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HIROTADA ANZAI

(1919—1955)



## **Hirotsada Anzai**

(1919 — 1955)

Hirotsada Anzai was born on April 13, 1919, in Osaka, Japan. He was the only son of three children born to Kaku and Terue Anzai. After finishing Osaka Kotogakko in March 1940, he entered Osaka University as a student in mathematics, and graduated in September 1942 with the degree of Rigakushi. Since then he has been with the Department of Mathematics of Osaka University as assistant (1942–44), lecturer (1944–52) and assistant professor (1952–55). In the meantime he received his doctor's degree (Rigaku-Hakushi) in February 1952, and was awarded a Yukawa fellowship in the first half of 1953. He went to Princeton in September 1953 on a research fellowship at the Institute for Advanced Study.

It was very unfortunate that the recurrence of the malignant brain sarcoma made it impossible for him to continue his work at the Institute. He had suffered from the first attacks of sarcoma shortly before he left Japan for the United States in 1953. He had two operations at Osaka University Hospital and it seemed that everything was fine when he left for Princeton. The recurrence, however, came toward the end of the summer of 1954. He was operated twice at the hospital of Columbia University in New York during the fall of that year. Although he seemingly recovered rather quickly after these operations, it was obvious to every one that his condition was becoming worse. He returned to Japan in January 1955 accompanied by Kôzaku Yosida. He died in Osaka on February 18, 1955. The day before his death he was promoted to professor of mathematics of Osaka University. He was single, and is survived by his mother and one sister.

Anzai's work in mathematics is centered around topological algebra and ergodic theory, although his interest extended over a much wider area. He published eight papers. In his first two papers [1], [2], he discussed the properties of Bohr compactifications of a locally compact abelian group. Monothetic and solenoidal groups were treated as Bohr compactifications of the additive group of integers (with the discrete topology) and the additive group of real numbers (with the usual locally compact topology), respectively. In his third paper [3], he discussed the structure of compact rings and proved that a compact ring without left or right total zero divisor is totally disconnected and hence can be considered as a limit ring of finite rings.

The rest of his paper were devoted to ergodic theory. Among

other things he was interested in constructing examples of ergodic measure preserving transformations with unusual properties. Some of his examples are based on special number-theoretical properties of certain irrational numbers. Perhaps the most interesting example he constructed is a measure preserving transformation which is not spatially isomorphic with its inverse (see his paper [8]). This answered a question raised by Paul R. Halmos and John von Neumann. Anzai also gave an example of a countably infinite number of ergodic measure preserving transformations which are spectrally isomorphic with one another, but no two of which are spatially isomorphic with each other (see his paper [7]). Both of these examples are so-called skew product (or semi-direct product) measure preserving transformations on a torus whose properties were discussed in detail in his paper [7]. He also worked on various problems connected with random ergodic theorems (see his paper [5]), Brownian motion (see his papers [4], [6]), dynamical systems and diffusion processes, but many of his results are still unpublished.

It was tragic that he had a very good knowledge of his disease and anticipated all that was coming to him, although he did not say a word about it. He faced his fate with calm and courage, and tried to do as much mathematics as possible while he still could. By the end of December 1954, he could no longer use his arms, he could not see nor hear well, and it was also difficult for him to speak. And yet he spent his last weeks in Princeton dictating mathematical papers. He asked Kiyoshi Ito to take notes for him from his oral exposition. From these notes of Ito and from fragmentary notes written by Anzai himself during the last two or three years, his friends are trying to write up posthumous papers for him.

Shizuo Kakutani

#### List of papers

1. (with S. Kakutani) Bohr compactifications of a locally compact abelian group, I, Proc. Imp. Acad. Tokyo, **19**, 476-480 (1943).
2. (with S. Kakutani) Bohr compactifications of a locally compact abelian group, II, Proc. Imp. Acad. Tokyo, **19**, 533-539 (1943).
3. On compact topological rings, Proc. Imp. Acad. Tokyo, **19**, 613-615 (1943).
4. A remark on spectral measures of the flow of Brownian motion, Osaka Math. J. **1**, 95-97 (1949).
5. Random ergodic theorem with finite possible states, Osaka Math. J. **2**, 43-49 (1950).
6. Mixing up property of Brownian motion, Osaka Math. J. **2**, 51-58 (1950).
7. Ergodic skew product transformations on the torus, Osaka Math. J. **3**, 83-99 (1951).
8. On an example of a measure preserving transformation which is not conjugate to its inverse, Proc. Japan Acad. **27**, 517-522 (1951).