

# EMIS AND ITS ELECTRONIC LIBRARY \*

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The electronic library of the European Mathematical Society and its services and facilities are described in the paper.

## 1. The General Concept of EMIS

The idea to develop the European Mathematical Information Service EMIS was born at the meeting of the executive committee of the European Mathematical Society (EMS) in Cortona /Italy, October 1994. It was decided to set up a system of electronic servers in Europe for Mathematics under the auspices of the EMS, and this was extended very soon to the current version of a central server collecting mathematical information and distributing this through a world-wide system of mirror servers. The installation of the central server began in March 1995 in co-operation with FIZ Karlsruhe at the editorial office of Zentralblatt für Mathematik in Berlin. In June 1995 EMIS went on-line under the URL <http://www.emis.de/>. The first mirrors were established very soon in Lisbon, Southampton and Marseilles.

The main sections of the contents of EMIS are the Electronic Library, information about the EMS, the European Mathematical Congresses, a link to the database MATH of Zentralblatt für Mathematik, an access to directories of mathematicians, and information about other mathematical servers throughout the world. The server is accessible using WWW, FTP, and Gopher. World Wide Web access is regarded the primary access method, and therefore not too much work has been done to make FTP and Gopher access really what they could be. The access to the contents of EMIS is free, and also the link to the database contains a free component which will be explained later in the corresponding section of this article.

Before giving a more detailed description of the services of EMIS which are of central interest for electronic publication some other general aspects should be addressed at the beginning. The most important one is the idea to distribute EMIS through a world-wide system of mirrors where the full content of the service will be available and updated periodically. This improves the accessibility of EMIS, and it simultaneously is important for the safety of the data and their archiving: if the master server one component of the system crashes down, it can be regenerated easily from the other components. In principle, every European country should have one mirror at least, and two mirrors should not be too near to each other in terms of the network geometry. Also applications for a mirror of EMIS from non-European sites are highly appreciated, but such an application should not be against the interests of the local mathematical society. This

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requirement never has been hurt for the applications we received in the past, and it seems to be rather unlikely that there will occur problems of this kind in the future.

The current distribution of mirrors is as follows:

1. Adelaide, University of Adelaide,
2. Brasilia, Universidade de Brasilia,
3. Brno, Masaryk University,
4. Budapest, Magyar Tudományos Akadémia,
5. Göttingen, Staats- und Universitätsbibliothek,
6. Helsinki, University of Helsinki,
7. Copenhagen, Københavns Universitet,
8. Krakow, Uniwersytet Jagiellonski,
9. Lawton, Cameron University, Oklahoma,
10. Lisbon, Centro de Álgebra da Universidade de Lisboa,
11. Marseilles, Centre International de Recontres Mathématiques,
12. Mexico City, Universidad Nacional Autónoma de México,
13. Moscow, Russian Academy of Sciences,
14. Ottawa, Canadian Mathematical Society,
15. Providence, American Mathematical Society,
16. Rehovot, Weizmann Institute of Science,
17. Shanghai, East China Normal University,
18. Southampton, University of Southampton,
19. Turin, Consortio per il Sistema Informativo (CSI-Piemonte),
20. Vienna, Rechenzentrum der Universität Wien,
21. Zürich, ETH Zürich.

This will be complemented very soon by additional mirrors in Athens, Ankara and Madrid, and most interesting a mirror in Novosibirsk already will have been installed when this article will have been printed. Due to the increasing traffic concerning the data transfer to the mirrors, the originally central distribution of the data from Berlin already has been given up and replaced by a tree-like structure managing the files transfer for the updates. Clearly, updates are done automatically and within short periods.

## 2. The Electronic Library

The Electronic Library of EMIS has the aim to present a collection of freely accessible electronic publications which should be as comprehensive as possible. There are four sections: electronic journals, electronic proceedings volumes, electronic monographs, and newsletters and mathematical notes. In order to guarantee that the electronic publications stored in the Electronic Library meet the requirements satisfied by articles in print journals, the decision on the inclusion of journals, proceedings or monographs is taken in accordance with the Electronic Publishing Committee of the European Mathematical Society. Hence no items will enter the library which have not been evaluated and recommended by a referee within the editorial procedures of the corresponding series. This is in particular important in order to rule out the reservations of many mathematicians who have the opinion that electronic publishing will damage the quality

of mathematical publications. Clearly, the section on Newsletters and Mathematical Notes is not subject to this kind of control.

