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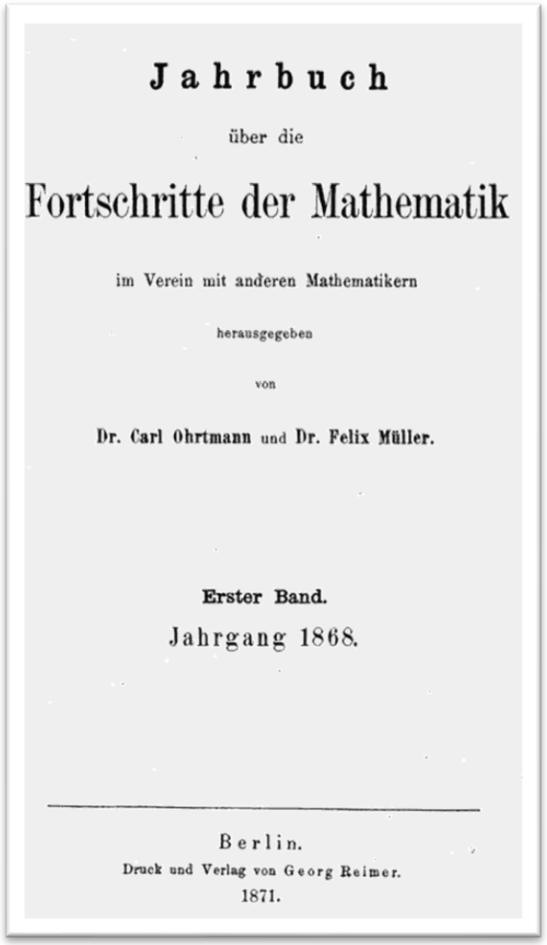
ADVANCING SCIENCE

30 years of zbMATH on the web, with a view towards Grenoble-Berlin cooperations

Olaf Teschke, MathDoc30, Oct 15h, 2025

Some Zentralblatt history before the MathDoc collaboration



Jahrbuch

über die

Fortschritte der Mathematik

im Verein mit anderen Mathematikern

herausgegeben

von

Dr. Carl Ohrtmann und Dr. Felix Müller.

Erster Band.

Jahrgang 1868.

Berlin.

Druck und Verlag von Georg Reimer.

1871.

- 1868 founded as Jahrbuch über die Fortschritte der Mathematik – an annual volume comprising reviews of all relevant mathematical publications of the year
- 1932 Zentralblatt für Mathematik und ihre Grenzgebiete founded by Springer – similar, but more international, more up-to-date (reviews published on a regular basis, not restricted to annual volumes)
- First Editor-in-Chief was Otto Neugebauer, working from 1934 in Copenhagen Exile
- 1938 Neugebauer resigns as EiC due to Nazi pressure on Jewish reviewers, and founds Mathematical Reviews in 1940, based on the Zentralblatt principles
- 1947 Refounding of Zentralblatt at Berlin Academy, Editorial office in East Berlin (after 1961 additional office in West Berlin), supported by Heidelberg Academy
- 1977 East Germany stops cooperation; FIZ Karlsruhe (newly founded in 1979) becomes a principal stakeholder

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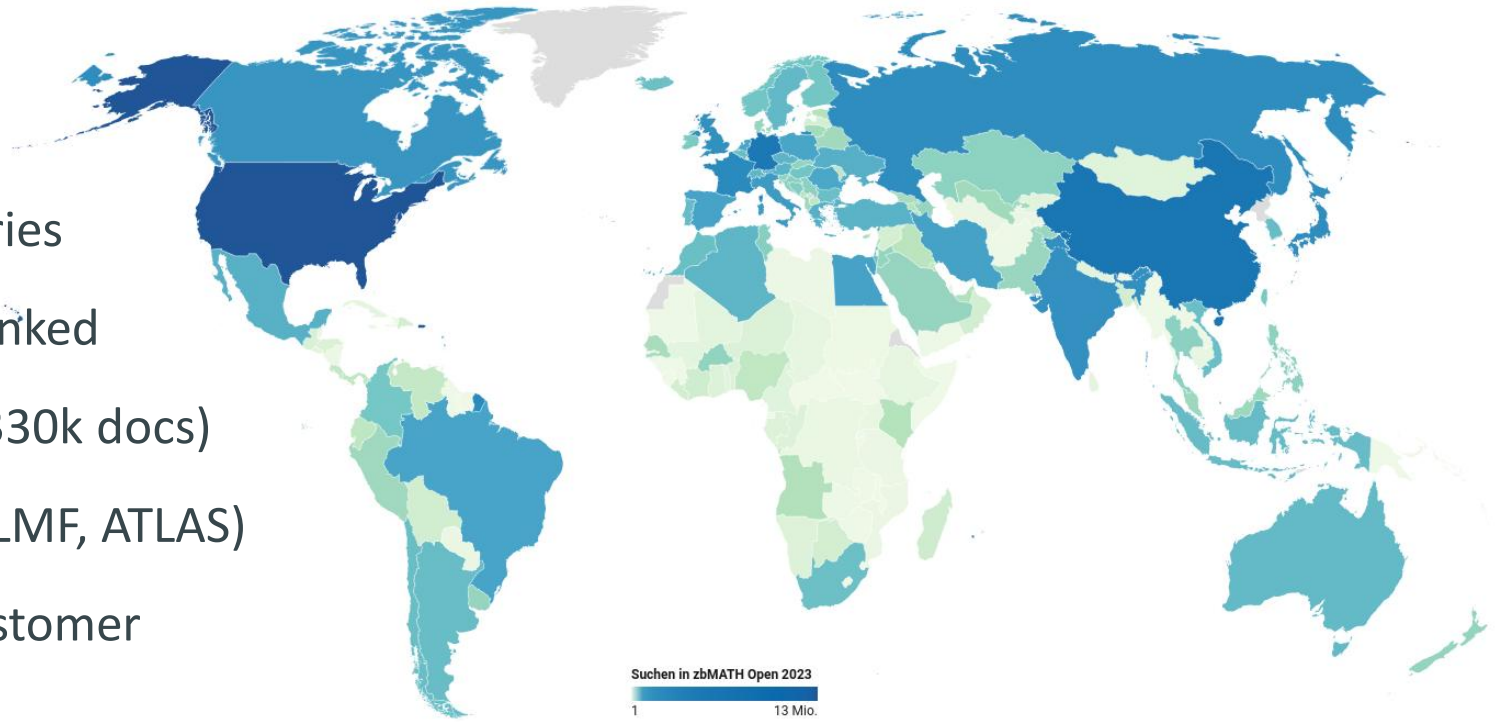
zbMATH Open – status 2025

