Greetings from Kyoto-U

楽友 Raku-Yu

Kyoto University Newsletter

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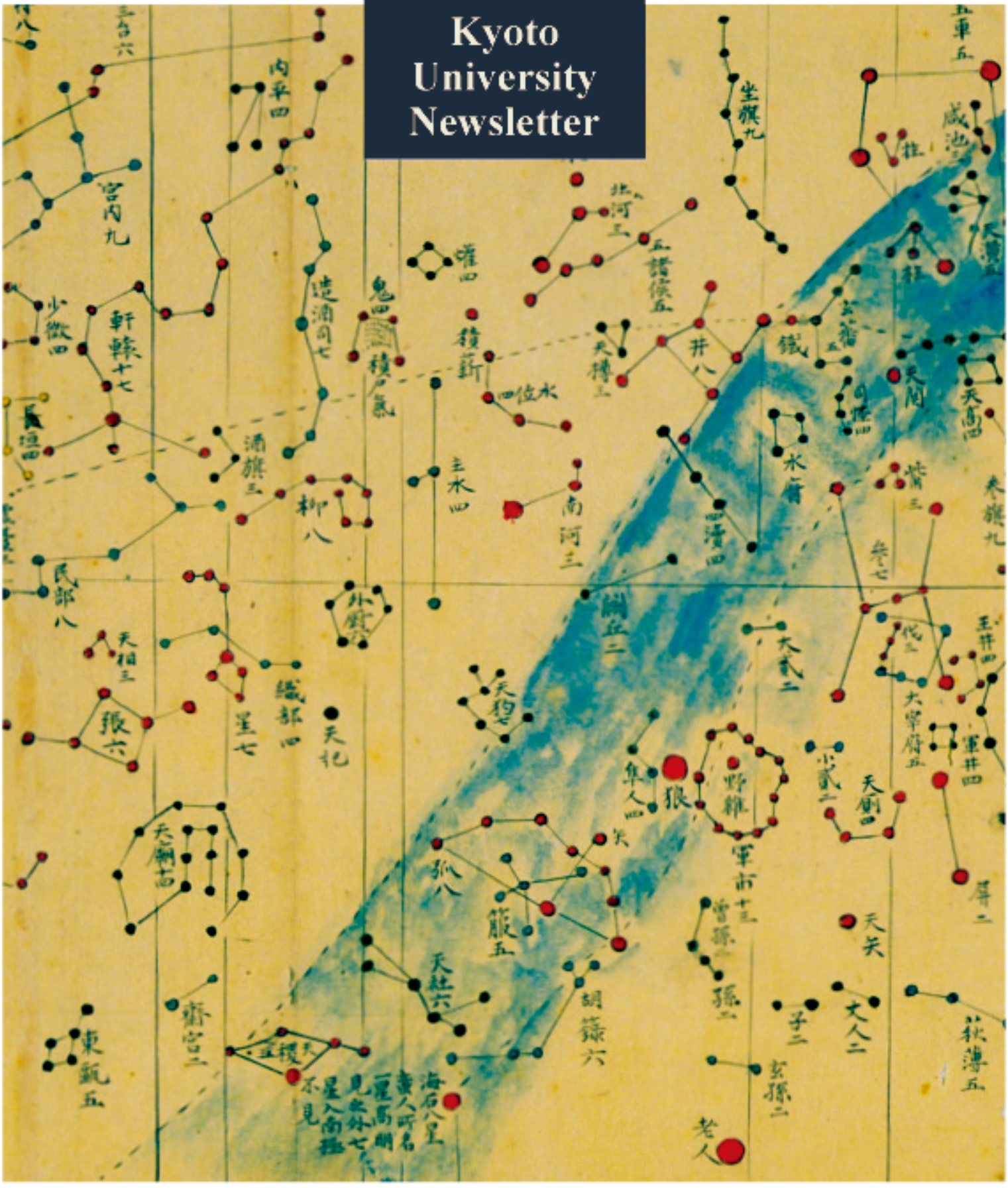


C O N T E N T S

Editor's notes

This issue of Raku-Yu features a special trilateral dialogue among Dr. Alan Kay, our President Professor Kazuo Oike, and Professor Hajime Kita. Dr. Alan Kay was a good friend of the late Professor Yahiko Kambayashi, who passed away in 2004 while he was serving as the Dean of the Graduate School of Informatics. Dr. Kay invented the concept of personal computers and is a 2004 laureate of the Kyoto Prize in Information Science. Their friendship led to the creation of the ALAN-K project, which is the project to utilize computers to promote creativity of young people in Kyoto. The reader is referred to the Spring 2003 issue of Raku-Yu for more details of the ALAN-K project.

The conversation with Dr. Kay took place at a guesthouse with a beautiful Japanese garden owned by Kyoto University, which is indeed an appropriate place for talking about the past and future of education and research. The rest of the articles report various activities of Kyoto Univesity, and I hope that the reader will enjoy reading them as well as the featured article

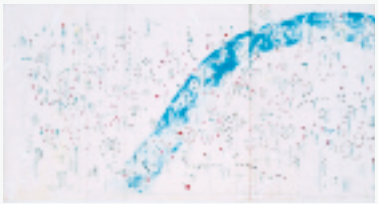
Masahiko Sato,Editor in Chief, The Editorial Commitee of Raku-Yu

Tenmonseisho

Sekisui Nagakubo (Mid-Edo Period)/Collection of Department of Mathematics, Faculty of Science

The dawn of astronomical study in Japan is generally thought to be during the Edo period. Before then, constellations and star charts were dependent on those imported from the continent, mostly from China, as there were no constellations developed in Japan. However, a scholar of astronomical calendar of the mid-Edo period, Harumi Yasui (later known as Harumi Shibukawa: 1639-1715), produced the first constellation and start charts based on own measurements by a Japanese. Around that time, many astronomy and calendrical science texts were being published, and the "Tenmonseisho" chart, which appears on the cover, was one of the charts produced in that period.

The man who drew this chart was Sekisui Nagakubo (1717-1801), a Confucian scholar and geographer. He is famous for his numerous map compilations such as a map of Japan that includes longitude for the first time in Japan entitled the "Kaisei Nippon Yochi Rotei Zenzu (Revised Complete Map of Japanese Lands and Roads)" which he drew in 1779 at the age of 63 and a map of the world in elliptical form entitled "Chikyu Bankoku Zenzu" which he drew in 1785. No detailed explanation remains regarding his "Tenmonseisho", but it is generally accepted Sekisui gained much influence from the astronomer, Harumi In addition to the "Tenmonseisho", he also worked on the star charts then, which are considered to be a kind of star wheels used today. Some of his charts were published in 1773 in an astronomy book entitled "Tenshokankisho".



Reference: Toshio Watanabe "Kinsei Nihon Tenmongakushi Vol. II (A View of Japanese History of Astronomy in Modern Times Vol. II)" Published by Koseisha Kosaikaku pp. 757-841.

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A Note on Order of Names
As a general rule, names appearing in *Raku-Yu* are written in given name/family name order.

楽
Raku-Yu means to respect, treasure, and enjoy one's friendship.
友

This name was taken from the assembly hall called "*Raku-Yu Kaikan*" that commemorated the 25th anniversary of the founding of Kyoto University.

