TRIBUTE

Tribute for Takayuki Tamura on his 90th birthday

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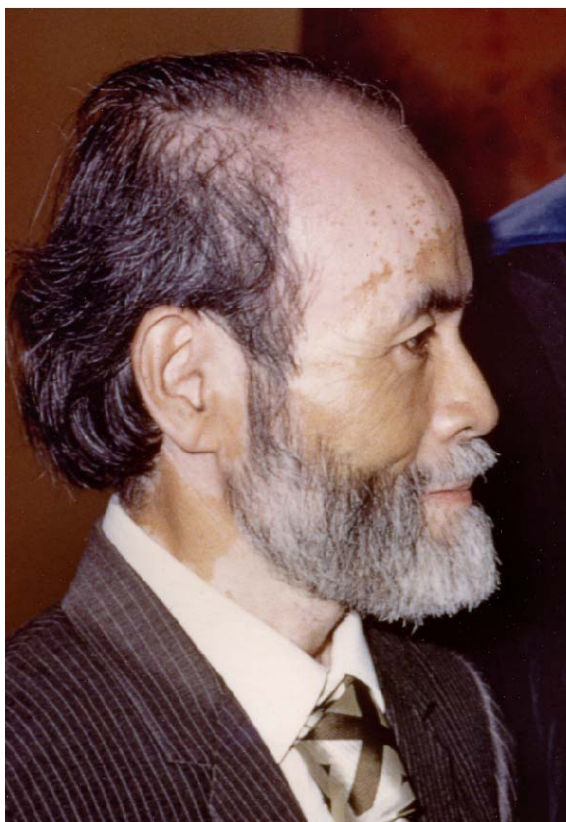
Communicated by László Márki.

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Takayuki Tamura was born in Tokushima City, Japan on March 12, 1919; he was raised in a British-Style house with hipped roof, as he would say. Tamura's parents always encouraged him in his interest in mathematics and he greatly appreciated them. He met his future wife, Kimie, when she was 5 years old in 1928. He and Kimie were married on December 31, 1945. She was a good complement and partner to Takayuki until her recent death. In traditional Japanese style she would walk 3 steps behind him. Their daughter, Hiroko, was born on October 31, 1946. Hiroko studied art at an art school in San Francisco and has continued her art work.

Tamura's education started with his elementary schooling at Tokushima City Middle School in Tokushima City, Japan. Next he attended Tokyo Science College from 1939 to 1942. This was followed by a stint from 1942 to 1944 at Osaka Imperial University. Tamura taught at Tokushima Middle School in 1946. Then he received an academic appointment at Tokushima Youth Normal College as Professor from 1946 to 1960. He, also, studied individually with his advisor Kenjiro Shoda. He published papers until it was felt that he had published sufficiently many works and he was granted a Doctor of Science degree from the Osaka Imperial University in 1958. Tamura referred to this as the "Paper-Doctor System".

On December 7, 1941 Tamura was 22 years old and at $4'10''$ ($=147$ cm); he had been rejected for military service as being too short. He would say that he was glad that he did not have to fight the United States. On the night of July 4, 1945 Tokushima City was reduced to ashes by an aerial bombing by US forces. All of his family's property was lost during that one night, just one month before WWII was over. His parents were older than 60 then and Takayuki did not live in Tokushima at that time but was working at Osaka Imperial University. It is perhaps not a big surprise that his and Kimie's families were concerned when Tamura and his immediate family moved to the United States in 1960. Takayuki Tamura, his wife Kimie and his then 14 year-old daughter, Hiroko, came to Davis in 1960 when the UC Davis Mathematics Department began to offer the Ph.D. degree.

In the late 60's the authors of this note were undergraduate students at UCD and one of the graduate students, Ed Shoemaker, befriended us and encouraged us to take a class from Tamura while he was still alive. With his gray-white beard it was hard for us twenty-year olds to judge his age. Tamura, as we would learn later, was only approaching 50 years of age. We began taking his algebra class and his seminars and began the gradual evolution in becoming his students without officially asking.

Tamura's speech was not always clear, Japanese speaking individuals told us that they also had some trouble understanding him as he had a lisp. He was clearly a warm-hearted person and handed us beautifully penned, nearly verbatim copies for each lecture that he would deliver.

Tamura and Kimie delighted in having students over to their place in Davis. We were regaled with their stories of being surprised on their first Halloween in the United States, wondering what these children dressed up in costumes were up to. Kimie would show off her origami work. For one party, a formal tea ceremony which we attended with our spouses, Kimie would keep close eye on us and ensure that we were sitting appropriately for the ceremony. We were privileged to attend the Buddhist wedding of their beautiful daughter, Hiroko, to Junji, a biochemist, who took a faculty position in Louisiana. The ceremony was held at Tamura's house and was

an interesting contrast as the Buddhist priest was Caucasian. Such an event was rarer then than it would be now.

