

Category Overview

Challenging Future Societal Issues through Open Innovation —Center for Exploratory Research—

Shinji Yamada, Ph.D.

MISSION OF THE CENTER FOR EXPLORATORY RESEARCH

WITH the spread of information and communication technology, the progress of globalization, the diversification of peoples' values, and other factors, an era of drastic change has arrived where the processes that create knowledge and value are undergoing tremendous changes, and the ideal situation of the economy and society and the structure of industry are changing rapidly. The Center for Exploratory Research has the mission of "pioneering new frontiers through vision-driven exploratory research." It is working to sketch out the form that the society of the future should take in this era of drastic change and is striving to achieve this society through open innovation. In particular, the center is promoting a focus on research and development toward realizing a human-centric "Super Smart Society" (Society 5.0)⁽¹⁾ as advocated by the Japanese government, a society that delivers both economic growth and solutions to societal issues. The center is working on developing the technology to form the seeds of innovation as well as advancing the construction of an open innovation platform for nurturing these seeds.

SEEDS OF INNOVATION

Research based on a creative vision for understanding the nature of future societal issues and solving them

is pursued with division into four fields: physical sciences, life sciences, information sciences, and frontiers (see Fig. 1).

In the field of physical sciences, the center is promoting research on atomic-resolution holography electron microscopes for discovering new quantum physics phenomena and creating revolutionary new materials, energy conversion materials, and magnetic materials. For example, among energy conversion materials, a thermoelectric material⁽²⁾ that can convert low-grade waste heat to electrical energy is being developed.

In the field of life sciences, research is being conducted on regenerative medicine, brain science, and smart diagnosis systems based on the vision of "empowerment of mind and body." In the field of regenerative medicine from among these, attention has focused on the expansion of previously developed fully enclosed cell culture technology⁽³⁾ to medical applications of induced pluripotent stem (iPS) cells.

In the field of information sciences, research is being pursued on the optimization of systems for a more complex society and is advancing new-paradigm computing⁽⁴⁾, artificial intelligence for business assistance⁽⁵⁾, and communication empowerment. For example, an artificial intelligence that understands the various values of humans and presents reasons and grounds both for and against them is being developed with the aim of supporting unbiased business decisions.

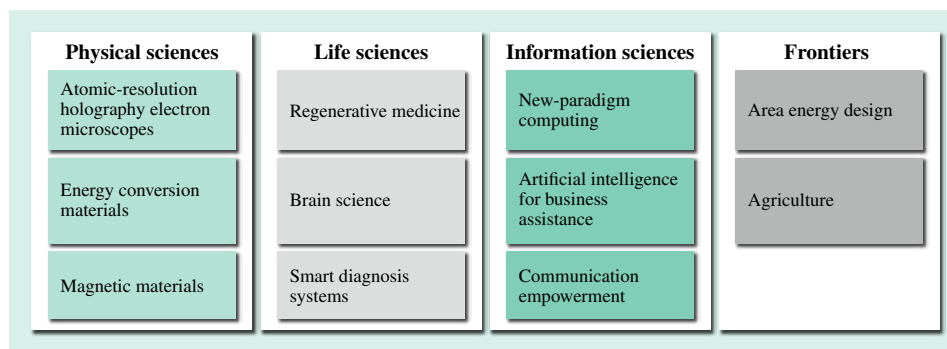


Fig. 1—Research Fields of the Center for Exploratory Research.

The center is promoting research with the aim of optimizing society and understanding humans in order to implement a Super Smart Society in the four fields of physical sciences, life sciences, information sciences, and frontiers.

In the field of frontiers, which aims to validate solutions in real society, experiments are being conducted to demonstrate local independent energy systems with high-efficiency combustion technology for low-concentration bioethanol⁽⁶⁾ at their core, and new agriculture based on soil sensing and farming knowledge databases.

OPEN INNOVATION PLATFORM

In an era when the creation of innovation by independent companies is difficult, the utilization of open “spaces” that transcend the boundaries of organizations, fields, nations, and regions is necessary in order to realize rapid innovation. The Center for Exploratory Research is promoting the construction and utilization of three types of spaces, namely, “university joint research sites,” “open laboratories,” and “external validation sites,” to promote collaboration with a wide variety of partners from vision creation and research and development to demonstrate social value and further create ecosystems with a focus on commercialization.

University Joint Research Sites

Universities have resources such as knowledge in variety of fields, from humanities to natural sciences, and strong networks that link to nations, regions, and citizens. Universities are also hotspots that accumulate cutting-edge information. To build mechanisms for creating and demonstrating a stream of new value with an eye toward the future, it is effective to place researchers in these hotspots to work closely together with the abundance of knowledge and networks of universities. Therefore, in addition to conventional collaborative research focusing on individual themes, a new form of academia-industry cooperation has been started that aims to build collaborative creation on an organization-to-organization basis.

