Berlin
as a Center for Organizing
Mathematical Reviewing

This is a state of the art report from 1985

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(Translation of an 1985 article in German, published in 'Mathematik in Berlin', provided by Kathrin Roegner)

The rising development of mathematics in the middle of the 19th century resulted in a growing need for a complete and reliable information service on mathematical literature. This led to the founding of the report periodical "Jahrbuch über die Fortschritte der Mathematik", which was later supplemented by "Zentralblatt für Mathematik und ihre Grenzgebiete" and, after World War II, by other reviewing services. The main editorial activities for each of the journals named above were carried out by Berlin mathematicians, as shall be seen through the brief summary of their histories given below. They held a unique position within mathematics up until the second world war. Afterwards, the Zentralblatt remained a leading reviewing journal for mathematics.

Here we present a short overview of the history of the Jahrbuch and Zentralblatt. Furthermore, a survey of the present-day problems in terms of the processing and editing should convey an impression of documentation activities in mathematics. Finally, some problems and possibilities for literary information on mathematical publications will be addressed resulting from the development of mathematics publications business and from advancements in information technology.

I. The Jahrbuch über die Fortschritte der Mathematik

This annual periodical started its publication 1869 in the programme of the publishing house Reimer Verlag, and at that time it was supervised by Felix Müller and C. Orthmann. The editorial board was located in Berlin. The subject of coverage was the entire field of mathematics including applications, which mainly lay in physics. The compilation of all published literature, provided that it was accessible, was arranged by the editors according to the year of publication. The strive to publish self-contained annuals due to the demand for completeness led in the long run to a lack of actuality. For example, the first annual for 1868 could only first appear in 1871, whereby this delay was, of course, partially due to war. Here, it has to be taken into account that back then about 800 works from 1868 were announced, which does not even comprise 2% of the yearly publications nowadays. These 800 works were spread over 80 journals and about the same number of non-periodic publications.

The editorship changed in the following years to Emil Lampe and then to Leon Lichtenstein and A. Korn. For some time, the Berlin Mathematical Society was involved in the editorial process. Because of a takeover, the publisher changed to Walter de Gruyter. As a consequence of the first world war, the

work on the annuals was in severe backlog. In the middle of the 20's, the Prussian Academy of Sciences took over the editing of the annual while de Gruyter remained publisher. This resulted in an increase in editorial staff, leading to an improvement in the actuality of the Jahrbuch. Georg Feigl, editor-in-chief at the beginning of the 30's, and later Helmut Grunsky were involved in this relative upswing. For example, the 1935 volume, which appeared in 1939, contained about 6000 entries from approximately 400 journals. The reviews were composed by over 200 referees from many parts of the world. At the end of the 30's, discussions on a possible merger with Zentralblatt, which in the meantime had been founded, were held, calling for a joint editorship for both reviewing journals under the direction of Harald Geppert. However, only a stronger cooperation between both periodicals followed and not a final merger. In the meantime, the political situation and finally World War II hindered the work of the editorial staff. The annual for the year 1940 was still possible to complete during the war years. For the following years, only single issues were at hand. After the war, the work on the Jahr buch über die Fortschritte der Mathematik did not resume.

II. The Zentralblatt für Mathematik und ihre Grenzgebiete

Back in the 1920's, the actuality of the annual Jahrbuch aroused much dissatisfaction amongst scientists who were interested in obtaining more quickly information on the rapidly growing number of newly published works in mathematics. This was one of the main reasons for the founding of Zentralblatt by the publisher Springer-Verlag, at that time based mainly in Berlin, together with the mathematicians Richard Courant and Otto Neugebauer. The publisher designated Berlin to be the location for the editorial staff of Zentralblatt. The spectrum of fields covered was comparable to that of the Jahrbuch. In contrast, each volume of Zentralblatt contained the reviews which the editorial staff had on hand at the time of the deadline. In this respect, it was no longer expected that the printing of a review had to wait until the volume was finished for the entire year.

