

# NIPPON STEEL NEWS

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錆付深鉢花器

A Series on  
Traditional Japanese Handicrafts:  
"Masterpieces" by Munemichi Myochin

### Rusty Iron Plant Holder with Deep Basin

The holder can also be used as a pillar decoration by making a hole in the upper part of the bracket.

**Munemichi Myochin:** Born in 1942 in Hyogo Prefecture. In 1983 when he was named the 52nd head of his artistic lineage, he received the Skills and Meritorious Service Award of Hyogo Prefecture and was designated by Hyogo Prefecture as a "Traditional Craftsman." In 1997, he was selected as a "Master of Japanese Sound" by the Japan Audio Society. Other major awards include the Great Prize and the Special Prize presented at the Japan Cultural Design Awards (2003) and the Arts & Culture Prize of Himeji City (2004).

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Seeking Truth: Expanding Perception through the Harmony of Western and Oriental Thought



Feature Story

Face-to-Face Discussion on Research and Development (Two-part Series: 2)

# Seeking Truth: Expanding Perception through the Harmony of Western and Oriental Thought



**Kozo Saito**

Professor, Mechanical Engineering and Director, Institute of Research for Technology Development (IR4TD) University of Kentucky

Nippon Steel seeks to become the world's leading comprehensive steelmaker, primarily in the area of high-grade steel products. This will be done through unflagging technological development and by means of a global player strategy that links its operations to global economic expansion. *Nippon Steel News* presents a face-to-face discussion between Dr. Kozo Saito, Director of Institute of Research for Technology Development (IR4TD) at the University of Kentucky, and Bun'yu Futamura, Director of Nippon Steel Corporation. Mr. Futamura served as Director of the Technical Development Bureau at Nippon Steel when the discussion was made.

Dr. Saito was instrumental in creating IR4TD, an interdisciplinary research institute attached to the University of Kentucky. Established with the basic idea of contributing to society through engineering research and a unique education, this institute promotes an extensive array of research projects. Dr. Saito gives to our engineers the lecture on scale modeling and other themes in applied engineering, and also cooperates in our joint research on



**Bun'yu Futamura**

Director Nippon Steel Corporation (Former Executive Vice President and Director, Technical Development Bureau)

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thermo-viewer utilization technology.

The primary focus of their discussion is the proper course of interdisciplinary collaboration in research and technological development, a commitment to globalization in its truest sense, and communications aimed at researchers and engineers.

*Nippon Steel News* (nos. 372 and 373) presents a two-part series that recounts this discussion:

### Part 1

- Encounter with Respected Teachers Capable of Seeing the “True Nature of Things”
- Principles to Live By: Zen Concepts

### Part 2

- IR4TD: A Team-oriented Research Institute with a Social Conscience
- Truly Global Entrepreneurship Supported by a Broad Perspective
- New “Kufu” Arises at the Moment of Insight into Fundamental Truths and Principles

The current issue (No. 373) highlights Part 2.



**Koza Saito:** Born in 1950 in Tokyo, he enrolled in a vocational senior high school and after self-educating himself in chemistry, physics, and mathematics, he was accepted into the Faculty of Engineering, Seikei University. At the university, he met Dr. Ichiro Emori, a world-renowned authority in the field of scale modeling theory and completed the doctoral program in 1980. That same year, he came to the US where he studied combustion as a postgraduate engineer at the University of California, San Diego (UCSD).

In 1981, he became a research associate then a professional research staff member of Princeton University’s Department of Mechanical and Aerospace Engineering and in 1986 became an associate professor in the Department of Mechanical Engineering, University of Kentucky. During this period, he served as a joint researcher with several American agencies: NASA, USDA, and EPA. In 1993, he became a full professor at the University of Kentucky and in 2001 assumed the post of Tennessee Valley Authority Endowed Professor.

In 2007, Dr. Saito established the Institute of Research for Technology Development (IR4TD) at the University of Kentucky as a site for interdisciplinary research. Here, he promotes the development of new technologies that are beneficial to society. His specialties include combustion, fire research, scale modeling, and production systems.

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### IR4TD: A Team-oriented Research Institute with a Social Conscience

**Futamura:** You have been deeply involved in research at the University of Kentucky for a long time. In 2007, you inaugurated IR4TD (Institute of Research for Technology Development) as an interdisciplinary organization that promotes social contribution. Please tell us what you had in mind when you established this institute.

