Chapter 7

Prof. Kaoru Ishikawa's Work at University

7.1 Prof. Ishikawa's Work

Prof. Ishikawa contributed widely to several fields as an academician, an engineer, a university president, and so on. Through the conversation of a father and his high-school son, let us look back upon what he did.

Son Dad, I've heard that Dr. Ishikawa was a professor of the University of Tokyo. Is that right?

Dad Exactly. After the World War II, he went back to his alma mater, the University of Tokyo, where he was appointed Associate Professor. According to his curriculum vitae, during his associate professorship, he held the chair first at Department of Petroleum Engineering, the 3rd Petroleum Refinery Engineering Laboratory in 1951, and then at the Department of Chemical Engineering in 1959. These changes of the chairs were due to the reorganizing/renaming of the department. In I960, he was promoted to Professor. He held the chair at the Fourth Course of the Department of Fuel Engineering (renamed the Department of Reaction Chemistry in 1971) from its establishment in 1961 until his retirement in 1976. He engaged in teaching at the Faculty of Engineering for over thirty years' total. He was granted the title of Professor Emeritus from the University after his retirement. After his two-year service as Professor in Science University of Tokyo†, he was invited to Musashi Institute of Technology††as President, and worked there until the end of his life.

Son What did he do at the University of Tokyo?

Dad Prof. Ishikawa taught quality control and experimental design at the Department of Fuel Engineering and researched quality control as well as coal sampling. He sent out graduates including 73 bachelors, 26 masters, and 2 doctors at the

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† Science University of Tokyo: Today, it is renamed as Tokyo University of Science

†† Musashi Institute of Technology: Today, it is renamed as Tokyo Metropolitan University

University of Tokyo.

He also sent out 25 bachelors in 2 years at Science University of Tokyo. And he had a class in the undergraduate and graduate schools, respectively, and supervised 10 master course students as his disciples at Musashi Institute of Technology. It is rare for a president to supervise disciples. However, Prof. Ishikawa strongly desired to do this and did so.

In addition to earnestly contributing to the research on quality control and bulk material sampling. Prof. Ishikawa had a strong commitment to promote the country-wide quality control movement for improving the quality of the Japanese products which had been blamed for poor quality and had been regarded as "cheap but shoddy" at the time. Further, he regarded the national standards as an important basis for the successful development of QC. He was devoted to improving and administering the national industrial standardization system for the further development of QC. In this way, his broad contributions included various fields.

Son What a giant he was! I've frequently heard that he was an authority in the quality control field, however, I have never heard of bulk… What is that?

Dad That is bulk material sampling. It is sampling method for materials that include a mixture of powder and such as coal, iron ore, fertilizer and so on.

Son What is the bulk material sampling?

Dad Let me see, how shall I explain it? Do you have any idea what sample surveying is? For example, during a general election campaign newspaper publishing companies run public opinion polls in which they survey the percentage support for a political party. Do you know how they take these polls? It is impossible to conduct interviews with all of the voters. Sampling is the easiest and the most appropriate way when the entire number of those being polled is so huge. We can assume the whole Japanese percentage support with errors within plus/minus 2–3 percent only by taking a small sample such as 1,000 or 2,000 of voters as a sample survey.

Son Are you sure of this? If a pollster asks every attendant at a support meeting: for the Liberal Democratic Party, I think, its support percentage will go up instantly.

Dad That is the case if the pollster purposively chooses those being polled but that is not how it is done. How do you select the 1,000 to be polled issue? A pollster should choose them "at random," that is to select items of a group in a random order to obtain an unbiased estimate, often by using a table of random numbers. This random sampling approach is required in the case of industrial sampling as

well. For example, coal, Oh No, boys have less opportunities to see coal today, let us take iron ore. The steel industry is very important for the Japanese economy, but there is no productive iron ore mine at all in Japan as you know. Therefore, Japan has to import iron ore from overseas countries. When a boat carrying iron ore arrives and our importer must pay the overseas exporter for it, he must determine how much he will pay?

Son Isn't the price fixed per ton?

Dad Partly right. He will pay for iron ore but he does not intend to pay for water, gravel, clay and sand, which might be included among shipping bulk. Iron ore varies in iron content; some contain a high percentage of iron but others do not. Then the importer needs to estimate how much iron ore is on the boat because the contents are varied from low to high. If the entire iron ore were used for analysis, there would be none left for making steel. There is no method other than sampling to test using a small portion.

Son That is the easiest way to conduct sampling. Are there any problems?

Dad Yes, a key question is how many pieces you take.

Son Will the sample be as much 1,000 or 2,000 pieces as in the political supporters' case?

Dad That's a good idea, but what do you mean by one piece?

Son Take one piece of iron ore?

Dad Things would be complicated. Iron ore is the mixture of a lump and powder; the former contains rather higher iron than the latter. Therefore, the exporter tends to pick up a lump as a sample rather than powder so as to sell the shipping bulk put the highest price he could, while the importer might pick up more powder as a sample for the opposite reason. It is not rational at all. In mathematical statistics, we can get the necessary sample size by deciding targeted precision as an estimation error percentage. However, mathematical statistics would be useless if a sample piece is not rationally defined.

Dr. Ishikawa's contribution in this area is to develop the bridge between bulk material sampling and mathematical statistics. He introduced the increment concept, namely, he proposed special scoops for sampling through his data-based study of the relationship between the increment size and the sampling dispersion. For his research, we can use the theoretical results of mathematical statistics for designing and evaluating bulk material sampling. (See Chapter 13)

Son How difficult it is to define a piece! By the way, what was Dr. Ishikawa's involvement in quality control?

Dad Dr. Ishikawa graduated from the Department of Applied Chemistry, the Faculty of Engineering, at the University of Tokyo in 1939, as you know. After graduation, shortly after he entered Nissan Liquid Fuel Co, he served in the Japanese Navy as an engineering lieutenant. After his two-year military service, he went back to the company while still on the Navy reserve. He was engaged in developing the process for liquefying coal into liquid fuel at the company, where he may have gone through various hardships with the line workers.

After the World War II, he returned to the University of Tokyo as Associate Professor in 1947, where he was involved in research with the theme of brick forming from coal under high pressure. He may have intended to develop a method to produce a strong coke at compression strength which is necessary for the steel industry, in order to overcome the weakness of Japanese coal which is not strongly viscous and therefore the cokes derived from are not suitable for the steel industry. Through conducting the experiments for his research, I think, he may have tried to make high viscous cokes by carbonizing Japanese coal and he may have been faced with difficulty in analytic method because of the sampling dispersion. Then, he began to study statistics, but, could not find a way to apply it due to the very abstract mathematical explanations. At that time, he heard of statistical quality control from his father, Mr. Ichiro Ishikawa, who was the President of JUSE (Union of Japanese Scientists and Engineers) and was appointed the first President of the Federation of Economic Organizations later. Professor Ishikawa got his inspiration through their conversation that statistical quality control may have been useful in his research. He visited Mr. Kenichi Koyanagi, Managing Director, JUSE, for the materials. He agreed to offer them to him on condition that he would lecture for the seminars in return. Eventually, to provide the seminar, he had to study quality control. His first intention was to further develop his research on “brick forming from coal under high pressure” by applying statistical methods, but it did not take too long until he got involved in the statistical methods and became quite devoted later on. As the proverb goes, he may have gone for wool and come home shorn. His hard experiences in the field works at the Nissan Liquid Fuel Co. may have had great influence on his quality control studies. The number of his papers and their titles might indicate his having been very active as if in one’s native element, after his encountering quality control.

Son What was Dr. Ishikawa’s involvement in sampling research?

Dad Unfortunately, precise stories have not been identified. After his encounter with

quality control, he frequently visited various production plants, where he may have found inaccurate data and realized the importance of accuracy of sampling, analysis, and measurement methods. In Japan, this was the case in the chemical and the steel industries when they first started quality control. He may have had a strong critical mind on practicing the inappropriate application of sampling and analytic methods, especially in the steel industry that was the basic industry in Japan at the time. This could be considered as the starting point of his sampling research. Only precisely analyzing a sample, it is not good enough to prepare the precise and accurate data. The whole sampling and testifying process including accurate analysis arid measurement must be considered. If you take an example of coal, the available carbon percentage of coal on a ship becomes an issue. Even if accurate analysis of a prepared sample is implemented, one cannot obtain available data unless the sampling process in the course of preparing sample is operated rationally. Many researchers had already paid attention to the effective analysis methods for a prepared sample; however, less attention was paid to the sampling process for the precise data. Then, Dr. Ishikawa might be interested in sampling as the pre-analysis process. He might be interested especially in bulk material, in which no academic research had been done. On another assumption, he might choose coal as his research material considering the linkage with what he had been doing so far. This is the research on brick forming from coal. Moreover, he may have considered his research theme as it related to chemistry because of his occupation in the Department of Applied Chemistry. In addition, he may have grasped that it is too difficult to complete a paper with such a big theme as quality control. That was, I think, why he selected the sampling research on coal rather than quality control as the theme of his doctoral dissertation.

Son How did Dr. Ishikawa carry on his work on quality control?

Dad Good question! He could have conducted theoretical studies of quality control even within the universities. However, we have to go out for the field of work so as to study items which are useful for practice. Then he started to go around the factories which offered various opportunities. Eventually, he encountered actual quality problems which drove him to go a further step in his studies. He also discussed various quality issues with his QC colleagues at JUSE research meetings. I have heard that curry and rice was offered to the members as a dinner during the evening meeting. It was said that this was an incentive for the members during the crucial time of food shortage after the World War II. He might have carried out his studies by attending study meetings, applying quality control

methods to the production process, making literature study, and working over his ideas of the publications.

