

**2.Summary of Proposal**

(Compile in English within 3 pages.)

Host institution	Osaka University
Head of host institution	Toshio Hirano, Osaka University, President
Research center	Osaka University Immunology Frontier Research Center
Center director	Shizuo Akira, Osaka University, Professor (WPI IFRcC)
Chief center-project officer (in October 2007)	Shizuo Akira, Osaka University, Professor (WPI IFRcC)
Project summary	IFReC aims to advance imaging and bioinformatic technologies by integrating them into experimental immunology for spatio-temporal studies from the molecular to the whole body level. This approach will provide comprehensive understanding of the immune system. Such advancement of basic immunology will improve medical strategies for diagnosis and treatment of pathogens and immune-related diseases through translational research. We shall further improve the research administration system so that domestic and overseas researchers can devote themselves to their research.
Mission statement and/or center's identity	IFReC aims to comprehensively understand immune dynamism. To this ultimate goal, we shall integrate imaging and bioinformatic technologies with experimental biology in order to study a wide range of spatio-temporal phenomena from the molecular to the whole body level. We believe this integrated approach will not only deepen our systematic understanding of the immune system but will also facilitate the basic research results to be targeted to medical applications through translational research. Thus, advancement in our understanding of basic immunology can improve medical strategies for the body's defense against infectious diseases, cancers, diagnosis and treatment of immune-related diseases. Through these endeavors, we shall establish a solid foundation for IFReC to be a truly internationally renowned research center.
Research fields	Fields: Immunology, Bioengineering and Bioinformatics Importance: Research into the immunological response to pathogens is important in prevention, diagnosis and treatment of various immune-related disorders and diseases. Despite extensive as well as intensive studies, it still remains unclear how immune cells actually interact with each other <i>in vivo</i> . Thus, it is of great and immediate importance to develop new technologies that can track as well as artificially control immune responses. Toward this end, it is necessary to make a breakthrough in traditional immunology by integrating imaging and informatics methodologies into immunology. Immunology at Osaka University is internationally acclaimed in its highest quality in addition to being recognized globally as among the foremost institutions regarding imaging and bioinformatics. Therefore, it is most pertinent to create an immunology research center here where domestic and overseas researchers in those different disciplines can come together to earnestly work towards a "comprehensive understanding of immune mechanisms <i>in vivo</i> ". This challenge to establish not only a new field of basic science but also overcome various immune-related diseases is of utmost importance.
Research objectives	Integrating imaging technology and bioinformatics into immunology for a comprehensive understanding of immune dynamism, which enables controlling immune system for the prevention, diagnosis and treatment of immune diseases.
Outline of management	The Center Director makes major decisions, to which the Administrative Director gives full support by handling practical matters via the administrative office. Important matters such as the annual budget and the appointment of PIs are to be approved by the center management committee and the board of representatives. The administrative office consists of the accounting and general affairs sections, and the research planning and management (RPM) office. The former two are composed of senior staff with rich administrative experience in the

	University and English-speaking personnel. The RPM office consists of several PhD holders and English-speaking personnel to cover publication, organization of seminars and symposia, outreach activities etc. The Liaison Office within the framework of RPM supports researchers from abroad in various aspects such as immigration matters, grant applications, etc.
Researchers and other center staffs, satellites, partner institutions	IFReC is now composed of 27 research groups (immunology, 17; imaging, 7; bioinformatics, 3), of which 15 are headed by full-time PIs and 12 by PIs who have concurrent positions at the graduate schools, the Research Institute for Microbial Diseases (RIMD), of Osaka University, etc. As cooperative institutions, IFReC has concluded academic cooperation agreements with the Research Center for Allergy and Immunology (RIKEN), the Institute for Frontier Medical Sciences (Kyoto University) and the National Institute of Biomedical Innovation (NIBIO). Overseas partner institutions include Institute for Systems Biology (USA), Pohang University of Science and Technology (Korea), Indian Institute of Science Education and Research (India), the University of Auckland (New Zealand) and the Catholic University of Korea Seoul St. Mary's Hospital.
Administrative director	Takao Kodama, Osaka University, Professor (WPI IFReC)
Outline of research environment	<ol style="list-style-type: none"> <li>1) The RPM office ("Outline of management") deals with planning and logistics of scientific meetings, outreach activities, etc.</li> <li>2) About two thirds of IFReC laboratories are housed in the Integrated Life Science Bldg., constructed in 2009 and the neighboring IFReC Research Bldg., constructed in 2011.</li> <li>3) Animal resource centers, radio-isotope experimental station and the core instrumentation facility are jointly operated by IFReC and RIMD. A list of core equipment, facilities and operational manuals will be available online in both English and Japanese.</li> <li>4) The Center for Information and Neural Networks (CiNeT) of the National Institute of Information and Communications Technology and RIKEN Quantitative Biology Center (QBiC) are scheduled to open within walking distance from IFReC. Both centers are headed by Professor Yanagida, a Deputy Director of IFReC. Their methodologies and technologies are common to those of IFReC, collaborations with these centers will help IFReC to advance interdisciplinary researches.</li> <li>5) Budget for equipment will be allocated to invite PIs from institutions outside Osaka University. Budgets for consumables and supplies will also be provided to new PIs to start research at maximum efficiency without losing time.</li> <li>6) Based on advice and/or suggestions by the working group of the WPI program committee and the International Advisory/Review Board, the center director will set up a research environment appropriate for a WPI center.</li> <li>7) International research conferences will be organized at least once a year.</li> <li>8) IFReC has introduced platforms for collaboration of immunologists with imaging and bioinformatics researchers as follows: <ul style="list-style-type: none"> <li>- The "Research Support Program for Fusion of Different Fields" (2009) to provide IFReC's young researchers in different disciplines with the financial supports to start collaborative studies. They have been succeeded by the double mentor fellowship/scholarship program (2011) to support graduate students or young post-doctoral fellows engaged in interdisciplinary projects under supervision by two PIs in different disciplines.</li> <li>- The IFReC colloquia have been established to facilitate mutual interactions between IFReC researchers by giving opportunities to young researchers to present their innovative research topics.</li> </ul> </li> </ol>
Outline of indicators for evaluating a center's global standing	<ol style="list-style-type: none"> <li>i) Criteria and methods to be used by IFReC for evaluating the center's global standing <ol style="list-style-type: none"> <li>a) <u>Major contributions to main research areas</u> - Are PIs leading and advancing main research areas and corresponding fields?</li> <li>b) <u>Creation of new research areas</u> - Are PIs opening or creating new research areas and corresponding fields?</li> <li>c) <u>Contribution to human welfare</u> - Are there any accomplishments from this center which have made great contributions to increases of quality of</li> </ol> </li> </ol>