Kazumi Matsushige Born in Fukuoka Prefecture in 1947, Prof. Matsushige graduated from the Kyushu University Faculty of Science in 1970, and earned his master's degree in 1972. He obtained his Ph.D. from Case Western Reserve University, USA. He was a professor at Kyushu University from 1990, and became a professor at Kyoto University Graduate School of Engineering in 1993. In 2003, he was appointed Vice-President of Kyoto University in April 2004, and Director of International Innovation Organization in April 2005.

Over the past 10 years, Prof. Matsushige has been energetically involved in collaborative projects with industry at Kyoto University. One wouldn't guess from his calm demeanor, but he has become famous as a capable manager of a string of projects both inside and outside the university, opening up new possibilities for Kyoto University, which had traditionally focused on basic research. Currently, Prof. Matsushige's focus is on molecular nano-electronics. While his current ultimate aim is to develop a molecular computer, he originally majored in physics, due to his admiration of Nobel-prize winning physicists Dr. Yukawa and Dr. Tomonaga. Changing departments prompted him to consider what he could do in this new environment, and caused him to change the theme of his research. The basic approach of that research was innovation based on creation and the fusion of disparate fields. This has continued to be his basic concept of collaboration between industry and academia. In the future, his efforts seem likely to expand beyond the field of industry, and into new fields such as culture, including the creation of the Neo Consortium Nishiyama, based on the Univeristy's Katsura Campus.

Innovation Based on University Knowledge

The 21st century is the era of information. Universities are being called upon to provide not only education and research, but also to contribute to society through knowledge-based activities. Kyoto University has long sought to serve as one of the world's most advanced centers of knowledge, by endeavoring to foster the continuation, deepening and development of learning and the creativity of young people. In recent years, we have lead the way in working with society to jointly develop next-generation technologies and creating a center of innovation with our university as a core institution.

Since its establishment, Kyoto University has maintained strong connections with leading high-tech firms in the Kyoto region, including Shimadzu Corp., Kyocera Corp., Murata Manufacturing Co.,Ltd. and Horiba, Ltd. However, during the days of the radical student movement in the 1960's, these relationships entered a prolonged period of estrangement. Yet over the past 10 years there has been a major shift in the environment and perceptions surrounding industry-university partnerships. The Venture Business Laboratory (VBL), founded in 1996, has been a pioneer in this regard, promoting organizational joint research between the university and industry and helping to develop students' entrepreneurial spirit. Further, in 2001 the university established an International Innovation Center (IIC), with the aim of promoting and supporting collaboration between industry, academia and government. Finally, in 2003 the Intellectual Property Office (IPO) was founded with the backing of the Ministry of Education, Culture, Sports, Science and Technology (MEXT) and a number of programs aimed at building an "intellectual creative cycle" were launched.

At the same time, Kyoto University has put effort into collaborative regional and international programs, with the goal of creating an open university. Progress has been made in a wide range of large-scale projects, including the Kyoto Nanotechnology Cluster and medical/industry cooperation, by working closely with local municipalities and small and medium-size businesses. In particular, the Katsura Innovation Park (KIP) adjacent to Kyoto University's Katsura Campus has raised hopes both domestically and internationally for its growth as a center for the creation of new industry. In addition, the university has emphasized collaboration with universities and corporations from Europe, North America and Asia, and a center for China's Qinghua University will be set up inside Kyoto University's ROHM Plaza.

With the incorporation of Kyoto University, the achievements of joint research with corporations and intellectual property have been greatly enhanced, and last year a total of 578 new inventions were reported, more than any other university nationwide. In order to further promote and support these kinds of collaborative programs between the university and industry, in April 2005 Kyoto University established the International Innovation Organization (IIO), an organization which will manage the VBL, IIC and IPO. In July of this year, Kyoto University was chosen as one of the "Super university-business cooperation headquarters." Kyoto University's collaborative programs with industry have made the university both a leader and a model for other universities nationwide. Kyoto University is expected to show the world the possible role of the university in the 21st century.

Kazumi Matsushige
Vice-President of Kyoto University

The challenge for universities is to make the invisible visible ～thinking behind the ALAN-K project～

Alan Kay
- Born in 1940, Massachusetts, USA
- B.S., Mathematics and Molecular Biology, University of Colorado, 1966
- M.S., Electrical Engineering, University of Utah
- Ph.D., Computer Science, University of Utah, 1969
- Visiting Professor at Graduate School of Informatics, Kyoto University

By seeing the computer as a tool to nurture creativity in people and by utilizing the programming language "Squeak", Alan Kay is trying to bring out the creative potential in children. The ALAN-K project (*1), in which. Kyoto University collaborates, began from friendship with the late Prof. Yahiko Kambayashi

A.K: (Alan Kay): The first time I met Professor Kambayashi was in 2002. I had just arrived in Japan on NEC's CLC Program and we met at a luncheon and became friends. Professor Kambayashi had a real strength of character; he was an extremely energetic person with a tremendous zeal for his own work. He had a strong unfaltering belief in following through his ideas.

Professor Kambayashi asked me to help out in an information education support program aimed at the children of Kyoto City. This is how the ALAN-K project started. By using the software Squeak that I developed, classes began in elementary, junior high and senior high schools that gave the children a freedom to explore programming. This resulted in the creation of a partnership with Kyoto University led by Professor Kambayashi and even after Professor Kambayashi's passing, this partnership is being continued by professors of the School of Informatics.

H.K: (Hajime Kita): In addition to the educational activities at elementary to high schools in Kyoto and Tokyo, Alan and I also teach classes that are open to all the faculties at Kyoto University.

A.K: One thing that is key to making this project successful is giving teaching support to the people who are teaching the children as this helps the children. Ultimately, the thing that makes or breaks such a project aimed at children is how we can create a skillful organization from the strengths of the people who extend a helping hand to the children. The Squeak project in Japan enjoys the contribution of many volunteers. We have also been lucky to receive volunteer contributions from Hewlett-Packard Japan. That we have these people who have taken it upon themselves to help out is really fantastic. Children, teachers teaching children and adults who are helping these teachers really hold the power to change things in a big way. This spirit of lending has spread so much, I can't help feeling Professor Kambayashi's energetic spirit was contagious and an inspiration to us all.

K.O: (President Kazuo Oike): The way that the children so readily embrace this new project can be attributed to Alan's star quality. Giving students the opportunity to meet a certain charismatic individual is extremely important in education.

A.K: I suppose some people may describe me as a charismatic person. But take Professor Kambayashi for example; he was an immensely charming person. The source of this charm was his natural bubbling enthusiasm. I think this pure enthusiasm was contagious and it had the power to inspire others. In other words, I think all the children possess their own charismatic qualities. I have had the opportunity to have contact with many children, and I really think that children hold the ability to openly convey their own sentiment. If there is something that attracts a child's interest, then the child naturally tends to get closer and express their sentiment towards that thing. With adults also, people with the ability to convey their own feelings with persuasion and conviction are riding on the pure enthusiasm to achieve something by themselves.

K.O: In my observation of the students of Kyoto University, I felt that in the past many of the students who entered university appeared to have maintained their childhood spirit. Recently however, such students are not as common as they once were. Perhaps a certain responsibility lies with the way the university entrance exam is conducted, but nevertheless after entering Kyoto University I want the students to understand that they are in a free learning atmosphere and I would like to see them develop into people who possess a rich conception. However from society in contrast there are expectations that students should be educated in ways that turn them into immediate assets. How can we turn out youth rich in creativity, and how can we comply with the demands of society? We continually confront these two conflicting interests. We must learn from Dr. Alan's experience.

