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

Titanium-made Bell

The bell, produced by forging hard titanium, has a wall thickness of 5 mm; its reverberation continues for 80 seconds for a large-size type.

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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Face-to-Face Discussion on Research and Development (Two-part Series: 1)

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



Operating Roundup



Financial Results for FY2008 (April 1, 2008 to March 31, 2009)

In fiscal 2008, declines in both sales and income were reported, with consolidated net sales declining ¥57.1 billion year on year, to ¥4,769.8 billion; operating profit decreasing ¥202.6 billion, to ¥342.9 billion; and net income declining ¥199.9 billion, to ¥155.0 billion.



Feature Story

Face-to-Face Discussion on Research and Development (Two-part Series: 1)

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. 372) highlights Part 1.



Kozo 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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Encounter with Respected Teachers Capable of Seeing the “True Nature of Things”

Futamura: In our discussion today, I hope to discuss such topics as the impetus behind your present commitment to interdisciplinary research and development, the operational principles of IR4TD*¹, the direction of interdisciplinary collaboration in research and technological development. Professor Saito, would you tell us what motivated you to seek a career in scale modeling theory*²?

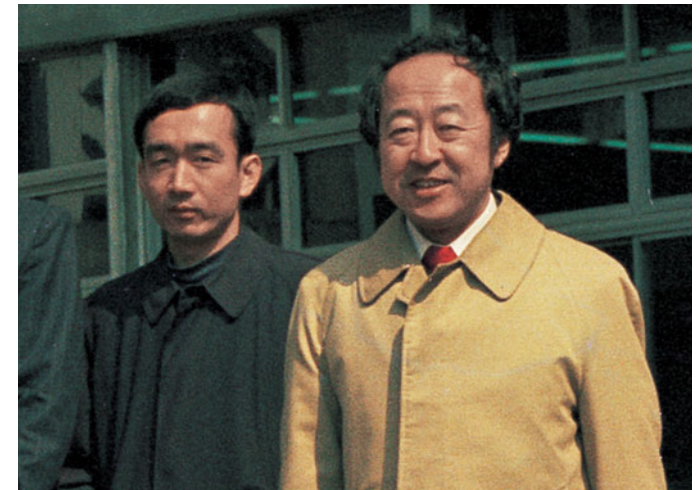
Saito: I was not a diligent student during my childhood. In fact, a teacher in my third year of junior high school told me that I should go to a vocational senior high school and secure employment upon graduation. Based on his advice, I entered a vocational senior high school. But, because of an inherent interest in mathematics, I gradually came to realize that I wanted to study engineering at a university. Unfortunately, though, my senior high school did not offer courses in chemistry, physics or advanced mathematics, subjects necessary for successfully taking the entrance examination to any faculty of engineering. Perhaps I was a diligent student after all because to get around this obstacle, I bought textbooks and studied these

necessary subjects by taking lessons broadcast on the radio and so I was able to enter the Faculty of Engineering at Seikei University in Japan.

Futamura: I hear that your encounter with Professor Ichiro Emori at Seikei University was a truly extraordinary experience for you. Professor Emori was not only involved in the Apollo Program of the United States, but was also a pioneer in scale modeling theory and a world authority in that field. Would you tell us about his research principles and his approach to technology and discuss what you learned from your encounter with his scale modeling theory?

Saito: For a couple of years after entering the university, my studies remained in a continuous state of “indigestion.” My constant and sole concern at that time was to discover the underlying “reasons” for the “facts” presented in class—I questioned why facts existed and why they were necessary, i.e. their *raison d’être*. But my every attempt to find a satisfactory answer failed.

In my third year, I took my first class with Professor Emori who had just returned from the US.



A memorial photo of Dr. Ichiro Emori (right) and Dr. Saito (left)

*¹ IR4TD: An organization proposed by Prof. Saito and established in 2007 as an annex of the University of Kentucky to promote interdisciplinary and collaborative R&D. The institute places prime importance on research for technology development and promotes social contributions and the nurturing of human resource through the implementation of research projects requested by business enterprises.

*² Scale modeling theory: A theory essential to the design of experiments to reproduce mechanical properties, natural phenomena, and other mechanisms in similar models of greater or lesser size. Scale modeling is applicable in solutions to issues spanning the entire field of engineering.

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By asking us why we need differential equations and then telling us that equations are simply a tool for describing the laws of nature, he made me keenly aware that the real reason I had come to this school was to meet him. I was profoundly influenced by the inward looking gaze of Professor Emori who, as a scientist, had insight into the “true nature of things.” That is why I sought out a career as a researcher.

