

**ADVANCING SCIENCE**



# zbMATH Open as a hub for digital research data

Olaf Teschke, FIZ Karlsruhe  
DMV-ÖMG-Jahrestagung, MaRDI Session, Sep 27th, 2021

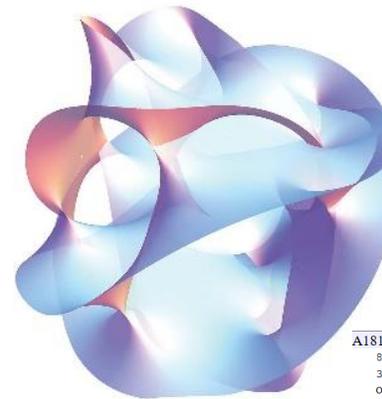
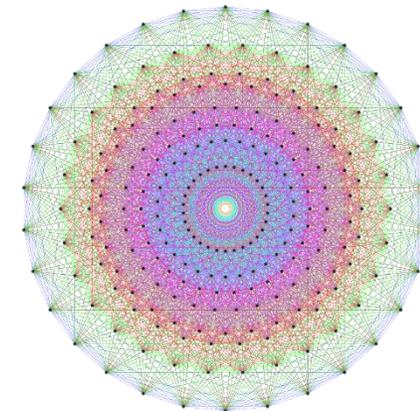
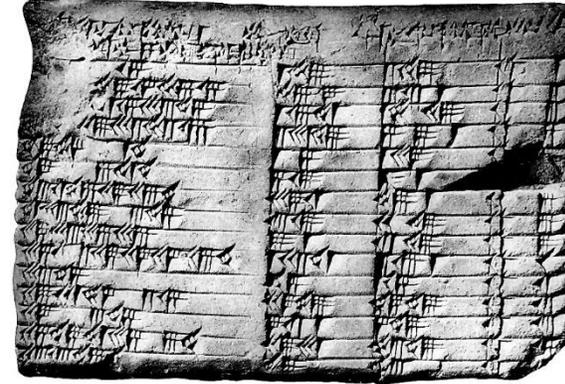
# MaRDI as a pillar of a Global Digital Mathematics Library

“Beyond digitization, more value is expected by creating connected information resources which are of greater value than the sum of its contributing parts.”

(2013 NAS report, Developing a 21st Century Global Library for Mathematics Research)

“The Mission of the GDML is to construct, as a global public good, an effective knowledge base encompassing the results of the world's mathematics through collaborations deploying both present and new technology, and to foster a supporting community.”

(2015 GDML Mission statement)



```
A181746 List of dimensions for which there exist several non-isomorphic irreducible representations of ES.  
8634368000, 175898504162692612600853299200000, 5695845883577082463522211712000000000000,  
30903356351561222538825891668691517440000 (list; graph; refs; listen; history; text; internal format)  
OFFSET 1,1  
LINKS Table of n, a\(n\) for n=1..4.  
EXAMPLE With the fundamental weights numbered as in Bourbaki, the highest weights 10100000 and 10000011 both correspond to irreducible representations of dimension 8634368000. The highest weights 23000130 and 12000231 both correspond to irreducible representations of dimension 175898504162692612600853299200000.  
CROSSREFS Terms in this sequence are the terms which should be repeated in A121732.  
Sequence in context: A017375 A017495 A017627 * A185429 A154876 A270612  
Adjacent sequences: A181743 A181744 A181745 * A181747 A181748 A181749  
nonn  
KEYWORD nonn  
AUTHOR David A. Madore, Nov 08 2010  
STATUS approved
```

## Some GDML (and MaRDI) history (I)

- 1998: WDML endorsed by the International Mathematical Union (IMU)
- 2001: IMU issues “Call to All Mathematicians to Make Publications Electronically Available”
- 2000’s: large digitization projects
- 2006: IMU Report Digital Mathematics Library: A Vision for the Future
- 2010: European Digital Mathematics Library (EuDML)
- 2011: Alfred P. Sloan Foundation funds WDML workshop at NAS November
- 2012-2013: NAS Digital Math Library Committee Report
- 2014: Seoul ICM Meeting Creation of GDML WG
- 2015: Recognized as WG of IMU CEIC