Tamura would pose for pictures at some of the parties at his house by standing on his tiptoes, or by standing on the base of the fireplace. We would be taught the importance of honoring our mathematical ancestors. We would learn that his teacher, Kenjiro Shoda, had studied with the famous Emmy Noether at Göttingen and that Shoda had subsequently received the Culture Merit Award of Japan for bringing modern mathematics to Japan. Shoda would tell Tamura and his students about how every day was alive with Noether bringing in fresh new work or fresh approaches to old work. Tamura gave us the strict proscription not to let Emmy Noether down. His great wish was that we would be excellent teachers and that we would not disappoint our teacher ancestor, Emmy Noether. Tamura would refer to Shoda as our "grand teacher" and Noether as our "great grand teacher". In developing mathematics we were told to take on topics that were initially not popular and make them popular.

Through our graduate years we were privileged to meet a number of the leading researchers in semigroup theory who would come to visit and present at Tamura's algebra seminar or else to the department at large. When AH Clifford came to speak to the Department it was a quite special occasion as this was the Clifford of Clifford and Preston, the first and main English Semigroup Text, the bible. Clifford, ever the gentleman, began alluding to Tamura that to speak of semilattice decomposition at UC Davis was like bringing coals to Newcastle.

The American Mathematical Society's MathSciNet lists 166 papers of Dr. T. Tamura (not counting supplements and errata separately; it actually lists 2 more but those on quantum physics are not his). In addition, he has written a book on semigroups in Japanese. Tamura

(1) began the study of greatest homomorphic image of a type T, where T is a collection of identities;
(2) established the finding that every semigroup is a semilattice union of semilattice-indecomposable subsemigroups and observed further with Kimura that if S were commutative, these semilattice-indecomposable subsemigroups would be Archimedean;
(3) characterized the structure of N-semigroups, that is, commutative cancellative Archimedean semigroups without idempotents and showed that all N-semigroups have a proper homomorphism into the non-negative reals under the operation of addition;
(4) established that the set of identities $\{xx = x, \ xy = yx\}$ is the only proper set of identities, T, on the class of semigroups that give a T-decomposition into a union of T-indecomposable subsemigroups (attainability).

Arguably, this result explains to a large extent why semilattice decompositions play such a prominent role in the structure theory of semigroups. Boris Schein noted that when A.I. Malcev discussed the attainability results of Tamura it was the first time that Malcev had ever discussed the topic of semigroups. Malcev extended the results of Tamura on attainability and defined a multiplication (now called Malcev product) for classes of algebraic systems that is of interest to researchers in universal algebra.

Early in his career Tamura had published a list of all semigroups of order 3, 4, and 5 up to isomorphism and anti-isomorphism. This was done by hand with some help from his students in Japan. Takayuki Tamura's last work involved studying the power semigroup, $P(S)$, of a semigroup. He was an initiator of the study of power semigroups of a semigroup, testing to see if S is isomorphic to T when $P(S)$ is isomorphic to $P(T)$. This question was answered in the negative for infinite semigroups by Mogiljanskaja, but Tamura was determined to show it had an affirmative answer for finite semigroups. One of the current paper's authors was still attending Tamura's Tuesday afternoon seminars during the 1980's and Tamura would show up most weeks with a new typed copy of his recent work on power semigroups. We would go over this new work with him and the complexity of it all was overwhelming to many of us. To see Dr. Tamura's ability to easily handle the vast amounts of such complicated structure was to this author the most amazing exhibition of Tamura's creative talent and his powerful mind. This author had a conversation with Peter Jones at a conference on semigroups at which Peter told him that Tamura was sending him copy after copy of this power semigroup stuff and asked whether he should be reading it all or should wait until Tamura had the final results. The isomorphism problem for finite semigroups remains open. The study of power semigroups has subsequently become of interest to those who study pseudovarieties. Researchers would be interested in problems including the study of (pseudo)varieties closed under the power set operation.

A major work for Tamura involved his help in teaching more than 20 students who achieved their Ph.Ds. under his guidance at UC Davis and while he was on the faculty of Tokushima Youth Normal College from 1946–1960. A perusal of his papers might give one a good idea of his students as he published many papers with co-authors including students. His students, besides the authors, also included James Chrislock and Junitaka Shoji. Tamura had great hopes for Kenya Yamaoka solving long-standing "historic problems", but his father required Kenya to take over the family business and forbade all mathematical contact with him.

Tamura's favorite idea/paper was his main work on the attainability of identities. He presented this at the International Congress of Mathematicians in Moscow, 1966 and it was published in the Journal of Algebra. He enjoyed the excitement of being at this congress. It was his favorite conference of all of the ones he attended.

He is not working on any mathematics now. He mentioned collecting students' papers. He also is collecting Japanese and English poetry and is a member of Short Poems of America and the Meiji Shrine Short Poem Society of Japan.

He was walking regularly to the UCD Math Department for many years till December of 2008. He says now that it is too far for him to walk and he is no longer walking the several miles to the Department.

When Tamura was asked at his 90th year birthday brunch what he had learned during his 90 years, he replied: "A miracle is my life".

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