

THE FIRST HUNDRED YEARS OF THE TOHOKU MATHEMATICAL JOURNAL

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1. The beginning. According to the official record [1], the first issue of the Tōhoku Mathematical Journal (henceforth referred to as TMJ, as it is commonly called) was published in July, 1911, which was even before the College of Science of Tōhoku Imperial University (henceforth referred to as the University) started offering classes in September.

It was Professor Tsuruichi HAYASHI who founded TMJ at his own expense as the first research journal ever in Japan dedicated solely to mathematics. Its editorial work was helped by the other faculty members of the College of Science: (in early years) Matsusaburō FUJIWARA, Tadahiko KUBOTA and Kinnosuke OGURA in mathematics as well as Jun ISHIWARA in physics.

The University had been founded in September, 1907 as the third imperial university in Japan, following Tōkyō Imperial University in 1877 and Kyoto Imperial University in 1897. After the preparatory period of four years during which many faculty member designates were dispatched to Europe, the College of Science was inaugurated as its first college in April, 1911, and started offering classes on September 11, 1911.

Professor Matsusaburō FUJIWARA describes the state of mathematics at that time in Japan in his “Obituary Note. TSURUICHI HAYASHI (1873–1935)” (TMJ, First Series, 41 (1935/36), 265–289) as follows:

The most prominent achievement of him was the foundation of the Tōhoku Mathematical Journal in 1911. This was undertaken by him on his own expense [*sic*]. In those days the state of mathematics in Japan was very poor. The journal in which mathematical papers were to be published was the Proceedings of Tōkyō Mathematio-physical Society only. The number of papers on mathematics at that time did not exceed one dozen every year. To found a new journal, periodically issued, in such a time, was a very bold enterprise. His foresight and audacity only could do this. The publication of the Tōhoku Mathematical Journal marked a striking epoch in the history of mathematics in Japan. The management of the Journal was afterwards transferred to the Mathematical Institute from his own hand, he remained, however, as the Chief-Editor until his last day. The memorial volumes, published in 1933 to his honor for the anniversary of his 60th birthday, by his friends and pupils, home and abroad, will remain forever to be the undying monument for his scientific achievement.

From the outset, TMJ was international in scope, accepting articles in Japanese, English, German, French or Italian from around the world. Mathematical Institute of the University sent copies of each issue of TMJ to major universities and research institutions throughout the world under the exchange agreements through the University Library. Later, Maruzen Co., Ltd., Tokyo purchased copies from the Library for worldwide distribution as well.

At the beginning, the founding President Seitaro SAWAYANAGI of the University arranged the University to purchase these exchange copies to alleviate the financial burden on Professor HAYASHI. The Government's Board of Audit, however, found it inappropriate for the University to purchase more exchange copies to meet the rising demand. Consequently, the University became the publisher of TMJ from Vol. 9 (1916) onward. Fortunately, TMJ could retain its international scope.

2. The first series. Publication of the First Series of TMJ was somewhat irregular, but on average two volumes were published each year. TMJ grew to become one of the major mathematical journals in the world until it had to suspend its publication after Vol. 49 (1943) (including the first part published in May 1942) due to the World War.

Browsing through the Volume and General Indices of the First Series (Vol. 1 (1911) through Vol. 49 (1943)), we can find important papers and research trends. Here are some noteworthy examples:

- Sôichi KAKEYA: On the limits of the roots of an algebraic equation with positive coefficients, First Series, Vol. 2 (1912), pp. 140–142.
The result proved here is known as Takeya's theorem.
- Sôichi KAKEYA: On some integral equations, First Series, Vol. 4 (1913/14), pp. 186–190; Remark on my previous note "on some integral equations" in this Journal, vol. 4, 1914, pp. 186–190, *ibid.* Vol. 6 (1914/15), p.187; On Some integral equations III, *ibid.* Vol. 8 (1915), pp. 14–23.
- Tetsuzo KOJIMA: On generalized Toeplitz's theorems on limit and their applications, First Series, Vol. 12 (1917), pp. 291–326.
This paper, by the author who passed away in 1921 at age thirty-four, proved fundamental theorems on divergent series.
- In 1933, TMJ was published in three volumes: Vol. 36 in 397 pages, Vol. 37 in 502 pages, and Vol. 38 in 481 pages. Vols. 37 and 38 have about a hundred papers arranged in alphabetical order of the authors from throughout the world. These two volumes must have been those published to honor the sixtieth birthday of Professor HAYASHI as referred to in his obituary by Professor FUJIWARA:

The memorial volumes, published in 1933 to his honor for the anniversary of his 60th birthday, by his friends and pupils, home and abroad, will remain forever to be the undying monument for his scientific achievement.