## Some GDML (and MaRDI) history (II)

- 2017: Foundation of IMKT based in Waterloo ON, Canada
- 2016-2021: GDML/MIDAS sessions (JMMs, ECMs, ICM)
- 2018, Nov 5th – MaRDI (pre-)Kick-off
- 2019, Jan 7th – MaRDI Initiative Meeting, leading to formation of consortium
- May 2019 – Participation 1st NFDI Conference
- Oct 2019 – MaRDI proposal submitted
- Sep 2020 – revised MaRDI proposal submitted
- Jul 2021 – MaRDI approved
- Oct 2021 – Start of MaRDI

## Some history of reviewing services

- 1871: First volume of Jahrbuch über die Fortschritte der Mathematik published (comprising the mathematics published in 1868)
- 1931: First volume of Zentralblatt für Mathematik und ihre Grenzgebiete
- 1940: First volume of Mathematical Reviews
- 1952: First volume of Referativny Zhurnal
- 1980: Electronic versions of Mathematical Reviews and Zentralblatt
- 1996: MathSciNet and MATH (later zMATH, zbMATH) online databases
- 2004: Jahrbuch digitization
- 2011-now: Profile and facet features at review databases, swMATH,...
- 2021: zbMATH becomes zbMATH Open

# Steps toward zbMATH Open

- 2017: Evaluation of FIZ Karlsruhe by Leibniz Association
- 2018: Strong recommendation for OA transition
- 2018: Development of OA concept, approval by supervisory councils of FIZ
- 2018: Application for special federal-state funds
- 2019: Two-step approval by governmental bodies
- 2020: Initial release of API for Jahrbuch data
- 2020: New Editorial contract of European Mathematical Society, FIZ Karlsruhe, and Heidelberg Academy of Sciences
- 2020-...: Negotiations with publishers, reshaped development, hiring...
- 2021: zbMATH Open (as of Jan 1st), zbMATH Open OAI-PMH API

# Progress of connected services (I) – author disambiguation and profiles (I)

zbMATH<sup>Open</sup> Documents Authors Serials Classification Software Formulæ

Structured Search

emmy noether   Fields Operators Help

## Noether, Emmy

Author ID: noether.emmy

Published as: Noether, E.; Noether, Emmy

External Links: [Women in Mathematics](#) · [MGP](#) · [Math-Net.Ru](#) · [Wikidata](#) · [Celebratio Mathematica](#) · [GND](#) · [MacTutor](#)

Documents Indexed: 49 Publications since 1908, including 4 Books

Biographic References: 84 Publications

### Co-Authors

- 44 single-authored
- 3 Brauer, Richard
- 2 Hasse, Helmut
- 1 Cavailles, Jean
- 1 Schmeidler, Werner Johannes

### Serials

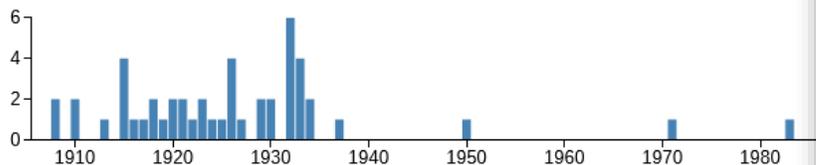
- 13 Mathematische Annalen
- 9 Jahresbericht der Deutschen Mathematiker-Vereinigung (DMV)
- 7 Journal für die Reine und Angewandte Mathematik
- 4 Mathematische Zeitschrift
- 3 Nachrichten von der Gesellschaft der Wissenschaften zu Göttingen. Mathematisch-Physikalische Klasse

all -

### Fields

- 4 Num
- 3 Field
- 2 Histr
- 2 Com
- 2 Calc
- cont

### Publications by Year



COLLECTION

# Emmy Noether

ALGEBRA

Life

Works

Students

Credits

Cover

## Bibliography

Filter and Search through this List

[1] E. Noether: *Über die Bildung des Formensystems der ternären biquadratischen Form* [On complete systems of invariants for ternary biquadratic forms]. Ph.D. thesis, Friedrich-Alex-

1907

1907

1908

1910

1911

### Biographies of Women Mathematicians

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## Emmy Noether

March 23, 1882 - April 14, 1935

**Written by Mandie Taylor, Class of 1998 (Agnes Scott College)**

Traditionally, people consider mathematicians to be men. This, however, is not entirely true. Throughout history, there have been many women mathematicians who have contributed just as much as their male-counterparts. Even though their names might have been forgotten, their contributions to mathematics have not. One of these women mathematicians was German-born Emmy Noether.