This has triggered the establishment of new collaborative research laboratories in The University of Tokyo, Kyoto University, and Hokkaido University in June 2016 (see Fig. 2). These laboratories will work to engage in problem-solving that makes use of the unique character of each university and region based on the common vision of “realizing a Super Smart Society.”

Hitachi The University of Tokyo Laboratory will sketch out a vision for realizing a society based on a “vision for creating Society 5.0” in which everyone can lead a rich life and create innovation based on knowledge collaboration by tying together a diverse range of knowledge. Hitachi Kyoto University Laboratory will work on “pursuing issues of the future” based on fundamentals and academic theory. This laboratory will utilize the long history and culture that are particular to the region to research societal issues of the future out to the year 2050 based on an understanding of humans and culture. Finally, Hitachi Hokkaido University Laboratory will investigate the many societal issues that are directly facing Hokkaido and work together with local governments to demonstrate the effectiveness of the solutions under the major theme of “solutions in a region with emerging issues.”

Open Laboratories

The Center for Exploratory Research has leading-edge research facilities including the only atomic-resolution holography electron microscope in the world. The center is working on creating value and building research networks by opening these facilities to research institutions outside of the company for collaborative use.

More specifically, the center is opening its 1.2-MV and 1-MV ultrahigh voltage holography electron microscopes and other holography electron microscopes to leading-edge researchers from around the world in order to collaborate on discovering new




Hub	Hitachi The University of Tokyo Laboratory	Hitachi Kyoto University Laboratory	Hitachi Hokkaido University Laboratory
Research theme	<p>“Vision for creating Society 5.0”</p> <ul style="list-style-type: none"> Recommend policies for the creation vision 	<p>“Explore future problems”</p> <ul style="list-style-type: none"> Academia and industries in the year 2050 Advancing artificial intelligence Fundamental physics 	<p>“Solutions for regions with emerging issues”</p> <ul style="list-style-type: none"> Area design and regional creation Food and health Mathematics for social creativity
Spaces	<ul style="list-style-type: none"> Hongo Campus Joint research sites 	<p>Yoshida Campus: International Academic Innovation Building</p> 	<p>Global Research Center for Food & Medical Innovation / Research Institute for Electronic Science</p> 

Fig. 2—University Collaborative Research Hubs.

The center has newly established cooperative research laboratories at three universities in Japan to work on solving societal issues by utilizing the unique characteristics of the universities and regions.

science. Furthermore, in regenerative medicine, the center is sharing with its partners the fully enclosed cell culture technology, which has no risk of contamination, and the center is working on automating the cell production process, with the aim of making regenerative medicine more widespread in medical treatment.

In the future, the center will share platforms that are under development with research institutions outside of the company in information fields such as Ising computers and artificial intelligence in order to work together to expand the application to societal issues.

External Validation Sites

In the development of solutions for solving societal issues of the future, it is essential to validate their effectiveness by applying them at actual sites. The center is therefore looking at regions that are facing real problems and is working together with local governments and local industry to trial proposed solutions and move forward with validating their value.

On Miyako Island, Okinawa Prefecture, the center is demonstrating an independent energy-recycling social system in the region. The system is based on bioethanol from sugar cane, which is a local resource, and uses an independently developed high-efficiency engine system with exhaust heat recovery at its core. Furthermore, in Iwamizawa City, Hokkaido, the center is working as a member of the Hokkaido University Center of Innovation (COI) on building a self-health-care platform that links the private hospitals, core hospitals such as Hokkaido University Hospital, city health centers, and social workers with the approximately 80,000 residents of Iwamizawa City. This makes it possible to implement a community that offers support for residents to be able to voluntarily manage their own health. On Okinawa Island, progress is being made with demonstration experiments of a plant factory that provides stable growth in a subtropical zone of high-value-added produce for primarily cold regions with the aim of revitalizing local agriculture.

CONCLUSIONS

The Center for Exploratory Research is promoting open innovation by utilizing the three “spaces” of “university joint research sites,” “open laboratories,” and “external demonstration sites” with the aim of solving the societal issues of the future. The center is working together with a variety of partners to

contribute to the realization of a rich human-focused “Super Smart Society.”

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ABOUT THE AUTHOR



Shinji Yamada, Ph.D.
General Manager, Center for Exploratory Research, Research & Development Group, Hitachi, Ltd.
Dr. Yamada is a member of the Chemical Society of Japan and the Society of Nano Science and Technology.