Son I've frequently heard of Japanese Quality Control. Is there any linkage with Dr. Ishikawa?

Dad Certainly there is. It was not developed by Dr. Ishikawa alone, but he strongly influenced a characteristic of new quality control methods in the corporate world with his colleagues. At that time, most companies in the West left QC matters to those who were trained as QC specialists; this is so-called professionalism. Dr. Ishikawa and his colleagues did not think of this system as appropriate for improving the quality of Japanese products. At the early stages, they already found it very important that all the employees such as executives, managers, engineers, foremen and workers over all departments including manufacturing, R & D, design, marketing and general administration throughout the company were involved under the strong leaderships of the top executives. They recommended and introduced such company-wide quality control, which was developed into the so-called TQC (Total Quality Control) movement later on. In this way, Dr. Ishikawa devoted his life to QC development. (See Chapters 8 and 9)

Son I have frequently heard that Dr. Ishikawa was "Father of the QC Circle," too. Is there also linkage with TQC?

Dad There Is. As I told you, the involvement of the employees is required to improve the quality of products/services. Nothing could be done without strong quality consciousness of first line employees at the workplace. "The QC Circle is a small group which performs quality control activities voluntarily within the same workplace." First line workers were considered only in terms of just obeying what their supervisors ordered all over the world until Dr. Ishikawa and his colleagues started QC Circle. Their promotion of QC Circle showed many effects on quality improvement and the great possibility of workers' devotion to quality. This brought about some kind of a revolutionary movement in the relationship between workers and managers. Before the introduction of QC Circle, workers were categorized the same as machines, parts, or material. Dr. Ishikawa started QC Circle based on his belief that we should make a workplace the self-actualization-site, where workers could work with devotion and display the human capability of "thinking." Dr. Ishikawa strongly emphasized the importance of "education" so that the workers could exercise their capabilities fully. I think you could find his idea among his frequently-heard sayings such as "Human being is a human being" and "Quality control begins with education and ends with

education." (See Chapter 10)

Son Dad, at the beginning you said something standard... What is it?

Dad Well, you mean industrial standardization, don't you?

Son What is industrial standardization?

Dad Let us take the easiest example of a roll of film and a dry battery. You know, any rolls of film are good enough for your use, wherever you may obtain that. That is because of the standardized size brought about international standards. Standardization is widely used in various fields including goods such as like film and battery, as well as methods like measurement, sampling, and statistical processing, although the latter might be rather difficult to be understood. Through standardized sampling and measurement methods, we can analyze and utilize the data which anyone might obtain by sampling and measuring. If the sampling and measurement methods were not standardized, we could not analyze and utilize the data which are collected at the different sites, even for the purpose of a simple numerical comparison. Steady activities like standardization promotion is necessary to circulate scientific information throughout the world. There are two types of standards, categorized into national and international. For example, JIS (Japanese Industrial Standard) stands for the former and ISO Standards for the latter. Dr. Ishikawa contributed to the successful preparation of JIS and ISO Standards for bulk material sampling, making the best use of his studies on the sampling methods. He also contributed to the improvement of the industrial standardization systems as a member of the committees organized by the Japanese government. The number of JIS and ISO Standards which he contributed to amounted to 62 and 7, respectively. This record might stand for quite some time as did the one that Futabayama, a *SUMO* Grand Champion, set by winning 69 consecutive victories in the tournament. (See Chapter 14)

Son You are using the words "*HYOJYUN*" and "*KIKAKU*." What is the difference between the two?

Dad Sorry for confusing you. You may think that they are synonymous. You can find the synonymous English words of "norm" and "standard": those derivatives are normal and normalization, and standardization, respectively. Today, "standard" and "standardization" are frequently used in English-speaking countries rather than "norm" and "normalization" are used in Latin countries such as of French-and Spanish-speaking. I don't know the origin of "*KIKAKU-KA*" and "*HYOJYUN-KA*" used since the Meiji era (1868–1912). They were probably translated in order to differentiate "standardization" from "normalization." The

distinctions people have made customarily between the two depending on the circumstances and, moreover, the usage differs from person to person. Sorry again for confusing you.

Son Anyway, what a great amount of works that Dr. Ishikawa has done!

Dad Exactly. His works are many over various fields beyond our imagination. Therefore, we tend to think there would be less linkage between each dedication. However, Dr. Ishikawa dealt with his works as if they had close linkage with each other. Moreover, any of his contributions in each field are highly appreciated as world-leading and distinguished works. He was indeed a giant, wasn't he?

Son Do you know what the key to his great success was?

Dad That's a good question. I regret not to have asked him about it. I think his research method was characterized as team work, in which his colleagues got together to promote research. That was the QC Circle version for research.

Rather than theoretical research, many of his contributions were data-based ones based on a great amount of experiments, data and literature, which needed great efforts and took a long time. He organized teams to conduct huge number of experiments and analyze various data.

Those teams worked not only for the task of promotion but also for the training of the younger specialists. Some may suppose that he was on Easy Street. But this is not true. While he left the precise matters to the members, he led the group earnestly by suggesting research policies and ideas for overcoming difficulties and removing barriers to improvement. He chaired several committees including the JUSE sampling research committee in industry by JUSE, where he was highly respected by most of the members. I think organization shows Dr. Ishikawa at his best. We can easily find many countries with many excellent QC specialists, but very few are outstanding organizer like Dr. Ishikawa.

Son Dr. Ishikawa was famous not only within but also outside home, wasn't he?

Dad Yes, that's right. He was widely read and well informed of the world affairs. His works are well known throughout the world. His publications, *Guide to Quality Control* and *What is Total Quality Control? The Japanese Way* (English translation of *Japanese Quality Control*) are included among the best sellers. His works could not be explained fully without international activities. (See Chapter 11, Chapter 12)

Son How are all his titles explained in a business card?

Dad That's a good thought. Let me carry on. President, Professor, Writer, Lecturer, Researcher, Editor, Organizer, Coordinator, Director, Chairman, Consultant,

Advisor, and Counsellor. These are not good enough to explain what he had contributed. How many in all? Will you count for me?

Son Let me see, one, two, three, 13 in all. He had 13 different faces!

Dad Interesting, isn't it! By the way, please bring a piece of paper and a pencil? Let's figure his works. That's it.

Son Great! Wasn't Dr. Ishikawa a workaholic?

Dad Though being extremely busy, he managed his time to enjoy chatting over a bottle of whisky, playing golf, taking pictures with his family and colleagues. Some may think of him as a master storyteller/stylist. However, I do not agree with this. In my personal opinion, he was not a master when it came to storytelling and rhetoric. He preferred easier words/phrases for the better understanding of the audiences/readers rather than a needlessly decorated style or complicated phrases. I think, he didn't need rhetoric to express his ideas/thoughts because they were based on his broad experiences over the years. That's why his lectures and publications were popular among-the QC people. We might find the same thing with his English speeches/lectures. Though he was not so good at speaking English, many people in the world had been moved and motivated by him. (See Chapters 4, 5, 6 and 12)

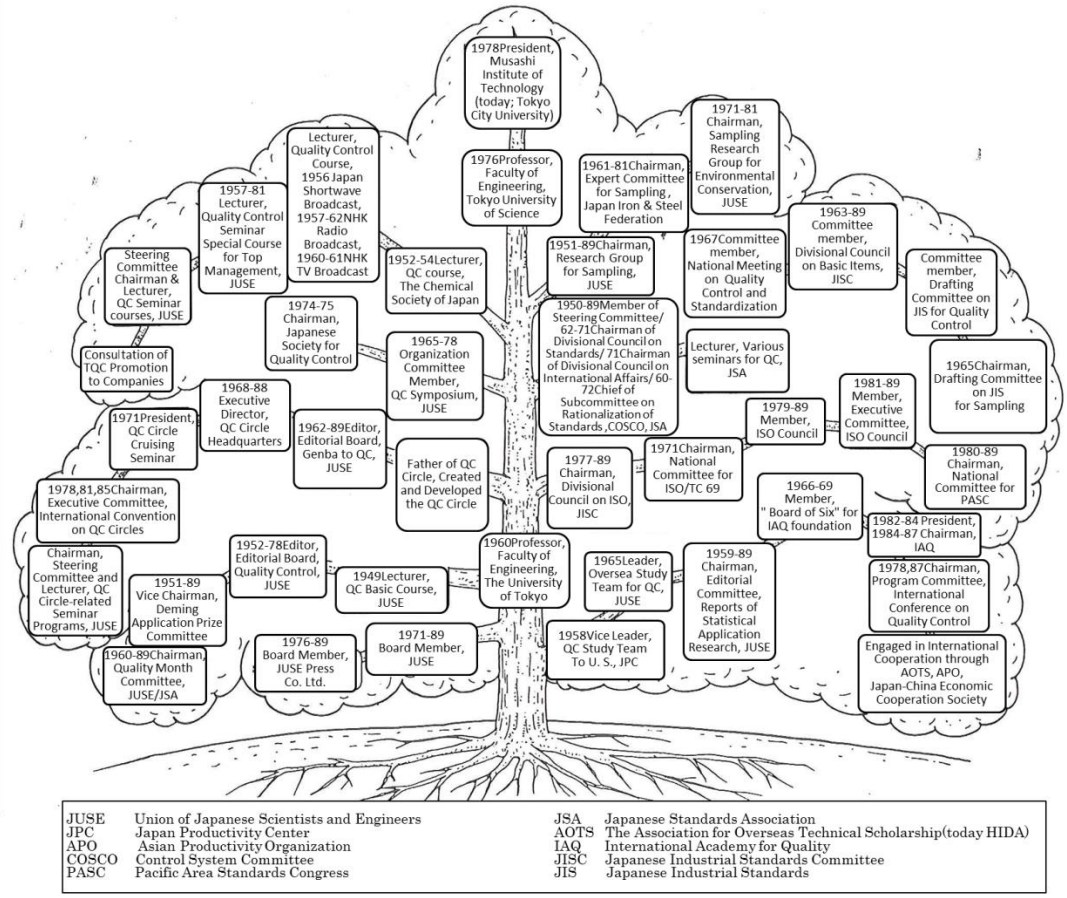
Son How do you explain about Dr. Ishikawa in a word?