**Saito:** Professors at US universities need the acumen of a business manager in seeking funding for research and in dealing with students in their research laboratories. In 1986, when research on combustion had gone out of vogue and federal funding was much less likely, Toyota Motor Manufacturing Kentucky (TMMK) of Toyota Motor Corporation had just begun operations and I met Mr. Fujio Cho who was then the president of TMMK.

While it was not my professional area and although it may have seemed ill-advised, we started to investigate new fields of research, wishing to stimulate local businesses and to enhance US-Japanese friendship. We undertook research on automobile production systems and, further, participated from the initial stage at the University of

Kentucky in a research program on lean production (a US version of the Toyota production system). At the same time, we also launched a joint project to solve various technical problems arising on site at production lines. President Cho then said: “I hope that you will promote this project as a joint US-Japan endeavor and serve as a friendship ambassador.”

In a joint project that started around 1993, we undertook scientific research on the painting process. After collecting and analyzing on-site data obtained from engineers, we conducted model calculations based on computational fluid dynamics and successfully developed a new technology—a system for capturing the paint that doesn’t reach the car body, what is called “overspray.”

As our research topics became more diverse, the joint projects in which our laboratory participated expanded beyond Toyota Motor Co. to include other entities such the US Navy and NASA. But, my goal was to advance the laboratory to the next stage by incorporating a much broader interdisciplinary vision. This led to the establishment of



Vortecone Scrubber, an over-spray paint capturing device, developed by Dr. Saito (in cooperation with the University of Kentucky, Toyota Motor Corporation, and Trinity Industrial Corp). Patents have been obtained in the US, Europe, and Japan.

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IR4TD in 2007 with the support of Toyota Motors, the state of Kentucky and other entities. Now, our original team of three laboratory staff, including me, has expanded to ten.

**Futamura:** I get the feeling that your personal outlook on life, which was formed through encounters with respected teachers and Zen, is reflected in the operational principles of IR4TD insofar as they aim to expand the organization's social contributions beyond its interdisciplinary framework.

**Saito:** After having visited the US, I gained a renewed appreciation for those aspects of the Orient that are truly unique. Now, I want to promote a diverse range of activities that incorporate Oriental thought, activities not based on monetary compensation and "avariciousness" but on the desire to benefit society. Desires such as this that derive from man's true inner being are the indispensable motivating force for promoting interdisciplinary tie-ups and collaboration.

Scholarly endeavors, because they benefit from the support that industry gives to the economy, are also beneficiaries of industrial activity. In order for society to function smoothly, we scholars

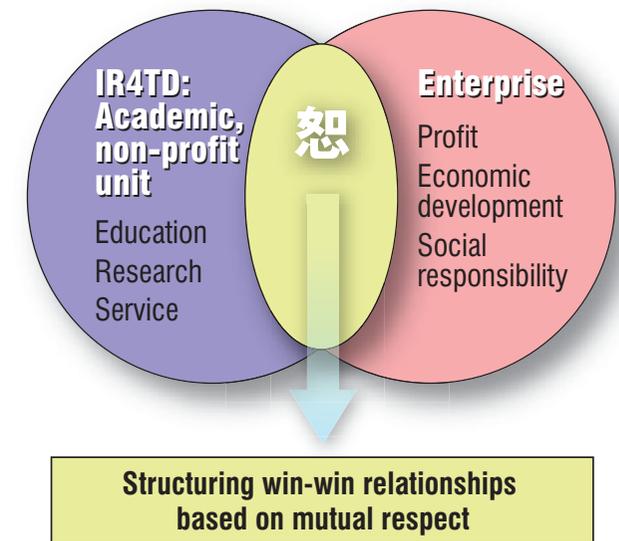
must make an effort to return something useful to society. I believe that the mission incumbent upon engineering researchers is to assist in solving the various types of problems engendered by industrial enterprises. The primary role of researchers in this endeavor lies in accepting challenges that require the steady observation of an entire situation and that are unrelated to profit-making, such as the promotion of basic research and conceptual reorientation.

**Futamura:** The collaborative operations of IR4TD are open to enterprises around the world and, further, the research staff consists of several races. In this situation, how did you introduce concepts based on Oriental thought?

**Saito:** At first, I was quite anxious when discussing the differences between Western and Oriental thought. I took much care in choosing my words so as to avoid giving an incorrect impression regarding the superiority or inferiority of either. I stressed that, if both types of thought were properly used, we could realize wonderful and otherwise unattainable achievements.

