



### *Green & Sustainable Chemistry Network*

GSCN was established in 2000 to promote research and development for the Environment and Human Health and Safety, through the innovation of Chemistry.

#### A New Start of GSCN

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President

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Since its establishment in March 2000, the Green and Sustainable Chemistry Network (GSCN) has been working to promote health- and environment-friendly chemistry and chemical technology that contribute to sustainable social development. I would like to express my deep appreciation to those of you who have been supporting the GSCN. Thanks to your kind understanding and cooperation, the GSCN's activities have continued to expand for these years.

In April of this year, the Technical Strategy and Planning Division of the Japan Chemical Innovation Institute, which had functioned as the GSCN's secretariat, merged with the Association for the Progress of New Chemistry to form the Japan Association for Chemical Innovation (JACI). By providing a powerful platform for industry-academia-government cooperation and advocating Green Sustainable Chemistry (GSC), the JACI seeks to promote the development of Japan's various industries, help enhance their international competitiveness, and support sustainable social development and sound economic growth. With the inauguration of the JACI, the GSCN changed from a private organization to become a division of the JACI in order to step up its activities.

GSC is an initiative to promote eco-friendly chemistry and unleash the potential of chemistry and chemical technology to contribute to sustainable social development. We the JACI are firmly committed to GSC, and by taking advantage of the power of chemistry, we will work to solve environmental problems and help develop new products and technologies that enable people to live a healthier life and make the world better.

The Japanese chemical industry now needs to not only address the pressing problems related to the global environment, resources and energy but also support Japan's endeavor to recover from the aftermath of the Great East Japan Earthquake. I strongly believe that the GSCN can play a significant role in the industry's effort to meet these extraordinary challenges. In addition, the GSCN should continue to promote the development of GSC in Asia and across the world by fostering cooperation among government, industry and academia. We the JACI would appreciate your continued support and cooperation.

## **Toward the 75<sup>th</sup> Anniversary of the Society of Chemical Engineers, Japan (SCEJ)**

Shin-ichi Nakao

President of Society of Chemical Engineers, Japan

I pray that the victims of the earthquake and tsunami that ravaged the Tohoku and Kanto regions will rest in peace. I also pray that those affected will be able to rebuild their lives as quickly as possible.

The Society of Chemical Engineers, Japan (SCEJ) was established on November 6, 1936, as the Society of Chemical Machinery Engineers with 162 members, later changing its name to SCEJ and then to SCEJ Incorporated Association. As a Public Interest Incorporated Association, it currently has 8,500 members, seven branches, 22 associations, and 14 committees (as of March 31, 2011).

As the society celebrates its 75<sup>th</sup> anniversary this year, I would like to describe the current state of its activities and future plans.

As you know, chemical engineering is an academic discipline that analyzes the various phenomena that accompany heat and mass transfers, treats them theoretically as groups of units of operations, and builds systems by combining these unit operations. Early on, it has contributed greatly to technological innovations and the development of chemical and petrochemical industries. It now supports technological innovations in all industries involved in production, including pharmaceuticals and food products.

For our 75<sup>th</sup> anniversary, we are digitizing references, papers and other publications over the course of the past 75 years. We plan to offer them in a digital library on the Web to preserve them and to allow members to access them.

This digital library will provide a platform of knowledge and technologies related to chemical engineering. I hope that many researchers and engineers will use this library, and that it will play a role in further developing chemical engineering and creating technological innovations.

An important role of the society is nurturing human resources. Teaching students in educational institutions from elementary school to graduate school is important, of course. However, because of the importance of continued education that supports the self-expression of working adults, in 2000 the SCEJ established an education center to provide uniform education for elementary students to working adults. We have already held basic lectures for novice engineers and continuing education seminars for mid-level engineers. Furthermore, to bridge the gap between the classroom and the real world, we have been carrying out an internship program since 2006. For our 75<sup>th</sup> anniversary, we are creating a video program in which students comment on how they have applied what they have learned to manufacturing facilities. We are also planning to create educational tools that students can access on the Web.

Through these activities, I hope we can instill heightened interest to engineering in chemistry in students to prevent their dropping out of the sciences by showing them the path from “classroom chemistry to engineering in chemistry,” and turn out outstanding scientists and

engineers for industries.

Another important role of SCEJ is the communication of academic achievements and contributing to society at large. SCEJ does not simply to transmit information within Japan but to the whole world. The society has always participated in exchanges and collaborations with chemical engineering societies in Europe and the U.S. through international conferences. In recent years, we have been deepening exchanges with chemical engineering societies in China and South Korea by signing cooperative agreements. As part of our efforts to further strengthen exchanges with Asia, we have created the SCEJ Asia Research Award for engineers and researchers active in Asia. Through this award, we are making progress in deepening exchanges.