I was inspired to write my Ph.D. dissertation on “the use of scale modeling to reconstruct fires” because Professor Emori stated that there was only scant research in this area. During the course of my research in the field of combustion and fire, Professor Emori introduced me to many related organizations, including the former Railway Technology Research Institute, the National Research Institute of Fire and Disaster, and the Building Research Institute. Thus, I was able to absorb an extensive amount of knowledge.

From this experience, I learned that, without the integration of information available at multifaceted institutions such as research institutes and universities, an all-encompassing theory could not be

established in the field of phenomenal research. In particular, since scale modeling theory is not limited to a particular area of study, such as mechanical engineering or civil engineering, knowledge integration is essential. In order to further advance the theory, a broad spectrum of knowledge is required. Professor Emori once said: “In the field of engineering, we must look at the whole forest, before observing each elemental tree. The ability to see the whole forest is not analytical, but synergistic. Without it, the true nature of an engineering problem is indiscernible.”

I think that, by studying scale modeling theory, I have been able to nurture not only analytical but, more importantly, integrative capabilities, namely a broad perspective.

Futamura: I now realize that the present underlying ideal of your interdisciplinary approach to research (i.e., placing greater value on the whole picture, or taking a broad perspective, rather than on the elemental parts) and your contributions to society were an outgrowth of your exhaustive study of scale modeling theory.

Years later, you went to the US where your re-

search activities led to your current position at the University of Kentucky. Please tell us more of your work in the US?

Saito: Upon graduating from Seikei University in 1980, I went to the University of California, San Diego, as a postgraduate engineer under Professor F.A. Williams to study combustion theory, which is essential for scale modeling theory as it applies to fire. Professor Williams is the founder and international authority of combustion theory. Starting life anew in a new world, I firmly resolved never to return to Japan before attaining the zenith of engineering. Upon first meeting Professor Williams, I had a strange feeling of familiarity, as if I had met him before. His view of life was that a man should not waste his time here on earth, because it is all that he will ever have. His basic philosophy of doing one’s best everyday touched my heart.

I became convinced that if people were serious, they could find common ground and interact with others in any field. About six years of committed research under the tutelage of Professor Williams, including time as a researcher at Princeton University, inspired me not to plunge merely into research

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that was of particular interest to me, but to nurture younger scholars, thereby repaying the kindness of Professor Williams and giving back to society as well.

In order to create my own unique program in engineering research and education, I applied to many institutions. My first applications to more than a dozen colleges and universities were rejected. But in 1986, the University of Kentucky, which had shown interest in my program, offered me a position after a dozen or so hours of interviews and discussions. I was so overjoyed by their offer that I immediately signed and returned the acceptance letter without checking the terms. My wife said in utter amazement: “In the United States, no one chooses to ignore the terms of an agreement.” I, on the other hand, take pride in having never negotiated over wages in my life.

From Initial Visit to the US to Inauguration of IR4TD by Dr. Saito

1980	Visit to the US, and learning at University of California (Profs. Williams and Gordon) Research Staff Member at Princeton University Associate Professor, University of Kentucky Meet with then President Fujio Cho of Toyota Motor Manufacturing Kentucky (TMMK)
1990	NASA project on fire safety in the universe Start of TMMK project and proposition of NVF heat treatment US Navy project on inspection of ship ballast tank Start of TMMNA project (Toyota Motor Manufacturing North America: research base and production company in North America) Start of Toyota Motor automobile project Start of painting technology consortium
2000	Invention of Vortecone over-spray paint capturing system and obtainment of its patent in the US Holding of annual paint technology workshop Start of Nippon Steel project Obtainment of US patent for infrared camera non-destructive inspection TMMK: Measure to improve clean room TMMK: Measure to prevent welding fire
2007	Establishment of Institute of Research for Technology Development (IR4TD) of University of California
2010	Development of quick curing paint Development of new painting machine



Dr. Saito and Director Futamura

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Principles to Live By: Zen Concepts

Futamura: I detect an underlying element of Oriental thought in your activities, or way of life. I understand that another pivotal event in your life was your encounter with “Zen.” How did this occur?

Saito: In my fourth year of primary school, I first encountered the word “philosophy” during Japanese language class. It was my belief that human beings were born for a certain purpose, and I wanted to ascertain if this was true. However, because classes at school did not offer me the answers that I sought, I spent much time reading books and listening to lectures until entering high school.