Otto Neugebauer directed the successful new periodical for many years until the political situation in Germany caused him to temporarily oversee the editorship from Copenhagen, eventually giving up his position as director of the Berlin editorial staff in 1938. Up until the time of the joint editorship with the Jahrbuch mentioned above, Egon Ullrich overtook this editorial posi tion. At this point in time, the monopoly of the German reviewing journals in mathematics also came to an end. Partially motivated by politics, Mathematical Reviews was founded in the USA as a competing enterprise. The reasons for this founding were diversely interpreted and shall not be expanded upon here.The collapse of Germany after World War II led to a temporary suspen sion of the work at Zentralblatt für Mathematik. Due to the initiative of the German Academy of Sciences, successor of the Prussian Academy of Sciences, and of Springer-Verlag, Zentralblatt came to life again in 1947. The Academy overtook the personal outfitting of the editorial staff with its headquarters in East Berlin. The editor-in-chief was Hermann Ludwig Schmid, professor at the Humboldt University. Schmid's promotion in 1953 to a position in Würz burg led to a temporary division of the editorial staff until his death in 1956. The

editorship was taken over by Erika Pannwitz, who had continually worked on the shaping of both the Jahrbuch and Zentralblatt since she was hired in the 30's.

The construction of the Berlin Wall caused a renewed division in the editorial offices into an East Berlin and a West Berlin part. The East Berlin part was carried by the German Academy of Sciences, which later became the Academy of Sciences of the GDR, and was directed by Walter Romberg. The Heidelberg Academy of Sciences, on behalf of all academies of the Federal Republic of Germany, was responsible for the West Berlin editorial staff. The direction remained in the hands of Erika Pannwitz. Printing and distribution was, as before, the task of Springer-Verlag. This joint cooperation, with both partners having equal say, lasted until 1977 and resulted in Zentralblatt regaining a leading position in mathematical reviewing, despite the difficult political constellation.

Long after recommencing the production of Zentralblatt, the problems arising as a consequence of the second world war had to be dealt with: a large backlog of unfinished work, financial problems, the advancement of the American competition, and loss of reputation. First, a fundamental reorganization of the editorial methods was achieved through the introduction of modern technological means. The credit for this reorganization went to the editor-in-chief Ulrich Güntzer, who replaced Erkia Pannwitz after her retirement. Together with other scientific institutions in Berlin(the Chemical Information Service, the Computational Center for the Sciences, Technical University Berlin), it was possible to convert part of the editorial work to electronic data treatment. This modernization was continued by the present author at the beginning of the 70's when he overtook the position of editor-in-chief for the West Berlin editorial staff.

Due to discussions concerning the installation of a system of information and documentation centers in the Federal Republic of Germany and the intended integration of mathematical information into one of these, the Academy of Sciences of the GDR announced the termination of its contract between the two academies. With an increase of funding, the West Berlin editorial staff was enabled to handle solely the necessary literature. It was integrated as the Department for Mathematics into the Fachinformationszentrum for Energy, Physics and Mathematics, which is located in Karlsruhe. Beforehand, for various reasons and after many discussions, it was agreed to that the Department of Mathematics would continue residing in Berlin. The editorial institutions of Zentralblatt since then have been the Heidelberg Academy and the Fachinformationszentrum Karlsruhe.

The introduction of new information technology for the work in the editorial office for the publishing of the services was changed in a way that eventually the recording of text was done on magnetic tapes, and, from these, the printed version of Zentralblatt could be produced. Simultaneously over the preceding years, an electronic version of this information service emerged, which is available as the database MATH for literature searches. Clearly, a compilation of the approximately 50,000 articles published annually using conventional methods is no longer feasible.