To advance industrial technologies, we have been hosting INCHEM TOKYO with JMA (the Japan Management Association) since 1966. This year, as SCEJ's 75th anniversary event, INCHEM TOKYO will be held jointly with the 2011 International Exhibition on Green Industry Development, co-sponsored by the United Nations Industrial Development Organization (UNIDO) and the Ministry of Economy, Trade and Industry. The conference will be held over three days from November 16 to 18. We will exhibit Japanese industrial technologies to the world under the theme of "Toward Green Innovation." We also planned an exhibition tour for government officials and industrialists from foreign countries who had planned to attend the conference.

Domestically, we made an emergency proposal on March 28 about power shortage in Japan as a result of the Great East Japan Earthquake. SCEJ has been responding to this pressing national challenge with all its might. We are also considering our proposals to challenges currently faced by the world, such as global warming. I would like to introduce a part of our proposals on March 14, 2012, at SCEJ's 75th anniversary ceremony.

In December 2001, SCEJ published "Vision 2011," our statement of what chemical engineers in the 21<sup>st</sup> century should be. Since that time, social conditions have changed, and we are planning to develop a new vision statement for the next decade. To be a society open to the outside world and an association that can communicate with society at large, I want members of SCEJ to not only deepen relationships with one another, but also to deepen partnerships with the different organizations in GSCN, and to continue to do their best.

## A Journalist's View of 40 Years of Japan's Chemical Industry

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Beginning with Hideki Shirakawa in 2000 and continuing with Akira Suzuki and Ei-ichi Negishi last year, there has been a continuing string of Japanese scientists winning the Nobel Prize in Chemistry. Including Kenichi Fukui, who won Japan's first Nobel Prize in Chemistry in 1986, Japan's seven winners of the Chemistry Nobel Prize rival the winners of the Physics Nobel Prize. Their achievements signal that the 21st century would be the "age of Japanese chemistry." However, a key phrase that has gained even greater prominence is, without a doubt, "Green Sustainable Chemistry" (GSC). In April, the strategic advancement department of the Japan Chemical Innovation Institute (JCII) merged with the Association for the Progress of New Chemistry and restarted as the Japan Association for Chemical Innovation (JACI). I have great expectations for this organization to lead in the development of new chemical technologies and in the improvement of industrial competitiveness.

I would like to begin with a personal reflection. I first began covering chemical-related industries in 1972, during a transitional stage in Japan's chemical industry, which had been enjoying rapid growth. Japan's petroleum combines, established in 1958, rode the wave of the country's economic development and grew in size. In less than ten years, newly-built ethylene plants were certified to produce 300,000 tons per year. New facilities that cleared this condition were launched one after another. In 1972, the last 300,000 facilities began operation in Yokkaichi (by the Shin-Daikyo Co., Ltd., currently the Tosoh Corporation) and in Mizushima (by Sanyo Ethylene, currently Asahi-Kasei Chemicals Corporation). The following year, the 1973 oil crisis plunged the oil industry into a period of turmoil.

Meanwhile, Japan's furious economic growth produced a series of pollution problems. Manufacturing industries were driven to respond to pollution of the atmosphere and water. At the same time, the public also looked closely into environmental and safety problems caused by plastic wastes, synthetic detergents and agricultural chemicals. The contamination of rice bran by polychlorinated biphenyls (PCBs) brought the issues to a head, and led to the passage of the Law Concerning the Examination and Regulation of Manufacture, etc. of Chemical Substances in 1973. Also, the mercury process of producing caustic soda was replaced by the diaphragm process. Later it was supplanted by the ion-exchange membrane method for its superior energy efficiency.

In the early 1980s, the petrochemical industry was stagnated by an excess of facilities. It recovered as the bubble economy grew, but by the 1990s, the industry was in turmoil again. Industrial reorganization gained momentum, and the Mitsubishi Chemical Corporation and Mitsui Chemicals engaged in large-scale mergers. Meanwhile, in the 1990s, a paradigm shift in environmental issues took place. What led to this shift was the 1992 United Nations Conference on Environment and Development (Earth Summit) in Rio de Janeiro. Awareness spread that global environmental problems were caused not only by industries placing a burden on the environment, but also by consumers. The effects were extensive and transcended time in causing

harm. From a passive stance that saw satisfying regulations as sufficient, the chemical industry shifted to carrying out voluntary efforts in the areas of the environment, safety and health. Since 1995, the Japan Chemical Industry Association has taken a key role in providing responsible care.

We have now entered into an era in which environmental measures are based on international frameworks, such as the Strategic Approach to International Chemicals Management (SAICM). This framework seeks to minimize the effects of chemicals and reduce CO<sub>2</sub> by 2020 to prevent global warming. For chemicals, following Europe's new regulations of chemical products called REACH (Registration, Evaluation, Authorization and Restriction of Chemicals) and Japan's revision of its Chemical Substances Law, the U.S. has begun to revise its Toxic Substances Control Act.