Dad Let me see. I would say "A PRAGMATIC THINKER AS WELL AS A GREAT ORGANIZER WITH FARSEEING WISDOM." I suppose that the expression of Mrs. Keiko Ishikawa, "The man who lived his life many times over" fits in very neatly. (See Postscript)

Son How was he as a professor?

Dad He did manage a lot of jobs enthusiastically, as I told you. He put most emphasis on his university jobs, especially when supervising and taking care of his doctor/master/undergraduate students. He was always saying/joking mockingly that once one works as a teacher or a monk three days, he never resigns in his life time. He seemed to supervise his students with his special enthusiasm and a warm heart. His enthusiasm also appeared in his seminars after he became a university president. He showed less interest in students cramming. I think his intention mostly was to educate each student to display his/her abilities fully for the further development of the society. (See Chapters 3 and 7)

(Noriaki Kano)



The Tree of Prof. Kaoru Ishikawa (Drawn by Shiro Ohtake)

7.2 Prof. Ishikawa and the University of Tokyo

Professor Kaoru Ishikawa's return to the University of Tokyo was determined before the end of World War II, but it was only officially announced on January 18, 1947, when he was appointed assistant professor on the Third Course of Oil Refining Engineering (led by Professor Shingo Ando), in the Department of Petroleum Engineering at the First Faculty of Engineering. This course was subsequently renamed the Fuel Engineering Course (1949) and the reorganization of the Department of Petroleum Engineering resulted in the course becoming part of the Chemical Engineering Program in the Department of Applied Chemistry (1951), before being transferred to the Department of Chemical Engineering (1959). With the restructuring and expansion of the Department of Applied Chemistry in April 1961, the course was merged with the department's course in explosives engineering to create the Department

of Fuel Engineering. In 1971, the department was reorganized into the Department of Reaction Chemistry. Accordingly, Professor Ishikawa's career path was as follows:

Appointed assistant professor (1947)

Third Course of Oil Refining Engineering, Department of Petroleum Engineering (1947–49)

Fuel Engineering Course, Department of Petroleum Engineering (1949–51)

Fuel Engineering Course, Chemical Engineering Program, Department of Applied Chemistry (1951–59)

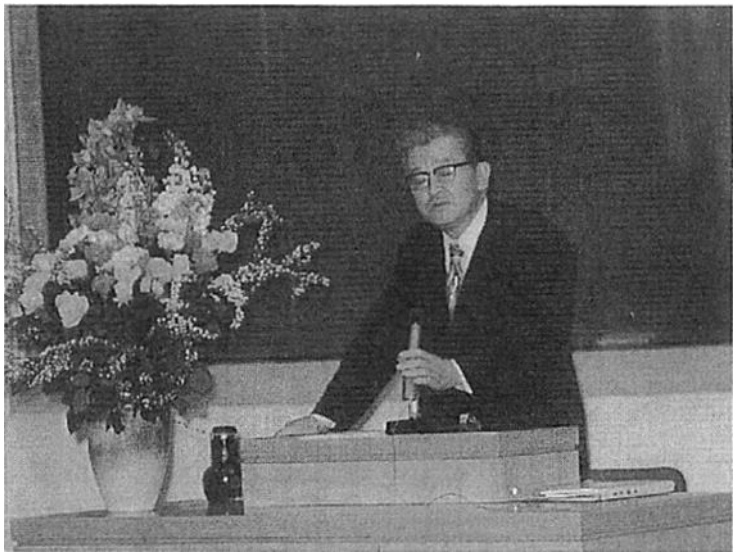
Fuel Engineering Course, Department of Chemical Engineering (1959–61)

Promoted to full professor (1960)

Fourth Course [Applied Combustion Studies], Department of Fuel Engineering (1961–71)

Fourth Course [Reaction Management Engineering], Department of Reaction Chemistry (1971 until reaching mandatory retirement age in 1976)

Note: This article has mainly been compiled with reference to the book *The Centenary of the University of Tokyo*. Professor Masahiko Munechika was also of great assistance in the compilation of this section.



Professor Ishikawa's Final Lecture at the University of Tokyo: In the auditorium in Faculty of Engineering Building No. 11 (February 24, 1976)

The University of Tokyo and Prof. Kaoru Ishikawa

Jiro Kondo

Professor Kaoru Ishikawa's outstanding achievements in the field of quality control will doubtless be described by many others in this memorial issue, so I would like to focus on the active role played by the Professor at the University of Tokyo.

As is well known, the Professor was the first-born son of the late Ichiro Ishikawa, who gave such sterling service as the Chairman of the Japan Federation of Economic Organizations (Keidanren). After graduating from the old Tokyo High School, the Professor entered the Department of Applied Chemistry at Tokyo Imperial University's Faculty of Engineering, graduating in 1939. He then spent two years in the Navy on a short-term posting as a naval engineering officer.

The war was still going on at the time of his demobilization, and he became involved in the design and construction of a new plant at Nissan Liquid Fuel Company for producing liquid fuel from coal, spending the rest of the war dealing with its running and related research.

For his graduation thesis, the Professor studied under the late Professor Naoto Kameyama (the first President of the Science Council of Japan), specializing in electrochemistry. He was a contemporary of such figures as Takashi Mukaibo, who went on to become President of the University of Tokyo and Vice-Chairman of the Japan Atomic Industrial Forum. After the war, the Department of Applied Chemistry was restructured into a number of departments, eventually being named the Department of Reaction Chemistry.

While the Professor was working as an engineer for Nissan, he would work until around midnight every night, repeatedly carrying out various tests to check whether the equipment that he had designed and built was working properly. It appears that this gave him valuable experience and understanding that chemical devices do not always work in accordance with academic theory. This is doubtless something not confined to chemistry, but which is true to some extent in engineering as well; at any rate, this practical experience gave him a rather different outlook from the academics who had remained in the classroom ever since graduate school.

Returning to the university seems to have required a great deal of determination on the part of the Professor who was away from research for a while. At first, he visited his old teacher Professor Kameyama and asked, "I don't suppose the university needs someone like me, who left academia and has been getting his hands dirty in the field since then?" Professor Kameyama replied, "It's precisely those rough and ready people

whom the university needs right now, so please do come back." And so, Professor Ishikawa made up his mind to return. Accordingly, in 1947, not long after the war ended, he was employed as an assistant professor and served as a professor in the Faculty of Engineering for 29 years, until 1976.

In around 1948, the Professor began to study statistical methods, because the data he was obtaining from experiments varied considerably and he was unable to reach a conclusion; this in turn led him into the field of quality control.

The Professor often used to say that Faculty of Engineering students should not have come specifically to learn physics, chemistry, mathematics, or electrical engineering. Rather, he argued, engineers and development researchers at the very least needed to clarify their objectives and utilize their knowledge of these disciplines as methodologies for contributing to society.

He experienced the fierce student unrest at the University of Tokyo from 1968 to 1969 and, as a member of the Management Subcommittee on University Reform formed during this crisis, recommended that assistant professors and professors alike should spend only a maximum of ten years in their posts, but this suggestion was ultimately not translated into reality, due to widespread opposition within the university. As this shows, if you are trying to achieve something great, there will be those close to you who will oppose it, so it will be difficult to succeed unless you can persuade them. One of the Professor's sayings was, "You'll find your enemies among those closest to you."

The coal sampling method that was the subject of the Professor's degree thesis later became an international technical standard. It was a time when the degree system was changing and the ceremony for the conferment of academic degrees was held while the Professor was overseas, so his wife attended in his stead; in fact, I myself received my academic degree on the same day. Having built up this stellar record of achievement, the Professor retired from the University of Tokyo upon reaching the mandatory retirement age of 60. When the Professor retired, I was Dean of the Faculty of Engineering, so I remember having the opportunity to express to him in person my regret that he had to leave.

I hope that this description of just a few of Professor Ishikawa's achievements while at the University of Tokyo will serve as a suitable memorial to him.

