

Humanity faces rapidly increasing serious problems, such as explosive population growth, global warming caused by mass consumption of fossil fuels, shortage of energy and materials due to economic expansion, the spread of pathogenic viruses, environmental pollution by toxic substances and frequent disasters due to increasing extreme weather events. This rapid environmental change has complicated interlinkages, which threatens sustainable development and healthy living. There is an increasing demand for reliable future projections of change based on an accurate understanding of these current conditions and for new measures to solve these problems. RISH defines the "humanosphere" as spheres that support and interact with human activities. We continue to pursue a comprehensive understanding of the current situation in the "humanosphere" to establish science and technology that are indispensable for sustainable development and that contribute to the betterment of society. RISH has been expanding its Joint Usage / Research Center activities, in collaboration with domestic and foreign research / education organizations and private sectors, through (i) shared use of large-scale facilities, (ii) open use of databases and (iii) promotion of collaborative projects. These activities have been pursued under the direction of RISH's four missions: "Mission 1: Assessment and Remediation of the Humanosphere", "Mission 2: Development of Science and Technology towards a Solar Energy Society through Biomass and Solar Power Satellite Research", "Mission 3: Study of the Space Environment and its Utilization", and "Mission 4: Development of Technology and Materials for Cyclical Utilization of Bio-based Resources". In 2011, RISH started "New Frontier Research", which aims to understand the environmental changes that affect human health and to find the systems that lead to healthy, safe and secure living.

Before beginning work on the "3rd Midterm Targets and Plans of National Universities" in 2016, RISH reconsidered the roles of its current missions, expanding and reassigning them as "Mission 1: Environmental Diagnosis and Regulation of Circulatory Function", "Mission 2: Advanced Development of Science and Technology towards a Solar Energy Society", "Mission 3: Sustainable Space Environments for Humankind", "Mission 4: Development and Utilization of Wood-based Sustainable Materials in Harmony with the Human Living Environment" and "Mission 5: Quality of the Future Humanosphere", which aims to create healthy and sustainable living environments for society by developing practical applications of research results. In connection to the new missions, we set up a "Humanosphere Asia Research Node" in Indonesia, thereby strengthening the hub functions of international collaborative research and fostering the work of people who sustain and expand Humanosphere Science to find global-scale solutions. We will continue to actively expand on educational and research activities in collaboration with the Humanosphere science community, comprising not only staff and students within RISH but also outside researchers, both domestic and international, in an effort to demonstrate scientific landmarks in mankind's path toward the construction of a sustainable Humanosphere. We look forward to your valuable assistance, support and participation.

