Special Issue

In remembrance of professor Murakami

Gordon Sato & Emily Amonett¹

*Department of the Navy, Asmara, Eritrea and*¹ *Department of Biochemistry and Biophysics, Oregon State University, Corvallis, Oregon, USA*

When I think about Hiroki Murakami, I, like most of us, remember the many things that he accomplished in his professional life, both for himself as an individual and for the group as a whole. I remember that he came to the USA in the late 1970's with his wife, Yasuko, and his three daughters, Kaori, Ayako and Hanako, and that he spent two years working on cell culture in my laboratory at the University of California, San Diego in La Jolla, California. I remember much about his scientific interests and the work he did, but what I remember more was his spirit, his character, his humor. From the outset he was clearly a very unusual Japanese scientist. He seemed immediately at ease with the informal American style and seemed happy to forego some of the stiff formalities that we had all come to associate with Japanese academics. Yet he also retained many of the work-ethic characteristics of his homeland.

Hiroki was quite an observer of human nature and of cultural phenomena. He was alert and insightful and studied the contrasts and the similarities. He was keenly perceptive of the ironies in the contrasts between Japanese and American cultures but rather than being uncomfortable with these 'discrepancies' he seemed to take delight in them, and he couldn't resist joking about these matters all the time. His outrageous hilarity was a great delight to us all. He made friends easily and many of these friendships lasted all his life. While making light of many aspects of American life, he also realized that there were many things of value in the US that did not exist in Japan. He studied these things and thought about them. We often talked about the differences between Japan and the United States and the good things about both countries, as well as the things that were not so good. Hiroki was able to look at his own country with the eyes of a scientist,

observing the methods and the results, scrutinizing the data and deciding which procedures gave the best results. We believe he returned to Japan after his stay at UCSD with the intention of effecting change in the Japanese approach to scientific research and education along lines he found of value in America.

To begin with, he founded the Japanese Association for Animal Cell Technology, JAACT, in the face of determined opposition from the cell culture establishment of Japan. To help overcome this opposition, he called on one of us (G.S.) to recruit eminent speakers for the first meeting. Among the speakers we were able to bring were Philip Leder and Stanley Cohen. The first meeting was the beginning of the realization of a dream that Hiroki had, a dream of bringing together the best of both worlds. Hiroki believed it was necessary to have a new society in order to do this because the old society(s) were not capable of coping with the new emerging scientific concepts and technologies that would soon become so important in industry, medicine, and basic research. Hiroki was a man of vision, he could sense the direction in which science was headed and he wanted to help prepare science in Japan for success in these new directions.

He foresaw that closer ties and communication would be necessary between academia and industry to increase the speed of technology transfer from university laboratories to practice, to bring industrial financial aid for university laboratories which are the source of future industrial developments, and to promote the progress of science. He also knew that young academic scientists needed to understand industry better. Hiroki endeavored to bring change to university scientific departments along the lines of his observations in America. He wanted to bring the best from the West

and infuse it into the Japanese system. Even when that system resisted him he did not give up. Hiroki spoke to me often about these dreams and realizations, and I will try to convey what Hiroki would have said had his life not been cut short. In this way I hope to further his dream and to help him continue his endeavor to be an agent of change even after his death.

Japan is a remarkable country. Its per capita gross national product ranks among the highest in the world despite its lack of natural resources. The economic rise of Japan is a momentous historical event. It has proven wrong the myth of the Asian as a racially inferior being, incapable of developing the science based industrial society of Europeans. The dispelling of this myth is especially important for those Asian people who came to share this view of themselves during the period of European colonization. Not only has this been healing for the Japanese people, but Japan's economic rise is being emulated with varying degrees of success by several other Asian countries and is even looked on as a possible model by African and Latin American countries.

In Japan the family structure is strong. Only one percent of the births are to unwed mothers, as compared to thirty percent in the US. The divorce rate is about thirty times lower in Japan than in America. Parents care for their children, especially their education, and children are respectful of their elders. About ninety five percent of the students graduate high school and must pass a fairly rigorous course in calculus to do so. In America, calculus is an elective course that only a small number of students choose to study. This means that, in Japan, the average taxi driver, automobile assembly line worker, hotel clerk, and waiter, has taken a course which in America is considered 'higher mathematics'. This makes for a very efficient work force. This work force is made even more efficient by the shared perception that the companies exist for the benefit of the employees. Life long employment has been a common practice and the great disparity between the income of the company head and the average worker in America does not exist in Japan. Eighty five percent of the Japanese feel they belong to the middle class and the statistics on income distribution support this view.

The number of criminals imprisoned in America per capita is about fifteen times the rate in Japan. This number would be double if we included the number of Americans who are on parole, but would be in prison by Japanese standards. The rate of murder, robbery and rape are minuscule in Japan compared to America.

And, of course, we all are aware of the problems in America related to handguns, problems which simply do not exist in Japan. The social cohesion, and almost universally shared sense of values is exemplified by the recent devastation of the Kobe earthquake. No looting took place. This was enforced, not by armed soldiers, but by the Japanese sense of propriety and the genuine concern that each citizen feels for the well-being of all other Japanese. Japan is an orderly, clean, safe and efficient society which is exemplified by the bullet train. This train system is a model of efficiency, cleanliness and comfort. It has never had a wreck and is recognized by many other countries as a remarkable and enviable accomplishment.