In order to assemble a research staff consist-

## Operational Principle of IR4TD



( 恕 : To become possible to think, speak, and behave with an empathetic understanding of one's partner )

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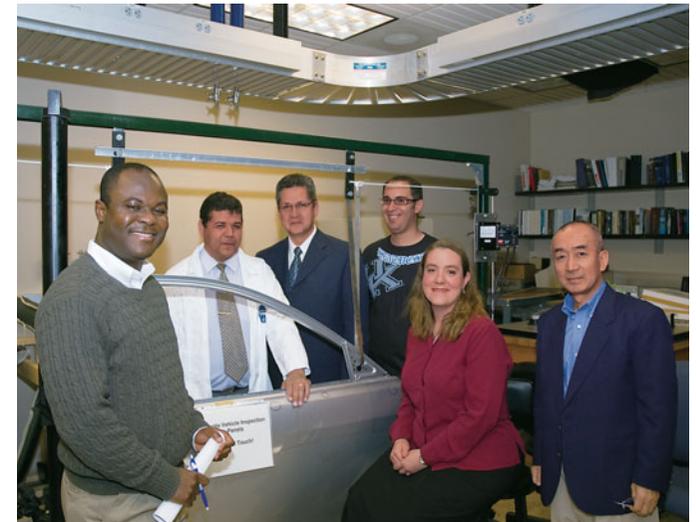
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ing of people who are different in both religion and race—American, Middle Eastern, Asian and European, I felt that the only way forward was to tell them what I believed. I described my career and stated my heartfelt desire to form a group that, by integrating the efforts of the entire staff, would conduct socially beneficial R&D. In doing so, I obtained the consent of all our staff members.

At our weekly group meetings, we introduce not only technical data but also the careers and cultural background of our staff members as well as encourage a beneficial exchange of questions. As in the Zen precepts that “Form is emptiness” and “Emptiness is form,”\*1 if all of us can experience the process of full self-revelation, we will be able to

feel on an elemental level how all things arise from “emptiness,” producing a resonance that transcends cultural differences. Then, each member of the IR4TD research staff not only participates in the research being conducted by the group but is also strongly aware that he is an integral participant in the formation of the group itself.

In the US, too, there is the term “inside out,” which means that when a person digs deeply into himself, he will be able to perceive his true capabilities and understand the principle of things. I think that it is commonly held throughout the world that the first and most important step is to refine oneself.



IR4TD research members and Dr. Saito

\*1 色即是空、空即是色：色即是空 (Form is emptiness) is the basic concept of Buddhism; namely, that form and phenomena do not exist in and of themselves but rely for their being on a relationship of mutual interconnectedness. On the other hand, 空即是色 (Emptiness

is form) is the concept that all phenomena can be understood under the premise that fixed practical substances do not exist by themselves and that, therefore, all is empty.

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Truly Global Entrepreneurship Supported by a Broad Perspective