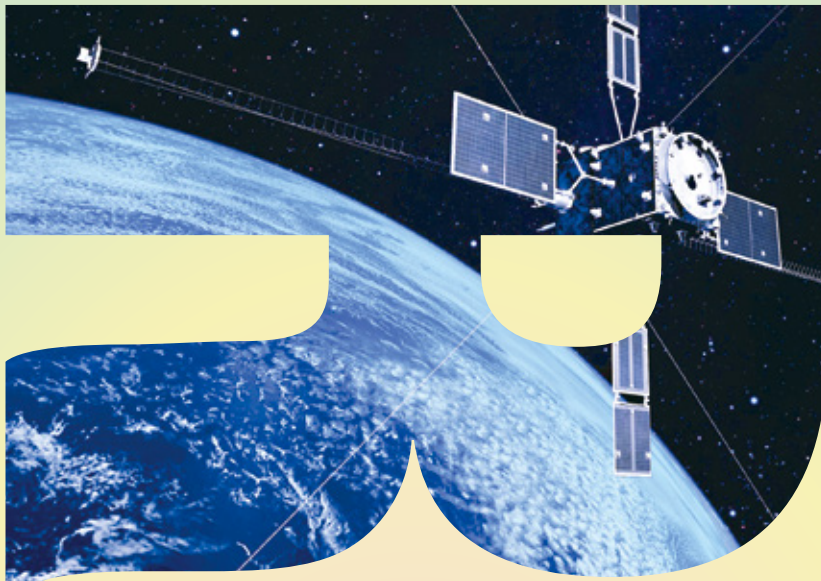
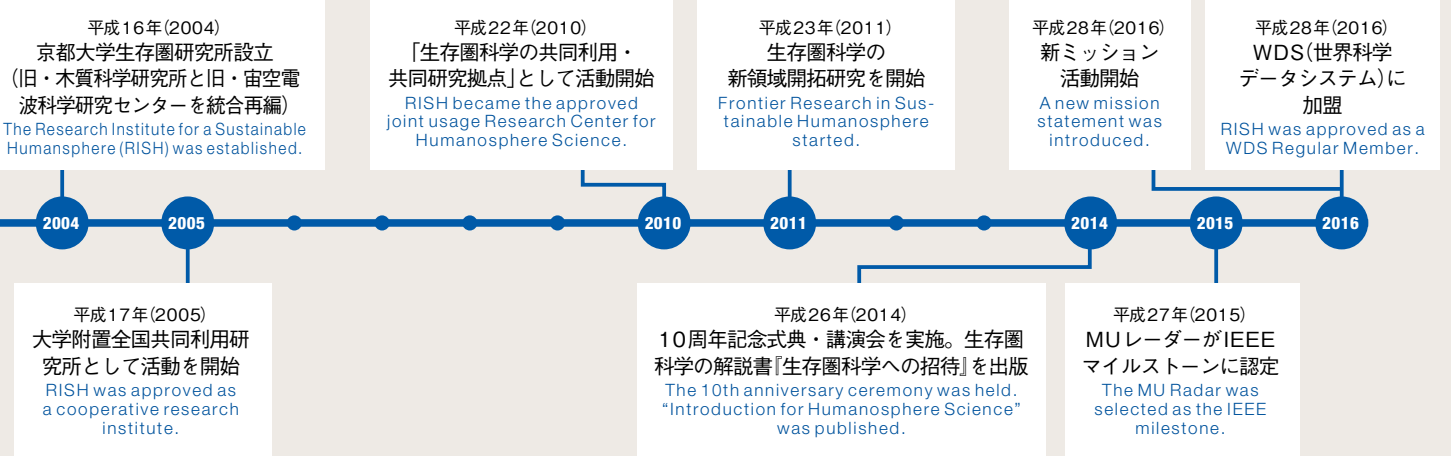
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京都大学生存圏研究所

Research Institute for Sustainable Humanosphere (RISH)
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ごあいさつ Foreword



第4代所長 渡辺隆司

急激な世界人口の増加と産業発展にともなうエネルギー・資源不足、化石燃料の大量消費による地球温暖化、病原性ウイルスの拡散、有害物質による環境汚染、さらには異常気象による災害の頻発など、人類の生存を脅かすさまざまな環境、エネルギー、資源問題が複雑に連関しつつ深刻化しており、人類の持続的な発展や健康的な生活を脅かしています。これらの現状を正確に把握し、的確な将来予測を行ない、さらに問題解決の方策を提示することが求められています。

生存圏研究所は、人類の生存を支え、人類と協調的に相互作用する場を「生存圏」と定義し、急速に変化する生存圏の現状を精確に診断して評価することを基礎に、生存圏が抱える諸問題に対して、包括的視点に立って解決策を示すことをめざしています。

生存圏研究所は、平成16年の発足以来、持続的な生存圏の創成にとって重要なミッションとして、「環境計測・地球再生」、「太陽エネルギー・変換利用」、「宇宙環境・利用」、「循環型資源・材料開発」を設定し、(1)大型設備・施設共用、(2)データベース利用、(3)共同プロジェクト推進の3つの形態の共同利用・共同研究活動をととして、国内外の研究・教育機関や民間企業などと幅広く連携し、持続的な社会の

構築をめざした活動を推進してきました。

平成23年度からは、健康的で安心・安全な暮らしにつながる方策を見出す「新領域研究」を課題設定型プロジェクトとして展開してきました。生存圏研究所は、第三期中期計画・中期目標期間の開始にあわせてミッション活動を見直し、これまでの4つのミッションと新領域研究を発展させた「環境診断・循環機能制御」、「太陽エネルギー変換・高度利用」、「宇宙生存環境」、「循環材料・環境共生システム」、「高品位生存圏」の5つのミッションを設定し、研究成果の実装を含めた社会貢献をめざすこととしました。