- > 5 M documents (~ 4.4M MSC classified)
- > 1.2M reviews (~ 7,300 active reviewers)
- ~ 1.4M authors, ~ 8k journals and book series
- ~ 55M references, ~ 1.6 M open fulltexts linked
- ~ 43k software packages (referenced in ~ 330k docs)
- ~ 70k references to research data (OEIS, DLMF, ATLAS)
- ~100M human searches/year [vs. 22 M customer searches in 2020],
- > 125k unique visitors/month (including institution proxies) [vs. 1,200 subscriptions in 2020]



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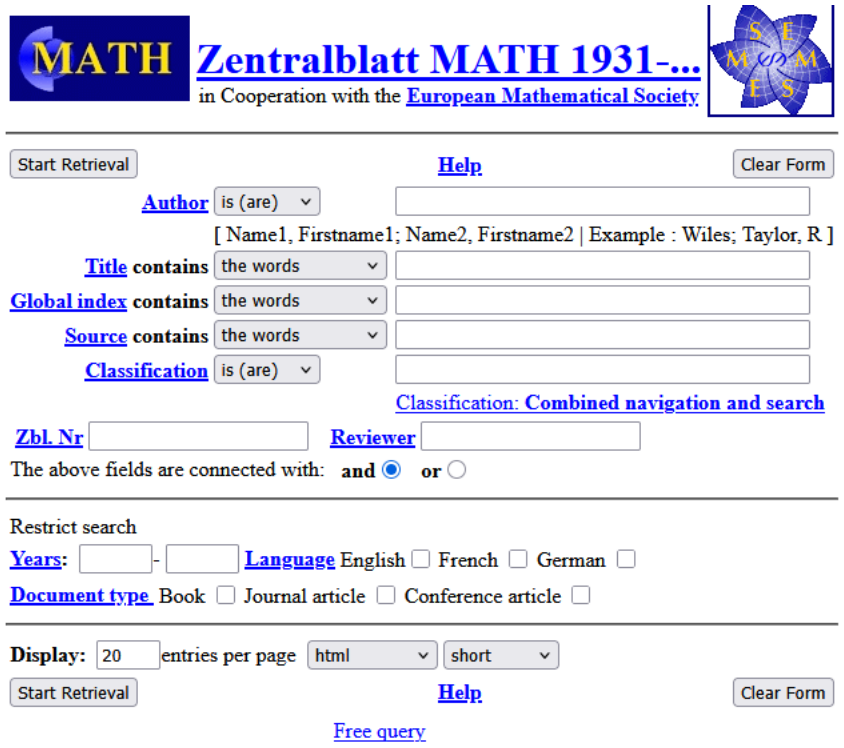
Going online in 1996[1]

[1]Actually, Zentralblatt had been electronically available via the STN network service 10 years, but most mathematicians won't notice

- Following the foundation of Cellule MathDoc, quickly a collaboration had been established culminating in the implementation of the edbm indexing software developed by Claude Goutorbe at MathDoc

- Essential in bringing the MATH database first on CD-Rom, than on the Web
- For the next ~15 years, the retrieval interval would carry the signature



