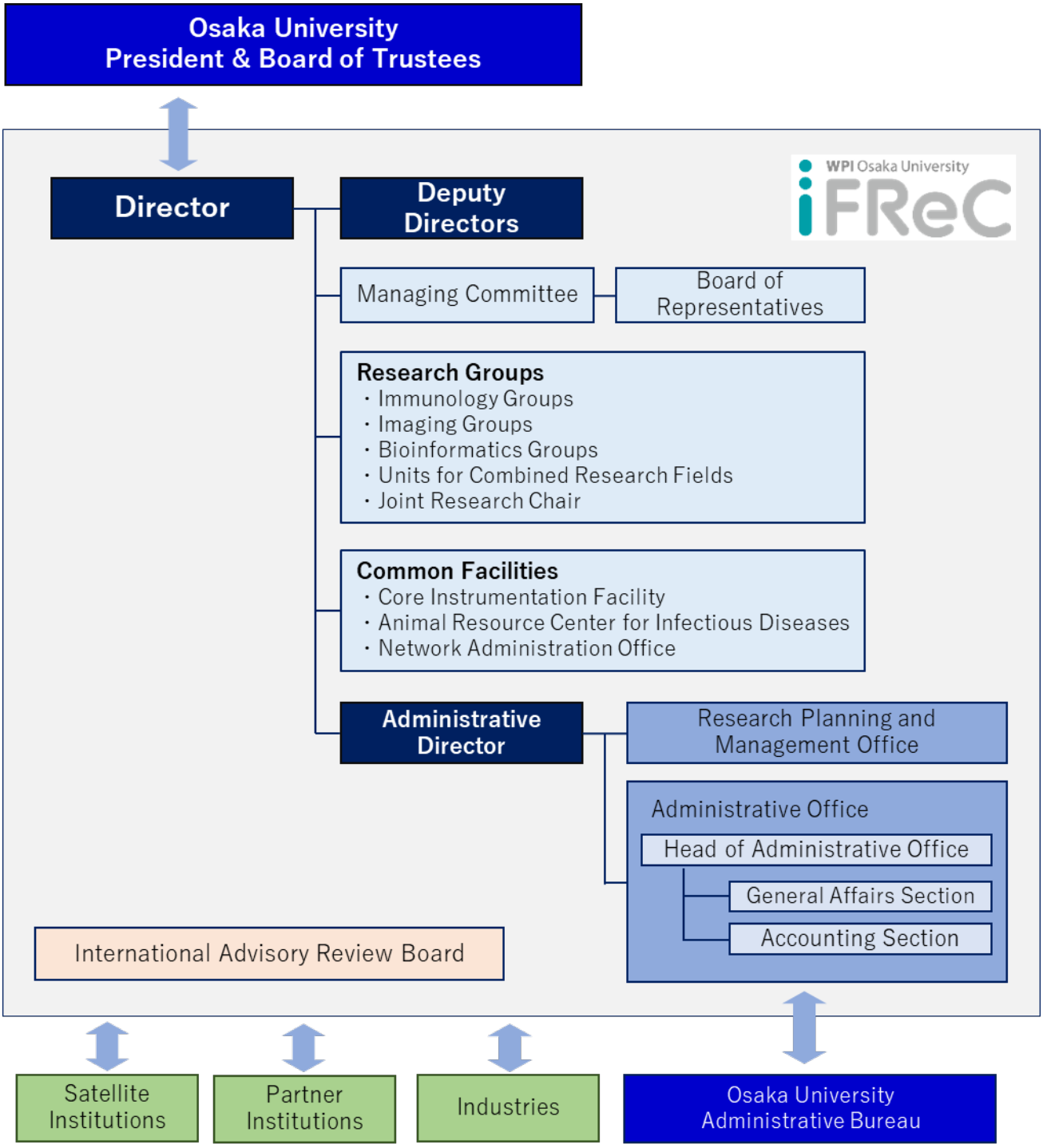
32	MORO Kazuyo	43	Professor, Graduate School of Medicine, WPI Immunology Frontier Research Center, Osaka University	MD.PhD. (Immunology)	10	ongoing
33	James Badger WING	39	Associate Professor, WPI Immunology Frontier Research Center, Osaka University	PhD. (Immunology)	100	ongoing
34	OKUZAKI Daisuke	47	Associate Professor, WPI Immunology Frontier Research Center, Osaka University	PhD. (Human Immunology)	50	ongoing

*Percentage of time that the principal investigator will devote to his/her Academy center work vis-à-vis his/her total working hours.

Appendix 3　Diagram of Organizational Management System

- Diagram **separately** the Center's organizational management system **and** its position within the host institution in an easily understood manner. If you are planning to change your organization management system and/or its position within the host institution in or after FY 2020 compared to their description in Appendix 3-1 of Activities report, show the changes in the diagram.

1. The Center's organizational management system



2. The position within the host institution