- Tadao TANNAKA: Über den Dualitätssatz der nichtkommutativen topologischen Gruppen, First Series, Vol. 45 (1938), pp. 1–12.
This paper proved the so-called “Tannaka duality” theorem, which was later developed by A. Grothendieck, P. Deligne et al. into “Tannakian category”.
- Kiyosi OKA: Sur les fonctions analytiques de plusieurs variables, VI. Domaines pseudoconvexes, First Series, Vol. 49 (1942), pp. 15–52.
This paper is one of his series of papers founding the theory of several complex variables and complex analytic spaces.
- We can find many papers on convex curves and surfaces published in TMJ. Together with Hamburg University in Germany, the University played the role of the world research centers at that time on convex curves and surfaces.
- Among the contributors of many papers were faculty members Tsuruichi HAYASHI, Matsusaburô FUJIWARA, Kinnoyuke OGURA, Sôichi KAKEYA, Tadahiko Kubota, Shin-ichi IZUMI, Tsurusaburo TAKASU and Yoshitomo OKADA.
- Wilhelm SÜSS, who later founded Oberwolfach Mathematical Institute in 1944 and who was spending some time in Japan teaching German in Kagoshima, contributed many papers between 1924 and 1937.
- Kien-Kwong CHEN, who was the first international student from China to the University and was conferred Dr. Sc. in 1929, contributed many papers between 1921 and 1936. Buchin SU, who was the second international student from China and was conferred Dr. Sc. in 1931, also contributed many papers between 1927 and 1941.
- We can also find many papers on traditional Japanese mathematics so-called “Wasan” (also pronounced “Wazan”). Professor HAYASHI, who in 1916 was conferred full mastership of the Seki School of Wasan, devoted himself to shedding light on and analyzing Wasan from the “Western” mathematical perspective. Professors HAYASHI and FUJIWARA were instrumental in collecting and preserving documents on Wasan scattered throughout the country lest they should be lost due to the prevalence of “Western” mathematics. As a result, the University Library now owns one of the largest collections of Wasan documents, most of which are now digitized and accessible at the University Library Web site as the “Wasan DB”:
<http://dbr.library.tohoku.ac.jp/>
- Each issue of Vol. 1 (1911) through Vol. 20 (1921) had “Miscellaneous notes” in Japanese, which contained news on new books, noteworthy papers, mathematics curricula at major universities in Germany, France, Italy and the United States, and news on mathematical meetings.

3. The second series. Although a few new mathematical journals had started publication in Japan by 1940, all of them had to interrupt publication during the World War just as TMJ did in 1944 due to economic hardship, loss of communication with the mathematical communities overseas, loss of the Mathematical Institute Building by bombing, etc.

In March, 1949, TMJ resumed publication as the Second Series, Vol. 1. Professor Shin-ichi IZUMI was instrumental in the resumption. At around the same time, many new mathematical journals started publication in Japan in addition to those which had interrupted publication during the War. Under the new academic system after the War, Tôhoku Imperial University was renamed Tohoku University in October, 1948 along with other imperial universities.

In the Second Series, TMJ started accepting manuscripts written only in English, German or French. Contributors continue to be worldwide. The referees of the manuscripts are sought worldwide as well: As referees of the submitted papers, the most suitable mathematicians are sought regardless of where they are.

The distribution of TMJ is worldwide as well. The University continues to exchange copies with major universities and research institutions throughout the world. TMJ remained not for sale for some time after it resumed publication as the Second Series. To meet the increasing demand and keep the publication cost down, however, the University arranged Maruzen Co., Ltd., Tokyo to publish TMJ simultaneously from Vol. 24 (1972) onward and share the cost of publication. To maintain the quality of printing, International Academic Printing Co., Ltd., Tokyo was chosen to take care of the printing. This arrangement continues to this day.

