

Kunihiko Kodaira (1915–1997)

Donald C. Spencer



Kunihiko Kodaira

Kunihiko Kodaira was born March 16, 1915, and died on July 26, 1997. His father was an agricultural scientist who, at one time, was Vice-Minister of Agriculture in the Japanese government and who also played an active role in agricultural developments in South America. His mother, a re-

Donald C. Spencer is a retired professor of mathematics. He resides in Durango, CO.

Editor's Note: A feature article on aspects of the mathematics of Kunihiko Kodaira will appear in a future issue of the Notices.

markable woman, will be remembered by all of us who visited the Kodairas in Tokyo as a warm and generous hostess. She spoke English well, having said to her son immediately after World War II: "Now all of us must learn English." His wife, Seiko, also came from a distinguished family, the Iyanagas. Her brother, S. Iyanaga, a well-known mathematician, influenced Kodaira's early years at Tokyo Imperial University where he first studied mathematics and later theoretical physics. Another brother, K. Iyanaga, was at one time president of the well-known Nikon camera firm, and a third brother, T. Iyanaga (now deceased), was a professor of Japanese history at the University of Tokyo.

At Tokyo Imperial University, Kodaira graduated first from the department of mathematics in 1938, then from the department of physics in 1941. From 1944 to 1951, he was an associate professor of physics there. He obtained his Ph.D. in mathematics in 1949 by submitting a thesis which appeared in the *Annals of Mathematics*, Vol. 50 (1949), pp. 587–665, under the title "Harmonic fields in Riemannian manifolds (generalized potential theory)". This paper caught the attention of H. Weyl, who brought Kodaira, in the fall of 1949, to the Institute for Advanced Study (IAS) in Princeton, New Jersey. This was the start of Kodaira's 18-year residence in the United States.

This paper also impressed others, including me, and I invited Kodaira to lecture on his paper at Princeton University during the academic year 1949–1950. This was the beginning of a collaboration which resulted in twelve papers and our close friendship extending to his recent death.

Kodaira's time in Princeton was divided between the IAS and Princeton University until 1961 when he became a visiting professor at Harvard University for the year 1961–1962. In 1962, he resigned his university professorship to accept a professorship at Johns Hopkins University, where he remained until 1965 when he accepted a professorship at Stanford University. His tenure at Stanford ended when he returned to Japan, and to the University of Tokyo in 1967. Since I had accepted a professorship at Stanford University from 1963 to 1968, I had two more years with Kodaira.

Kodaira's wife and two young daughters did not join him in Princeton until 1951, so he rented a room on Bank Street for his first two years in Princeton. When his family arrived, he bought a house where they lived until 1961.

I arrived in Princeton from Stanford University in 1949, at about the same time as Kodaira. At Stanford, I had worked mainly on the deformation of 1-dimensional complex structures, first on variational methods, with A. C. Schaeffer, which were used to characterize the coefficient regions of univalent (schlicht) functions, and resulted in a Colloquium Volume of the American Mathematical Society (Volume 35, 1950). Later, with M. Schiffer, I worked on deformation of the complex structures of Riemann surfaces.

Deformation of complex structures was therefore much on my mind when I arrived in Princeton. Since quadratic differentials are connected to the moduli of Riemann surfaces, I wondered what mathematical objects were connected to moduli in higher complex dimensions. Finally, Frölicher and Nijenhuis showed, in an important paper, that the vanishing of the first cohomology group with values in the sheaf of germs of holomorphic vector fields implies the rigidity, or the nondeformability, of the complex structure on a compact manifold. At about the same time, J.-P. Serre proved a duality theorem which, applied to a Riemann surface, implies that the quadratic differentials are dual to this cohomology. This was the starting point of Kodaira's and my joint work on the deformation of the structures on higher dimensional complex manifolds. Most of the work is described by Kodaira in his monograph *Complex Manifolds and Deformation of Complex Structures*, Springer Verlag, 1986.

Our departure from Princeton in the early 1960s ended the collaboration between Kodaira and myself, although we kept in close contact with each other's work until 1967, and even later, especially on our visits. Kodaira's research after 1961 was centered around the problem of classifying compact analytic surfaces and their structures.

After returning to the University of Tokyo in 1967, Kodaira had an impressive number of excellent students. At Princeton, he had fewer, but one is outstanding, namely W. L. Baily Jr. Since his

student days, Baily has been a close friend of the Kodairas, and he wrote the preface to Kodaira's *Collected Works*, Iwanami Shoten Publishers and Princeton University Press, 1975. This preface provides an overview of Kodaira's work up to 1975.

During his three years at Johns Hopkins, Kodaira had two students, A. Kas, and J. Wavrik, and they followed Kodaira to Stanford, receiving their Ph.D.s there. J. Morrow is also one of his Stanford students, and wrote a book *Complex Manifolds* with Kodaira, which appeared in 1971.

In conclusion, I shall list some of Kodaira's awards. In 1954 he received, with J.-P. Serre, the Fields Medal. The President of the Fields Medal Committee was H. Weyl, and its other members were E. Bompiani, F. Bureau, H. Cartan, A. Ostrowski, A. Pleijel, G. Szegő, and E. C. Titchmarsh. Weyl's address, at the International Congress of Mathematicians in Amsterdam, summarizes Kodaira's work up to that time (see *Proc. Int. Congress*, Vol. 1, 1954, pp. 161–174). In 1957, Kodaira received the Japan Academy Prize, and in the same year, the Cultural Medal, the highest level of recognition in Japan for cultural achievement. Since 1965, he has been a member of the Japan Academy, and since 1975, a foreign associate of the National Academy of Sciences, USA. Also, he was an honorary member of the London Mathematical Society. In 1985 he received the Wolf Prize from Israel.

I am very fortunate to have known Kodaira, and to have been able to collaborate with him.