Keihanna Human L³ Cluster

Life Sciences IT Environment Nanotech/Materials

Kansai Science City

Aiming to create new industries through teamwork and networking between industry, academia and government, and by exploiting a unique combination of factors—like science/technology, industrial infrastructure and cultural assets—in Keihanna Science City.

Cluster Vision

Kansai Science City has built up a large fund of intellectual capital at its core universities and major research institutes: the former represented by the Nara Institute of Science and Technology, Doshisha University, and Osaka Electro-Communication University, and the latter include the Research Institute of Innovative Technology for the Earth and the Advanced Telecommunications Research Institute International. Using this intellectual capital and through collaborative activities between industry-academia-government, we conducted research on technologies that will become the core of next-generation industries in the Human L-cube areas: life science, living technology, and learning oriented toward full lives emphasizing human values, i.e., lifestyles appropriate to the 21st century. Then, we created a "knowledge reproduction cycle" that links research results with projects. Through these endeavors, we aimed to realize an innovation cluster combining IT and the life sciences.

Project Overview

In order to realize the Cluster Vision, we have undertaken the following projects:

(1) The construction of a "knowledge reproduction cycle" through the collaboration of industry-academia-government
In order to construct a mechanism that would allow the parties responsible for innovation to form partnerships organically and enable the knowledge reproduction cycle to operate autonomously and efficiently, we have endeavored to clarify and share the regional Cluster Vision, gather and build a network of researchers, entrepreneurs, educators, etc., establish a support system for cycle sustainment composed of regional governments, economic organizations, etc., promote exchanges and joint research activities with major domestic and foreign clusters, and foster next-generation researchers and entrepreneurs.

(2) Joint study to create new technologies that serve as the core of next-generation industries
The research group led by the Nara Institute of Science and Technology worked on research projects in the life sciences including technology to produce proteins for medical use from vegetable foliage, the development of low-impact medical materials, and purification of the soil with plant roots. The research group led by Doshisha University and Osaka Electro-Communication University undertook studies into intelligent lighting systems in the area of "Neo-Kaden," or new concept electrical appliances. These systems have the capacity to independently adjust light output to the most appropriate level. This group also studied wireless communication security technology that does not use encryption and high-function myoelectric prosthetic hands. The group worked hard to achieve the "creation of new industries that combine Kansai's cultural assets and IT technology," utilizing next-generation learning systems and Kansai's rich cultural assets.

(3) Incubation /commercialization support utilizing research results
In order for research results to help create new businesses, we undertook support activities tailored to corporate requirements, including marketing research on the potential for utilization of research results, support for trade show exhibitions, and advisory services after selection as public projects.

Project Director
Masaharu Noyori

Masaharu Noyori is an honorary advisor to Matsushita Electrical Industrial Co., Ltd.

Looking back on the five years of the Keihanna Human L³ Cluster

Since 2002, we have been promoting our project based on the concept of "realizing full lives emphasizing human values, or lifestyles appropriate to the 21st century." The joint research, led by the three core universities, has evolved into an immense project with the participation of a total of 153 organizations, producing 581 research papers, 239 patent applications, 44 technology transfers, and 11 venture businesses and commercializing 29 products. Moreover, directions for practical use are starting to take shape for core technologies for next-generation industries such as genetic engineering technology for chloroplasts, although commercialization will take a little more time. Furthermore, the movement (revolving around regional governments and the Kansai Economic Federation) to create new businesses via this project has gathered momentum across the entire region and is becoming instrumental in the development of an innovation system based on industry-academia-government collaboration, such as establishment of the Keihanna Center for New Industry Creation and Exchange. That being said, however, we are still only halfway to the realization of the innovation cluster the region has been attempting to create. We are still confronted by a number of challenges including the limited scope of the economic benefits of this project and the need to enhance our international competitiveness.
Therefore, the Third Science and Technology Basic Plan also emphasizes the rejuvenation of the innovation process, and Kansai Science City remains committed to building an international innovation cluster.

Cluster Headquarters

○President……Hiroyuki Mizuno (Director, Kochi University of Technology, General Research Center)
○Project Director……Masaharu Noyori
○Chief Scientist……Naotake Ogasawara (Professor, Nara Institute of Science and Technology)
○Deputy Chief Scientist…Yoshiaki Watanabe (Professor, Doshisha University)
○Coordinators……Haruo Misumi, Kunio Nakamura, Ken Abe
○Advisers……Kenichi Ito, Masako Yamashita, Yuka Nobuhara

Core Organization

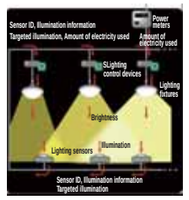
Keihanna Interaction Plaza Inc.

Participating Research Organizations (Bold: Core Research Organization)

Industry…Hagihara Farm Co., Ltd.，SANWA CORNSTARCH CO., LTD.，EZAKI GLICO CO., LTD.，Environmental Research Center The Kansai Electric Power Co., Inc.，OMRON Corporation，CUBIC INC.，ATR，DoGA Corporation，Micronix Inc.，NIPPON SYSTEM DEVELOPMENT CO., LTD., NTT DoCoMo Kansai, Inc., and others
Academia…**Nara Institute of Science and Technology，Doshisha University，Osaka Electro-Communication University，** and others
Government…Nara Agricultural Technology Center，Nara Prefectural Institute for Hygiene and Environment，Kyoto Prefectural Institute of Agricultural Biotechnology, Technology Research Institute of Osaka Prefecture, **Research Institute of Innovative Technology for the Earth, RITE,** and others

Main Results

1. Intelligent lighting technology for next-generation offices
The intelligent lighting system, consisting of multiple intelligent lighting fixtures, multiple movable lighting sensors, and power meters connected to a single network, provides optimum illumination in any given location through the independent illumination control of lighting control equipment installed in intelligent lighting fixtures. This system is a model for next-generation lighting systems that enable energy conservation.
Through the "Smart Office Environment Consortium," we are aiming to create working spaces controlled and optimized for each office worker and to become the de-facto office lighting standard for Japan and the rest of the world.

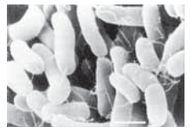


intelligent lighting system

2. Medical protein production technology through genetic engineering of chloroplasts
Using technology to genetically engineer chloroplasts from leafy vegetables (lettuce), we were able to produce a tetanus vaccine, which is an inactivated toxin (protein), thereby establishing basic technology including applications for basic patents.
Hopes are that this genetic transformation technology will lead to the development of a plant production factory capable of producing value-added proteins such as medical proteins safely and inexpensively.


Chloroplast transgenic lettuce

3. Environmental cleanup technology using plants and microorganisms
Through analysis of useful genes in the halophilic bacterium Halomonas elongata, we developed a highly responsive cell-surface engineering technology for bioremediation.
We succeeded in improving the heavy metal remediation of Halomonas cells by "arming" them (so they feature protein arms on the cell surface),. Hopes are that this will lead to the development of a remediation system that inexpensively eliminates contaminants that could not be eliminated conventionally.


Halophilic bacterium
Halomonas elongata

Overview of New Human L³ Industries —New Businesses and Key People—