Press Release #1729

November 8, 2024
Japan Science and Technology Agency (JST)
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JST to jointly fund five research projects with the Biotechnology and Biological Sciences Research Council of the United Kingdom on the theme of Engineering Biology under the ASPIRE Program

The Japan Science and Technology Agency (JST, President HASHIMOTO Kazuhito) has approved funding for five new research projects jointly from the International Science Partnerships Fund, implemented by the Biotechnology and Biological Sciences Research Council (BBSRC) of the United Kingdom and the ASPIRE's Japan-UK Joint Call in Engineering Biology.

ASPIRE program aims to maintain and improve Japan's scientific and technological capabilities by connecting top researchers in Japan and advanced STI countries and regions through international joint research and talent circulation. The program focuses on promoting cutting edge R&D, fostering and mobilizing the next generation of research leaders.

This call for proposals aims to support internationally competitive collaborative research projects between Japan and the UK focusing on the fundamentals of engineering biology and cross-cutting technologies, creating leading international researcher networks, and nurturing early career researchers to drive tomorrow's engineering biology.

JST and BBSRC received a total of 30 proposals for this call, and five projects were selected for funding after assessment by a panel of experts in Japan and the UK and a joint funding meeting.

The research period will be up to three years (36 months). *

*This may be extended to the end of March 2030, subject to travelling and other research exchanges.

Attachments

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Inquiries

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Appendix 1

List of the Funded Projects

	Project Title	Principal Investigator (Japan) Principal Investigator (United Kingdom)	Affiliation	Research Outline
1	Data-driven multi-scale engineering of cell fate decisions	OKADA Mariko	Professor, Institute for Protein Research, Osaka University	A cell ensures its survival and proliferation by sensing and responding to environmental cues through a series of intracellular signals that modify its internal functions. However, most of our understanding of intracellular cell signalling has been gleaned from reductionist approaches which trace processes of isolated individual pathways. These approaches fail to encapsulate a complete understanding of complex cellular regulation that includes multiple signalling pathways, transcription/translation and heterogeneous responses. Understanding of the cell fate regulation requires adopting a holistic approach to understanding the intricate communication networks of cell fate. In this proposal we aim to deepen our understanding of pathways through engineering of cells. The engineering process will involve data-driven modelling of cell fate pathways, transcription and translational regulation, and the design and implementation of synthetic components and circuits. This will be achieved through the collective efforts of an international consortium of experts in cell, computational and synthetic biology. We will provide bespoke research training across the international collaboration network to foster the next generation of interdisciplinary scientists and research leaders in biological engineering.
		Richard Bayliss	Professor, Astbury Centre for Structural Molecular Biology, University of Leeds	

	Project Title	Principal Investigator (Japan) Principal Investigator (United Kingdom)	Affiliation	Research Outline
2	A bioengineering platform for creating agriculturally-applicable sentinel plants	Fyodor Kondrashov	Professor, Evolutionary and Synthetic Biology Unit, Okinawa Institute of Science and Technology	Bioengineered plants may revolutionize existing agricultural practices and help to prevent food shortages becoming a global problem. One promising technology is the use of luminescent crops that can detect pest damage in real time. Our interdisciplinary team of Japanese and British scientists aims to develop reporter plants that can be used at the farm and in the lab. To achieve this, we will combine complementary expertise in machine learning, molecular engineering, and plant science. Specifically, we will develop tobacco and Arabidopsis with new luminescent reporters that detect plant hormones released by plants in response to pests and pathogens, as well as rice and soybean that can detect crop damage in real time in actual farms. It is expected that these developments will make it possible to monitor pest damage in real time by detecting plant luminescence with a drone. We also aim to further expand our international network by holding international conferences that bring together researchers from Japan and abroad.
		Karen Sarkisyan	Group Leader, Institute of Clinical Sciences, Imperial College London	

	Project Title	Principal Investigator (Japan) Principal Investigator (United Kingdom)	Affiliation	Research Outline
3	Orthogonal phages from non-linear sequence topologies: towards an artificial phage-host system	SUGA Hiroaki	Professor, Department of Chemistry, Graduate School of Science, The University of Tokyo	While advances are being made in engineering bacterial viruses and bacteriophages for applications as diverse as antibacterial therapy and the treatment of alcoholic liver disease, many of these efforts rely on existing biological systems. However, a phage-like system or its host have not yet developed due to its high challenges. In this study, researchers from the University of Tokyo and the UK's National Physical Laboratory have formed an international partnership to create artificial phages synthesized from a novel idea and explore the basis of their replication hosts. Unlike existing biological phages and viruses, we have designed artificial phages that are assembled from short nonlinear amino acid sequences and used them as innovative tools for biodesign, gene reprogramming, and protocells to expand the chemical space. We aim to construct an artificial phage and non-virus capsid host system that interact with host cells as an organism orthogonal to resident organisms, which exemplifies the emergence of artificial life from the human body. We will also further develop our international network, focusing on long-term travel from Japan to the UK.
		Max Ryadnov	Professor, National Physical Laboratory	

	Project Title	Principal Investigator (Japan) Principal Investigator (United Kingdom)	Affiliation	Research Outline
4	Engineering sustained function in SYNthetic cells through enERGY generation, storage and transformation (Japan-UK SYNERGY)	TAKINOUE Masahiro	Professor, Department of Computer Science, Institute of Science Tokyo	Artificial cell technology is expected to achieve a revolution in healthcare, bio-manufacturing, and environmental restoration. However, since artificial cells have problems with energy generation, conversion, and storage, sustaining their functions for long periods is difficult, making practical application difficult. In this Japan-UK SYNERGY project, top research teams from Institute of Science Tokyo, Imperial College London, and University of Cambridge will come together to develop functional modules for energy and logistics, by which artificial cells i) produce ATP from substrates, ii) store ATP in molecular batteries, and iii) convert heat and magnetic forces into ATP. The long-lasting functionality of artificial cells using the modules will enable their applications in the real world. Furthermore, through extensive exchanges including mutual research visits and international research meetings, we will create opportunities for international talent mobility and circulation through the development of artificial cell technology as well as the cultivation of young human resources. As a permanent international research hub, the Japan-UK SYNERGY will contribute to the UK and Japan playing a leading international role in the coming artificial cell revolution.
		Oscar Ces	Chair of Chemistry, Department of Chemistry, Imperial College London	