On one of those days, I learned of the Zen Buddhist monk Dogen*³ and was deeply impressed by his teachings. He went to China to master Zen in 1223, after returning to Japan in 1228, established the Eiheiiji temple in Hokuriku, the principal monastery of the Soto sect of Zen. To learn more about Dogen, I read a collection of his sayings

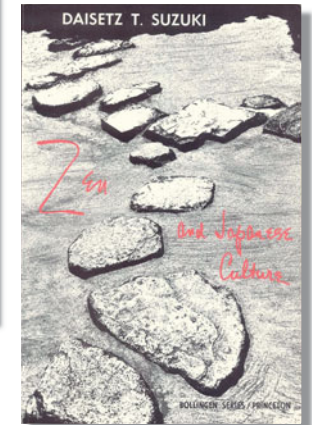
entitled “Shobogenzo-Zuimonki.” In it, I found many truly instructive teachings, such as “You, students of the Buddha-Way, seek not food or clothing,” and “By forcing yourselves to practice now, you will surely attain the Way.” I was moved that anyone had ever lived such a splendid life and thought that I would surely be able to live in a similar way. Since then, what has captured my interest is not historical facts, but the causal forces and thoughts behind history.

Yet another significant encounter for me was my discovery of *Zen and Japanese Culture* written by Daisetz T. Suzuki*⁴. I read this work upon the recommendation of a Japanese minister whom I met about the time that I moved to the University of Kentucky. *Zen and Japanese Culture* is a truly great work written in English to explain to Western people the oriental philosophy of Zen, which is difficult to explain even in Japanese or any language. Take, for example, the word “*kufu*” or “a source of



Portrait of Dogen, a Zen monk (possession of Hokeiji Temple)

Zen and Japanese Culture by Daisetz T. Suzuki (possession of Prof. Suzuki)



*³ **Dogen (1200-1253):** A Zen monk who founded the Soto sect of Zen. His main writing on Zen, *Shobogenzo*, describes the Zen concept that sitting in meditation is itself Buddhahood and that spiritual awakening is obtained during training. *Shobogenzo* attracts

the attention of contemporary philosophers in both the US and Europe.

*⁴ **Daisetz T. Suzuki (1870-1966):** A scholar of Buddhism who wrote many books on Zen in English in order to inform overseas

readers about Zen culture. Of his 100 books, 23 are written in English.

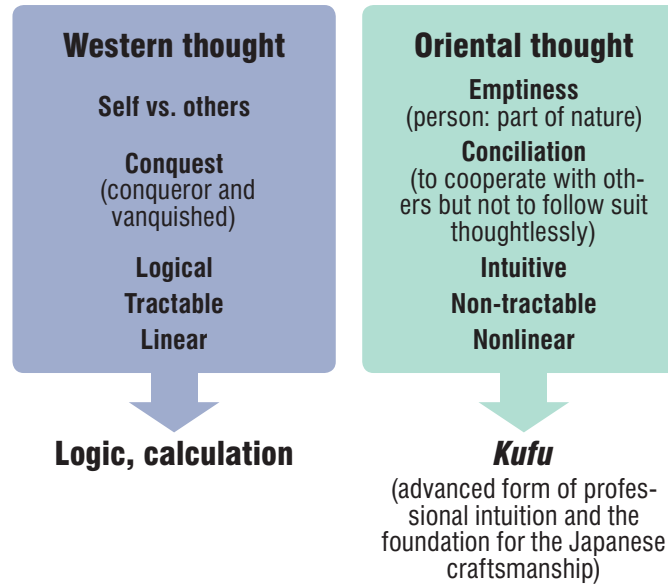
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imagination and creativity—advanced form of professional intuition.” Although we Japanese often use this term, it is not part of the Western lexicon. In order to explain its meaning to Westerners, we Japanese must comprehend the often unrecognized meaning that lies behind the term “*kufu*.”

On the strength of his ability in English, D.T. Suzuki succeeded in logically discussing how the origin of “*kufu*” is deeply related to Zen. This “re-discovery” of *kufu* provided me the opportunity to reaffirm the totality of Oriental thought and to commit myself to new learning.

Futamura: D.T. Suzuki’s work helps us understand “integration,” “broad perspective,” and other oriental world views by expressing them in a Western or “analytical” manner, doesn’t it?

Comparison between Logical Thought in the West and the Idea of Kufu in the Orient



Saito: That is true. As for myself, in the course of writing papers in English and spending time doing research in the United States, I have become accustomed to the practice of logical explanation and taking a rational approach to things. In addition, because I still appreciate the values and culture inherent in the Japanese character, I am perhaps better able to understand D.T. Suzuki’s teachings.

(To be continued in the next issue.)

Nippon Steel Corporation

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