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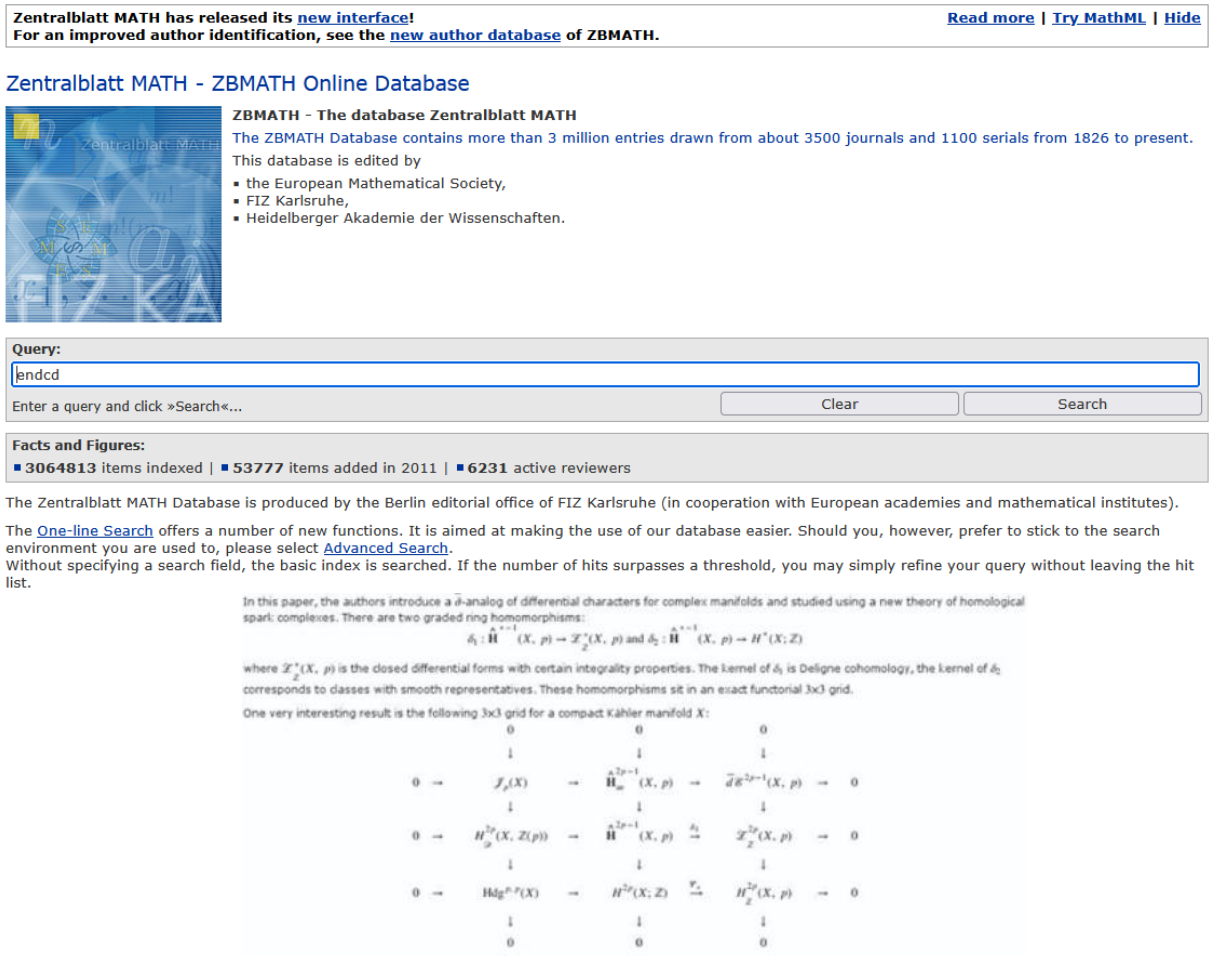
… and maintaining a development cooperation

- Following a Grenoble workshop in 2009, a new versions were developed and maintained in Berlin, being the core of zbMATH Open retrieval for another decade (until being replaced by ElasticSearch).

- Another result of this visit was the usage of INRIA‘s Tralics software for the MATHML conversion of the database content, resulting in MATH display as early as 2010.



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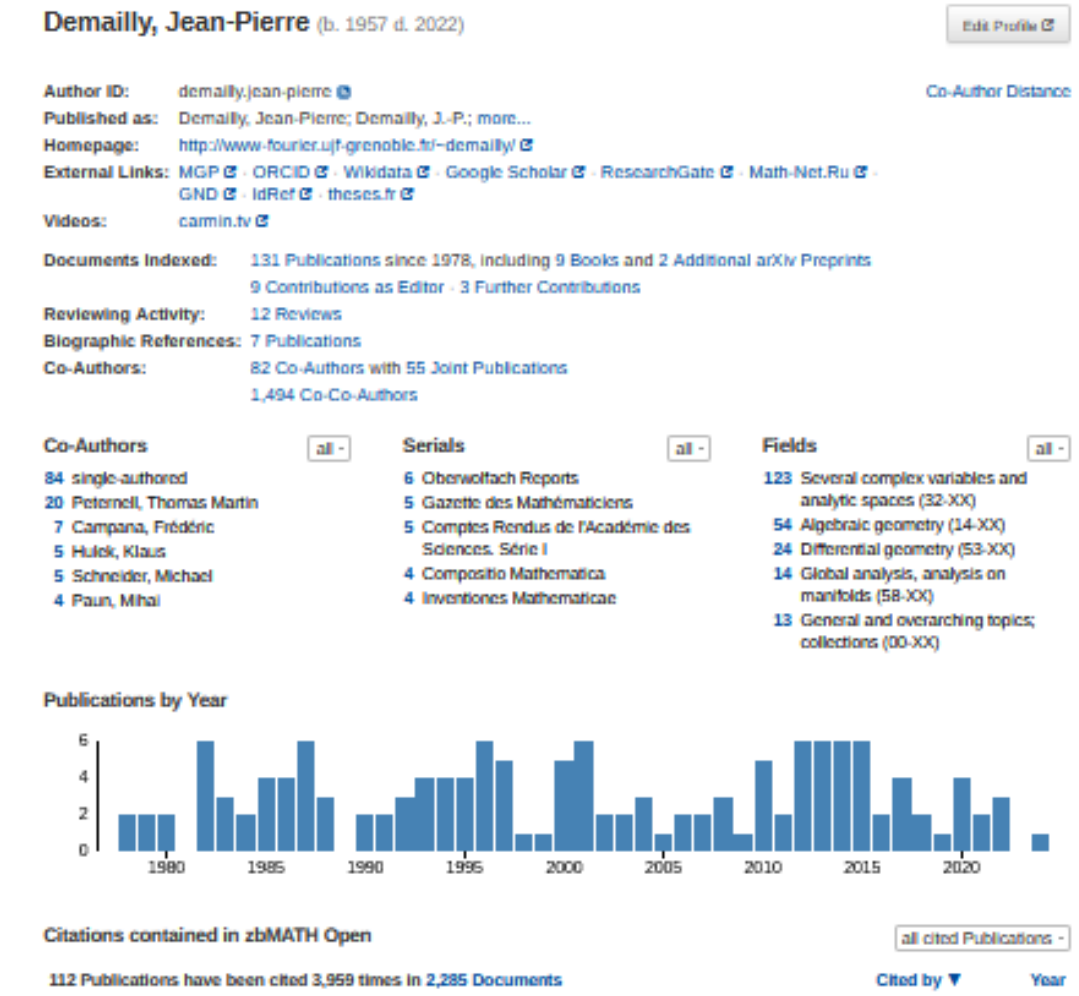
… which supported lots of features such as author database etc. (I)