(Professor Emeritus, the University of Tokyo;
President, Science Council of Japan)

Idealistic Leading Engineer

Yoshio Kamiya

I first met Dr. Ishikawa in 1952, when my graduation thesis was assigned to Prof. Ando's Laboratory, in the Department of Applied Chemistry and Chemical Technology, School of Engineering, at the University of Tokyo, in which I was engaged in the theme of coal oxidization. Dr. Ishikawa was an associate professor at that time, and took charge of coal relations. He did not mention any small details about experimental method, but responded to me seriously by taking me on laboratory visits to companies, arranging samples for experiment and attending discussions on the results of experiments. Dr. Ishikawa, constantly on the move for QC at that time, managed a superhuman schedule by traveling back and forth on the night train to the Kansai region. I remember there were two baskets of cold soba noodles on his desk, on the day he was present at the laboratory. "Be an engineer," "It is your job to foster engineers," and "The important thing is to have a sense of engineering" were his favorite phrases. His best and brightest talent was, especially an excellent sense to decipher the core of problems instantly, by judging whether the goal was reasonable and feasible in a short period of time, respecting autonomy of each member in the group and looking after them at the same time, mobilizing the collective efforts of the group, and leading the group from the front. Efforts to try to acquire this sense, gave me courage to face difficulty in later years of my life.

Fond memories will not end; I was strongly told, not to ruin the autonomy of students working on graduation theses, by giving them small directions; I made Dr. Ishikawa's blood freeze by my driving at beginner's level while I studied in Canada; I was impressed by his power to stand his ground, by saying exactly the right thing during a campus riot; Everyone relied on him, as a sense of good, for the 5th building of engineering department for a long time.

I would like to pay my heartfelt respects and gratitude to him with a gentle heart for supporting me, by devoting his valuable time, while giving daggers to me, who was wondering by a difficult steering, in the last year of my duty at the University of Tokyo. I esteemed highly his calm and sincere attitude when he was in hospital for a surgical operation of kidney in the same year. What I regretted was that I did not stand in the long queue for greetings at his conferral celebration party, because he seemed already tired. I never expected this would become the last chance.

I believe that Dr. Ishikawa was real engineer. After 60 years of age, I was amazed afresh by his greatness, and felt ashamed of being an unworthy student.

(Professor Emeritus, the University of Tokyo;
Professor, Department of Industrial Chemistry,
Faculty of Engineering, Science University of Tokyo)

Chewed out for Fielding the Professor's Fly

Tadao Yoshida

I came to know Dr. Ishikawa in 1955, when I was a senior student of the Department of Applied Chemistry, at the University of Tokyo, and received his "Design of Experiments" lecture. His lecture was one of the unique ones which incorporated workplaces for understanding. I think this heritage is one of the reasons why he developed "Quality Control" in Japan and proceeded with it to TQC.

After graduation, I joined the Nippon Kayaku Co., Ltd. I often heard of the name of Dr. Ishikawa because the Quality Control movement was active in the company at that time. I was secretly proud as being a person who had received his lectures. When Nippon Kayaku applied for the Deming Prize, I had an opportunity to explain the contents of my job. Dr. Ishikawa remembered the time I was a student, when I greeted him.

At the invitation of Dr. Namba, I made a career transition to the faculty of fuel engineering at the University of Tokyo, in which Dr. Ishikawa was there as a senior. As Dr. Namba got along well with Dr. Ishikawa, Dr. Ishikawa was kind to me.

I spent a good time with Dr. Ishikawa at various drinking parties. He was big-hearted and loved drinking alcohol. After the party, Dr. Ishikawa gathered young people and enjoyed debating with them over drinks. One proof of getting drunk was Dr. Ishikawa spilt out "*Kisama*, bustard…" which he had a habit of saying, as he served in the Navy. Dr. Ishikawa treated young people like us, in a frank manner, without prejudice, even though he was so accomplished.

I played baseball only once with Dr. Ishikawa, which was a match between Ishikawa laboratory and Namba laboratory. It was when he was 50 years old. Dr. Ishikawa hit a fly ball to left. As I played left field, and caught his ball, I was scolded by the students.

"That's a no-no, Dr. Yoshida. You ruined Dr. Ishikawa's hit."

(Professor Emeritus, the University of Tokyo;
Professor, Department of Mechanical Engineering,
Faculty of Engineering, Hosei University)

7.3 Prof. Ishikawa, as Remembered by Students and Staff Whom He Supervised at the University of Tokyo

Professor Ishikawa taught 73 undergraduate students, 26 graduate students on the master's program, and 4 graduate students on the doctoral program (2 of whom dropped out). In addition, he was the doctoral dissertation supervisor for the following 5 candidates, serving as the chief examiner for the thesis examination.

1. Doctoral degrees following a course of study
   Hitoshi Kume, A Study of Work Sampling (March 1965)
   Noriaki Kano, A Study of Interaction (March 1970)
2. Doctoral degrees by thesis only
   Takashi Miyazu, A Study of the Industrial Standardization of Coal and Coke Analysis Methods (March 1961)
   Toshimi Fujimori, A Study of the Industrial Standardization of Coal and Coke Analysis Methods (February 1973)
   Jiro Nitori, A Study of International Oil Classification and the Standardization of Coal Analysis Methods in Japan (February 1975)

The fact that the dissertations of all three thesis-only doctoral candidates concerned coal analysis is closely related to the fact that the theme of Professor Ishikawa's own degree thesis was coal sampling (1956). Furthermore, Masumasa Imaizumi undertook research under the guidance of Professor Kaoru Ishikawa and was awarded a degree for his thesis, A Study of Process Analysis and Steel Type Design in the Steel Industry after the Professor had retired from the University of Tokyo (June 1980).

The Professor's weekly activity schedule at the University of Tokyo had been standardized, as follows:

	Morning		**Afternoon**	
	08:00–10:00	10:00–12:00	12:00–13:00	15:00–18:00
Mon.	Research and promotion of quality control outside the university, various committees			
Tue.	Lecture (Heat management)	Lecture (Quality control)	Lunch with students	Colloquium (seminar)
Wed.	Research and promotion of quality control outside the university, various committees (and occasionally golf?)			
Thu.	Away from the university		Attending departmental and faculty meetings	
Fri.	Lecture		Away from the university	
Sat.	Away from the university			

As can be seen from the table above, outside the university, at government bodies, academic societies and other organizations, and companies, the Professor was involved in research and promotion focused on quality control, industrial standardization, and sampling, as well as various committee activities; so he certainly was not the kind of lecturer who would always be in his office. However, one could always reach him when needed, via his secretary. In addition, when his turn as head of department came around every four years, he was almost always in his office during the aforementioned periods when he would otherwise have been away from the university. Moreover, at the time of the students unrest at the University of Tokyo in the late 1960s, some of the lecturers had a tendency to stay away to avoid trouble, but conversely, Professor Ishikawa was almost always in his office, watching developments and analyzing the situation.

Outside the university, I understand that he had a reputation as quite a strict lecturer, but I believe that there were hardly any alumni who had received a tongue-lashing from the Professor, as he would always try to find some good points and give students confidence, even those who were not very good. The Professor always drew a clear distinction between getting angry at someone and scolding them; sometimes a student would say, "You got angry with me" and he would reply, "No, I didn't get angry; I scolded you with love." The Professor and those of us he supervised would have get-togethers several times a year. These were occasions when we really let our hair down and some students went so far as to ask impudent questions, but the Professor never took offence. A custom developed whereby those still under his supervision would give a "leaving certificate" to those who were going out into the wider world. I believe that this started the year that Mr. Kume, Mr. Takamatsu, Mr. Takematsu, and Mr. Hirata graduated from graduate school, with those staying on giving the leavers a certificate bearing various amusing parting messages. Professor Ishikawa greatly enjoyed this custom. (Nobuo Ikebe)

Private Institutes in the East and the West

Shuichi Ochiai

In the last years of the Tokugawa shogunate, during the Tempou era, a rather eccentric institute for western studies was born in the west, at Kawaramachi in Osaka. It was founded by the great Doctor Koan Ogata. The name of the institute was Tekijuku, named after Dr. Ogata's pen name Teki Teki Sai. The institute produced not only its disciples doctors of western medicine and Scholars of western studies, but also a wide

range of splendid individuals such as strategists, servicemen, economists, politicians, and educators. This was due to Dr. Ogata, who had the eye to see through the disciples' aptitudes and enjoyed teaching them.

Dr. Ogata took into consideration also the disciples who were not so splendid so that they could get by in this world in their own way. Sometimes, Dr. Ogata seemed to favor those not so splendid disciples rather than the splendid ones. He had been a natural born educator.

Fast forward to the Showa era, the Ishikawa Laboratory was born in the east, in Hongo of Tokyo. The teacher of this laboratory was Dr. Kaoru Ishikawa, the man who had established quality control system, the engine of Japan's prosperity. Dr. Ishikawa enjoyed finding out his disciples' aptitudes and nurturing them. His laboratory produced many splendid individuals among the disciples. Dr. Ishikawa did not disregard those not so splendid such as I, and would accept us as those with excessive irregularities. Maybe Dr. Ishikawa's generosity exceeded that of the teacher of the west.

When I visited Dr. Ishikawa to discuss my Bachelor's degree thesis, he declared, "*Kisama* (he still had the navy tone in him), you are a kind of guy who thinks after you begin to run, and good for learning using your body rather than thinking in your mind. You should measure coal ash sample reduction error."

Thus my days began as if I had applied for an apprenticeship as a stoker at the University of Tokyo. And when I finally improved an apprentice for the Ishikawa Coal Shop, I had a vague understanding of what quality control was. Such was the significance of Dr. Ishikawa's insights. Dr. Ishikawa was a natural educator like a person who could sow seeds onto hard ground and make them grow.