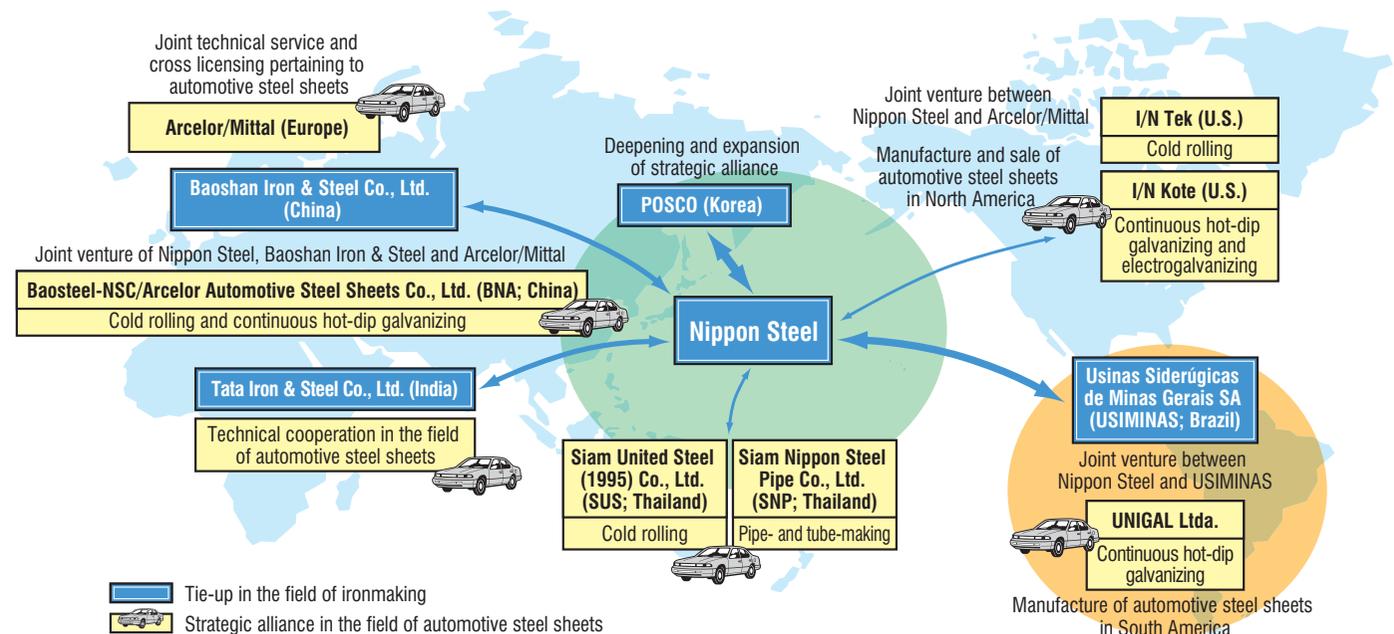
**Futamura:** Currently, Nippon Steel is promoting an operational shift from being a “global supplier” who provides the production bases of our customers throughout the world with steel produced in Japan or who provides steelmaking technologies to overseas steelmakers who then supply steel products to local clients. The goal to which the company now aspires is to become a “global player” whose operations are directly linked to global economic expansion through ever deepening “soft alliances” with local steelmakers and whose formation of joint-venture companies overseas will lead to expanded local production.

Today when national and racial frameworks are being increasingly transcended, if we cannot create a common vision that respects cultural and racial differences and if we cannot establish relationships that yield beneficial synergy, it will be difficult to attain global growth. Dr. Saito, from your perspective as someone who has visited the US and taken the initiative to promote the above, please offer some advice to Japanese entrepreneurs who aim to enhance their global activities.

**Saito:** The following statement by Dr. Reona Ezaki (Nobel Prize Physicist) might serve as a helpful reference. Early in the 1980s when I was in New Jersey, Dr. Ezaki, then Executive Officer of IBM

and President of the Japanese American Association of New York, delivered a televised New Year’s greeting in which he said: “An American living next to your home will understand Japan through your

Global Alliance Networks of Nippon Steel



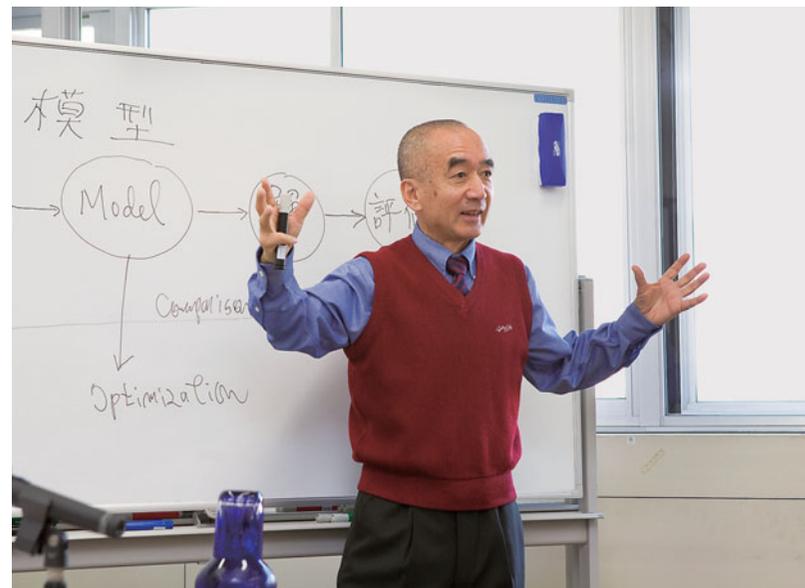
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behavior. I would like to ask all Japanese residents in the US to act with the understanding that you are not simply an entrepreneur but also a private ambassador.” Globalization can be taken to mean worldwide competition but we could also pursue globalization as cooperation. Those are “win-win (mutually beneficial) situations,” “co-existence and co-prosperity,” and “world peace,” as well as the type of “mutual respect” in daily action that was espoused by the Chinese thinker Confucius (551-479BC). I think that such daily judgments and actions made over time will serve as a prime force in promoting globalization.

