Hidehiko YAMABE

(1923-1960)

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Hidehiko Yamabe was born on August 22, 1923 in Ashiya, Hyogo-ken, Japan. He was the sixth son of Takehiko and Rei Yamabe. After finishing Daisan Kotogakko (The Third Senior High School) in September 1944, he entered Tokyo University as a student of the Department of Mathematics and graduated in September 1947 with the degree of Rigakushi (Master of Science). Since then he was associated with the Department of Mathematics at Osaka University until June 1956. In the meantime he received his doctor's degree (Rigaku Hakushi) in April 1954. In September 1952, he went to the Institute for Advanced Study at Princeton as assistant to Professor Deane Montgomery and stayed there for two years. Then he served the Department of Mathematics at University of Minnesota, as assistant professor (1954–57), and later as associate professor (1957–58). He came back to Japan in September 1958 and was soon appointed to be a professor at Osaka University. In July 1959 he crossed the Pacific Ocean again to take the position of associate professorship at University of Minnesota. In the fall of 1960, he moved to Evanston and became professor of mathematics at Northwestern University. By a sudden attack of subarachnoid hemorrhage, he stayed in the Evanston Hospital for five days without regaining consciousness, and died on November 20, 1960.

Yamabe was interested in several problems, some of which are very famous ones, covering a rather wider area of mathematics. He published eighteen papers. Among them [1], [4], [5], [6], [7], [9], [10] and [11] are papers concerning topological groups and Lie groups. In [1] he proved that an arcwise connected subgroup of a Lie group is a Lie subgroup. A theorem of Mostow concerning Lie groups was extended to the case of locally compact groups in [7]. It seems that [10] and [11] are the greatest contributions to mathematics made by him. There he demonstrated that a connected locally compact group is a projective limit of a sequence of Lie groups, and if the locally compact group has no small subgroup, then it is a Lie group. This gave a final answer to a problem, called the fifth problem of Hilbert, which had been discussed mainly by Chevalley, Gleason, Iwasawa, Kuranishi, Montgomery, Pontrjagin, von Neumann and Zippin. In [5], [6] and [9] he obtained partial results for the problem.

Later he spent some time working in diffusion equations. In [14] and [15] he gave a natural generalization of a theorem due to Aronszajn by showing a unique continuation theorem of a diffusion equation. He also constructed, in [13] and [16], the kernel function for a diffusion equation of a euclidean domain in an explicit way by means of iterating Gaussian distributions restricted to the domain.

In his attempts at solving problems in other branches of mathematics he was also successful as may be seen in the papers [2], [3], [8], [12], [17] and [18]; their explanations will be omitted here. It is to be noted that he attacked problems in the most direct and elementary manner, and thus his proofs are always extremely simple and elegant.

MORIKUNI GOTO

List of Papers

[1] On an arcwise connected subgroup of a Lie group, Osaka Math. J. 2 (1950), 13–14.

[2] On an extension of the Helly's theorem, Osaka Math. J. 2 (1950), 15–17.

[3] (with Zuiman Yûjôbô), On the continuous function defined on a sphere, Osaka Math. J. 2 (1950), 19–22.

[4] (with Morikuni Gotô), On continuous isomorphisms of topological groups, Nagoya Math. J. 1 (1950), 109–111.

[5] (with Morikuni Gotô), On some properties of locally compact groups with no small subgroup, Nagoya Math. J. 2 (1951), 29–33.

[6] Note on locally compact groups, Osaka Math. J. 3 (1951), 77–82.

[7] On a locally compact group with a neighbourhood invariant under the inner-automorphisms, Proc. Japan Acad. 27 (1951), 55–56.

[8] A condition for an Abelian group to be a free Abelian group with a finite basis, Proc. Japan Acad. 27 (1951), 205–207.

[9] On a problem of Chevalley, Sûgaku 4 (1952), 17–21.

[10] On the conjecture of Iwasawa and Gleason, Ann. of Math. 58 (1953), 48–54.

[11] A generalization of a theorem of Gleason, Ann. of Math. 58 (1953), 351–365.

[12] A proof of a theorem on Jacobians, Amer. Math. Monthly 64 (1957), 725–726.

[13] Kernel functions of diffusion equations I, Osaka Math. J. 9 (1957), 201–214.

[14] A unique continuation theorem of a diffusion equation, Ann. of Math. 69 (1959), 462–466.

[15] (with Seizô Itô), A unique continuation theorem for solutions of a parabolic differential equation, J. Math. Soc. Japan 10 (1958), 314–321.

[16] Kernel functions of diffusion equations II, Osaka Math. J. 11 (1959), 1–6.

[17] On a deformation of Riemannian structures on compact manifolds, Osaka Math. J. 12 (1960), 21–37.

[18] (with Lawrence Markus), Global stability criteria for differential systems, Osaka Math., J. 12 (1960), 305–317.