(President, Yayoi Real Estates; graduated in 1953)

"Doubt All Data"

Katsushi Ogawa

I first met Professor Ishikawa in May 1960, when I asked him to supervise my graduation research; it was the year that he had been promoted to full professor. The now-Professor Fujimori of Nagasaki University and Professor Kume, who had just started his master's program, were the only others in Professor Ishikawa's laboratory at the time, and the lab was tucked away in a corner of the research institute. When I look at how Professor Ishikawa's lab subsequently flourished and how Professor Kume's lab is now expanding and developing, I cannot help but feel that it is a world away from

what it was then. In the world of quality control, SQC was in its prime.

The Professor would occasionally say, "Doubt all data." I gradually came to realize that this was the starting point not only for QC, but also for management in general, but initially I thought that he had said a terrible thing, because a professor of the University of Tokyo was encouraging us to doubt rather than to believe. After joining an oil company and going into the field, I developed my own precept modeled on his words: "When you see a valve, assume that it will leak." I congratulate myself that this is a good observation, not only from the perspective of quality control, but also from that of safety management.

When my wife and I married, I asked Professor and Mrs. Ishikawa to be our matchmakers. When I was still a newlywed, I once got a lift in the Professor's car to my home in Mitaka. I think he might have been on his way home from a farewell party. When we reached my home, the Professor told the driver to wait, as he just wanted to say hello to my wife and have a glass of whisky before going home. It was quite late and my wife was about to go to bed, so she emerged to greet us in her pajamas, startling the Professor, and it was a bit of an awkward encounter because she did not have time to change her pajamas.

Sometime later, Mrs. Ishikawa kindly said, "I'm afraid he has a bit of a habit of intruding on newlyweds..." This "after-sales service" on the part of our matchmaker was almost certainly also part of the Ishikawa Way. I feel a sense of nostalgia, recalling how typical it was of the Master of QC.

(Director, Petrochemical Products Office, Showa Shell Sekiyu;
graduated with a bachelor's degree in 1961)

Prof. Ishikawa and "3"

Nobuyoshi Takamatsu

It was 29 years ago. There was a company in Funabashi called Asahi Special Glass (now known as Asahi Glass), which was Japan's largest producer of cathode-ray tubes for televisions. I had been sent there to study quality control. The first time, the Professor took me there to introduce myself. All he said to me was, "Don't worry about what I might think; just say what you think. But when you see any data, assume that they are inaccurate." I wanted to help in some way through my studies, but the process was a series of consecutive procedures in which there was no scope for action, so I thought that there was nothing that could be done. Recalling the Professor's words, I

began to pursue detailed data and compared them against the actual situation. After about three months, the Professor came to see me again. He also took another look at the process. Nodding as he listened to my not-especially-illuminating report, he did not say anything in particular. Inconclusively, my training came to an end. The Professor was kind enough to go one more time to thank the company. Thinking about it now, it must have been a bit nerve-racking for him and I am sure he must have worried about it. At the time, I simply felt a sense of gratitude, but in later years I came to believe that this was the very essence of management. At the same time, I became keenly aware that one must value the start of things. When I am working with youngsters at our company, I will help them to get it right the first time they do something, and the second time I will leave them to do it unaided, and sometimes they fail. I tell them that they will only really master the job the third time.

When I graduated, I was told to remember three things: 1. Learn to hold your drink; 2. Develop excellent general knowledge; 3. Utilize your superiors skillfully. I feel that it was only six or seven years after joining my company that I began to understand what he meant. During my student days, there was now-Professor Kume on the doctoral program and three of us, Takesue (Toray), Hirata (NKK), and myself, on the master's program. When the Professor told us to hurry up and learn to stand on our own two feet, we would jokingly reply that the three of us together constituted one foot, or perhaps the three parts of the thong on a single geta sandal. Oddly enough, these anecdotes involving the number 3 are how I remember the Professor.

(Director, Electronics Development Department, Showa Denko;
completed a master's degree in 1965)

A Collection of Prof. Ishikawa's Quotes

Nobuo Ikebe

A collection of case studies is an essential accompaniment to any publication about QC, so I would like to venture to put down on paper as many of Professor Ishikawa's public and private sayings as I can fit onto this page.

- I saw a cautious side to his generous nature

  Everyone will tell you what a generous man the Professor was. One day, when there was an unbelievably heavy snowfall in Tokyo, the Professor and I both went home early from the university. Addressing me by my nickname, he

said, "Ike-chan, this is terrible. If you think about the possibility of an accident in a taxi or a bus, where the drivers aren't used to the snow, it's safer to get a bus. Let's get the bus." After standing there for some time in the bitter cold, wordlessly smoking a cigarette, he finally said, "Looks like there aren't any buses. I don't suppose there'll be any taxis either."

- His almost-square rectangular briefcase

The Professor's briefcase was heavy—perhaps a sign of his tendency to value everything—but only he knew what was in it. One time, when I was on a business trip with him, he said,

"Ike-chan, bring me my briefcase."

He opened it up and took out a bottle of whisky nicknamed Kakubin, after its square (kaku) bottle (bin). I later discovered that this sort of thing was a daily occurrence with him.

- His regular lunchtime menu at the university was tempura soba and cold soba

The Professor seemed to love soba noodles. Whenever he had lunch at the university or ate with students, he would have tempura soba and cold soba served with a dipping sauce. I will never forget the way he ate with loud slurps.

- How to teach us the phone numbers of many bars

The Professor was kind enough to take us to various bars and eateries.

When we were going to drink alcohol, he would say, "Ike-chan, call XX and check if they have enough room or not for all of us.

"Will do!" and like "200-3971" etc. that were in my memory of 28 years ago, however they drop from my lips correctly and smoothly. He was so good at teaching.

- No matter how tired he was

During my student years, he would go hiking with us at various hills. No matter where we went, on the way up, he would say:

"I'm just going to have a cigarette; you go on ahead."

I never heard him say the words "I'm tired."

With no more space here, so I will just give the titles of a few examples...

- Do you know the Beatles?

- An unmanned Volkswagen runs?
- You should go to bed earlier than me.
- The Tale of the Koshu Kaido Route.
- Have a meal delivered from a sushi restaurant in Tsukiji.

Every single one of these anecdotes shows Professor Ishikawa as "an academic, but first and foremost a human being" and I think that he was a living dictionary of these words.

The Professor was always very kindhearted.

His favorite phrase to reassure people was, "Life always has its ups and downs."

These words live in my today's life.

(President, QMI;
Former research assistant at the Ishikawa Laboratory, the University of Tokyo)

Thinking of Prof. Ishikawa

Ms. Hiroko Narabayashi

In April 1987, I heard of Dr. Ishikawa's passing away with surprise and grief. I went from Kobe to his house in Tobitakyu to bid him my last good bye. His house was surrounded by the fresh green of trees, the wisteria trellis light purple flowers were quietly in bloom. It has already been three years since then.

Looking back now, I assisted Dr. Ishikawa as a secretary for two years from April 1966, at the Number 5 Building of the Engineering Department. The campus including the Hongo campus was quiet, as it was a little before the intense campus dispute occurred and spread throughout Japan. I was surrounded by documents using terms such as quality control, QC Circle, ZD activity, coal sampling, and Deming Prize etc. I was unfamiliar with these terms and was bewildered, but Dr. Ishikawa gave me thoughtful and precise directions. His schedule book was filled with small handwritten appointments several months away, but he easily accomplished the minute by minute schedule. I can still see him actively moving from one appointment to another, answering to inquiries from overseas, especially from developing countries such as India regarding documents on QC and requests for lectures, inquiries from America where QC originated from, regarding QC circle activities which developed distinctively and succeeded in Japan with the endeavor of Dr. Ishikawa.

He would teach his students and research students with vigilance and kindness. He

would hold New Year parties at his house and invite his students to his second house in Karuizawa for fun study meetings in the summer. He left a lot of joyful memories for the members of his laboratory.

I deeply remember Dr. Ishikawa's energetic passion towards his study. In addition, I can't forget his affection and kindness towards his unshakable warm family.

Dr. Ishikawa went about his busy schedule holding a heavy brown brief case and walking briskly. I wish I had a chance to write on the first page of his schedule book, "Please take it easy once in a while." Although the time was short, I am happy that I had the opportunity to work directly under his supervision.

(Former Secretary for Ishikawa Laboratory,
The University of Tokyo)

His Mother's Praise for QC and Admiration of QC Circle

Shinsuke Furuya

At the time when I had been attended to the Professor's laboratory, the first stage of the Professor's research into the sampling of bulk materials had been completed. The sieves and mixers used for experiments were lying about the lab unused, and the students' desks slotted into the gaps between them. There were international students from Taiwan in his laboratory that was very relaxed place only when the Professor was not there; On the other hand, we felt unstable if our master had left us there. The atmosphere was very different from that of the other experimental chemistry labs around us.

Every week, we would get together with the Professor for lunch and a taking turn discussion, which were very sociable occasions. All of the students were amazed by the Professor's behavior during these occasions. He usually listened to the speech being half asleep, however he criticized some points sharply after the speech. He was a truly embarrassing listener who would not allow us to cheat. Although I tried to approach his way, I was unable to do it. This was because my real ability was far from his. Thus, when it's my turn to be a listener, I just drank coffee preventing doze. He should have taught me the tip of his behavior.