A.K: The Squeak project is basically a tool to bring out ideas. It is nothing but a tool and it would be wrong for all eyes to focus on it. What gets hard here

is that people tend not to detach themselves from their daily life and focus too much on pondering what is normal. For many people things that are considered normal in society are simply taken for granted. However children and artists for example, are not like this. Children have a lower recognition of what is normal and this allows them to pump out powerful ideas rich in creativity. Artists do comprehend what is normal in society, but they also can recognize the existence of many things outside of this and express them. In other words, the fields of science, education and art are all about making the unapparent apparent. In this sense, I think the reason for existence of universities is to change things that are not visible into things that are visible.

H.K: What was tremendously interesting about doing classes together with Alan is that what he demanded in class completely ran against the grain of conventional school education. The university students were asked to design educational materials to benefit the children's study. Alan wanted something that the children could play with, enjoy and learn through the process of using. The university students were planning to create a finished program that would hand on the knowledge that they held but in a revolution of consciousness Alan requested that the students create a tool that helps the children do the programming themselves. When this tool was finally used in the elementary schools, the university students understood the reason for Alan's request. It was like a switch was turned on for both university students and children and there was a really good vibe.

Hajime Kita
- Born in 1959,Osaka
- B.S., Electrical Engineering, Graduate School of Engineering, Kyoto University
- Ph.D., Engineering, Kyoto University
- Professor, Academic Center for Computing and Media Studies, Kyoto University

K.O: In Japan today opportunities for young adults to mix with children are becoming less and less. I have three grandchildren and when I do experiments with them, I take great pleasure in watching their reaction. Can you suggest any interesting experiments to try out?

A.K: One thing I can think of is to carry in your pocket a microscope with a 40x magnification, which you can pull out every now and then to allow your grandchildren to view various things. I think the opportunity to see things differently to your own eyes is certainly valuable experience. By doing this it allows us to realize that the world in which we live our normal lives is just one part of a much bigger world.

Kazuo Oike
- Born in 1940, Tokyo
- B.S., Geophysics, Department of Geophysics, Division of Earth and Planetary Sciences, Graduate School of Science, Kyoto University
- Dean of Graduate School of Science, Kyoto University, 1997-1999
- Appointed President, Kyoto University, December 2003

K.O: That's a fascinating suggestion. If you take just a cursory glance at the dreamy imaginative world of children, it is easy to perceive it as nothing very

Sitting on the veranda sipping green tea

special. With subject content such as candy and sweets, their imaginings don't seem to venture outside the scope of the ordinary everyday. But once we engage in discussions like today's, one begins to realize that if we can just equip the children with sensors to detect the existence of a world that they cannot see through their own eyes alone, then the possibilities for broadening the scope of imagination are amazing.

A.K: Through broadening the scope of our own awareness, we gain the ability to change how we think about things. As such a change occurs we notice that the current processes behind our current way of thinking are not so good after all. I think learning this at an early age and having this experience many times over can yield a wonderful capacity for thought.

H.K: Alan is always asking the students "What can you do outside of the computers?"

A.K: With school education in most countries, the notion of education is to hunt for the answers; an answer exists and students seek to find what it is. If this pattern is followed for the student's entire school life including university, then for 16 years the student diligently studies to discover answers that have already been established. What is important however is whether or not these questions are significant enough to be worth pursuing to find the answer and this is a choice that the students themselves make.

K.O: I think the job of university is to get students to discover the questions. After a student enters university, he or she must embark upon a path of study. From this study, the student discovers the questions alone. This is the most crucial point. And then once the student discovers many questions the challenge of identifying the most important question presents itself. Getting the student to carry out this autonomous study is one of the major jobs of universities. The discovery of many questions is an indication that the student is rich in dreams and imagination. The questions "what do I want to do?" and "what do I want to know? are crucial here.

My field is geophysics and what I want from a computer is super fast computing power and enormous memory. My greatest expectation for a computer is an Earth simulator that processes mammoth amounts of data. I therefore tell my students to always consider simulation models that can be used on the next generation of computers and then proceed to fetch the required data. The students embark on field work, gather data from around the world and compile the data based on the model they had previously designed. By following this method, the timing of when the data is finally compiled coincides with the availability of the next generation of computer.

A.K: In respect to the question of whether computers are more akin to people or mote akin to tool, I think about my musical instruments at home. I certainly do not want my instruments to start thinking for themselves. But I do want them to amplify my own thoughts. Another way of thinking of

The conversation with Alan Kay was held at *Seifuso*, which is owned by Kyoto University as a guesthouse. Originally the second home of the elder statesman *Kinmochi Saionji*, it was first used by Kyoto University as a campus conference center in about 1965.

On the other side of the gate is a garden with large lawn areas. The aging structures are carefully maintained.

Looking at a 100 year-old newspaper article "Predictions of the 20th Century" and discussing the dreams of Japanese of that time

computers as tools is to consider the wonderful finishing technology in Japanese carpentry by using the wood plane. The shaving ability of the plane acts to polish the wood to make an exquisitely beautiful wooden surface. It not only provides an excellent finish but also enhances the wood's hardness. Although computer technology can be used to do the work of the plane while bypassing the need for human power, the plane itself is a product of human ingenuity. The computer is able to further enhance the polishing technology conceived by man. I think the computer functions as such a tool. But in any civilization, man would not have gone far if he had entrusted the thinking to others.

H.K: When I thought of using computers as part of education, I thought it was very important to think in this way. Computers should not be used as tools that teach answers, they should be tools that help people find answers.

Lately we are witnessing Japanese universities pouring efforts into tie-ups between industry and universities. I wonder where relationships between these two organizations are heading. Also what about the publicness of universities?

A.K: Over the last 25 years in the US, collaboration between industry and universities has become complex. 40 years ago, collaborations between industry and universities were simple affairs. For example around that time, the Massachusetts Institute of Technology (MIT) produced numerous research results due to a tremendous amount of grants from the government. As a result these results became available in the public domain and many enterprises were launched from MIT graduates or from inside MIT. I think Stanford University enjoyed a similar climate. Then from about 20 years ago universities who received government grants to conduct research that was intended to be used for general and public use decided to use the results of such research for business purposes. In some cases there were claims for intellectual property rights by universities and individuals. When this happened, information that could be used in the public domain and research of that information was extremely limited. I think by undertaking simplistic industry-university collaborations many problematic issues emerged. I am not well acquainted with the current situation in Japan, but in the US, collaboration between industry and universities has gone too far, which has led to a situation where research used by the public aimed at producing results for the public is being stifled.

K.O: Kyoto University was founded 108 years ago and since it was founded it has been carrying out joint development with Shimadzu Corporation. This led to release of new X-ray products to Japan and the related research led to Shimazu Scientist Koichi Tomoka's Nobel Prize in 2002. Sixty years ago, Masao Horiba, Chairman of Horiba Limited became a pioneer when he created the first student venture company. Recently such relationships have become increasingly more complex as various people in Japan have realized the important value of

Spotbill mother duck and her ducklings swimming in the garden pond

Alan Kay admiring the main building's sukiya style architecture from the garden

universities and industry collaboration. Many voices were crying out for American models to be adopted. As a result, the same problems have now emerged. Now that universities have a stock of acquired intellectual property, we have entered an age where one must be conscious of making this stock available to the people of the world as much as possible for the tasks ahead.