- zbMATH author database was introduced (somewhat late) in 2010, and the author disambiguation has been gradually extended to all historical content and adapted to challenging issues such as Chinese names, varying transliterations etc.
- authorship assignments now unique (with sufficient certainty) for 97.5% of the signatures (thereof 30% manually checked)
- External IDs matched and maintained for up to 18 services like Wikidata, Math Genealogy, ORCID, Google Scholar, Idref, dblp, carmin.tv etc. …, allowing for detailed, interconnected profile information



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Author Database – successes and challenges (II)

While some authors have >20 spellings, there are currently 401 uniquely identified Persons named Wang, Wei in the database.

Also, there is still a € 100 bounty to identify the author of this 1850 Crelle article.

Chebyshëv, Pafnutiĭ L'vovich (b. 1821 d. 1894)

Author ID: chebyshev.p-l
Published as: Chebyshev, P. L.; Tschebyscheff, P. L.; Tschebyschew, P. L.; Tchebycheff; Tchébycheff; Tchebycheff, P.; Tchébycheff, P.; Tchebichef, P.; Tschebyscheff, P.; Tschebyschew, P.; Tschebychew, P.; Čebišev, P. L. less
Further Spellings: Чебышёв Пафнутий Львович
External Links: MacTutor · MGP · Wikidata · Math-Net.R

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30.
Fragen über Fuhrwerkräder.
(Von Herrn *B.* auf der Insel Rügen.)

I. Wenn die Achse *C* (Taf. V.) eines Wagenrades *PQ*, welches sich um die Achse dreht, auf *geradliniger* Bahn PQ_6 mit *gleichförmiger* Geschwindigkeit fortgezogen, nach C_1, C_2, C_3, C_4, C_5, C_6 gelangt, so durchläuft der Punct *P* der Reihe nach die Cykloïdenbogen PP_1, PP_2, PP_3, PP_4, PP_5, PP_6: der dem Puncte *P* im Durchmesser gegenüberliegende Punct *Q* aber *gleichzeitig* die Cykloïdenbogen QQ_1, QQ_2, QQ_3, QQ_4, QQ_5 und QQ_6; denn es ist $Pp_1 = P_1p_1$, $Pp_2 = P_2p_2$, u. s. w. Die Bogen PP_1, PP_2, PP_3, PP_4 und PP_5 sind aber *kürzer*, als die Bogen QQ_1, QQ_2, QQ_3, QQ_4 und QQ_5; erst der Cykloïdenbogen PP_6 ist dem QQ_6 *gleich*. Wie erklärt es sich nun, dafs die beiden *fest mit einander verbundenen Puncte* ? Und hat e *P* und *Q*

Found 401 Authors (Results 1–100)

Alphabetically | Citations

Wang, Wei
51 Publications (2009–2025) indexed
1,546 Citations
Co-Authors: Wen, Changyun; Huang, Jiangshuai; Zhou, Jing; ...
Main Fields: Systems theory; control (93-XX)
Published as: Wang, Wei

Wang, Wei
115 Publications (1989–2025) indexed
1,263 Citations
Co-Authors: Wang, Dong; Sun, Ximing; Zhuang, Yan; ...
Main Fields: Systems theory; control (93-XX); Computer science (68-XX)
Published as: Wang, Wei; Wang, W.

Wang, Wei
105 Publications (1995–2025) indexed
553 Citations
Co-Authors: Yang, Zishen; Zhang, Hao; Qiu, Lihong; ...
Main Fields: Combinatorics (05-XX)
Published as: Wang, Wei

Wang, Wei
82 Publications (1994–2025)
Co-Authors: Shi, Yun; Chang, Der-Chen E.; Wu, Qingyan; ...

Filter Results by
Main Field
68-XX (64)
90-XX (53)
93-XX (49)
External Link
ORCID (52)
dblp (48)
Homepage (29)

- For more than 10 years, the zbMATH author disambiguation framework is developed and maintained by Nicolas Roy…

Roy, Nicolas David

Author ID: roy.nicolas.1
Published as: Roy, Nicolas; Roy, Nicolas D.; more...
External Links: ORCID · arXiv · Google Scholar · ResearchGate · MathOverflow · dblp · GND · IdRef · theses.fr

Documents Indexed: 14 Publications since 2004, including 2 Additional arXiv Preprints
1 Further Contribution
Reviewing Activity: 3 Reviews

… who, of course, did his thesis in Grenoble!

Notes

Note publique d'information :
Titulaire d'un doctorat de l'Université Joseph Fourier de Grenoble, spécialité "Mathématiques"

Note publique d'information :
En poste : Mathematics Department, FIZ Karlsruhe, Berlin, Allemagne (en 2017)

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Supporting integrity of mathematical research

In collaboration with the European Mathematical Society through its committees, MathDoc and zbMATH representatives helped to formulate guidelines such as https://euromathsoc.org/predatory-publishing to battle problematic publishing behaviour.

On the zbMATH side, this lead to a discontinuation of indexing for many journals.

Unfortunately, this is an ongoing issue (example from yesterday).

Advances in Pure Mathematics

78 Articles (2011–2014)
indexed
95 Citations

Publisher: Scientific Research Publishing, Irvine, CA
Short Title: Adv. Pure Math.
Main Fields: Functions of a complex variable (30-XX); Partial differential equations (35-XX); Operator theory (47-XX); ...