"Green Sustainable Chemistry" began from "Green Chemistry" proposed by the U.S. in the mid-1990s and "Sustainable Chemistry" used by the Organization of Economic Co-operation and Development (OECD). The background of these proposals was the sense of crisis in Europe and the U.S. brought about by the belief that while chemical technologies have contributed to the improvement of human lives and economic growth, their load on the environment has not been fairly evaluated. In Japan, the GSC Network (GSCN) was established in March 2003 with JCII as its core. Reviewing an editorial in *The Chemical Daily* at the time, I observed great expectations being placed on GSCN. At the same time, the editorial pointed out its challenge in that "Concrete operations are not clearly spelled out."

After its creation, information about the activities of the GSC Network was transmitted through the creation of a network of chapters and by hosting symposiums. Green Sustainable Chemistry was also included by the Ministry of Economy, Trade and Industry in its 2008 technological strategy map. The map placed great importance on the chemical industry to overcome the limitations of the environment, resources and energy through technological development. Meanwhile, besides production processes that exert less load on the environment, chemical companies have made progress in developing products and systems that are friendly to the environment.

Unfortunately, however, one cannot deny that the efforts and achievements by the chemical industry have not been correctly evaluated by society. I look forward to even better transmission of information by the GSC Network. Meanwhile, the chemical companies of the world are rapidly shifting their presence from advanced industrialized countries to developing countries such as China and India, and to oil-producing countries in the Middle East. The keyword that will remain in this era of fierce competition is "Green Sustainable Chemistry." I look forward to Japan's chemical technologies as tools for GSC, to Japan's chemical industry strengthening its competitiveness, and to the Japan Association for Chemical Innovation in its role as playmaker.

## The 11<sup>th</sup> GSC Symposium

The 11<sup>th</sup> GSC Symposium was held over two days on June 2 and 3, 2011, at Waseda University's International Conference Center. Previous GSC Symposiums were organized by the former JCII as a secretariat of the GSCN. However, this symposium was hosted by JACI because the GSCN has been one of the divisions of the JACI from this April. Also, because the symposium was co-hosted with Waseda

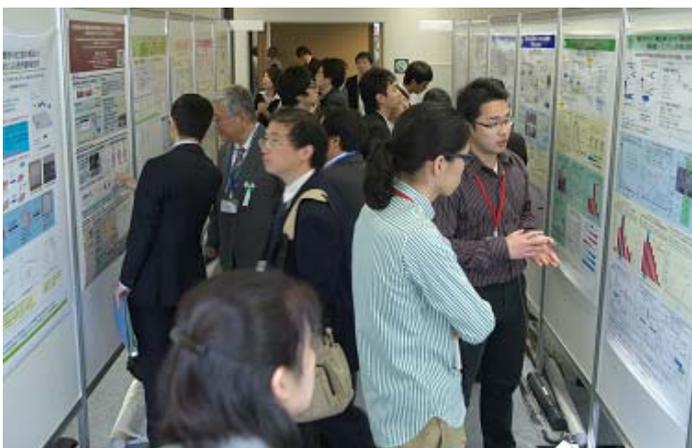


Conference Hall

University's Global COE for Practical Chemical Wisdom, the symposium could make use of the university's facilities and drew many student participants from the university. Furthermore, to respond to the wishes of members involved in GSCN, the symposium was moved from March to June.

With the main theme of "Practice and Prospect of GSC toward a Sustainable Society," the symposium held 12 invited lectures on 1) the practice and prospect of GSC by industry, academia and the government, 2) state-of-the-art research in GSC, and 3) national strategies in the area of GSC. Four addresses were also given by GSC Award recipients and 125 poster presentations were given. Since the Lehman shock, the symposium has drawn an increase of ten percent in participants year after year, with more than 400 participants this year. This demonstrated that fears over the effects of the Great East Japan Earthquake did not exert great influence, and that concern for GSC continues to grow.

The poster session was held at two spacious halls in the afternoon of the first day. A lot of participants visited the poster sessions, and engaged in lively discussions about advanced GSC and visions for the future. The halls remained packed like rush hour trains until the very end of the two-and-a-half hour session, causing some participants to comment on the need for even wider spaces next year. Also, many students stopped by company exhibition booths, which were placed in the lobby connecting the two event halls, and listened intently to explanations by the exhibitors. Nine young researchers were awarded for outstanding posters following the ceremony for the STGA. The award recipients showed joyous looks on their faces, renewing their commitment to build on their own work and contribute to an achievement of a sustainable society with bursting ideas about the roles chemistry should play.



Poster Session