The section on Electronic Journals contains pure electronic journals as well as electronic versions of print journals. The pure electronic journals are produced elsewhere and EMIS only serves as an additional distributor. The installation of electronic versions of print journals depends on the technical facilities of the editors of these journals. Some of them prefer to offer the electronic version on their home server, such that a mirror of this content can be taken over by EMIS. Others do not care about the installation of the electronic version themselves, and send the files to the master site of EMIS in Berlin where they are brought into a shape which is suitable for an electronic offer through WWW. Most of these print journals are published at a low-budget level, and hence the risk to loose subscribers to the print version due to the free electronic offer is considered as low by them. Some of them give the electronic offer with a delay to EMIS such that the earlier availability will be considered as an advantage of the print version. There is no chance to get copies of electronic versions of the highly prestigious mathematical journals for EMIS, because these can take a lot of money for the subscription to the print version, and they will also require a considerable charge for the access to the electronic version.

Nevertheless, EMIS succeeded to get the agreement of a series of quite established journals to be offered freely in its library, as can be seen from the subsequent list. The pure electronic journals are marked by an (e) in this list:

1. Acta Mathematica Universitatis Comenianae (Bratislava),
2. Annales Academiae Scientiarum Fennicae Series A. Mathematica (Helsinki),
3. Archivum Mathematicum (Brno),
4. Beiträge zur Algebra und Geometrie / Contributions to Algebra and Geometry,
5. Commentationes Mathematicae Universitatis Carolinae (Prague),
6. The Electronic Journal of Combinatorics (e),
7. The Electronic Journal of Differential Equations (e),
8. Electronic Journal of Probability and Electronic Communications in Probability (e),
9. Electronic Research Announcements of the AMS (e),
10. Electronic Transactions on Numerical Analysis (e),
11. Geometry and Topology (e),
12. Journal de Théorie des Nombres de Bordeaux (Bordeaux),
13. Journal of Convex Analysis,
14. Journal of Lie Theory,
15. Matematički Vesnik (Belgrade),
16. Mathematica Pannonica (Miskolc),
17. Mathematical Physics Electronic Journal (e),
18. Portugaliae Mathematica (Lisbon),
19. Rendiconti dell' Circolo Matematico di Palermo (Palermo),
20. Rendiconti dell' Istituto di Matematica di Trieste (Triest),
21. Revista Colombiana de Matemáticas (Bogotá),
22. Séminaire Lotharingien de Combinatoire,
23. Southwest Journal of Pure and Applied Mathematics (e),
24. Theory and Applications of Categories (e),
25. Universitatis Iagellonicae Acta Mathematica.

Soon some more journals will be included: Journal of Graph Algorithms and Applications, Webs and Quasigroups, Journal of the Turkish Mathematical Society, Matemática Contemporanea and the three recently founded journals of the French Society for Applied Mathematics SMAI. Last but not least there will be a Siberian contribution to EMIS by providing electronic versions of the Journals Computational Technologies and Siberian Mathematical Journal, produced at the Siberian Branch of the Russian Academy of Sciences.

The access to these journals in EMIS is organised quite conventionally. On the home page of EMIS a list of mirrors is provided where the site with the (probably) quickest access can be clicked. Then a choice can be made, to enter the Electronic library though the short list of journals without graphics or to use the full display of these items. The first one is preferable, if the choice of journal is clear already and if one wants to avoid the lengthy transfer of the graphical data associated with this journal. The full display contains also background information on the editorial policy of the corresponding journal and instructions how to submit an article. In cases style files for such a submission can be found on this level.

Having made the choice of journal one wants to read, the level of the contents will be reached which is organised as usual. At that level information on the offer of files is given. In all cases DVI- and Postscript-files will be available, sometimes also TEX-files can be found in addition to that, and in cases geometric material is stored in separate files. Clicking one of these files its content is transferred to the computer of the user and can be viewed there. Also printing or storage of these files will be possible at the site of the user, but he is requested to respect the copyright according to the rules of the corresponding journal.

The access to the section of Proceedings Volumes is organised in a similar way. At present only a few volumes can be found there: Proceedings of the 5th International Conference on Differential Geometry and Its Applications, Opava, Czechoslovakia, 1992; Proceedings of the 6th International Conference on Differential Geometry and its Applications, Brno, Czech Republic, 1995, Proceedings of the 3rd International Conference on Approximation and Optimisation in the Caribbean, Puebla, Mexico, 1995. Though the electronic offer of proceedings volumes will become more and more attractive in the near future, there are fundamental difficulties to extend this section of EMIS at present.

I see the following reasons for these problems. At present the organisers of conferences prefer to publish printed proceedings, because they can support this publication from the conference fees or money they receive from sponsors and because the majority of participants consider a publication as more valuable than an electronic one. In spite of the financial support, a commercial publisher will be involved in the production of the proceedings volume, which makes it rather unlikely that a free electronic offer will be made available simultaneously. There is a chance to get such an offer with a delay of about two years when the main portion of print version is supposed to be sold, but also here most publishers behave rather restrictively.