III. The Present Coverage in Mathematics from the Editorial Staff in Berlin

The qualitative demands of the coverage of mathematical literature have not changed since the publication of the first Jahrbuch. The most important criteria are actuality, the completeness of the mathematical literature covered a good system for bibliographic information (indexes, etc.), the expert quality of the reports, and the editorial staff's objectivity in processing the literature. The actuality is guaranteed by a strict organization of the work in the editorial office (acquisition of literature, preparation of the literature for reviewing, enhancement of incoming reviews, recording of the reviews along with corrections) and short time periods for the production of the reviews. Here, the introduction of electronic data processing and a mixture of external, author, and in-house reviews provide invaluable assistance. Among these, reviews written by the author of an article are especially attractive for articles which have just been accepted for publication in a mathematical journal.

Concerning the acquisition of reviewing copies the editorial office is dependent upon the support given by the respective publishers or by other editors because of the diversity of mathematical publications, although the mathematical journals which are commercially available are bought just to be on the safe side. Normally, every publication which is procurable without too much effort or expenditure is announced in Zentralblatt. At the present, approximately 700 journals and 2000 non-periodical collections are handled. Concerning the supply of literature, the cooperation with the large Berlin libraries (Technical University Berlin, Free University Berlin, and the State Library) and with the Technical Information Library Hannover is of utmost importance.

The problems related with the searchability of the literature information have been nearly eliminated by the simultaneous production of a literature data base. The formatted entry of each individual documentation unit automatically enables the easy production of indexes for the printed version of Zentralblatt, which are ordered according to various aspects (authors, subjects) and which are accumulated over varying periods of time (one volume, ten volumes, fifty volumes). The subjects correspond to the most widely used mathematical classification, the AMS Classification Scheme, which is presently undergoing revision through a joint effort of Zentralblatt and Mathematical Reviews leading to the MSC 1991. The data base MATH, the electronic version of Zentralblatt, naturally offers the additional possibility to search according to subject as well as to a given time period. It is worth mentioning that for each individual review, keywords, which are more valuable for searches than the classification, are also stored.

The main task for a good reviewing journal is naturally ensuring the quality of the reviews themselves. A key role is played by the editors for the different subject areas, mathematicians employed full-time by Zentralblatt, serving on the editorial staff, or research mathematicians who work free lance with the editorial staff. Here, the cooperation with both of the West Berlin universities (Technical University and Free University) is of particular significance. The subject editors decide for each piece of literature which method will be used for its processing: the obtainment of a review from an expert in the corresponding

field (external review), the description of the work by its author (self-review), or an editorial handling (take over the summary, parts of the work or something similar). The determination of a competent referee for an external review requires a good overview of the given field as well as mathematical expertise. At the present, Zentralblatt has a little over 5000 referees worldwide. Their services are rewarded with a comparatively low acknowledgement fee and require interest in the topic of the given publication as well as an appreciation of the importance of a reviewing service in mathematics. The reviews are predominantly written in English, less often in German or French. A description of the essential content of the work is expected, when possible this should take into account related publications. A deep analysis of the facts from the viewpoint of correctness does not correspond to the concerns of a review; such an analysis is rarely performed by the referees. This task is actually the responsibility of the referee who decided whether the work was worthy of publication. Because of this, critical reviews occur seldomly. Considering these facts, the question of whether a reviewing journal should contain self-reviews or not is of minor relevance. The only problem relevant in Zentralblatt's decision to use a self-review is a somewhat too great self-representation by some authors. From time to time, the self-reviews contained in Zentralblatt are considered unfavorably, as lack of quality compared to Mathematical Reviews. But this criticism is also invalid to some degree because the American competition uses to just as large an extent the abstracts appearing in articles, which are also composed by the authors.