At New Year, it was customary for us to gather at the Professor's home. Once, the Professor's mother joined us and began to admonish us students. She expressed praise

for quality control and admiration for QC Circle. She said that quality control has changed the irrational way in Japan before the war and made Japan an excellent country. In particular, she said that QC Circle which began in Japan were a world-class achievement. It is worth being proud of QC Circle. Young people should study them thoroughly.

The Professor used to say, "I can say you're mature if you're able to manage your superiors." It was typical of the Professor who had convinced the superiors even his family of becoming such a fan of quality control. I dare say, I wanted to tease the Professor that he had "powerfully enlightened" or "brainwashed" his mother! We say that if a person is too close we often overlook his good point, but the Professor clearly transcended this word.

(Full-time lecturer, Seikei University;
completed a master's degree in 1971)

Memories of a Trip to Taiwan

Mikio Kawai

In the summer of 1970, when the World Exposition was being held in Osaka, Professor Ishikawa, Mr. Kano, and four of us in the second year of our master's program (Okubo, Furuya, Fujita, and I) went on a trip to Taiwan.

At that time, both Chao-Song Tsong and Kai-Siou Liao, who were a few years senior and former students of Professor Ishikawa, were in Taiwan. They had returned home and Mr. Tsong had recently launched an organization called the Advanced Corporate Management Development Center to promote QC.

These days, it is quite common for students to travel overseas, but at that time, foreign travel was still a rare occurrence.

We time-rich, but money-poor students took an express train from Tokyo to Kagoshima on July 30, sailed to Naha, where we flew to Taipei from Naha and met with Professor Ishikawa who took a direct flight to Taipei from Tokyo on August 4.

From the 5th to the 14th, with an official schedule we held seminars and diagnosis at the factory in Taipei and Kaohsiung. Then, we visited Cape Eluanbi and Taitung, from Taiwan's southernmost point to the east coast for research. In the morning of the 17th, we parted from Professor Ishikawa at Hualien and he returned home.

Then we traveled across Taiwan, visiting Taroko and Sun Moon Lake before returning to Taipei and flying back to Japan on the 20th. (We were initially supposed to

go home by ship, but thanks to the Professor's generosity, we were able to return home by plane.)

We happily made the first overseas travel, enjoying warm hospitality everywhere even we were low status students. Thinking back now, it would be fair to say that it was entirely due to the Professor's warm-heartedness to realize this trip enen overseas travel was not so easy. He had kindly made time in his busy schedule to give his students the opportunity to gain international experience. In addition (although I am probably not a suitable person to write this), I believe that it would be fair to say that this trip was an expression of the Professor's regard for his former student, and he honestly wanted to support Mr. Tsong who launched QC activities in Taiwan. I have traveled abroad many times since then, but this trip left the strongest impression on me and I remember it with a sense of gratitude toward the Professor.

(Deputy Director, Shodex Group, Specialty Chemicals Division, Showa Denko; completed a master's degree in 1971)

Human Education Given by a Master

Hiroshi Osada

I was affiliated to the Ishikawa Laboratory for three years from 1970. For me, as a graduate student, the most enjoyable experiences and those from which I learned the most were the lab seminars and the Union of Japanese Scientists and Engineers Ishikawa Subcommittee, which met once or twice a year.

The seminars were held one afternoon in a week and mainly consisted of lunch with the Professor, followed by presentations of research and introduction of reference documents by the students, but occasionally Professor Ishikawa himself would give a talk. When taking part in these seminars, the first thing that surprised me was that the Professor invariably ate two helpings of soba noodles. After we had eaten, it would be time for the student presentations, and the Professor always dozed off during the commentaries on mathematical formulas and abstract explanations. What is more, he would be facing us as he did so, which made us reflect that it might be because there was something wrong with our presentations. The upshot was that we were grateful for the Professor's silent educational guidance (?). Another thing that astonished us was that the questions that the Professor asked us upon waking from his slumber were always extremely straightforward and to the point. I believe that the Professor made ample use of this outstanding flair and insight into the true nature of things in QC.

The Ishikawa Subcommittee was usually a two-day event involving an overnight stay and the evening session would turn into a critique of the presentations given by the students during the day, as well as a sermon to each of us, based on the Professor's day-to-day observations. At the time, I was pursuing in-depth study of mathematical statistics and I had assumed that studying theory was everything for my research, but the Professor often told me, "You're delving deeply into a single topic, but you won't become a mighty oak unless you branch out." I believe that he was telling me to become what we call today a "T-shaped person." The Professor was also adept at recognizing a person's true nature.

The last thing that the Professor taught me was the importance of identifying problems. Looking at the Professor's research methods during my student days, it seems to me that his focus was always on identifying or discovering issues or themes that were ahead of the times. He probably thought that his pupils or someone else would solve those problems one day. The Professor ceaselessly scrutinized trends worldwide and walked countless shop floors in order to discover "what" in this way. He often told me, "It's no good just reading books and papers. The problems are lying around on the actual workplace."

Having spent 20 years as a working member of society, I am keenly aware of the importance of what the Professor taught me. I also put into practice the Professor's motto, which he often repeated to me: "Broaden your horizons. Look overseas. Be tolerant of everyone."

(Deputy Director, Specialty Plastics Business Development Department,
Asahi Chemical Industry;
completed a master's degree in 1972)

7.4 Education at Science University of Tokyo

The Professor retired from the University of Tokyo in March 1976. At the same time, he started to take up the position at the Management Engineering Division of the Second Management Department in the Engineering Faculty, which was opened in April 1976, at Science University of Tokyo. The Professor passionately worked on undergraduate education for working students. However two years later, he assumed the position of the President of Musashi Institute of Technology. Although his teaching lasted for only 2 years at Science University of Tokyo, he lectured the first year students (General Education Course; Inductive Statistics) and the second year students (Process

Analysis) at the Engineering Faculty Second Part Department, as well as tutoring the fourth year students of the Management Engineer Division of the Engineering Faculty First Part Department for their graduating research guide.

Although it was merely 2 years, it is noticeable how enormous the impact was at that time from the recollection essays (below stated) written by Mr. Hideki Takahashi (present Komatsu Ltd.) and Mr. Takehiro Uehara (present Isuzu Motors), both of whom had been enrolled in the Ishikawa laboratory.

Just before retiring from the University of Tokyo, the Professor's health condition was not seemingly good after his hospitalization and operation. Nevertheless at the summer camp, he used to talk with students over drinks until late night. This was exactly the same behavior as in his days at the University of Tokyo, and I believe his character and philosophy have been inherited by his graduates and still remain alive in their hearts.

Also I should note here that, among many teachers who have been teaching on full-time basis since the set-up of the Management Engineering Division Part 1 and Part 2 in the Faculty of Engineering, the Professor was the most popular teacher in terms of caring very well for young teachers at that time.

(Ms. Toshimi Fujimori, the Nagasaki University;
Yoichi Kataoka, Professor of Science University of Tokyo,
the Engineering Faculty, the Management Engineering Division)

A Prominent Professor and his Students

Hideki Takahashi

"A prominent professor is possibly coming to our university!"

This was the first information I got about Dr. Ishikawa just before I became a senior.

While I was in university, I was totally hooked on Japanese archery and always hung around the clubroom, as if I entered the Faculty of Japanese Archery not the Faculty of Engineering at Science University of Tokyo. That was why I was not asked to join any laboratories to study. So, I decided to "Why not?" and applied to the Dr. Ishikawa's laboratory. This changed my life drastically as a result.

At the laboratory, the prominent professor did not put up any barriers between himself and his cheeky students, treating us as equals and supporting our members who had passion, regardless of our experience or knowledge or lack thereof. I still remember

his generous and warm personality.

In his lectures, he told us about the importance and effectiveness of the theoretical approach rather than of each theory and method itself. When he showed his analyses and countermeasures that he had used, he always asked a question to us: "What would you do?" I took it meant his saying "Think about it on your own," which was tough and demanding to me.

Thanks to his personality and knowledge, a lot of students and companies have grown to play key roles in today's world.

If Dr. Ishikawa, who was a great man of both theory and practice and also a great educator, had lived in the era of the Meiji Restoration, he would have actively played an important role such as Shoin Yoshida and Kaishu Katsu, who both contributed to Japan's growth at the time, did.

I still remember how much we enjoyed a night when Dr. Ishikawa and the laboratory members were having a summer study retreat. Sitting around Dr. Ishikawa, who wore his yukata loosely, we enjoyed talking over glasses of *Sake*.

The time I spent at the doctor's laboratory affected my life very positively. I would like to express my sincere gratitude to him.

(Information System Division, Komatsu Ltd.; graduated in 1978)

"Worker Controllable Defects are One-Fifth or Less of the Total"

Toshihiro Uehara

The cause of my stepping into the field of Quality Control was when I received help from Professor Ishikawa's research group for my graduation thesis in my 4th year at university. The Professor's laboratory was popularly known for practicing theories by using physical data taken from corporate work sites. I joined them and started working on improvement for processing accuracy of the parts for attaching lenses, which was used at a factory of a copy machine manufacturer.

No problem in taking data, the processes are under control, but there are still many defects. I was searching for the real cause of this by fully utilizing various statistical methods I had learned before. Thinking that I might have taken a wrong direction of analysis I nervously asked the Professor, but he replied with a smile, saying, "90% of problems can be solved by stratifications, histograms and control charts. Then you

should check what the workers are doing and what they are controlling because the causes of defects attributable to workers are limited to below one fifth (1/5) at most."