Individual nations profit when the entire world economy grows. If a forest is managed with broad-ranging oversight, each tree will grow naturally. Unless each individual is constantly aware of his or her behavior, I think it will be impossible to nurture and educate human resources.

**Futamura:** The world currently faces a paradox—how to maintain balance and compatibility between worldwide environmental preservation and global economic growth. How do you resolve the apparent conflict between “the environment and



Delivery of a lecture on applied engineering to younger researchers of Nippon Steel



growth?” It seems to me that we are entering an era that requires us to conceive of and bring about a means to simultaneously make two apparently conflicting issues compatible, and your view of fusing Oriental and Western thought is gaining

importance. I think that this suggests a direction to be targeted by our company in its aspiration to achieve global growth, including the nurturing of human resources.

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New “Kufu” Arises at the Moment of Insight into Fundamental Truths and Principles

**Futamura:** Our company is undertaking the development and supply of user-oriented and society-oriented solutions to meet advanced needs and is placing a priority on its responsiveness to rapidly changing market needs and to environmental and resource issues. In order to develop advanced products and solutions, it is necessary to accelerate the process from R&D to practical application. You mentioned that an important role of scholars lies in conceptual reorientation. From the perspective of superior technological edge and rapid R&D, please elaborate on the direction of interdisciplinary research being promoted at IR4TD. Also give us your opinion on the essential nature of research and development that researchers and engineers involved in product making should understand.

**Saito:** I believe that one important issue is how to preserve the valuable outsider stance of universities. Everyone wishes to integrate the research done by universities with the work of corporate R&D programs, where achievements must be accompanied by practical applications. But something valuable can be lost if universities become

too integrated into the corporate point of view. There are cases when a project that has advanced to a certain level cannot proceed further based only on improvements derived from conventional research. Further progress must await the discovery of new next-generation technology.

Because universities are outsiders, we can take a step back to see an entire research project and anticipate future aspects of it. Accordingly, we may create the new technology by fully utilizing mature peripheral technologies and by capitalizing on “kufu” (a source of imagination and creativity—advanced form of professional intuition) and “flashes of intuition” derived from a conceptual reorientation.

The structuring of win-win relations in which both industrial and academic sectors collaborate by maximizing their respective functions will not only allow for enhancing the advancement of the target R&D but will also lead to a more rapid R&D process. I think it is more important in the future to form a “soft network” that efficiently utilizes the diverse functions of an enterprise and of outside



Prof. Saito inspecting the Technical Development Bureau of Nippon Steel

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organizations.

**Futamura:** You mention that the *kufu* and the ideas that lead to conceptual reorientation first emerge in extreme situations when one is faced with self destruction. I do not think that their emergence is sudden or unexpected, but rather they can be obtained through a deep understanding of the fundamental truths and principles that govern the phenomena being studied. I believe that the only path to strengthen the technological edge in the steel industry is to intensify the pursuit of the fundamental principles that govern physical phenomena such as metallurgy, heat, fluid dynamics, and crystal plasticity. Of key importance to this is identification of the core technologies to be honed. It is only when we explore the potential of these technologies in greater depth that we can examine both emerging social needs and themes and secure a competitive edge in technology.

It is, of course, important for engineers and researchers to refine their respective specialties, but even more important is the group dynamics that will link the content of their research to actual development and practical applications. It is neces-



Dr. Saito and Director Futamura at the headquarters of the Technical Development Bureau

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sary to fuse the seeming conflict between “individuality” and the “group.” I feel that engineers and researchers can find joy, a worthwhile life, and the essence of life in that process. I also strongly feel, as you stressed, that they should, by all means, contribute in broader ways to their enterprises and to society.

Would you please give a message to our younger engineers and researchers?

**Saito:** I hope that they will become internationally active. In my view, such people correctly know their own country’s culture, study the differences between theirs and other cultures, and nurture hope for human coexistence. A global outlook and

a sense of the interconnectedness of their own research to the world—I believe that in the future these two attributes will be important prerequisites for engineers and researchers. For the mental approach of those working in an international environment, I suggest the ideas of “mutual respect and discipline” as described by Confucius and, for researchers, I recommend the concepts of “the view on the universe and selflessness” discussed by the Chinese thinker Laozi around the 5th century BC.

**Futamura:** Thank you very much for your valuable insight.

## Nippon Steel Corporation

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