また、これにあわせて、平成28年度からは、インドネシアに「生存圏アジアリサーチノード」を整備・運営することで、国際共同研究のハブ機能を強化するとともに、生存圏科学を支え、さらに発展させる国際的な人材育成を進め、地球規模で起こる課題の解決に取り組みます。

所内教職員と学生を中核に、国内外の生存圏科学コミュニティと連携した教育研究活動を積極展開し、持続発展可能な循環型社会の構築にむけて人類が歩むべき道標を科学的に示すことができるよう取り組み所存でございます。みなさまのいっそうのご支援とご協力をお願い申し上げます。

第4代所長 渡辺隆司

沿革 Historical Background

木質科学 研究所 WRI

昭和19年(1944)
管制が公布され、
京都帝国大学に
木材研究所が附置
The Wood Research Institute (WRI) was established.

昭和24年(1949)
京都大学附置となる
WRI was recognized as
an institute affiliated to
Kyoto University.

平成3年(1991)
3大部門・1客員部門に
改組・拡充され、
木質科学研究所に改称
The institute was reorganized and expanded into four divisions.

宙空電波科学 研究センター RASC

昭和36年(1961)
京都大学工学部
附属電離層研究施設
として発足
The Ionosphere Research Laboratory (IRL) was established.

昭和56年(1981)
京都大学超高層電波
研究センターに改組
The Radio Atmospheric Science Center (RASC) was established from reorganizing and renaming IRL.

平成12年(2000)
京都大学宙空電波科学
研究センター
(全国共同利用)に改組
RASC was reorganized and renamed as the Radio Science Center for Space and Atmosphere (RASC).



Mission 1

環境診断・循環機能制御

Environmental Diagnosis and Regulation of Circulatory Function

地球温暖化や極端な気象現象の増加などの環境変動の将来予測には、高機能の大気観測レーダーや衛星などで現状を精密に測定・診断する必要があります。生物圏から大気圏にわたる物質輸送・交換プロセスのメカニズムの解明も必要です。さらに、資源生産・物質循環にかかわる植物・微生物群の機能の解析と制御を通じて、化石資源によらない再生可能植物バイオマス資源・有用物質の持続的な生産利用システムの構築をめざします。物質循環の観点から土壌圏をふくむ生物圏全体を俯瞰します。

To develop predictions of environmental change, such as global warming and the increase of extreme weather events, Mission 1 diagnoses atmospheric conditions by highly sensitive radar and satellite measurements. This work elucidates the mechanisms of material transport and exchange between the atmosphere and the biosphere, including the pedosphere. To establish a fossil fuel-independent sustainable energy production and utilization system based on biomass resources, this mission views the whole humanosphere from a material cycling perspective.

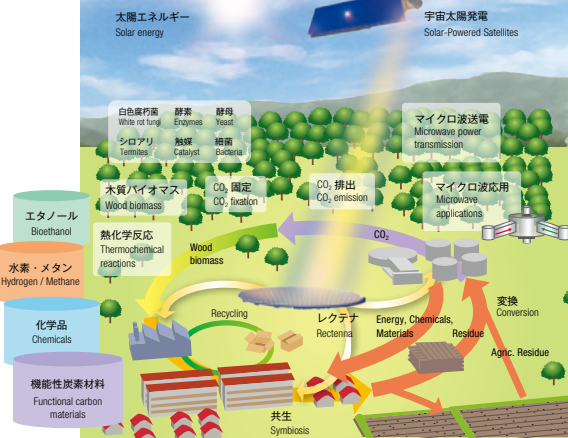
RISH defines the “humanosphere” as the spheres that support human activities, including the human living environment, the forest-sphere, the atmosphere and the space environment. We aim to investigate present and future problems of the humanosphere and explore innovative technology that will contribute to establishing a sustainable society in harmony with the natural environment.

Mission 2

太陽エネルギー変換・高度利用

Advanced Development of Science and Technology towards a Solar Energy Society

ミッション2では太陽エネルギーを変換して高度利用するために、マイクロ波応用工学やバイオテクノロジー、化学反応などを活用して、太陽エネルギーを直接に電気・電波エネルギーや熱などに変換する研究を進めます。さらに、光合成による炭素固定化合物であるバイオマスを紹介し、高機能な物質・材料に変換して有効利用する研究にも取り組みます。とくに高機能物質への変換を重点化し、その要素技術だけでなく全体システムにも展開します。



Mission 2 aims to develop technology for advanced solar energy conversion by means of microwave technology, biotechnology, and chemical reactions. We study the direct conversion of solar energy into electric and electromagnetic wave energies, as well as the indirect conversion of solar energy into highly functional materials via wood biomass, a carbon fixation product of photosynthesis. Mission 2 intensively promotes these conversions and also develop an understanding of how total systems are implemented in the humanosphere.