In the Second Series, except during the early years, one volume has been published each year, and each volume consists of about 600 pages, published quarterly in four issues in March, June, September and December.

All the papers appearing in TMJ are reviewed by Mathematical Reviews/MathSciNet and Zentralblatt MATH. In fact, TMJ is among the approximately 450 MathSciNet “Reference List Journals”, journals for which original reference lists are included in the reviews.

Since Vol. 32 (1980), TMJ has been one of the source journals of ISI Web of Knowledge of Thomson Reuters (formerly, Science Citation Index of the Institute for Scientific Information) as well.

To mark the cumulatively hundredth volume, TMJ compiled and published the Volume and General Indices of the First Series as a supplement to Vol. 54 (2002). The preface says:

To mark the occasion of the volume number in the Second Series exceeding that in the First Series, we carried out the following projects.

First, we redesigned the cover from Volume 51 in 1999, and adopted “Tohoku Mathematical Journal” instead of “Tôhoku Mathematical Journal” as the official name.

Second, we switched the typesetting of the journal to the de facto standard document preparation system \TeX of Dr. Donald Knuth. In this way, we can not

only take advantage of input files prepared by authors but also convert the articles into portable document format files. Thus we hope to be able to provide an online version of the journal in the near future.

Third, we compiled a database of all articles in the First Series. As a result, we are able to present here the tables of contents of all the volumes in the First Series, as well as the list of titles of all the articles, arranged in alphabetical order of the authors.

The new cover was designed by Mr. Yuji KOMAI, an editorial art designer.

Subsequently, the Volume and General Indices of the Second Series (Vol. 1 (1949) through Vol. 51 (1999)) were also published as an electronics only supplement to Vol. 57 (2005). These Volume and General Indices of the First and Second Series are freely accessible on the TMJ Web page as well:

<http://www.math.tohoku.ac.jp/tmj/Especial.html>

Browsing through the Volume and General Indices of the Second Series Vol. 1 (1949) through Vol. 52 (2000), we can find important papers such as:

- Claude CHEVALLEY: Sur certains groupes simples, Second Series, Vol. 7 (1955), pp. 14–66.
This is the famous paper that introduced finite simple groups of “Chevalley type”.
- Alexander GROTHENDIECK: Sur quelques points d’algèbre homologique, Second Series, Vol 9 (1957), pp. 119–221.
The homological algebra of categories and functors developed here was indispensable to the development of algebraic geometry in the latter half of the twentieth century. The theory was further developed into that of derived categories, which provide crucial tools in algebraic geometry, number theory, algebraic analysis, mathematical physics, computer science, etc.
- Shigeo SASAKI: On the differential geometry of tangent bundles of Riemannian manifolds, Second Series, Vol. 10 (1958), pp. 338–354; II, Second Series, Vol. 14 (1962), pp. 146–155.
This paper introduced on the unit tangent sphere bundle a metric, which was later named the “Sasakian metric” by J. Eells.
- Shigeo SASAKI: On differentiable manifolds with certain structures which are closely related to almost contact structure, I, Second Series, Vol. 12 (1960), pp. 459–476; II (with Yoji HATAKEYAMA), Second Series, Vol. 13 (1961), pp. 281–294.
This paper introduced important odd-dimensional analogs of complex and Kähler manifolds, which are now called “Sasakian manifolds,” extracting important properties of the contact structure on the unit tangent sphere bundles on Riemannian manifolds.

4. The advent of information technology. In late 1980's it became realistic to use personal computers. Thus in 1988, TMJ started using database software on personal computers for editorial management purposes, i.e., listing all the data on the manuscripts submitted to TMJ.

This eventually led TMJ to compile in 1999–2000 the database of all the papers published in TMJ, and publish the cumulative Volume and General Indices of the First and Second Series mentioned earlier.

International Academic Printing Co., Ltd., Tokyo was ready to start using \TeX for printing from Vol. 51 (1999) onward with a new cover design as was mentioned earlier.