A.K: I would like to suggest something here. Nicholas Negroponte, who is the chairman of MIT's Media Laboratory has a plan to create $100 computers. The purpose of this plan is to make it possible for all children in the world to use a computer. This plan is already underway and I actually think it would be possible to create about 200 million computers each year. These computers can be connected to the Internet. Some have Squeak installed. The ability to connect to the Internet is a great idea as it allows children and students of advanced nations to assist children of developing nations as mentors. A public service could be offered where, for example, students of Kyoto University, or teachers devote two hours each week to offer mentoring to children of developing nations.

H.K: If these $100 computers that he is proposing actually get made, then I would like to have classes for my students at Kyoto University to devise ways that the children throughout the world can use these computers.

K.O: If we get to the stage where the students formulate some ideas, then we will consider the implementation of these ideas. I think such implementation must be supported by the administrative and executive arm of Kyoto University. Kyoto University will be supportive of any ideas that the teaching staff at Kyoto University propose. I like to base my leadership on the principle of supporting a bottom-up structure.

(*1) ALAN-K Project

Alan Kay has been called the father of the Personal Computers. Currently he is involved in education that utilizes a programming language called "Squeak" at elementary schools such as the UCLA Elementary School annexed to the University of California, Los Angeles. The basis of Alan Kay's work is to offer classes to children at the elementary level that teaches them basic concepts of software and ways of thinking when creating systems in a style that is aimed at their level of development and conducive to the natural learning process of children. His current project is to equip young people with the skills required for the information society, which is continually permeating our everyday lives, by broadening the scope of the activities to include public elementary, junior, and senior high school in Kyoto City. The project is working to integrate countermeasures for contemporary challenges and is being designed to incorporate the development of a "zest for life" which is a reason behind the revision of school curriculum guidelines. The project is also including education on intellectual property rights, which come hand in hand with the information society.
(Reproduced from http://www.edu.city.kyoto.jp/school/alankay/)

The name the ALAN-K project was conceived by the late Professor Kambayashi. "ALAN-K" stands for Advanced LeArning Network in Kyoto. Alan Kay confessed he was a little embarrassed when he was told the name.
(For more information, see http://www.kyoto-u.ac.jp/english/ekenkyu/e02_ken/forefront/rakuyu03_a.htm)

The ALAN-K project team participated in the joint open workshop of Kyoto University and Horikawa High School, which use Squeak in classes.

People looking at programs that have been created by students using Squeak

Features 1 Kyoto University's Combat team participates in the ACM International Collegiate Programming World Finals Contest.

On 6th April 2005, the 29th ACM International Collegiate Programming Contest was held in Shanghai, hosted by Shanghai Jiao Tong University. This year, winning an impressive first ranking from the Asia Regional Contest, Kyoto University's team Combat entered the World Finals Contest representing Japan. This contest is an international computer-programming contest for university students and is sponsored by ACM (Association for Computing Machinery), the world's largest academic organization for computer science. Each team, consisting of three players and one coach is given one computer, 10 problems and a 5-hour deadline. The competitors receive a ranking based on how many of these problems they can solve within the allocated time. The official language for the competition is English, and all problems and questions are in English.

4,109 teams from 1,582 universities from 71 countries participated in the 29th competition. Competitors first had to compete in the domestic contest, and then if successful, the regional contest. Through this process of elimination, 78 teams took part in the World Finals Contest. In Japan, 200 teams from 45 universities participated; 9 of those teams were from Kyoto University. One team from Kyoto University and one team from the University of Tokyo qualified for the World Finals Contest. The winner of the World Finals was the team from Shanghai Jiao Tong University, who managed to solve 8 of the 10 problems. After putting in a valiant effort, Kyoto University's Combat solved 4 problems, which put them in equal 29th ranking together with CalTech, MIT and Seoul National University.

The members of Combat and Dr. Yuasa (front left) notify President Oike (front right) of their victory at the Asian Regional Contest, and qualification for the World Finals Contest. (18th March 2005)

Features 2 Kyoto University ROHM Plaza Completed

In May, 2005 construction of the Kyoto University ROHM Plaza, donated by ROHM Co., Ltd., was completed on the university's Katsura Campus. The Plaza is a three-story building (with a penthouse) with a total floor space of approximately 6,600 square meters, and was built by ROHM Co., Ltd. at a cost of about 2 billion yen. The building has been donated to Kyoto University to serve as a concrete center for the International Innovation Organization (IIO), which supports and promotes collaborative efforts among industry, academia and government, and for the International Innovation Center (IIC), which aims to develop original and synergistic research. Facilities such as the large hall, which can accommodate 300 people, and university-industry research exchange lounges can be used to host a wide variety of events and university-industry-public information-sharing exchanges, such as international conferences, academic conferences and meetings, Kyoto University The Top Seminar and the Kyoto University IIO Forum. Furthermore, the Plaza is located close to the International Research Center for Japanese Studies and the Kyoto City University of Arts, positioning the Plaza to play an important role in promoting and supporting the Neo Consortium NISHIYAMA's efforts to create a 3-way collaboration to fuse science technology, culture and art.

Features 3 Six Universities Disseminate Japanese University Education to the World through Open Course Ware

Six universities, Osaka University, Kyoto University, Keio University, Tokyo Institute of Technology, University of Tokyo and Waseda University, seeking to promote the globalization of education and firmly recognizing that the role of a university in the 21st Century is to create knowledge and channel it back into society, have established the Japan OCW Alliance and have made a commitment to actively disseminate knowledge at an International level by making coursework information publicly available in accordance with the OCW (Open Course Ware) protocol proposed by Susan Hockfield, President of MIT (Massachusetts Institute of Technology).

The 21st Century has been hailed the knowledge century and the changes to how knowledge is created, disseminated and distributed are expected to cause the structures of all areas of society including industry, culture and education to dramatically transform. Up until now, universities, whose purpose is grounded in the creation of knowledge, have been offering publicly available education such as public lectures, but this has been done at a very limited scope at the individual university level. In recent years there has been a growing awareness that unless Japanese universities actively disseminate information to contribute to the international society and promote evaluation on an international level of university education, they will be excluded from the world.

The six universities, Osaka University (President Hideo Miyahara), Kyoto University (President Kazuo Oike), Keio University (President Yuichiro Anzai), Tokyo Institute of Technology (President Masuo Aizawa), University of Tokyo (President Hiroshi Komiyama) and Waseda University (President Katsuhiko Shirai), share a sense of crisis regarding the current circumstances of publicly available information that is at an international level in these Japanese universities and they have agreed to collaborate together to address this issue.

The American university MIT, with which the six universities have a cooperative relationship on this venture, has received international attention over its OCW program and the program currently has a very large number of users. The aforementioned six universities who are participating in the Japan OCW Alliance are providing, free of charge, coursework information to the public of initially 10 courses following the system that MIT uses for its OCW public sharing of coursework information. Moreover by directly collaborating with a unique user base of 500,000 people around the world that MIT has already established, the universities are aiming to accelerate the dissemination of knowledge that represents Japan to the world.

The Secretariat Office for the Japan OCW Alliance is at Keio University and its function is to strengthen ties between the aforementioned six universities and MIT, and to actively publicize the achievements of the alliance.