My hope is that the contributors to such volumes will become aware very soon, that the print versions of proceedings have a very low distribution in the average. Decreasing library budgets and growing prices for these volumes will make the distribution even worse. Hence, if these contributors really are interested to make their work public in a reasonable way, they will see that the only chance to improve the distribution lies in an electronic offer which can be accessed easily at several places. For this EMIS is just the appropriate system. This is underlined by the present access numbers which are growing continuously. The additional offer of electronic versions by the system of mirrors of EMIS is used frequently: all servers together report some 200,000 hits per week.

### 3. The Link to the Database of Zentralblatt

To connect EMIS with the database of Zentralblatt für Mathematik is one part of the increasing involvement of the European Mathematical Society in the edition of this reviewing service. The vision for the near future is to design this service as a European database in mathematics, which has Zentralblatt as its core, but relies on additional distributed input from several European backbones. Hence this information service should continue the tradition of Zentralblatt to cover the mathematical literature as completely as possible by transferring some part of the responsibility to these backbones and giving them the opportunity to take better care about the representation of the achievements of their mathematical community.

Here Zentralblatt für Mathematik stands for the conventional printed reviewing service as well as for the two electronic offers, one on CD-ROM for off-line use and one as a database with WWW-access. EMIS provides a link to the WWW-access which can be reached directly under the URL <http://www.emis.de/cgi-bin/MATH> where MATH is the official abbreviation of Zentralblatt on-line. Additional access will be directly available to the mirrors of MATH in Grenoble, New York, Copenhagen and Warsaw. But the full use of the database only will be possible for subscribers. For two sites in Siberia this will have been installed already when this article will have been published: the Sobolev Institute of Mathematics will have a site license within its operation as a Siberian backbone in the co-operation described above, and the Institute of Computational Technologies at the Siberian Branch of RAS will get a satellite license to this. Further distribution to other mathematical institutes in Siberia is under discussion.

Hence MATH as a tool to access information on mathematical literature will be practically available for Siberian mathematicians. It covers information on all mathematical literature, starting with 1931. The total amount of documents for which information is stored in MATH is more than 1,500,000. This increases by more than 55,000 items annually. The update of the database is made every two weeks which corresponds to the production of the print version of Zentralblatt. The scope of publications handled by this service includes in addition to mathematics mathematical applications in physics, mechanics, computer science, economics and biology.

Searches can be made using the following list of fields: authors, titles, classification, basic index, source, language etc. A search can be formulated in logical combinations of these terms. The search can be made in a command mode or be guided by a graphic menu. The information is available in the AMSTEX source code, but tools for a convenient formula display are available. Download of the hit list at the users site is possible, and, coming back to the other content of EMIS and other electronic journals and publications, links to the full text of the corresponding article will be arranged, if this is available electronically.

Clearly, such a link only will work, if the access to the electronic article is free or if the user has subscribed to the corresponding journal. Other options to get the full text of such an article consist of central document delivery services. Buttons to connect to such services and to see, if the corresponding article is available there, are installed in the menu for the search. Document delivery can be arranged by these services electronically or by sending copies by ordinary mail at reasonable rates.

Finally, as promised above, I should mention the free component in the link from EMIS to MATH. Any user of EMIS can do searches in MATH. But non-subscribers only will get information on at most three hits from their list. These hits will be taken from the top of the list, where the most recent items are listed. Hence, if very precise information is searched which

probably leads to a small hit list, then this can be reached by everyone who has access to the internet.

In addition to this the EMS will install a freely available current awareness service in EMIS in co-operation with FIZ Karlsruhe. This is called CAP-EMS (Current Awareness of Mathematical Publications), and it will rely on electronic material provided by publishing houses in the course of the edition of their mathematical journals. The idea is to snatch the data needed for the field structure of Zentralblatt automatically from the files used by the publishers for the production of these journals, and to add an abstract to them as far as this will be available at that level. This will be stored in the database of Zentralblatt as a preliminary item, and offered freely in a separate database CAP-EMS provided by EMIS. The offer in CAP-EMS will provide full search facilities for quick information on recent publications and finish after a period of 6–12 months. The preliminary data at Zentralblatt will be subject to the usual editorial procedures, and in particular reviewers will be asked to write reports on these items.

In combination with the Electronic Library and other links to electronic publications the offers of MATH and CAP-EMS in EMIS provide a quick and easy access to qualified mathematical publications. These tools can be used by the mathematical community at suitable sites simultaneously for free or at modest rates.

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