Applied Mathematics

15 Articles (2010–2011)
indexed
18 Citations

Publisher: Scientific Research Publishing, Irvine, CA
Short Title: Appl. Math., Irvine
Main Fields: Ordinary differential equations (34-XX); Partial differential equations (35-XX); Harmonic analysis on Euclidean spaces (42-XX); ...

Open Journal of Discrete Mathematics

33 Articles (2011–2012)
indexed
59 Citations

Publisher: Scientific Research Publishing, Irvine, CA
Short Title: Open J. Discrete Math.
Main Fields: Combinatorics (05-XX); Number theory (11-XX); Numerical analysis (65-XX); ...

ANALYSIS AND PROOF OF THE RIEMANN HYPOTHESIS

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Istanbul Technical University, Ayazaga, TURKEY

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(**Received:** *May 18, 2025* **Accepted:** *Jun. 28, 2025* **Published:** *Jun. 30, 2025*)

Abstract: We propose a proof for the Riemann Hypothesis by dividing the Dirichlet eta function into a main term and a remainder term, focusing primarily on the behavior of the remainder in the critical strip $(0 < \sigma < 1$ *where* $s = \sigma + it)$. Then, we express the Riemann zeta function using the same decomposition and show that its main term cannot vanish at the nontrivial zeros. Finally, we focus on the limit on the main terms as $|\lim k \to \infty \ \zeta_k(s_0)/\zeta_k(1 - s_0)|$.

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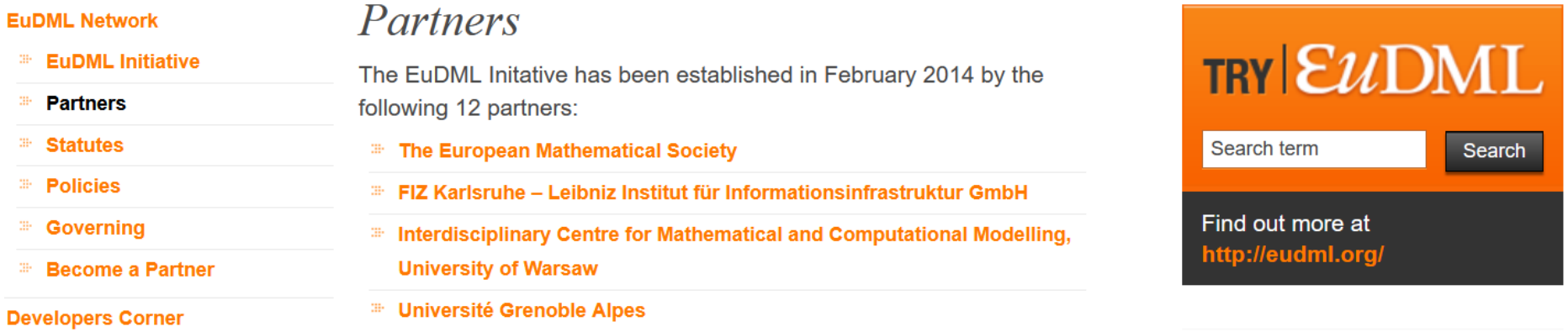
Pursuing a Global Digital Mathematics Library (I) – Early efforts to make math fulltexts OA

After the European Mathematical Society (EMS) joined the zbMATH institutions, in 1999, there has been a number of joint projects with MathDoc to make the math literature accessible, such as LIMES, EMANI, EuDML (usually involving NUMDAM and EMIS fulltexts as well as zbMATH data).



Since then, also the head of MathDoc has been one of the EMS representatives in the zbMATH advisory board.

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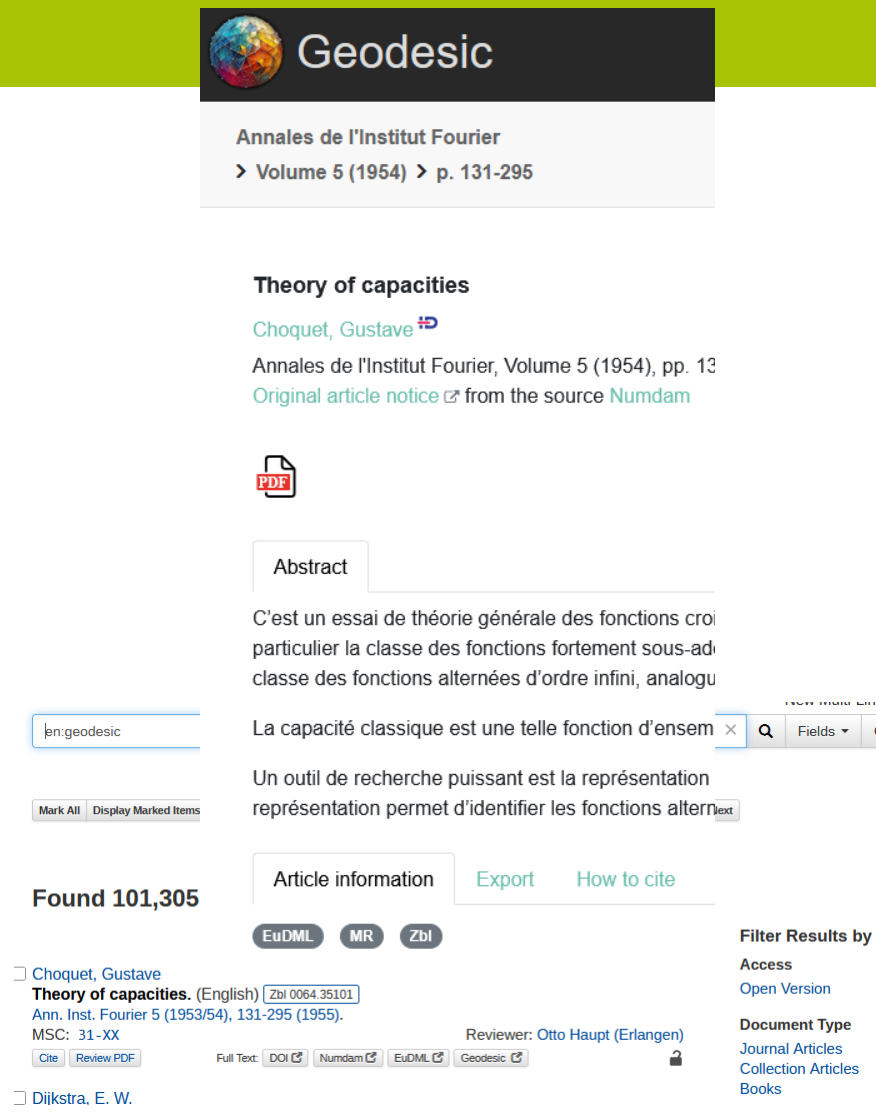
Pursuing a Global Digital Mathematics Library (II) – Political support for Open Infrastructures