- バイオマス高度利用のための生分解・化学変換研究
Studies on the Biochemical and Chemical Conversion of Biomass for Advanced Utilization
- 宇宙太陽発電所のためのワイヤレス給電技術研究
Wireless Power Transfer Technologies for Solar Power Satellites/Stations for a Sustainable Humanosphere
- バイオマス循環の基礎理解と応用展開
Elucidation of Biomass Formation/Conversion for Break-Through Technologies
- 機能性木質炭素の開発と分析電子顕微鏡による材料評価
Development of Wood-Based Functional Carbon Materials and Analytical Electron Microscopy for Material Science

地球の診断と治療：生存圏科学の創生

Creation of Novel Science for the Humanosphere: Diagnosis and Remediation of the Earth

ミッション

By integrating the research results obtained in all the Core Research Divisions, we pursue solutions to present and future problems concerning the humanosphere by addressing our four missions: “Mission1: Environmental Diagnosis and Regulation of Circulatory Function”, “Mission2: Advanced Development of Science and Technology towards a Solar Energy Society”, “Mission3: Sustainable Space Environments for Humankind”, “Mission4: Development and Utilization of Wood-based Sustainable Materials in Harmony with the Human Living Environment”, and “Mission5: Quality of the Future Humanosphere.” Mission research fellows are assigned to the Department of Collaborative Research Programs and the Center for Exploratory Research on the Humanosphere. Projects addressing the missions are then conducted by research fellows and project leaders, in collaboration with visiting scientists from domestic and foreign institutions.

教育

We promote the education of graduate students in the scientific fields of agriculture, engineering, natural science, and informatics at the graduate schools of Kyoto University. We likewise educate young research fellows by encouraging their participation in collaborative projects using the world-class, top-level research facilities available at the Joint Usage/Research Center. Through our symposiums and open seminars, we are fostering the development of the future leaders of our society.

Mission 5

高品位生存圏

人の健康や環境の調和、脱化石資源社会の構築、生活情報のための宇宙インフラ構築とその維持、木の文化と木材文明による社会貢献などに取り組み、生存圏の質を向上させます。新しいミッションは、平成27年度まで5年をかけて推進してきた課題設定型共同研究「生存圏科学の新領域開拓」の発展型と位置づけることができます。国内外のコミュニティと連携しつつ、生存研全体の成果をもとに、人をとりまく生存環境の向上をめざす課題解決型の研究を推進します。

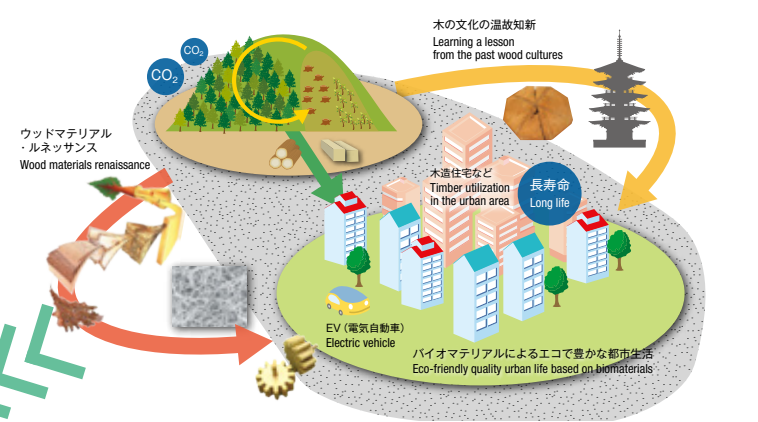
The purpose of Mission 5 is to take effective measures to harmonize human health and environmental issues, establish a society independent from fossil resources, maintain a space infrastructure that supports the human living environment, and contribute to society by creating a renewable wood-based civilization, for the purpose to improving the quality of the humanosphere in the future. This mission is based on collaborative research activities carried out from 2011 to 2015 as “Frontier Research on the Sustainable Humanosphere” and promotes problem-solving project studying the five main themes for human life by means of Humanosphere Sciences.



