

**Kimura, Tatsuo (ed.); Satō, Mikio**

**Mathematics of Mikio Sato. 2nd enlarged ed. (Satō Mikio no sūgaku.)** (Japanese)

[\[Zbl 1394.01001\]](#)

Tokyo: Nihonhyouronsha (ISBN 978-4-535-78587-8). 490 p. (2014).

This is an interesting book about Mikio Sato's mathematics. It is an expanded version of [\[Zbl 1396.01002\]](#), consisting of four parts and containing 490 pages, while the original version consists of the former three parts, containing 376 pages.

In the first part, Sato speaks of himself. This part consists of two articles. They are:

- An interview to Mikio Sato by Emmanuel Andronikof;
- My mathematics – Sato hyperfunctions and their periphery.

The first article is a reproduction of [\[Zbl 1142.01324\]](#) translated into Japanese by Kazunari Sugiyama. The second article is a reproduction of an autobiography by Sato published in a Japanese journal called "Mathematical Seminar" in the April issue of 1981 (this journal is issued every month).

Part 2, consisting of 10 articles, is entitled "Speaking about mathematics". They are:

- Speaking about modern mathematics;
- The development of mathematics from the viewpoint of prime numbers;
- Numbers and functions;
- The mathematics of Leonhard Euler;
- About equations;
- Hidden structures behind equations;
- The periphery of algebraic analysis;
- The emergence of Sato hyperfunctions and their developments;
- $\mathcal{D}$ -modules and nonlinear integrable systems;
- The Weil conjecture and the Ramanujan conjecture.

The first article is an interview to Sato by Shin Hitotsumatsu, and the sixth article is an interview to Sato by Harue Sogawa (the CEO of Kousakusha, which publishes Japanese books about various areas). The remaining eight articles are discussed by Sato himself. The first and second articles appeared for the first time in a Japanese journal entitled "Nature" in 1970. In the second article, the emergence of the Riemann hypothesis and its developments are discussed. The third article appeared for the first time in the Japanese journal "Mathematical Sciences" in 1974, in which Sato argues the days of Leonhard Euler as good old days in analysis. This view is shared by the reviewer, who was once a colleague of Sato at the Research Institute for Mathematical Sciences, though Euler's thoughts appear algebraic to Sato while they appear geometric as well to Nishimura. The fourth and fifth articles appeared for the first time in a Japanese journal entitled "Mathematical Seminar" in 1983 and 1986, respectively. The sixth article appeared for the first time in the Japanese journal "Recreation" in 1980. The seventh article appeared for the first time in "Mathematical Seminar" in 1988. For a classical introduction to algebraic analysis, one is referred to [\[Zbl 0605.35001\]](#). The eighth article appeared for the first time in a Japanese journal entitled "March of Mathematics" in 1970. The ninth article is a record of Sato's speech at a discourse party in the Mathematical Institute of Tohoku University in 1986. The 10th article appeared for the first time in "March of Mathematics" in 1963. There it was argued that the Ramanujan conjecture is reducible to the Weil conjecture, which has been settled in [\[Zbl 0456.14014; Zbl 0314.14007; Zbl 0287.14001; Zbl 0219.14022\]](#), as is well known.

Part 3, consisting of seven articles, is concerned with Sato's mathematics. I should stress that Sato's mathematics was developed by not only Sato himself but also many excellent mathematicians surrounding him (e.g., Masaki Kashiwara [\[Zbl 0739.17005\]](#), Michio Jimbo [\[Zbl 0587.17004\]](#), Tatsuo Kimura [\[Zbl](#)

0321.14030], etc.). Mikio Sato is a great magnet attracting a lot of talents. The seven articles are:

- What are Sato hyperfunctions?
- An interview to Mikio Sato concerning Sato's game,  $\mathcal{D}$ -modules, microfunctions, micro-local analysis, etc.;
- What are prehomogeneous vector spaces?
- Mathematical physics and Mikio Sato;
- An invitation to singular perturbation methods;
- Sato's  $\sin^2$ -conjecture;
- The Sato-Tate conjecture has been settled [Zbl 1264.11044; Zbl 1263.11061; Zbl 1169.11021; Zbl 1169.11020].

The first article was written by Tatsuo Kimura, based on a private lesson by Mikio Sato to him. The second article is a discussion between Mikio Sato and Tatsuo Kimura at Mikio Sato's home on the 2th and 11th of February, 1997. The third article was written by Tatsuo Kimura, who has written a comprehensive book on this subject [Zbl 1035.11060]. The fourth article is a discussion by four Japanese mathematicians (Tetsuji Miwa [Zbl 0557.35091], Masatoshi Noumi [Zbl 0874.33011], Kanehisa Takasaki [Zbl 0838.35117] and Kenji Ueno [Zbl 0299.14007]) chaired by Kenji Ueno held in Kyoto on the 13th of February, 1999. The fifth article was written by Takahiro Kawai [Zbl 0277.46039] and Yoshitsugu Takei [Zbl 1100.34004]. The sixth article, written by Kanji Namba [Zbl 0263.02035], is a valuable report of computer experiments by Sato and Namba at Tokyo University of Education (the predecessor of the University of Tsukuba) in 1962 (when Namba was a graduate student of Gaisi Takeuti [Zbl 0354.02027]), from which the Sato conjecture emerged. The reviewer proposes that the Sato conjecture should be called the Sato-Namba conjecture or the Sato-Namba-Tate conjecture. The seventh article was written by Nobushige Kurokawa [Zbl 0397.10018], who prefers the Sato conjecture to the Sato-Tate conjecture in calling it. The first, third, fourth and fifth articles appeared for the first time in the Japanese journal "Pleasure of Mathematics" in 1999.

Part 4, consisting of four articles, is a supplement to the original version [Zbl 1396.01002]. The four articles are

- My student days;
- Directions of mathematics;
- Maya game or Sato's game;
- Theory of hyperfunctions.

The first article is a short (only three pages) essay written by Mikio Sato in 1955 for a newspaper of a Japanese high school in Tokyo. The second article is a discussion between Mikio Sato and Mitsuo Sugiura [Zbl 0204.04201] appearing in "Mathematical Sciences" in May 1993. The third article is a record of Mikio Sato's lecture in the research meeting entitled "Some problems on games and puzzles by computers" written down by Hikoe Enomoto. The fourth article was written by Mikio Sato, which appeared for the first time in the Japanese journal "Mathematics" [Vol. 10, No. 1, 1-27 (1958)]. This is a good explanation of Sato hyperfunctions by himself [Zbl 0080.32303; Zbl 0087.31401; Zbl 0087.31402; Zbl 0097.31404].

Reviewer: Hirokazu Nishimura (Tsukuba)

#### MSC:

- 01-01 Textbooks (history)
- 01A60 Mathematics in the 20th century
- 01A70 Biographies, obituaries, personalia, bibliographies

Cited in 1 Review

#### Keywords:

Sato functions; Weil conjecture; Ramanujan conjecture; Sato-Tate conjecture

#### Biographic references:

Sato, Mikio