Under the auspices of the IMU, the vision of a World Digital Mathematics Library (since 2014 Global Mathematics Library, GDML) has been pursued with the aim of connecting an interconnected infrastructure of open mathematical ressources (strongly driven by various representatives of MathDoc and zbMATH, who maintained the largest active components of a future GDML).

[Note that maintenance usually also means frquenlty development of new platforms according to evolving standards!]

Ideas and policies created in the GDML framework were essential in the the transformation of zbMATH (which was subscription-based until 2020) into an open service.

zbMATH Open provides now APIs and tools that facilitate a seamless connection to many open resources.



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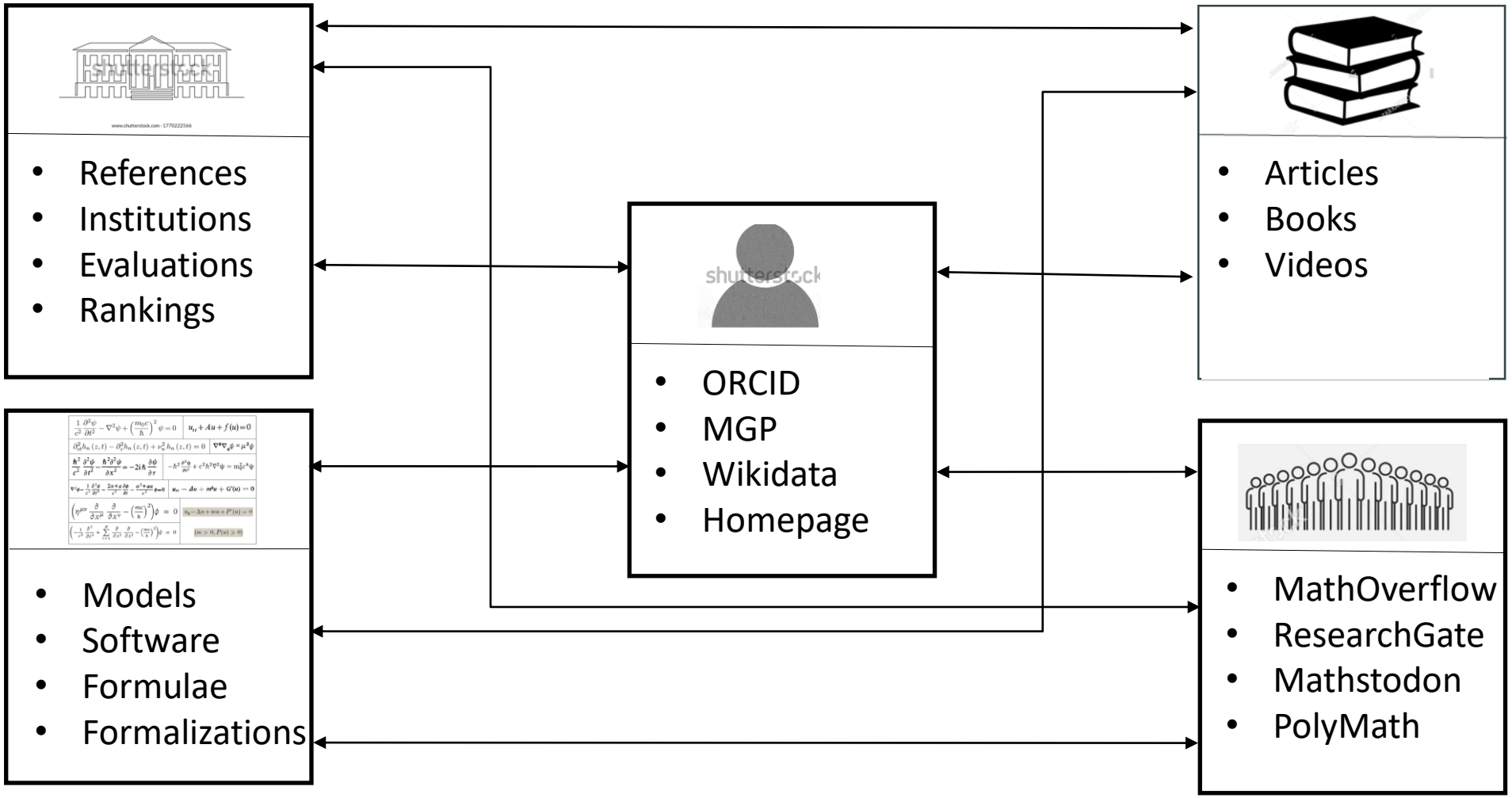
Interlinking mathematical resources (ongoing)