Mission 4

循環材料・環境共生システム

Development and Utilization of Wood-based Sustainable Materials in Harmony with the Human Living Environment



循環型生物資源、とくに木質資源の持続的利用を進めるため、生存圏科学に由来する技術を結集して生物の構造や機能を最大限に引き出す機能性材料の創製、安全・安心な建築技術を開発します。生態系と人間活動との調和と発展にむけて、樹木、植物、昆虫、微生物の管理・利用法も研究します。基礎・応用の両面から環境未来型の生活圏のありかたを探るとともに、「創造」を意識しつつ、自然との共存を継承・継続する技術、材料の開発をめざします。

Mission 4 aims to develop a sustainable, renewable and cooperative human living environment by constructing a novel social system based on wood-based resources. This mission focuses on human habitation by examining biologically-based and sustainable materials, the architectural function of structures and the human habitability of these structures. The principle of this mission is to unify state-of-the-art technologies in engineering, agriculture, biology and anthropology through wood and material sciences. This mission is designed with creativity in mind to develop materials and techniques inherited to create harmony between nature and human activities.

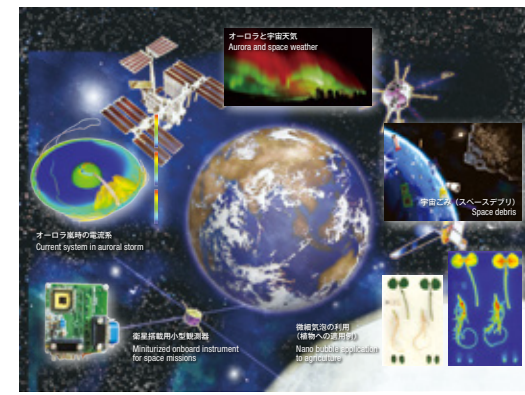
- 低環境負荷型木質新素材の創成および再生
From Production to Recycling of Wood Biomass-based Materials
- 木質材料・木質構造の評価・開発
Development and Evaluation of Timber Materials and Structures
- 生物由来ナノ材料の創成
Bio-Inspired Nanostructures & Nanomaterials
- 未来型資源循環システムの構築
Eco-Friendly Life Systems for a Sustainable Future
- 木本植物の計量形態学的研究
Quantitative Morphology of Woody Plants

Mission 3

宇宙生存環境

宇宙圏・大気圏の理解のための研究を深化・融合させ、生活圏や森林圏との接続性の解明に取り組みます。太陽フレアを原因とする放射線帯や磁気嵐の変動などの理解を深め、スペースデブリへの対策や、生存環境への影響が甚大である小惑星の地球との衝突の可能性にそなえて、地球衝突の前に小惑星の軌道を微修正する工学的対応に取り組みます。宇宙インフラの維持・発展に貢献し、生存環境の維持・改善、ひいては大気圏、森林圏、生活圏との接続性も重点化します。

The aim of Mission 3 is to advance research for the understanding of space and atmospheric environments and their interactions with the human living environment-sphere and the forest-sphere. This mission aims to deepen our understanding of the fluctuations in radiation belts and geomagnetic storms due to solar flares and study an engineering approach to prevent asteroid impacts on Earth including potentially hazardous space debris and asteroids. This mission emphasizes the maintenance and improvement of space environments for daily human life, as well as interactions with the atmosphere, forest-sphere, and human living environment-sphere.



- 宇宙プラズマ計算機シミュレーション
Space Plasma Simulations
- 地磁気誘導電流の研究
Study of Geomagnetically-Induced Currents
- 宇宙電磁環境の計測
Exploration of Space Electromagnetic Environments
- 宇宙用新材料の開発
Development of New Materials for Space Humanosphere

分析、実験、
研究をささえる
共同利用設備

Facilities of
Cooperative Study
Program

マイクロ波エネルギー
伝送実験装置

Microwave Energy
Transmission Laboratory

先端電波科学計算機
実験装置 (A-KDK)

Advanced Kyoto-daigaku
Denpa-kagaku Keisanki-jikken
computer

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