In the meantime, Mathematical Institute found the deterioration of the existing copies of the volumes in the First Series, and decided to convert them into microfilms in 1999. In connection with the SPARC Japan project mentioned below, these microfilms were converted into pdf files in June, 2005. In addition, Vol. 1 (1949) through Vol. 53 (2001) were converted into pdf files as well.

At the beginning of the twenty-first century, digitization and Web-based access to scholarly journals became a worldwide trend. Due to the rising subscription price for scholarly journals charged by many of the commercial publishers, movement for “open access” became prevalent.

SPARC (Scholarly Publishing and Academic Resources Coalition) based in the United States has been the leading proponent of open access. National Institute of Informatics (NII) in Tokyo joined hands with SPARC to launch SPARC Japan. Since TMJ had been playing leading roles among the mathematical journals in Japan in coping with the digitization trend, SPARC Japan chose TMJ as one of its partner journals in September, 2003, and funded the retro-digitization of all the past volumes of TMJ taking advantage of the existing microfilms.

Here is the SPARC announcement on December 18, 2006:

<http://www.arl.org/sparc/media/06-1218.shtml>

Japanese Universities Launch SPARC Japan

New Initiative Supports Development of Japanese Scientific Journals,
Strengthens Japanese Scholarly Societies

Tokyo and Washington, DC — SPARC (Scholarly Publishing and Academic Resources Coalition) today announced the launch of SPARC Japan, a collaboration of Japanese academic institutions and scholarly societies working to promote and make widely available the work of Japanese researchers.

SPARC Japan (<http://www.nii.ac.jp/sparc/>) is an initiative of the Tokyo-based National Institute of Informatics (NII), a national research institute which unites Japanese academic librarians, scholars, researchers, universities and learned societies to support initiatives that improve scholarly communications in Japan.

SPARC Japan is supported by more than 600 university libraries affiliated with library associations, including those of national, private and prefectural/municipal

university libraries. As an authorized SPARC affiliate in Japan, SPARC Japan will create initiatives that encourage improved access to Japanese research and support expanded institutional and scholarly community roles in, and control over, the scholarly communication process.

The announcement goes on, and points out the leading roles TMJ had been playing as follows:

“The creation of SPARC Japan highlights the growing worldwide momentum behind SPARC’s mission to improve access to research, empower scholarly societies, and return control of individual works to the author,” said SPARC Director Heather Joseph. “The innovators behind SPARC Japan saw the barriers faced by researchers in promoting and disseminating their achievements, and they responded pragmatically. We are proud they chose to organize under SPARC’s auspices.”

SPARC Japan has already lined up a number of publishing partners. They include the UniBio Press, a non-profit aggregation of biological journals such as the international journal *Zoological Science* and leading mathematical journals such as *Tohoku Mathematical Journal*, *Japanese Journal of Applied Physics (JJAP)*, and others. (For a complete list of SPARC Japan partners, please see

<http://www.nii.ac.jp/sparc/partners/index.html>.

Several of these partnerships were originally developed in coordination with SPARC partners BioOne and Project Euclid.

To provide the electronic access to TMJ, however, the copyright clearance to the papers had to be taken care of. Here is what TMJ announced:

Tohoku Mathematical Journal is pleased to announce its open access policy. As of April, 2010, all articles in the past volumes below can be freely accessed through Project Euclid and Journal@rchive.

1. All volumes in the First Series (1911–1943)
2. Volumes in the Second Series (1949–) after a lapse of five years

Authors who prefer to opt out of this arrangement are requested to contact the Editorial Office at tmj@math.tohoku.ac.jp. A list of all articles in both series, arranged in alphabetical order of the authors, is available at:

www.math.tohoku.ac.jp/tmj/Especial.html

The more detailed “Open Access Policy” in www.math.tohoku.ac.jp/tmj/Emain.html further mentions, among other things, that the downloaded electronic files can be used only for noncommercial personal use, that the copyrights to the papers published in or before 1989 belong to the authors while those in or after 1990 belong to TMJ, and that the inclusion of a paper published by TMJ in any other repository must be authorized by the TMJ.