URL http://ocw.mit.edu/index.html

Bioinformatics for understanding cells, organisms, and the biosphere

Bioinformatics

Bioinformatics, also called computational biology, is a relatively new discipline that has emerged as the result of high-throughput experimental technologies in genome research and post-genome research. The data generated by these technologies include genome sequence data, cDNA (mRNA) sequence data, gene expression data by DNA chips or microarrays, genome variation data such as SNPs, and 3D coordinates of protein structures. The increasing amount of such genomic information is the basis for understanding principles of how higher-order biological systems, such as cells, organisms, and the biosphere, are formed, as well as for medical, industrial, and other practical applications. However, current bioinformatics technologies cannot readily uncover higher-level complexity of such biological systems, although they are quite effective for finding and characterizing building blocks of genes and proteins. We at the Bioinformatics Center of the Institute for Chemical Research, Kyoto University develop knowledge-based methods for uncovering higher-order systemic behaviors of cells and organisms from genomic information. The reference knowledge is stored in KEGG, Kyoto Encyclopedia of Genes and Genomes, and associated bioinformatics technologies are developed for both basic research and practical applications.

New concept of database

Large amounts and different types of biological data are stored in various databases worldwide. For example, the Entrez System of the U.S. National Center for Biotechnology Information integrates PubMed for biomedical literature, GenBank/RefSeq for nucleic acid and protein sequences, PubChem for small chemical compounds, and many more databases. Here the database is a repository of all published data in a given domain, and the integrated system such as Entrez forms an information infrastructure for biomedical sciences. However useful such a resource may be for searching and retrieving individual data, it does not provide an overall picture of how the biological system works. We believe that an ultimate goal of bioinformatics is a complete computer representation of cells and organisms, which will enable computational prediction of higher-level complexity such as cellular processes and organism behaviors. Here the database is not a simple repository; it is a computer representation of the biological system. Developing this type of database is like synthesizing a virtual cell or an organism from the building block information currently available. Searching against such a database is like doing an *in silico* experiment on cells or organisms. KEGG is a practical implementation of this database concept.

The KEGG resource

The KEGG database project was initiated in our laboratory in 1995, the last year of the first five-year phase of the Japanese Human Genome Program. It, continued in the second five-year phase, and was significantly expanded under the Millennium Project. Figure 1 illustrates an overall architecture of KEGG, where genomic information (GENES database) and chemical information (LIGAND database) are integrated in terms of network information (PATHWAY database). In contrast to traditional bioinformatics technologies for screening of useful building blocks (molecules), our approach is first to understand wiring diagrams (molecular interaction networks) of building blocks and then to find functions and utilities of biological systems as a whole. KEGG is a reference knowledge base containing current knowledge on such wiring diagrams, and it is used worldwide as a unique resource for reconstructing metabolic and other cellular processes from genomic information and for understanding systemic functional meanings and utilities (Table 1).

Integration of Genomics and Chemistry

In the fall of 2003, the U.S. National Institutes of Health announced the Roadmap, which contained new chemical genomics initiatives for screening of useful chemical compounds such as imaging probes and drug leads. While traditional genomics and post-genomics have contributed to our knowledge on the

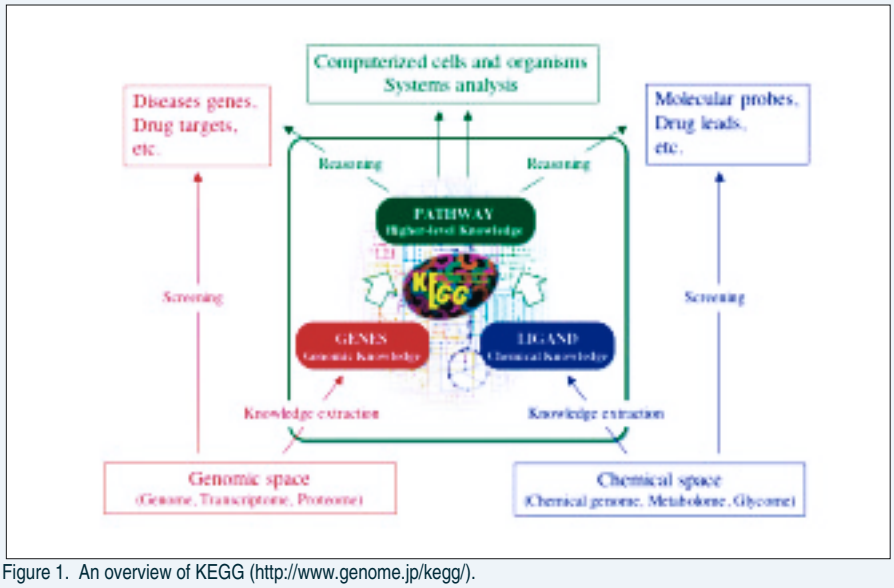


Figure 1. An overview of KEGG (http://www.genome.jp/kegg/).

genomic space of possible genes and proteins that make up the biological system, chemical genomics will give us a glimpse of the chemical space of possible compounds and reactions that exist as an interface between the biological system and the natural environment. The wiring diagram information in KEGG can then be extended to include both endogenous and exogenous molecules, which would enable reconstruction of the still higher biological system, the biosphere. A joint venture between the Bioinformatics Center and the School of Pharmaceutical Sciences in Kyoto University has been undertaken as a 21st Century Center of Excellence (COE) program, aiming at developing new bioinformatics technologies integrating genomics and chemistry for the purpose of pharmaceutical and medical applications.

Table 1. Major biological database services.

Database service	URL	Number of links*
NCBI	www.ncbi.nlm.nih.gov	29,800
ExPASy (SwissProt)	www.expasy.org	18,300
EBI	www.ebi.ac.uk	13,200
GenomeNet (KEGG)	www.genome.jp	9,430
DDBJ	www.ddbj.nig.ac.jp	620

* The number of pages linked to each database service site according to the Google links search on July 16, 2005.

A distance learning linkup with a laboratory in Tokyo

A cluster of database servers supporting the core operations of KEGG

Minoru Kanehisa

- Born in 1948.
- Specialized Research Field: Bioinformatics
- Graduate of the doctoral program, Graduate School of Science, The University of Tokyo
- D.Sc., The University of Tokyo
- Professor and Director, Bioinformatics Center, Institute for Chemical Research, Kyoto University
- URL http://kanehisa.kuicr.kyoto-u.ac.jp/

Overseas, they don't call me "Professor Kanehisa"; they call me "Mr. KEGG"

Currently, GenomeNet is accessed about 10 million times per month. Professor Kanehisa set up the GenomeNet service in 1991. The international project to decipher the human genome had only just begun, and the Internet had yet to spring into existence. In 1995, he started using his own database that was to form the core of the project, KEGG. Since then, KEGG has become a unique database, winning international recognition and becoming widely used. However, Prof. Kanehisa has described the structure of the project as "feeling a bit like creating life inside a computer." Prof. Kanehisa, who originally majored in physics, became a pioneer in the field of bioinformatics in Japan through his research at the Los Alamos National Laboratory in America. From his initial use of models to view the world, Prof. Kanehisa's approach underwent a 180 degree change, to using data to explore the world. This change was, simply put, brought on by exposure to a different culture. Based on his experiences, Prof. Kanehisa remains a strong proponent of cooperation among "cultures". While sharing results and conducting joint research in collaboration with industry, particular emphasis is being placed on the human resource development of people knowledgeable in the field of bioinformatics. In cooperation with Kyoto City, "Sakagura VIL" was set up in a converted sake brewery, in order to support the development of bioinformatics venture businesses. Since bioinformatics is such a new field, it has attracted a range of people with diverse backgrounds. New ideas springing from the merging of disparate cultures - this is one of the most important sources of energy driving the vigorous research of Prof. Kanehisa and the Kanehisa Laboratory

Donated Chairs at Graduate School of Economics and their Future

Since Japan experienced collapse of the bubble economy at the beginning of the 1990s, it has been in a long recession. The Japanese economy seems to have lost its self-confidence. Some people refer to the 90s as the lost decade. One of the causes often cited for the long recession is the financial crisis resulting from the fact that Japanese bankers were unable to better respond to drastic financial revolution. After a decade, both the government and financial institutions are gradually realizing the need for institutional change of financial systems.