	<p>human life in various ways, such as developing therapeutic or diagnostic means?</p> <p>ii) Results of current assessment made using said criteria and methods</p> <p>a) <u>Major contributions to main research areas:</u>          Immunology: Akira, innate immunity; Sakaguchi, regulatory T cells; Kurosaki, differentiation of lymphocytes; Kishimoto, cytokines. Bio-imaging: Yanagida, single molecule imaging; Yoshioka, MRI imaging; Smith, Raman microscopy; Kikuchi, chemical imaging.</p> <p>b) <u>Creation of new research areas:</u>          Saito, single molecule imaging analysis of immune responses; Kumanogoh, immune regulation by semaphorins; M. Ishii, two-photon imaging of bone tissues <i>in vivo</i>.</p> <p>c) <u>Contribution to human welfare:</u>          Kishimoto, anti-IL-6 receptor therapy for inflammatory diseases; Hatazawa, integrated PET/MRI system as diagnostic means for various diseases; Coban, Malaria immunology; K. Ishii, vaccine science.</p> <p>iii) Goals to be achieved through the project (at time of final evaluation)</p> <ul style="list-style-type: none"> <li>- To establish methodologies of intravital and noninvasive imaging of immune cells and immune-related molecules and those of systems biology for understanding of the immune network.</li> <li>- To open a new vista for controlling immune system for the prevention, diagnosis and treatment of immune diseases</li> </ul>																						
<p>Securing research funding</p>	<p>Osaka University will provide support to meet the necessary expense, on top of Grant-in-aid (about 13.5 hundred million yen/year) and Research Grants for Principal Investigators.</p>																						
<p>Appropriations plan (Exchange Rate: JPY/USD=80)</p>	<table border="1"> <thead> <tr> <th>FY</th> <th>2012</th> <th>2013</th> <th>2014</th> <th>2015</th> <th>2016</th> <th>Total</th> <th></th> <th></th> <th></th> <th></th> </tr> </thead> <tbody> <tr> <td>Cost (\$ millions )</td> <td>16.68</td> <td>16.68</td> <td>16.68</td> <td>16.68</td> <td>16.68</td> <td>83.4</td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>	FY	2012	2013	2014	2015	2016	Total					Cost (\$ millions )	16.68	16.68	16.68	16.68	16.68	83.4				
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<p>Summary of host institution's commitment</p>	<ol style="list-style-type: none"> <li>1) As stated in its mid-term strategic target and plan, Osaka University will provide every possible support for IFReC to become a true WPI center.</li> <li>2) The University has entitled the IFReC Director to manage and operate the center and to make decisions regarding substantive personnel and budget allocation as are the Deans and Directors in other faculties in the University. Thus, the Director can make top-down decisions and reformation of project-oriented improvements of research environments.</li> <li>3) Osaka University will make every effort to support IFReC so it can establish its foundation to become a WPI center by providing available resources that would be either greater or equal to the WPI project grant.</li> <li>4) If researchers from other departments in the University are working concurrently at IFReC, the University will support resource sharing/exchange between the WPI and the other departments.</li> <li>5) The existing annual salary employment system of Osaka University is applied to IFReC employees. If, however, the system does not fit in well with the operation of IFReC as a WPI center, the university will consider revising its present internal system for IFReC's operation.</li> <li>6) Concerning the planning and logistics of running large-scale research projects, research staff at the Support Office for Large-Scale Education and Research Projects will collaborate with IFReC staff. The Office for International Planning and Programs will support IFReC to promote research collaborations with scholars and institutions overseas.</li> <li>7) To facilitate interdisciplinary researches at IFReC, the University will make necessary arrangements for IFReC researchers to collaborate with those of CiNeT and QBic (See "Outline of research environment").</li> <li>8) Osaka University has established the Gender Equality Promotion Office to provide career support and encouragement for young scholars who will be next-generation researchers, which will be beneficial for IFReC to increase the number of female PIs and junior researchers.</li> </ol>																						