	Project Title	Principal Investigator (Japan) Principal Investigator (United Kingdom)	Affiliation	Research Outline
5	Japan-UK collaboration for artificial photosynthetic cell systems	NOJI Hiroyuki	Professor, Department of Applied Chemistry, Graduate School of Engineering, The University of Tokyo	This research aims to develop an artificial photosynthesis platform by hybridizing synthetic microorganisms and electrochemical devices, while also fostering young talent who will become the next generation of leaders through research activities. To realize the artificial photosynthesis platform, we will establish a cross-disciplinary Japan-UK cooperative system by bringing together top researchers not only from engineering biology and biophysics, but also from fields such as electrochemistry, nanomaterials chemistry, microfluidics, and information technology. This initiative will establish foundational technologies for the production of valuable materials using light energy, contributing to the realization of a sustainable bioeconomy. In addition, through unique workshops and collaborations with industry, this project aims to form strategic international networks. By providing numerous opportunities for young researchers to participate in cross-border interdisciplinary research, we will nurture the next generation of leading researchers who possess not only cutting-edge technical skills but also effective communication abilities.
		Huang Wei	Professor, Department of Engineering Science, University of Oxford	

Appendix 2

Experts for the Evaluation

Name	Affiliation	Role
SHIMIZU Hiroshi	Professor, Osaka University	Program Officer/Chair
Alan Dobson	Professor, University College Cork	Co-Chair
BAMBA Takeshi	Professor, Kyusyu University	Advisor
Thomas Curtis	Professor, Newcastle University	Advisor
Katherine Dunn	Senior Lecturer, The University of Edinburgh	Advisor
Alicia El Haj	Professor, University of Birmingham	Advisor
FURUSAWA Chikara	Group Leader, RIKEN Center for Biosystems Dynamics Research	Advisor
Louise Horsfall	Professor, The University of Edinburgh	Advisor
MATSUI Tomoko	Director, Novonesis/Novozymes Japan	Advisor
MINAGAWA Jun	Professor, The National Institute for Basic Biology (NIBB)	Advisor
David Roper	Professor, The University of Warwick	Advisor
TSUMOTO Kouhei	Professor, The University of Tokyo	Advisor

Annex

Evaluation Criteria

Criteria	Description of the criteria
i. Relevance and quality of the research content and plan	• Are the proposed research activities of an excellent quality and importance within or beyond the fields or areas concerned? • Has the potential to advance current understanding, generates new knowledge, thinking or discovery within or beyond the field or area? • Is timely given current trends, context and needs? - is relevant to the scope of the scheme including at least one of the research themes. • Will impact world-leading research, society, the economy and/or the environment. • Has the viability to create a leading international researcher network of the research community in the relevant research area?
ii. Have the applicants demonstrated that they have designed their approach so that it	• Is effective and appropriate to achieve their objectives. • Is feasible, and comprehensively identifies any risks to delivery and how they will be managed. • If applicable, uses a clear and transparent methodology. - The tools, methods and technologies applied should be the most appropriate for the delivery of the objectives according to the cutting-edge of the field, or fields, under investigation. • If applicable, summarizes the previous work and describes how this will be built upon and progressed. • Will maximize translation of outputs into outcomes and impacts
iii. Clear rationale for the Japan-UK partnership and the added-value this offers to advance the research field. Concreteness and feasibility of the plan to create a leading international researcher network.	• Explaining the research strengths, the unique added value opportunities, complementary expertise or synergy in research efforts that bringing together the UK and Japanese teams, provides to advance the research. • Describing an appropriate balance of opportunities for the exchange of people (for example. researchers and technicians), including the purpose of the exchanges and their potential to enhance the professional development of those involved. • Has an appropriate, concrete, and feasible plan for how the UK and Japanese teams and their research environments

	will realize the creation of a world-class international researcher network in the relevant research community
iv. Concreteness and feasibility of plans for promoting early career researchers and researcher mobility	• Are appropriate goals set for fostering early career researchers through international mobility activities? • Are there plans to involve a sufficient number of early career researchers? • Is an effective developing plan for the early career researchers considered and is the plan suitable for fostering the next generation of top researchers? • Are the roles and length of stay for the outgoing researcher(s) clearly described and appropriate? Is the exchange plan feasible?
v. Relevance and diversity of the research team. Qualification of the PIs/PLs and the team of the research project in Japan and the UK	• Does the research team have a well-balanced composition of experience, given the objectives of the proposal? • Does the PI/PL have sufficient ability to manage the research? • Does the PI/PL have sufficient research achievements to have potential to join the international top research community, or can be deemed to already be a part of it as shown by high level research achievements? • Does the PI/PL have demonstrated the ability to support early career researchers and international talent mobility? • Do the PI/PL and team have sufficient qualifications to carry out the research activities in accordance with the proposal and purpose of this call?
vi. Have the applicants demonstrated how the resources they anticipate needing for their proposed work	• Are comprehensive, appropriate, and justified, is the budget for fostering early career researchers through international mobility activities sufficient and is the budget plan appropriate? • Represent the optimal use of resources to achieve the intended outcomes. • Maximize potential outcomes and impacts