Corresponding to such trends of institutional change, the Graduate School of Economics, Kyoto University has also realized the need to change research and education in finance. With this institutional change in mind, the Daiwa Chair was first established in 2002 for studies of financial engineering. Funds for this were donated by Daiwa Securities Group. And this year, in 2005, two donated professorships were established. One is the Chair that concentrates research and education on corporate finance. Funds for this have been donated by Mizuho Securities Co. Ltd. The other is the Chair that concentrates research and education on venture capital management. Funds for this have been donated by UFJ Capital Co. Ltd. Now our school has three donated professorship chairs, all of which are related to finance.

All of these chairs will contribute to the development of research and education on financial analysis in various aspects. First of all, financial engineering is a new research area that has been making dramatic progress since Black and Scholes invented the formula to price European call options. It has contributed to diverse areas of economics, including the evaluation of credit risk that is essential to the issue of disposal of non-performing loans.

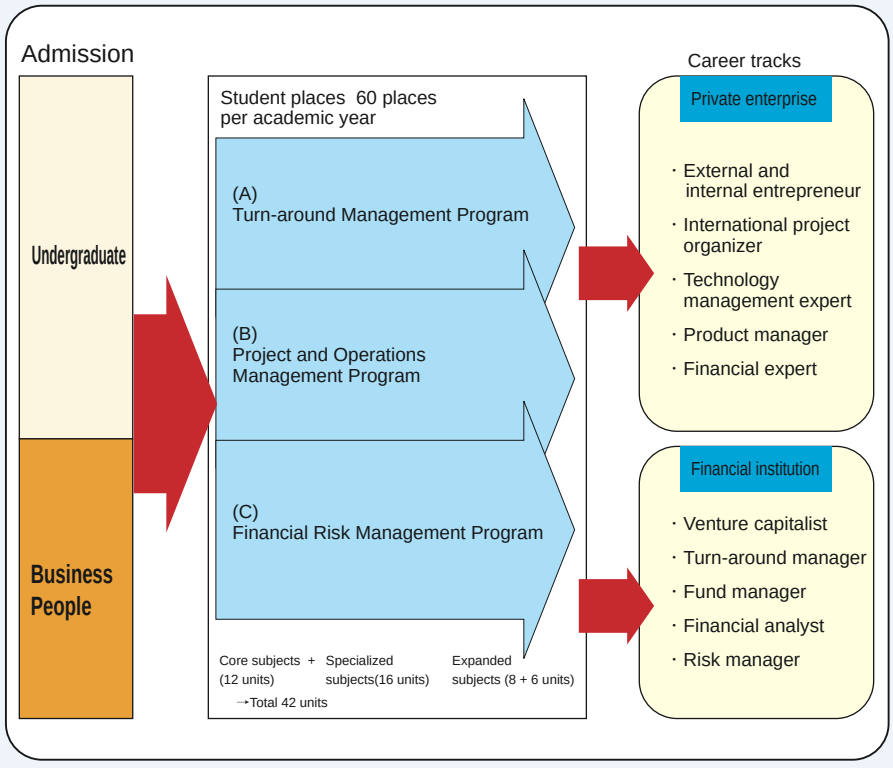
The Daiwa Chair provides several programs and lectures on financial and securities systems and tries to develop valuation methods and risk management for assets in incomplete markets.

Corporate finance is a research field that our graduate school has pursued for a long time. Among finance research areas, our school has advantages in macro-economic aspects, while we are also realizing the need for supplementing micro-economic aspects such as corporate finance. Mizuho Chair is a timely establishment for the whole arrangement of our research and education.

Venture capital management is also a timely establishment for our graduate school. Since our school had already opened the venture business management chair in 2001, this new research area will collaborate in fostering new businesses. On one hand, research on venture business management will give wisdom on how to foster entrepreneurship, while on the other hand, research on venture capital management will give insight on how to evaluate and finance potential venture businesses.

By the way, our Graduate School of Economics is planning to establish the new Management School as a joint operation with the Graduate School of Engineering. This School will start in April 2006, with the help of many other graduate schools such as the Graduate School of Informatics. In this new school, Finance will also play the core role in research and education. The donated chairs described above will also participate actively in research and education at the new school.

Our graduate school's policy on accepting donated chairs is as follows: although our school has been put emphasis on basic research during the long history of one of the two oldest schools on economics and management research in Japan, we also have a tradition of studying practical matters in economics and management. Therefore, it is quite natural for our school to try to mitigate basic and applied researches. To study what is going on now in the real business world is important in itself and also for basic research.



Outline of Kyoto University's Establishment of the Graduate School of Business Management Education and the reorganization of Graduate School of Economics

■Objectives and reasons for the establishment and reorganization

It has been suggested that one reason Japan's economy has been in a slump in recent years is a distinct lack of suggestions for reformation based on systematic business education and research in areas such as corporate management. To address this need and offer courses that teach practical and advanced specialist knowledge, the Graduate School of Economics and the Graduate School of Engineering have joined forces to establish a Business Management Course in the Graduate school of Business Management. The education offered in this course shall be based on the following fundamental concepts.

(1) Take advantage of the multi-discipline nature of Kyoto University and seek cooperative participation from all faculties, and in particular, utilize the knowledge of the latest technologies of, for example, the fields of information science and engineering.

(2) Place priority on specialist fields not offered by other universities such as "Turnaround Management","Project and Operations Management", and "Financial Risk Management" and offer education training to people wishing to enter advanced specialist occupations relevant to these fields.

(3) Adopt a multifaceted educational approach by inviting numerous teachers with practical experience to access knowledge from the work front of cutting edge businesses in addition to research-based teaching staff.

In addition to the establishment of these graduate courses, the two courses, Contemporary Economics and Business Science offered by the Graduate School of Economics will be reorganized and offered as Contemporary Economics and Business Analysis. These measures will further enrich the substance of the education and research of the existing Contemporary Economics Course. The function of developing people in advanced specialist occupations will be moved from the Business Science Course to the Business Management Course of the Graduate Department of Business Management Research and the Business Management Course of the Graduate Department of Business Management Education to provide education aimed at building a system of educational guidance that places importance on developing researchers.

■Approach and Characteristics of the Educational Curriculum

The educational coursework of the Graduate School of Business Management consists of traditional core subjects in the economic field such as business management, marketing, and accounting (12 units), a base of specialized subjects such as organizational behavior, technological management, corporate analysis, and logistics management (16 units), and extended subjects primarily taught by professional experts with practical experience such as business startup models, venture capital, intellectual property management, disaster recovery, investment risk management, and corporate finance (14 units). In addition, numerous lecture-based courses such as information systems analysis theory, information systems design theory, and risk management are planned to be offered through positive contributions from lecturers from other graduate schools such as Graduate School of Informatics. Moreover, the course shall not merely consist of providing the practical business knowledge of experts; rather, students will receive a broad grounding of the fundamentals of this knowledge in a carefully prepared environment consisting of new methods and curriculum such as concurrent lectures from several teaching staff.