TMJ started publishing its electronic edition from Vol. 57 (2005) onward through Project Euclid (see below): “Euclid Select” from Vol. 57 (2005) through Vol. 61 (2009), and “Euclid Prime” from Vol. 62 (2010) onward.

As was mentioned in the open access policy announcement above, the electronic edition is available through Project Euclid (from Vol. 1 (1949) onward) and J-STAGE (from Vol. 53 (2001) onward), while all the papers in the older volumes are available through Journal@rchive.

In addition to the electronic edition, however, the University continues to publish the printed edition of TMJ jointly with Maruzen Co., Ltd., Tokyo, since TMJ needs to maintain, through the University Library, the journal exchange agreements with academic institutions throughout the world. Thanks to this arrangement as well as the non-commercial nature of Project Euclid, TMJ continues to offer the printed and electronic editions at reasonable price.

Here are the descriptions of Project Euclid, J-STAGE and Journal@rchive:

- Project Euclid's mission is to advance scholarly communication in the field of theoretical and applied mathematics and statistics. Project Euclid is designed to address the unique needs of low-cost independent and society journals. Through a collaborative partnership arrangement, these publishers join forces and participate in an online presence with advanced functionality, without sacrificing their intellectual or economic independence or commitment to low subscription prices. Project Euclid was developed and deployed by the Cornell University Library and is jointly managed by Cornell and the Duke University Press. Start-up funding was provided by The Andrew W. Mellon Foundation.
(cf. <http://projecteuclid.org/> for more detail.)
- J-STAGE (Japan Science and Technology Information Aggregation, Electronic) is operated by the Japan Science and Technology Agency (JST). In order to support the information function of user organizations, J-STAGE sets up the hardware and software necessary for electronic journal release within JST to provide services 24 hours a day, 7 days a week.
(cf. <http://www.jstage.jst.go.jp/> for more detail.)
- Journal@rchive is an archive site of J-STAGE. On Journal@rchive, academic journals scanned through the Electronic Archive Initiative are released from their first issues, including those issued in the 19th century. The initiative commenced by JST in Fiscal Year 2005.
(cf. <http://www.journalarchive.jst.go.jp/> for more detail.)

These crucial developments involving information technology took place during the ten year period till 2007, while Seiki NISHIKAWA served as managing editor. The author, who served for twenty years before him, would like to thank NISHIKAWA for his hard work and sound judgments involved.

5. The next hundred years and beyond. TMJ is all set to start its second century as one of the major international mathematical journals:

- The editors are determined to maintain the high quality and standard of TMJ.

- The Editorial Office is ready to handle both manuscript submission and refereeing online to serve mathematicians spread throughout the world.
- The electronic edition is published through Project Euclid Prime.
- The printed edition continues to be published by the University jointly with Maruzen Co., Ltd. The University Library continues to exchange copies with major universities and research institutions worldwide, while Maruzen Co., Ltd. takes care of the worldwide distribution.
- The papers published in TMJ are now freely accessible *after a lapse of five years*. This is crucial in view of the longevity of mathematical literature:
 - First Series (Vol. 1 (1911) through Vol. 49 (1943)):
 - Journal@rchive (<http://www.journalarchive.jst.go.jp>)
 - Second Series (Vol. 1 (1949) through Vol. 52 (2000)):
 - Journal@rchive (<http://www.journalarchive.jst.go.jp>)
 - Second Series (Vol. 1 (1949) through six years ago):
 - Project Euclid (<http://projecteuclid.org/>)
 - Second Series (Vol. 53 (2001) through six years ago) are also accessible through
 - J-STAGE (<http://www.jstage.jst.go.jp/>)

They can all be reached through the links found on the TMJ Web page:

<http://www.math.tohoku.ac.jp/tmj/Emain.html>

In addition, the following can also be reached through the links on the Web page:

- The table of contents and abstracts since Volumes 52 (2000).
- The Volume and General Indices of the First Series, Vol. 1 (1911) through Vol. 49 (1943) as well as the Second Series, Vol. 1 (1949) through Vol. 51 (1999), which were published as Supplement to Vol. 54 (2002) and (electronics only) Supplement to Vol. 57 (2005), respectively.

No challenges seem to be in store in the foreseeable future. The author would like to extend his very best wishes for the bright future of TMJ.

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