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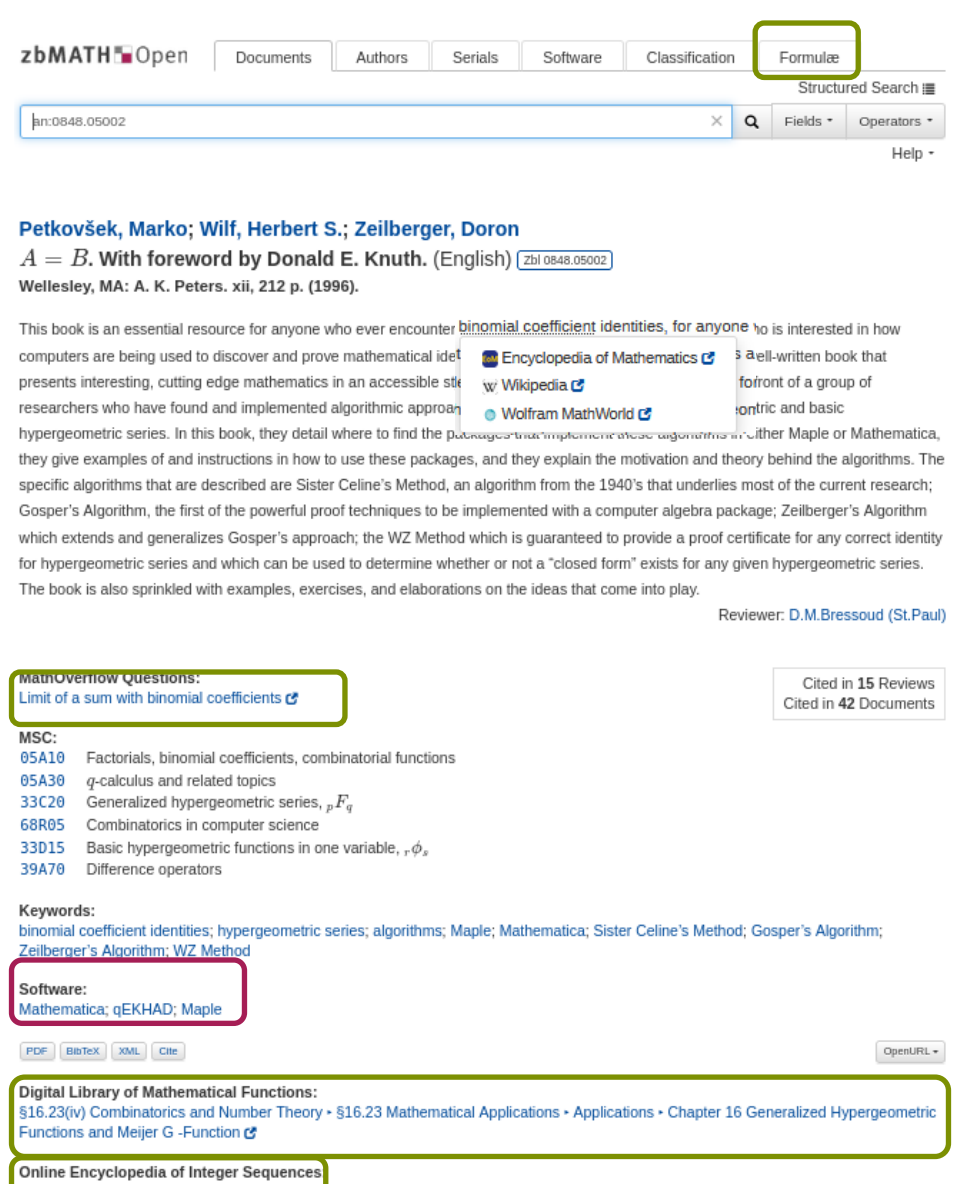
Some decades of matching tools