By this one word of advice, I became interested in workplace-rooted quality control, QC as controllers' obligations, a charm of own technique in the form of control, and an aspect of quality control in the Japanese way.

Since then this made me devote myself to quality control for 11 years, and drove me further in quality control to the extent of becoming an advising lecturer for intra-company basic courses 4 years ago. Especially in the last 4 years I have further realized Professor Ishikawa's greatness deeply in my heart when I had participated in the project to construct our factory in America.

All core people among newly employed American managers, staff and main suppliers, not only know the name of Professor Ishikawa but own a copy of the book *What is Total Quality Control? The Japanese Way*, which is the English text version of the Professor's written book, *Japanese Quality Control* in Japanese. I presume that by now, this has become the worldwide bible of quality control.

When we held an alumni association of the research room at a tavern in Shinjuku prior to my departure for the American assignment, the Professor came to join in despite his busy time, saying "Take this book and it will be enough," and gave me his book *Japanese Way Quality Control* with his signature on its cover. I always keep this book at my side on the desk. (Isuzu Motor Company; graduated in 1979)

7.5 The achievements of President Kaoru Ishikawa at Musashi Institute of Technology

President Kaoru Ishikawa took office at Musashi Institute of Technology in April 1978. He was the fifth president after our institute was promoted to a university. Twelve years and four terms have just passed since President Ishikawa took office and it was the first time for us to have the demise of the incumbent president. At the time when President Ishikawa came to our institute, a campus dispute spread in the late 1960s had quieted down and we developed a momentum to enhance the curricula on the occasion of forthcoming 50th anniversary. At the time of taking office, President Ishikawa stated about what were "good universities" and "good students" as follows. "The products (effects) as a university are the graduates, the accomplishments of research, and academic / social activities. So if these are good, it means good universities." Namely he insisted that he hoped the faculty itself continually presented good quality research

outcomes at academic conferences and in the industrial world, which would contribute to nurturing good students. To the students, he wished for them to become engineers / researchers with vitality, independence and cooperative attitudes in anticipation of a coming integrated high-tech society and encouraged them to become people who aspire to be successful in the world.

President Ishikawa newly created 6 committees soon after becoming the president for bringing his ambitions into reality and questioned them. The 6 committees are 1) Three-year plan committee, 2) Budget distribution committee, 3) Research system improvement committee, 4) Common facility committee, 5) Entrance examination research committee, and 6) Future plan committee. President Ishikawa executed the management of the university based on each of their responses against his inquiries. The results were as follows. The 50th anniversary came in his second year, and together with doing the overall finishing for the anniversary, he opened up long-desired Information Processing Center. Later on, we completed the structural testing building (1980) and the Research Building 16 (1983), etc. The building 16 has a language laboratory with updated equipment for pouring his energy into increasing the international sense of the students. For the academic side, he was dedicated to raising the level of graduate school, setting up the doctoral course of the Civil Engineering, the master's course of the Management Engineering and the Nuclear Power Engineering in 1981. He established the rules of the graduate school scholarship (1983) and introduced the course system (this year), etc. He also made efforts to renew the admission process such as introducing the system of preferred application, the system of testing for qualification of enrollment from the affiliated high school, and the adoption of the B method utilizing the National Center Test for University Admissions. However, what was reflecting President Ishikawa's characteristics most were the enhancement of international exchanges with overseas universities such as with the Oregon Institute of Technology, and the improvement of campus rules and regulations. He made more than 30 regulations during his terms such as the rules and regulations of the head conference of the graduate. It reminds me of President Ishikawa's character based on real values. (*MIT Press*, No. 90)

He adopted QC Circle to the administration bureau, conducted lectures of the company-wide quality control to the students every week, and opened up the Ishikawa Laboratory to supervise the graduate students on how to write good thesis. He started various pioneer activities for internationalizing the university. Today, QC Circle is performed in most parts of industries in Japan and by over 60 different countries in the world. But among the universities, Musashi Institute of Technology might be the first

one in the world to perform it. It is also uncommon for universities, that the president of a university conducts a regular lecture and supervises the graduate students' theses. Therefore Prof. Ishikawa was an unconventional president in this regard.

He also served as a board member of Kanto Society for Engineering Education, Association of Private Universities of Japan, Gotoh Educational Corporation and Tokyu Foundation for foreign students and contributed to the development of Japanese academic education.

1. QC Circle activities in the university administration bureau

In 1979, a year after Prof. Ishikawa became the president of our university, he conducted a lecture on QC that was the first time for the administration bureau to be introduced to QC Circle activities. This triggered the implementation of QC Circle to the administration bureau later on with the cooperation of Prof. Masumasa Imaizumi and Prof. Ikuro Kusaba at the Department of Industrial Engineering. During the later processes of promoting QC activities, we received occasional detailed instructions from Prof. Ishikawa on them.

As a result of patient efforts, in 1984 we increased the momentum to hold an administration bureau conference on QC Circle and set up the steering committee for the conference. Then in that year, we held the first conference on QC Circle inside our administration bureau.

In 1985, we organized the administration bureau QC Circle promotion headquarters based on the steering committee set up in the previous year and officially came into practice. At the same time of the establishment of the headquarters, 7 circles were registered, and then increased to 14 circles that we are now working on.

Since then, we have held the administration bureau QC Circle conference 6 times as of June 1990. From the QC Circle, 7 members are participating in QC Circle Cruising Seminar.

Improvement cases presentation program (1984)

Section	Name of the circle	Leader	Theme to improve
1. Admin. Sec.	Trendsetter	F. Komiyama	Reduction in air Conditioning power (cost) in Bldg. 15 IP Center and improvement of its efficiency.
2. Career Sec.	Droll Quintet	T. Oba	Reduction in processing time for career placement.
3. Library A	Nyannees	A. Tanaka	Enhance services to users.
4. IP Center	T&M	T. Uchida	Enforce the use of footwear locker.
5. General Sec. (Personnel Sec.)	Café Royale	A. Kataoka	Reduction in processing time for overtime payment.
6. Registrar Sec.	Kintaro Candy	J. Saito	Improve punctuality to send back answers to surveys from publishers.
7. Student Affairs Sec.	Euphoric Nine Circle	K. Ichikawa	Improvement of services. (better services given to students)
8. Accounts Sec.	Carrot Circle	K. Narita	Speed up the counter payment.
9. Library B	Baumkuchen	M. Hirose	Facilitation of consumable supplies request.
10. Nuclear Sec.	Atom Circle	Y. Kataoka	Improve “visitor reception job.”

2. International exchanges of professors

Before Prof. Kaoru Ishikawa became the president, we were not allowed to spend the education/research expenses for the overseas business trip expenses of professors. Since April 1, 1981, we have revised the rules for the payment of the overseas travel expenses, etc. contained in the guideline of overseas business trip by the order of President Ishikawa. In consequence, if the senior professors, consider the business trip is necessary, professors can be permitted to go abroad for study. Professors are given the budget less than 150 thousand JPY per travel from the education/research expenses distributed to each department. Other universities have not necessarily done the same as we have done.

3. Direction of internationalization

Prof. Ishikawa, after becoming the president, insisted upon the necessity to become

internationalized, exhibited a better understanding of enhancing the education of foreign languages in this regard, and strengthened this field at the time to establish the graduate school. So the number of staffs engaging in the education of foreign languages became more than twice as large as before. The contents of foreign language education were tremendously enhanced and this direction has been succeeded by the present president.

4. Adoption of foreign teachers

Recently, each university is having many discussions over this topic, but only President Ishikawa made a wise decision to adopt foreign teacher as longtime employment. This decision was justified by the fact that other universities that observed us followed MIT. Today a foreign teacher who has applied for a second time for longtime employment is working.

5. Small classes for foreign language education

Our language school repeatedly demanded to form a small class per 50 students. Thanks to the increase of the staffs and the secret backups of President Ishikawa, our small class system was brought in and has been sustained even now.

6. Language training

We have held the summer language course in the Oregon Institute of Technology in the USA since 1989 and this year is the third round of the language course. Thanks to the great efforts made by President Ishikawa, there is a promise between the Oregon Institute of Technology (OIT) and MIT as sister universities. Therefore the teachers and the students at OIT give instructions to the students of MIT in a very friendly manner during the course. The length of the course is about four weeks. We gave one credit to the English lesson at first, but now give two credits. The course is popular especially among the freshman and the sophomore and the upper limit of 40 students is soon reached.

7. Lecture on company-wide quality control

Prof. Ishikawa took office at our university as the president in 1978, and from April of the following year 1979 until 1981, he conducted a lecture named as a "special lecture." The theme was company-wide quality control given to the senior students in the departments (Mechanical Engineering, Electric and Electronics Engineering, Electronic Communications Engineering, Construction Engineering, Civil Engineering and Management Engineering).

From 1982, the name of the lecture was changed to "Company-wide Quality Control" and the President continued the same lecture. The lecture given by the President went on for four years without any cancellation until he reached his retirement age and around 500 students attended the lecture every year.

Since 1982, the summary of his lecture has been on the outline of the university.

1. History of company-wide quality control
2. Difference of the social background between Japan and Europe/the USA
3. Features of Japanese Total Quality Control (TQC)
4. Progress of quality assurance
5. What is company-wide quality control
6. What is quality
7. What is control
8. Quality control on new product development
9. Managements for quality control

(Nobuhiko Tawara, Associate Professor,
Department of Industrial Engineering, Musashi Institute of Technology)

Heavy Smoking

Hidesuke Yamada

I am writing on the manuscript papers guessing what many people besides me talk about the Professor's heavy smoking. Heavy smoking is the only theme of my writing, which is different from others.