The things I have just mentioned are the kind of things that Hiroki really respected about the Japanese system, the things that made him want to live in Japan, happy to raise his family there. One day, however, he said to me that the very things that made Japan a good society made it difficult to be a creative scientist in Japan. As supporting data for this observation, he mentioned that Japan has had only six Nobel Prize winners in the entire history of this tradition of recognizing creative, original scientific ideas. In the USA, the Rockefeller Institute alone has produced more Nobel Prize winners than all of Japan. This caused me to wonder why there is so great a discrepancy between the number of Nobel Prize winners in Japan and the country's great economic and sociological achievements.

Japan is famous for producing top quality automobiles, computers, micro circuits, video and audio equipment, etc. It is also famous for not inventing any of them. The ability to perfect the inventions of others has allowed Japan to achieve economic success in the latter half of the 20th Century. We believe that the 21st century will be quite different. Japan must unleash its creative genius if it is to maintain its economic status and social cohesion. The Japanese people are masters of adaptation, once they decide to do so. Japanese scientists must adapt and become more creative, more risk taking, more innovative if they are to contribute appropriately to the overall good of the Japanese people in the future.

It is illuminating to examine the six Nobel Prizes won by Japanese scientists. Five are in theoretical physics and one is in biology. None are credited to Tokyo University, in spite of its academic credentials. The biology prize, won by Susumu Tonegawa, was for work done in Europe by a Japanese trained in America. That the other five are in theoretical physics is understandable. The social pressure to conform is enor-

mous in Japan and people, including scientists, are discouraged from doing anything unusual. In theoretical physics almost no one understands what the physicist is doing, and anyone smart enough to be a physicist is not likely to be dissuaded from his thinking by the opinions of others. Also, a theoretical physicist need not apply to the government bureaucracy for approval of his work and financial support.

By the criteria of developing science to its highest levels, the Japanese government support of research is largely a failure. There are a number of reasons for this. First of all, the decisions are made by administrators who are not scientists. In contrast, the National Institute of Health and the National Science Foundation in the USA (although also bureaucracies) are administered exclusively by scientists. The idea that an intelligent administrator can effectively direct activity in an area in which he has no working knowledge is at this time being discredited, not just in Japan, but world-wide. When a Japanese scientist accepts support from the government he is told he cannot accept support for the work from other sources. This has nothing to do with developing science to its highest level and has everything to do with maintaining the power and influence of a bureaucracy.

It is an enormously difficult job to nurture the individuality necessary for great science in the face of societal opposition. Unusual work of potential greatness, which could truly compete with the best scientific minds in the entire world, should be strongly encouraged at the highest levels. Otherwise, government policies will be extremely frustrating for the Japanese scientists who want to be courageous and bold and who want to truly explore unknown territory; a waste of Japan's creative potential. The zeal to maintain high educational standards has done much damage to the fabric of Japanese society. Generations of children have been made miserable and their health, both mental and physical, has been damaged in the name of the good of the citizens of Japan. Up until school age, Japanese children are some of the happiest in the world. They are treated well, loved, and cared for. Then, when they begin school, they are put under terrible pressure. They attend regular school, and then special tutoring classes, *Juku*, in order to pass university entrance examinations. They must study constantly, memorizing reams of information, facts, data. But it is not alive, there is no spark, there is no time to think for themselves. They have no childhood once school has begun. The childish wonderment that is so essential for creative genius is systematically destroyed. Par-

ents worry about their children, yet feel helpless to change the system. The resentment that the children feel against this extreme regimentation is expressed in the phenomenon of schoolyard bullying and student suicide.

The belief in the system is epitomized in Tokyo University. All Japanese, including Tokyo University students, believe it is the greatest. Government bureaus and companies assiduously recruit its graduates. Yet by the criteria we are using, Nobel Prizes and the highest level of creativity, the product of Tokyo University is not very good. In an ideal participatory democracy, government agencies are accountable to the people and subject to constant scrutiny, and critical analysis of government policy would be appropriate here. I believe that this should be done by a combination of Japanese and non-Japanese peoples because of the reluctance of the Japanese to disrupt the apparent harmony. Once the educational system begins to change and allows the children to maintain their natural curiosity and creativity, then it is entirely possible that innovation will begin to emerge as an intrinsic Japanese trait.

However, even as the natural tendency to innovate begins to emerge, there will be problems unless other fundamental changes are encouraged. In a hierarchical society such as Japan, where social harmony is a paramount concern and deference to authority is the norm, opportunities to innovate are lost. This is true despite Japanese institutions that are extremely well equipped for research. Two examples come readily to mind. The Mitsubishi Life Science Institute has equipment and financial resources, the envy of any institute in the world. It is truly a shining example of technology. The second example is the fisheries institute in Yokohama, which is lavishly equipped at great expense to provide the best conditions for research in marine biology. It has a practical mission to be a resource for fishermen. It assesses fishing gear and fish stocks, and makes policy recommendations on conservation. It has the potential of being the greatest marine biology institute in the world. However, when authority and responsibility only reside high up in the government hierarchy, the major product ends up being rigidity and resistance to change and exploration. Buildings and equipment do not alone make an institution; the most essential and least expensive ingredient of the success is creative people who have the freedom to think independently, combined with the desire to work collectively toward a common goal.