The educational coursework of the existing researcher courses of Contemporary Management and Business Science shall continue to be provided through the Contemporary Economics and Business Analysis Course.

Shuzo Nishimura

- Born in 1945.
- Specialized Research Field: Health Economics
- Graduate of the doctoral program, Economics
- Professor,Graduate School of Economics, Kyoto University

It is sometimes difficult to address what must change to match the times and what should be left alone regardless of the changing times. Being at the helm of Graduate School of Economics as it searches for clarity in these issues is an extremely challenging task.

Although Kyoto University's collaborative projects with industry have till present focused on the research fields related to natural sciences, the Graduate School of Economics has now begun a full-scale industry-university collaboration aimed at conducting research in the field of social sciences and implementing the findings of this research in the real social world. The introduction of a course in contribution by commercial industry is perceived as a first step towards concrete collaboration. Meanwhile, collaboration with other faculties within the university is also continuing well with the steady development of joint-establishment initiatives such as the Management School in collaboration with the Graduate School of Engineering and the Graduate School of Public Policy in collaboration with the Graduate School of Law, which are expected to open in April 2006. This move, which is a response to globalization in universities and the Japanese economy, is a big change for the Graduate School of Economics, which till present has maintained staunch independence. Professor Nishimura, whose strong leadership has been bringing these new projects to fruition, has encountered many occasions where his position as Head of the Graduate School of Economics has been in contradiction with his personal research position. Professor Nishimura's field of specialty is the health economics. This field's strong relationship with an aging society and social welfare is reason alone for taking a prudent stance towards global standards based on the competitive principle. Professor Nishimura has expressed his desire to see Kyoto University take advantage of all the wisdom that a multidisciplinary university can generate by creating a system with which all the faculties cooperate to tackle the issue of the aging society. Despite his hectic workload as Head of the Graduate School of Economics, he has yet to lose his passion for research. Born and raised in Kyoto City, he has inherited the city's venturesome spirit and love of the new. The study of the health economics is a new field for the economics faculty. He considers economics to be like politics in that it is a method for resolving conflict and we look forward to seeing his Kyoto-spirit at work in his future endeavors.

Tomotaka Takahashi

A Robot as a Member of the Family ? That's a Future I'd Like to Make a Reality.

Tomotaka Takahashi
- Robot Creator
- Founder of Robo Garage, a Kyoto University venture
- B.S., Mechatronics, School of Engineering and Science, Kyoto University
- URL http://www.robo-garage.com/english/index.html

Humanoid robot, "Chroino." The robot is demonstrating a new biped walking technique called the "SHIN-Walk," which was developed by Robo Garage.

Robot creator Tomotaka Takahashi has been increasingly profiled by the mass media, and has earned a measure of fame both inside and outside Kyoto University. In addition, "Chroino," the humanoid robot he created, was chosen by Times Magazine as one of its "Coolest Inventions 2004," proof that his activities have attracted international attention. Asked about his involvement in recent events, he coolly replies, "If you're not a regular topic of conversation, you'll be forgotten." Mr. Takahashi started up his own business in April 2003, the month he graduated from Kyoto University's Faculty of Engineering. Mr. Takahashi set up "Robo Garage", the first of "the Kyoto University Ventures" to make use of the facilities of the Kyoto University Venture Business Laboratory (KU-VBL), and he handles all the technological development, design, and construction of humanoid robots. There are two main reasons he attracts such wide attention : interest in the possibilities promised by the development of robots, and interest in the viability of university-based venture businesses. "It's a question of being in the right place at the right time," says Mr. Takahashi when asked about his future and the future of robots.

When asked what led him to become a robot creator, Takahashi throws out the name of a famous Japanese cartoon. "As you might expect, I was heavily influenced by "Tetsuwan Atomu" (known in English-speaking countries as "Astroboy")." Atomu, a humanoid robot, lived a normal life alongside other people, and through his stories of overcoming hardships with his friends, achieved unprecedented popularity as a televised animation series in the 50's and 60's. In Mr. Takahashi's most famous work, Chroino, one can detect shades of Atomu. Even when he was a young boy, Mr. Takahashi had enjoyed making a variety of things by himself, and by the time he was accepted to Kyoto University he had already settled on robotics as his major. After graduating from Ritsumeikan University, he applied to Kyoto University. In what was thus his second experience as a university student, he began his studies with a firm goal in mind. Starting in his first year of studies, Mr. Takahashi persistently sought the advice of Professor Tsuneo Yoshikawa, who became his faculty adviser in his third year. Prof. Yoshikawa, a researcher in the field of robot arms and virtual reality, believes in "allowing students to decide the topic of their research by themselves" and thus gladly welcomed Mr. Takahashi, with his dreams of developing a humanoid robot, into the laboratory. "By the time I was a third-year student, I'd already made robots I'd designed myself. Yet I already had an image in mind of the next robot I wanted to build. And the construction of that robot became the topic of my graduate research." In the environment of respect for student ambitions and freedom of research created by Prof. Yoshikawa's Laboratory, Mr. Takahashi's talents bloomed. The robot that formed the basis of his graduate project, after additional development, was tagged "Neon," and its commercialization was recently announced.

By the time he was a third-year student, Mr. Takahashi was already thinking about starting his own business after graduation. At the time, the creation of a new industry through industry-university cooperation had begun to attract interest, and at Kyoto University organizations were being developed to support this type of project. Mr. Takahashi's connection to the Kyoto University VBL dates back to the completion of his first self-produced robot. One day, he saw a posted notice for the VBL's "Patent Rights Consultation" and after discussing the technology used in his robot, the VBL agreed to support the patenting and marketing of the technology. As a result, he was able to set up Robo Garage, the first of Kyoto University Ventures. "I never imagined I'd be able to turn my hobby into a business. Maybe it fits the times. I was really lucky," says Mr. Takahashi of the circumstances surrounding the establishment of his business. Setting up base in Kyoto University is an important benefit for venture businesses in which trust is a key concern. He adds:"Industry-university cooperative projects take a mean position between the university and businesses, and sometimes can serve as an intermediary between the two sides." A good example of this is the "Team Osaka" joint project among Osaka City, Osaka University, and venture companies. The project produced a bipedal robot named "VisiON NEXTA," which won the Best Humanoid award for the second time running at the "2005 RoboCup World Championship" held in July.

Robo Garage has developed and/or produced a total of six robots, including those developed in partnership with other companies. Even as work is being done on an emergency rescue robot, Mr. Takahashi remains fascinated with the construction of humanoid robots. "A robot as a member of the family ? that's a future I'd like to make a reality." Behind these words lies an approach that seeks to find an intermediate step between man and machine. In Japan, comics and animation such as "Tetsuwan Atomu" have established a widespread view of robots as midway between humans and machines, which Mr. Takahashi sees as a big advantage in developing humanoid robots in Japan. At the same time, he believes it is possible to share this view with the world. To that end, Mr. Takahashi pays close attention to the design of the robots he develops. "I envision robots that won't be expected to do work, but to serve as friends and companions. So it's extremely important to create an appealing exterior so that people will be able to think of them as companions." In order to make this vision a reality, Mr. Takahashi plans to continue his efforts by himself. "I'd rather see myself as an artist than a successful businessperson," he says of his identity. "The things I make myself give shape to my ideals," says Mr. Takahashi, whose own love of making things led him to become a robot creator. We can't wait to see what kinds of robots are going to spring from his hands next.