The second phase in which, again, the mathematical competence of the subject editors in the editorial staff of Zentralblatt is required is the enhancement of the incoming review. The designation of the corresponding description from the classification scheme as well as the final selection of keywords play an important role for the factual quality of Zentralblatt and the success of searches using the database MATH. The decision of whether the incoming text corresponds to the factual and formal demands, with an adjustment if need be, requires know ledge of the specific mathematical field. In spite of the acknowledged factual qualities of the external referees, it is not possible to dispense with the standardizing function of the editorial staff. The objectivity used in the processing of literature is not a current problem for Zentralblatt. A selection results only under the aspect of whether the work falls into the subject matter of Zentralblatt or not. The ideas of "important mathematics" and "unimportant mathematics" are nonexistent for the choice criteria of the editorial staff. The external referees may of course give some quality judgement within a technical framework related to the work. Whether the objectivity is upheld during the revision was, in the past, an underlying point of discussion of various reviewing journals. With the increasing growth in the amount of literature, capacity limits can inflate the imagined importance of this type of problem. The above feature of the scientific aspect in editorial production does not illuminate the technical expenditure needed to handle approximately 50,000 works annually. An impression can be given by the size of the editorial staff; there are just over 50 coworkers, some full-time, some free lance. Besides the universities in Berlin, there are many other scientific institutions for differ-

ent types of cooperation available; thus, it should be emphasized again that the resources for the successful processing of mathematical reviewing are present in Berlin.

IV. Perspectives and Problems in the Further Development of Mathematical Reviewing Journals

As a literature information service, Zentralblatt is dependent foremost upon the development of mathematical publication systems. There are quantitative changes to be noticed which in many ways are having an impact on the organization of the reviewing journals and their corresponding databases. A further factor is the usage of modern information technology in mathematical research. A few of these problems should be addressed here. The increasing literature advent in mathematics burdens the library budgets as well as the capacity of the editorial staff of the reviewing journals. On the one hand, the subscription to Zentralblatt rises, while on the other hand, the finances of the subscriber allows for ever decreasing elbow room. Due to financial reasons, many mathematical institutions do not have access to a reviewing journal. Mathematicians in countries with hard currency problems especially have big problems with remaining informed about the status of mathematical research when they do not have a special personal information source at hand. But, if one considers the financial support which is given to the Berlin editorial staff for the benefit of the worldwide society of mathematicians and the invaluable support provided by referees from all over the world, it is regrettable that most probably less mathematicians can profit from the existence of Zentralblatt in the long run. Solutions must therefore be found to offer a reviewing journal in a more flexible manner than a common mathematical journal.

Similar problems arise with the use of the data base MATH. Because mathematicians have nearly no research funding outside of the library, the use of the data base has to be financed out of the library budget, which tends to be highly exhausted already. Delayed usage of the data base MATH and high prices for its usage form a vicious circle, resulting in the impression that mathematicians are not interested in this form of literary information. The hope exists that, within the framework of the European Mathematical Council's projected system Euromath, the use of MATH will become so simplified, widespread, and promoted that the prices for the individual user slides down to an acceptable range. Euromath should offer a European network for mathematicians in which information can be exchanged electronically (use of various field related data bases, electronic mail, electronic publishing, electronic conferencing, etc.).

Euromath could also change the editorial work of Zentralblatt to some extent. Through the use of suitable text recording systems, the text from referees could be turned into maschine readable form. The editors would still have to ensure the proper standardization, as was mentioned in the third section. The use of electronic equipment for mathematical research and publication activities are presently growing strongly. It is however not possible to assume that an electronic communication network will be available for the entire mathematical community world wide within the foreseeable future. For a world-wide useable literature information service in mathematics, conventional methods must therefore continue to be offered.

To conclude, I would like to address the idea of merging both English speaking reviewing journals: Mathematical Reviews and Zentralblatt. From the point of view of their common efforts, the idea seems obvious, and negotiations in this direction have in fact taken place. The principle for the negotiations was only an equal partnership by a joint venture. Zentralblatt's tough adherence to this principle during a lengthy discussion led to an abrupt break off of the talks on the side of the American Mathematical Society, publisher of Mathematical Reviews. The reasons for this break off are interpreted differently. If one looks however at the history of both reviewing journals and that of the Jahrbuch, then one finds a series of ideas for why the time for such a merger of both reviewing journals on equal footing is not yet ripe. For me, it is however clear that the conception of Zentralblatt is optimally serving the needs of all mathematicians on a long-term basis and that Berlin is a suitable location for the editing of a reviewing journal which provides as objectively as possible reviews on the appearance of mathematical literature world wide.