There is one more thing I have to ask you. What I write here is supported only by my dogmatic speculation.

However, I have already made up my mind that not a few people who read my writing would say that they also think so, or that they agree.

The professor, late in his life, was hospitalized on and off until just before he passed away. I used to be amazed at how quickly he was released from the hospital every time he went into the hospital. My guess started this time "Why did the professor choose that hospital?" I doubted him. "Did he control the hospital easily?" Then, one after another, my own imagination runs wild.

"I'm dying to smoke" "I gotta leave here to smoke." Then, the professor decided to leave the hospital and declared his decision. I visited the professor guessing a lot of him.

Now I have the impudence to write down about his smoke.

He smoked with great relish and blew it toward the ceiling. The professor broke into a broad smile and blew his cigarette, showing his reaction as if he said that my deduction was not bad.

A moment when the professor changed vividly to a mischievous kid from a man that is the picture of diligent remains in my memory still now.

Now I am in problem. My 5th trial to stop smoking is almost perish. A word of my late father is coming back to me.

"Son, you have started to stop smoking, haven't you? It's easy, but I don't know how many times I have tried it!"

(Chairman of Gotoh Educational Corporation)

Thinking of President Ishikawa

Shiro Nakayama

The president is having a pleasant chat surrounded by his students. By the time he tips his second or third glass, he says as he went back to the days when he was an engineering officer of the Imperial Navy, "*Kisama*, your research paper was excellent!" After that, a party with his students would quickly come alive.

President Ishikawa, even though he had to do his daily duties inside of and outside of the university, he conducted the lecture and created the opportunity to teach directly for his students. He told them every occasion "to be an engineer or a researcher with leadership in the world." He encouraged them to participate in extracurricular activities and tried hard to guide them to form rational, sensitive and harmonious characters. Such an ideal model of a student that the president had in his mind, was also a challenge to the professors and staffs.

In 1978, by receiving a supplicant from the late Mr. Noboru Gotoh, who was the CEO of the Tokyu Group as well as the chairman of Gotoh Educational Corporation at that time, Prof. Ishikawa took office as the president of Musashi Institute of Technology which was established by the group. It is difficult to write about the important achievements in various fields that the president made inside and outside of the university during his eleven years of presidency only on this page, even only writing about the achievements inside the university.

If I force myself to summarize his achievements, he accomplished the 50th anniversary project including the fund-raising campaign soon after taking office as the

president, made the short and long-term management plan after the 50th anniversary, then carried it out and vitalized the campus. During this period, he paid special attention to the improvement of research capability, significantly maximized the opportunities to dispatch teachers overseas and improved the working conditions of teachers and staffs for improving research capability. And then the winter time of universities came. But even when the environments surrounding the university were changing rapidly, he worked for sophistication, individualization and vitalization in the educational research of the university. He strived to explain the raison d'etre of the university both internally and externally by explicating the characteristics of Musashi Institute of Technology as a technical college responding to the expectations of internationalization.

The president also worked for making and realizing the long-term management plan after the 60th anniversary including carrying out the 60th anniversary (1989) social works.

When making the plan, he separated jobs by sectors and distributed them to each faculty member to develop a sense of participation of all the faculty members. He took initiatives many times with his administrative ability to raise a sense of unity between the governing board and the university by overcoming typical aspects of decision making at educational corporations. In consequence, he restored the financial base from the crunch situation due to the student activism at the time when he became the president and made it possible to carry out the aforementioned plans.

Together with the chairman Mr. Gotoh, the president will be watching the progress of the first and the second long-term plan from the above now.

(Advisor of Gotoh Educational Corporation;
Former Secretariat of MIT)

A Letter to Mrs. Keiko Ishikawa

Larry J. Blake

It is a distinct honor and a privilege to write a letter for the memorial book of your husband, Dr. Kaoru Ishikawa, former President of Musashi Institute of Technology.

Early in 1985, I visited with the Japanese Counsel General in Portland, Oregon, to determine what Japanese universities might be interested in forming a partnership with Oregon Institute of Technology, where I was President for seven years until 1990.

At his suggestion, I wrote to a select number of Japanese universities and one president who expressed interest in such a partnership was Dr. Ishikawa.

To continue exploration of potential future partnerships, I visited Japan and Musashi Institute of Technology in 1986.

After a delightful taxi ride from the center of Tokyo well into the western suburbs where Musashi is located, I was privileged to meet Ishikawa-san. During our conversation we did indeed find ourselves of like minds and like interests.

Ishikawa-san had long been an internationalist with strong ties to the United States by his teachings and writings through his work with Dr. W. Edwards Deming, and his international eminence. We both agreed that it was very important, in any way possible, that our future students be aware of the ties between our two countries, be aware of and appreciate the different cultures we bring together, and form friendships with each other. We agreed to begin with a broad outline of a partnership envisioning exchange of students, faculty, curriculum and research, and let the future fill in what distinct activities might be undertaken.

Dr. and Mrs. Ishikawa returned the visit to Oregon Institute of Technology in the fall of 1987 when we signed the formal paper of partnership. Ishikawa-san and myself, spent the day visiting the many advanced technological laboratories at Oregon Tech (as I had visited earlier at Musashi) and discussing the future of world technology, the educational needs for that world, and the importance of mutual understanding and friendship between our two countries.

Mrs. Ishikawa and my wife, Jeane (she has asked me to say hello to you, Keiko) had lunch at our home with Japanese friends and then visited the Big R Department Store and the Favell Western Museum to gain an understanding of the mountainous ranching country surrounding Oregon Tech.

The next year following the signing of the partnership, forty students and three faculty from Musashi visited Oregon Tech on summer break, experiencing the activities of our part of the world, brushing up on English, and gaining a better understanding of American culture. It was moving for me to see the strong friendships that can be built in only a week between our students and I enjoyed the follow-up visit a year later.

In closing, Ishikawa-san's wisdom and his view of the future are timeless. I was privileged to share that vision and, with him, steer our activities in that right direction. There could be no more fitting tribute to Ishikawa-san than for Musashi Institute of Technology and Oregon Institute of Technology to perpetuate the activities that we envisioned on a spring afternoon in Tokyo.

(Former President, Oregon Institute of Technology)

President and my Supervising professor

Yasutaka Kainuma

It was in April, 1982, that the Ishikawa laboratory (also, known as the Total Quality Control Laboratory) was established at Musashi Institute of Technology, which was 5 years after Prof. Ishikawa came to assume the post of the President at Musashi Institute of Technology. The Ishikawa laboratory was designed only for the master's course, in which Prof. Ishikawa directly gave guidance for master's theses, from 1982 to March 1986, for just 4 years. I was one of the first batch of students, entering the Ishikawa laboratory in April 1982. I received Prof. Ishikawa's guidance for a total of 3 years; two years for the master's course, and another year before going on to Waseda University for the doctoral course.

At the postgraduate school, Prof. Ishikawa took charge of special lectures on Total Quality Control, as well as workplaces. Although he was extremely busy with his work, not only in Japan, but also overseas, Prof. Ishikawa was never absent from his lectures and workplaces at the school.

During the special lecture on Total Quality Control, students took turns reading and explaining Prof. Ishikawa's book, *What is Total Quality Control? The Japanese Way*, to which Prof. Ishikawa gave comments and advice. Prof. Ishikawa shared a wealth of information from his actual experience, which could not be gained from the text alone. During workplaces, one or two students reported on the progress of their research, followed by discussion, which took place from 1 to 3 p.m. every Tuesday. Process control, outliner, software quality control, human error, etc. were the major research themes of students, and Prof. Ishikawa gave appropriate advice on how each member should proceed. When it came to micro parts, such as deployment of the formula, Prof. Ishikawa had a habit of saying, "Consult with Mr. XXX, to make sure there are no mistakes." His advice, based on his experience, was very helpful for how I should proceed with my research, when I was struggling. Sometimes, I disagreed with Prof. Ishikawa, but later, I realized that Prof. Ishikawa was right on many occasions.

Because Prof. Ishikawa also served as the President of Musashi Institute of Technology, he was very busy, except the time for special lectures and workplaces on Tuesdays. We had dinner over drinks with Prof. Ishikawa once or twice a year during laboratory parties. Prof. Ishikawa took us to a Chinese restaurant at Jiyugaoka or Roppongi, where we enjoyed excellent food and beverage. When having dinner, Prof. Ishikawa generously drank Shaoxing rice wine, saying that Shaoxing rice wine does not cause hangovers. We were always patted on our butt by him, to drink more. Prof.

Ishikawa invited us to his house, where we enjoyed a variety of dishes and drinks. When we were having sushi, Prof. Ishikawa looked annoyed at having sushi lodged in his throat. Immediately after, Prof. Ishikawa drank up a glass of whiskey on the rocks in one breath, as if it were a cup of tea. It was a good memory that we, all, looked at each other, out of surprise.

In conclusion, I was taught by Prof. Ishikawa, to have a passion to "do my best," not only for my study, "Quality Control," but also for my hobbies and pleasure activities, i.e. photography, golf, mah-jongg, etc. I try to follow the cue of Prof. Ishikawa's passion, as much as possible.

(Lecturer at Tokyo Metropolitan Collage;
Master degree at Musashi Institute of Technology in 1984)