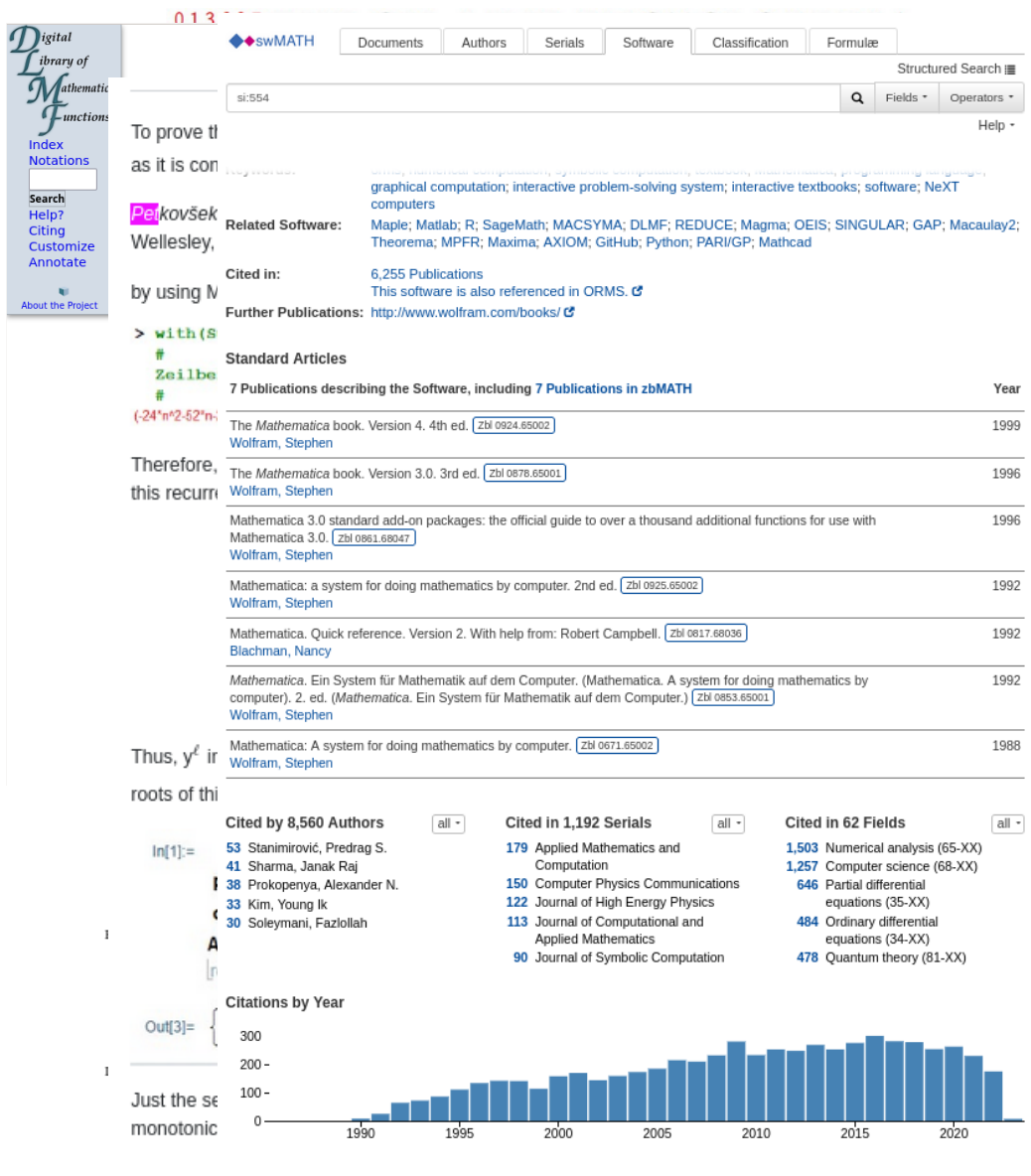
Naturally, creating and maintaining such a heterogenous framework requires not just open data but appropriate APIs and matching tools (again, a story which begins here with Claude's citation matcher for NUMDAM, see https://eudml.org/doc/221170)

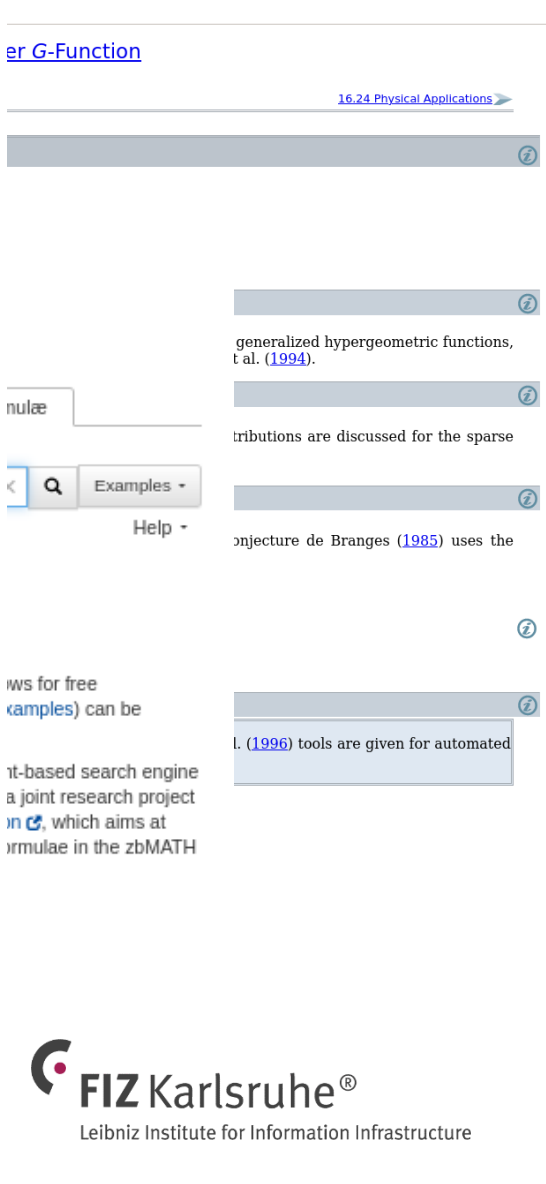
Based on this ideas, more tools have been developed which serve on the zbMATH side purposes such as

- Interlinking digital mathematics libraries (NUMDAM, EuDML, Geodesic…, since 2011)
- Identifying mathematical software references to create the swMATH database (since 2012)
- Reference matching to create the citation database (since 2013)
- Identifying and matching arXiv versions of published documents (since 2015) and identify the complentary set for preprint indexing (2022)
- Interlinking platforms such as MathOverflow (since 2017) and mathematical research data (DLMF, OEIS, ATLAS…, since 2022)
- Mathematical entity linking (EoM, Wikipedia…, since 2025)

Interlinking mathematical resources (example)







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Anchoring the needs of the mathematical community

Currently, UGR/MathDoc and FIZ/zbMATH Open are involved in further activities to ensure that the needs of the mathematical communities are addressed within large-scale information system

- Math representatives in the EOCS project LUMEN (approved/start in 2025; subject-specific functions for math in collaboration with other fields; involves also AI tools etc.)

Still, aspects such as the need of correctness and precision, longevity of results, and tools to address mathematical content like formulae remain fundamental.

Looking forward to the next 30 years of collaboration!

Thank you!

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Zertifikat seit 2016
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Leibniz Association