Emmy Noether was born in Erlangen, Germany on March 23, 1882. She was named Amalie, but always called "Emmy". She was the eldest of four children, but one of only two that survived childhood. Her brother, Fritz, also made a career of mathematics. Her father was Max Noether, a noted mathematician of his time. Her mother was Ida Amalie, for whom Emmy was named.

As a child, Emmy Noether did not concentrate on mathematics. She spent her time in school studying languages, with a concentration on French and English. Her mother taught her the traditional skills of a young woman of that time. She learned to cook, clean, and play the clavier. At the time of her graduation from high school, she passed a test that allowed her to teach both French and English at schools for young women.

At the age of 18, Emmy Noether decided to take classes in mathematics at the University of Erlangen. Her brother, Fritz, was a student there, and her father was a professor of mathematics. Because she was a woman, the university refused to let Emmy Noether take classes. They granted her permission to audit classes. She sat in on classes for two years, and then took the exam that would permit her to be a doctoral student in mathematics. She passed the test, and finally was a student in good standing at the University. After five more years of study, she was granted the second degree to a woman in the field of mathematics. The first graduated a year earlier.

Now that Emmy Noether had her doctorate in mathematics, she was ready to find a job teaching. The University of Erlangen would not hire her, as they had a policy against women professors. She decided to help her father at the Mathematics Institute in Erlangen. She began doing research there, and helped her father by teaching his classes when he was sick. Soon, she began to publish papers on her work.

During the ten years Emmy worked with her father, Germany became involved in World War I. Emmy was a pacifist at heart, and hated the war. She longed for a Germany that was not at war. In 1918, her wish was granted, as the war ended. The German monarchy was removed and the country became a republic. Noether, and all women in Germany, were given the right to vote for the first time. Even with the new rights granted to women, Noether was not paid for her work teaching.

During this time, Felix Klein and David Hilbert were working on further defining one of Einstein's theories at the University of Göttingen. They felt that Emmy Noether's expertise could help them in their work. They asked her to come and join them, but since there were no women on the faculty, Noether was unsure if she would be welcome. Many of the faculty did not want her there, but in the end, she came. She worked hard and soon was given a job as a lecturer. Even though she still was not paid for her efforts, for the first time, Noether was teaching under her own name. Three years later, she began receiving a small salary for her work.

During her time at the University of Göttingen, she accumulated a small following of students known as Noether's boys. These students traveled from as far as Russia to study with her. Noether was a warm person who cared deeply about her students. She considered her students to be like family and was always willing to listen to their problems. Her teaching style was very difficult to follow, but those who caught on to her fast style became loyal followers. Noether's teaching method led her students to come up with ideas of their own, and many went on to become great mathematicians themselves. Many credited Noether for her part in teaching them to teach themselves.

Peace-loving Noether was soon to wish for peace again. In 1933, Hitler and the Nazis came into power in Germany. The Nazis demanded that all Jews be thrown out of the universities. Noether's brother, Fritz, was also a professor at the time. Offered a teaching position in Siberia, he moved his family there. Even though friends tried to get Emmy a position at the University of Moscow, she opted to move to the United States, where Bryn Mawr College offered her a position teaching. The appointment of Noether was made possible by a gift from the Institute of International Education and the Rockefeller Foundation.

1907

1907

1908

1910

1911

1911

## Progress of connected services (II) – author disambiguation and profiles (II)

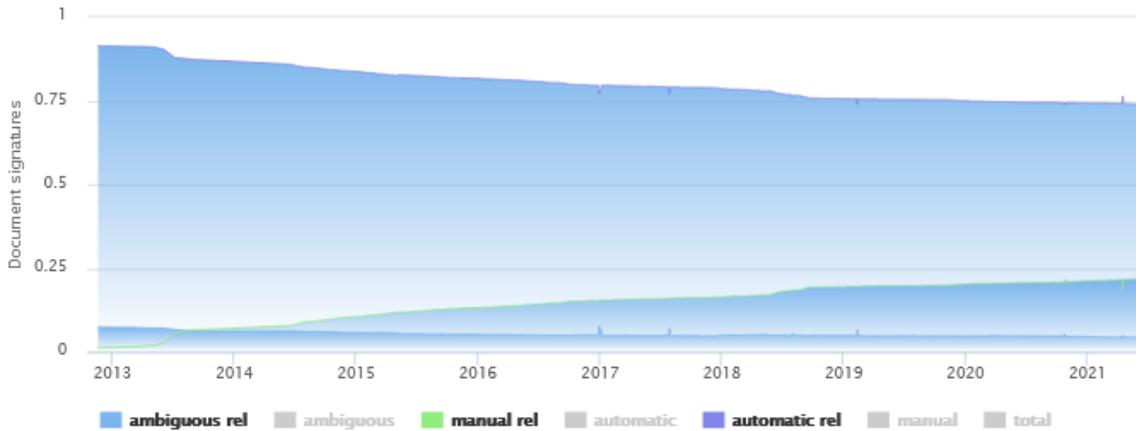
Author disambiguation is a great example for both the efficiency and challenges of open interlinked quality services:

- There is a great need for quality open data
- There is an incentive for crowd participation (though there is not always an incentive for quality)
- There are many different open services providing different information facets
- Automated, crowd, and intellectual approaches are combined
- Great opportunities for automated correction by linked information but also significant danger of error propagation

# Progress of connected services (III) – author disambiguation and profiles (III)

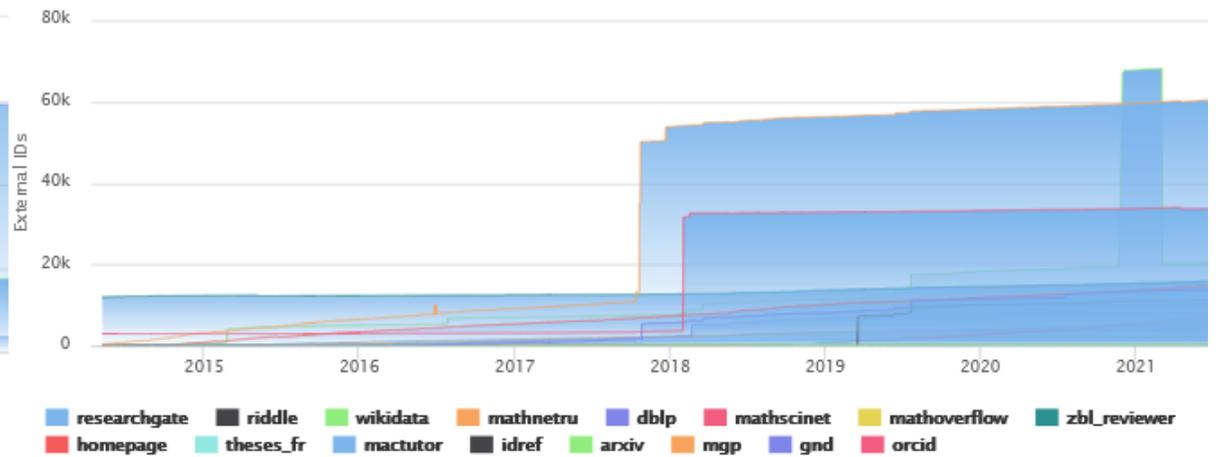
Document signatures

Click and drag in the plot area to zoom in



External IDs

Click and drag in the plot area to zoom in



Special page

## Search results

To search for Wikidata items by their title on a given site

Q | detlef gronau

Advanced search: Sort by relevance X

Search in: (Main) X (Property) X

**Detlef Gronau** (Q95335205)  
10 statements, 0 sitelinks - 19:13, 18 November 2020

**Detlef Gronau** (Q102254728)  
Ph.D. Universität Innsbruck 1969  
5 statements, 0 sitelinks - 20:16, 23 November 2020

Google Scholar label: algebraic\_geometry

Profile

- Justin Smith**  
Professor Emeritus of Mathematics, Drexel University  
Bestätigte E-Mail-Adresse bei drexel.edu  
Algebraic topology operads algebraic geometry GPU programming writing novels and screenplays  
Zitiert von: 130340
- Chen Jungkai**  
Professor of Mathematics, National Taiwan University  
Bestätigte E-Mail-Adresse bei math.ntu.edu.tw  
algebraic geometry  
Zitiert von: 48306
- Christopher Estrada**  
Caltech  
Bestätigte E-Mail-Adresse bei caltech.edu  
Algebraic geometry mathematical physics noncommutative geometry low-dimensional topology  
Zitiert von: 33991
- Robin Hartshorne**  
Professor of Mathematics, Emeritus, UC Berkeley  
Bestätigte E-Mail-Adresse bei hartshorne.net  
algebraic geometry  
Zitiert von: 31490