Kyoto University holds AEARU Board of Directors Meeting and signs academic exchange agreement with the four other Board Member Universities

On 13th May, this year, Kyoto University hosted a Board of Directors Meeting for AEARU (The Association of East Asian Research Universities).

AEARU is a league of universities whose membership includes 17 research-oriented universities such as Peking University, Tsinghua University and Seoul National University. All member universities are located in the East Asia region and share a regional and cultural affinity with each other. The association was founded in 1996 for the purpose of building cooperation based on the common interest between the member universities by promoting exchange between the faculty and students, conducting joint research projects and cosponsorship of theme-based conferences. Apart from Kyoto University, there are five other member universities from Japan: Tohoku University, University of Tsukuba, University of Tokyo, Tokyo Institute of Technology and Osaka University. Kyoto University is assuming a two-year Board Member position, which began in 2004.

Before holding the Board of Directors Meeting, President Kazuo Oike met with the four other Board Members, President Paul Ching-Wu Chu (Hong Kong University of Science and Technology), President Robert B. Laughlin (Korea Advanced Institute of Science and Technology), President Wei-Jao Chen (Taiwan University) and President Qingshi Zhu (University of Science and Technology of China), where they sealed an agreement of academic exchange between the universities.

In the Board of Directors Meeting, the implementation report of the previous fiscal year's business and the business plan for the current fiscal year were accepted. The meeting closed with the announcement that a joint symposium will be held at Kyoto University from 31st August to 2nd September by AEARU and APRU (Association of Pacific Rim Universities) to address the risk of earthquakes in the Pacific Rim and what predictive and preventative measures can be taken.

From left, President Robert B. Laughlin Laughlin (Korea Advanced Institute of Science and Technology), President Oike, President Qingshi Zhu (University of Science and Technology of China), President Paul Ching-Wu Chu (Hong Kong University of Science and Technology), and President Wei-Jao Chen (Taiwan University)

After the meeting, the attendees toured the Kyoto University Museum, and Katsura Campus (Graduate School of Engineering) and then made their way to Arashiyama to experience the wonderful forest greenery of Kyoto.

Presentation of the Hideki Yukawa UNESCO Medal to Mrs. Sumi Yukawa

The Kyoto University Yukawa Institute for Theoretical Physics, whose name is taken from Professor Hideki Yukawa, has presented Mrs. Sumi Yukawa, the wife of the late professor, with two UNESCO medals, one silver and one bronze that were created by UNESCO (United Nations Educational, Scientific and Cultural Organization). The medals, bearing the image of Professor Hideki Yukawa, Physicist and the first Japanese to receive the Nobel Prize for Physics, were designed by prominent artist, Ikuo Hirayama (UNESCO Goodwill Ambassador, and President of the Tokyo National University of Fine Arts and Music).

UNESCO medals are created using designs based on world heritage, historical events or people who left an impact on the world through remarkable achievements and are presented by the executive body of UNESCO to prominent people and organizations during, for example, official visits to various countries.

This is the first time a UNESCO medal has been designed with a Japanese person as the motif.

After the medal presentation, Mrs. Yukawa recounted episodes to journalists regarding the Nobel Prize Award Ceremony and a meeting with Albert Einstein.

Kyoto University is currently planning an exhibition and commemorative booklet to commemorate 100 years since the birth of Dr. Hideki Yukawa (1907-1981) and Dr. Shinichi Tomonaga (1906-1979). Both professors studied at Kyoto University, and each went on to win the Nobel Prize in Physics, Dr. Yukawa in 1949 and Dr. Tomonaga in 1965. In addition to an exhibition to show their achievements, and a symposium to discuss current issues in the areas of physics pioneered by the two scientists, there will be a memorial ceremony and lecture on January 23, 2007, the 100th anniversary of Prof. Yukawa's birth. The foundation of a "Yukawa-Tomonaga Prize" is also being considered.

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P R O M E 京都逍遥 N A D E

万福寺

Manpukuji Temple - the first winds blow from Obaku

Kyoto University's Uji Campus, on the southern edge of Kyoto City, is currently an area with a concentration of advanced engineering research facilities such as natural science research institutes and centers as well as large - scale testing facilities. Yet just half a kilometer to the east sits Manpukuji Temple, unique even amongst Kyoto's numerous temples for its exotic atmosphere and ancient history. This is one of the places where students who studied or researched at Kyoto University's Uji Campus take nostalgic strolls.

The founding of Manpukuji dates back to the middle of the 17th Century. In 1654 the Chinese Zen-Buddhist priest Yin-yuan (known in Japan as Ingen) came to Japan along with his disciples, in response to an invitation from Japan. With the support of the Imperial family and Tokugawa Shogunate, he founded the Obaku Sect, Japan's new Zen sect, bringing a blast of fresh air to Japan's then-stagnant Buddhist community. Manpukuji, which serves as the head temple of the Obaku sect, was built in 1661 along the lines of Chinese (Ming era) style of the time, introducing new techniques and designs which had heretofore never been seen in Japanese temples. The symmetrical layout of the grounds of the temple bring a kind of lightness to the air. The teachings of the monks during the time, when Japan had entered a period of isolationism, were not limited to the teachings of Zen. The monks of the Obaku sect brought advanced techniques from China, and had a major impact on Japan's society and culture as experts in land reclamation and bridge-building, and in setting up Japan's first library.

Professor Hitoshi Tanaka, Assistant Director of the Disaster Prevention Research Institute located on the Uji Campus, said he often visited the temple when he was a student. "In those days, Kyoto University's student housing was in Obaku. Due to the effects of student protests, there were often no classes, so I had a lot of time to spend on club activities," says Prof. Tanaka looking back over his student life in the 70's. Obaku was the closest train station, and for many Kyoto University alumni remains memorable as the label given to the entire Uji Campus. Prof. Tanaka, an architecture major, was sufficiently interested in the temple to make Manpukuji the subject of one of his papers on Japanese architectural history.

Manpukuji was an important source of Chinese advanced cultural influence during Japan's period of isolationism. Kyoto University's Uji campus fulfills a similar role in disseminating advanced natural science research in this period of globalization. Although the times are different, Obaku area continues to radiate such a unique presence as a place of gathering and transmission of knowledge, even to the current day.

The buildings of Obakusan are a Buddhist temple layout modeled on the Chinese Ming style. The main temple is a high-roof space that is set off from the front room and nested between halls of the same size on its left and right. The temple remains in its original form. Its style is rare to Japan and is seen as a representative Zen Buddhist temple complex.

Sekijo : This temple's approach crosses the temple grounds both lengthways and width ways. Paved with flat diamond-shaped stones arranged in the diagonal, it was designed to resemble the scales of a dragon's spine. Its name refers to the unique stone edging on both sides of the path.

Seated Hotei (Maitreya-Bodhisattva) in *Tenouden* : Tenouden was built in 1668. At the front of Tenouden is enshrined Hotei, who is said to be the incarnation of Maitreya Bodhisattva in China. Hotei is seated in Tosotsuten (Tusita Heaven), his dwelling in the celestial world.