Why does Japan not have a Rockefeller Institute with a long record of outstanding achievement? It has

the economic strength to support one and it has a highly educated populace from which to draw faculty. It should be relatively simple to create one. How have other such institutes been created? A lesson could be drawn from the California Institute of Technology. In 1917, Cal Tech was a high school that featured courses in sewing and elocution. It became the great powerhouse of science and engineering after recruiting three men, Robert Millikan, Alfred Noyes and Crellin, despite its humble origins.

Perhaps you think that we have painted a dismal picture of Japanese creativity. There are bright spots that should be highlighted. Honda is one shining example. As a young man he defied the slavish mind set that placed a premium on passing the exams. He never graduated high school. He said a high school diploma was worth less than a ticket to a movie. He was a bicycle mechanic who bought surplus Japanese army engines at the end of World War II and mounted them on bicycles. This evolved into the Honda motorcycles, which are now world-famous. When he decided to build a motor car company the Japanese government told him not to do so because Japan had enough car companies. When he decided to assemble cars in America, the government also disapproved. The Honda became the only automobile that could pass USA pollution emission standards without a catalytic converter. The success of the Honda Motor Company is legendary. Japan needs more independent creative thinkers and doers like Honda. The world needs more Honda.

Yasutomi Nishizuka, one of the most creative scientists in Japan and in fact the world, was asked by a friend if the Kobe earthquake placed him at great disadvantage to this competitors. He replied that competition was important in ordinary science but not in creative science. Dr. Saya has been appointed as the youngest full professor in the history of Japan at Kumamoto University. He was brought from the MD Anderson Cancer Research Institute where he had an eminent record of research on oncogenes. Someone at Kumamoto had the vision and the courage to defy convention. Someone was willing to risk bringing him to Kumamoto University. If this continues, Kumamoto can become the greatest university in Japan.

It seems difficult, perhaps frightening to bring new people and ideas to Japan. In an effort to remain undiluted by outside influences, Japan risks missing the opportunity to capitalise on a wealth of information and talent. Insularity is a problem in Japanese science and thinking. A Japanese could emigrate to Peru and two generations later his grandson could become Pres-

ident of Peru. If a Peruvian immigrated to Japan it is unthinkable that his grandson could ever become prime minister of Japan. It would be good if Japanese could contemplate why things unthinkable on their island are thinkable outside their island.

It would be interesting to reflect on the ascendancy of American science. It was not very good before the 1930's. With the influx of refugees from the impending turmoil in Europe and the persecution of Jews by Hitler, a large number of great scientists came to America. A generation later, scientists everywhere were maintaining the high standards established by this group. Japanese should contemplate emulating the American experience at least to some extent. The experience was not without discomfort as clashes recurred over the confrontation of cultures and not all the immigrants were great scientists or pleasant colleagues. A half century later all this is forgotten and what is remembered is the greatness that emerged from this historical movement.

Finally, Japanese science lacks a postdoctoral system. Any Japanese who has spent time in an American laboratory remembers the rich diversity of students and postdoctoral fellows from all over the USA and the world. This diversity of backgrounds and experiences contributes to the creative atmosphere and exposes people to new ideas and different ways of thinking. This is an enriching and challenging experience. In contrast, in a Japanese university a student becomes a graduate student and then a faculty member all at the same institution, usually without the maturing experiences brought about by exposure to other universities within Japan, to say nothing of the benefit of 'outside' influences. In this context, government support of postdoctoral fellowships, for people at the same institution from which they received their doctorate will be of limited value. Hiroki was working to remedy this problem at the time of this death. He was actively recruiting a diverse group of foreign students in his department at Kyushu University. He had faith that what was good about the Japanese system would not become damaged by contact with other cultures and other ways of thinking.

Hiroki Murakami was a Japanese scientist. He was also very different. He studied other cultures, not just the USA, but Europe and other countries in Southeast Asia. He gathered many ideas from other cultures and made them his own. He was not afraid to change. He was a Renaissance Man. He loved being a Japanese scientist, but that did not stop him taking risks, being creative, being innovative. Hiroki knew that there is

much in Japanese society which is good and must be zealously guarded and maintained. Many of the Americans who came to know him also came to value these Japanese characteristics. But one of his concerns was the great potential that could be realized if only the Japanese could actively and openly discuss the problems we have raised here and could energetically move to solve them. Foreigners, ignorant of detailed intricacies of the Japanese society could not hope to realisti-

cally offer any solutions, but we know that the Japanese people can and do accomplish that which they are determined to accomplish. We would like to join together and envision a Japan that encourages and nurtures its creative genius to produce knowledge for the benefit of humankind. We want to envision Japanese scientists who are in a position of leadership in the world of the 21st century.