[+] Jianbing Shen [ID]

> Home > Persons

[-] Person information

- affiliation: Beijing Institute of Technology
- affiliation (2007 - 2008): Indiana University Purdue University
- affiliation (PhD 2007): Zhejiang University, State Key Laboratory of Mathematics Education for Elementary School Teachers

ORCID

- 0000-0003-2656-3082
- 0000-0003-1883-2086
- 0000-0003-0193-0384
- 0000-0002-4109-8353
- 0000-0002-4343-623X

Main page  
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Random Item  
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Help  
Donate

Lexicographical data  
Create a new Lexeme  
Recent changes  
Random Lexeme

# Progress of connected services (IV) – institution disambiguation and profiles

Analogous (but different) work is currently down for affiliation assignments (initial release planned for 2022)

Berlin

<input type="checkbox"/> Hochschule für Technik und Wirtschaft Berlin	Types: <ul style="list-style-type: none"><li>university</li></ul>	Parents:	Children:	External sources: <ul style="list-style-type: none"><li>HTW Berlin</li></ul>
<input type="checkbox"/> Beuth Hochschule für Technik Berlin	Types: <ul style="list-style-type: none"><li>university</li></ul>	Parents:	Children: <ul style="list-style-type: none"><li>Fachbereich II Mathematik, - Physik - Chemie</li></ul>	External sources: <ul style="list-style-type: none"><li>Beuth University of Applied Sciences Berlin</li></ul>
<input type="checkbox"/> Freie Universität Berlin	Types: <ul style="list-style-type: none"><li>university</li></ul>	Parents:	Children: <ul style="list-style-type: none"><li>Institut für Theoretische Physik</li><li>Institut für Statistik und Ökonometrie</li></ul> <p><a href="#">view more</a></p>	External sources: <ul style="list-style-type: none"><li>Freie Universität Berlin</li></ul>
<input type="checkbox"/> Fritz-Haber-Institut Max-Planck-Gesellschaft	Types: <ul style="list-style-type: none"><li>institute</li></ul>	Parents:	Children:	External sources: <ul style="list-style-type: none"><li>Fritz Haber Institute of the MPG</li></ul>
<input type="checkbox"/> Deutsches Zentrum für Luft- und Raumfahrt e. V. (DLR)	Types: <ul style="list-style-type: none"><li>misc</li><li>misc</li></ul>	Parents: <ul style="list-style-type: none"><li>Linder Hoehe</li><li>Thermotechnology and Energy Storage University of Stuttgart</li></ul> <p><a href="#">view more</a></p>	Children: <ul style="list-style-type: none"><li>Institute of Communications and Navigation</li><li>Digital Enterprise Research Institute (DERI)</li></ul> <p><a href="#">view more</a></p>	External sources: <ul style="list-style-type: none"><li>German Aerospace Center</li><li>German Aerospace Center</li></ul>
<input type="checkbox"/> Helmholtz-Zentrum Berlin für Materialien und Energie	Types: <ul style="list-style-type: none"><li>misc</li></ul>	Parents:	Children:	External sources: <ul style="list-style-type: none"><li>Helmholtz-Zentrum Berlin</li></ul>
<input type="checkbox"/> Humboldt-Universität zu Berlin	Types:	Parents:	Children:	External sources:

Home

Affiliation: Humboldt Universität zu Berlin

Labels

IDs

Types

Address

Countries

Parents

Children

External Sources

Add information

## Labels from zbMATH

### Humboldt Universität zu Berlin

Sources:

Lauret, Emilio A.: The spectrum on  $\mathbb{Z}(p)$ -forms of a lens space (zbMATH)

Lange, Herbert; Ortega, Angela: On the Prym map of cyclic coverings (zbMATH)

Approve

Disapprove

Has been approved 1 times; has been disapproved 0 times

## Labels from other sources

### Humboldt University of Berlin

Sources:

Humboldt University of Berlin (wikidata)

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# Progress of connected services (V) – Digital Mathematics Libraries

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Documents | Authors | Serials | Classification | Software | Formulæ

Structured Search 

any:riemann   Fields Operators Help

Moree, Pieter; Stevenhagen, Peter

Prime divisors of the Lagarias sequence. (English) [Zbl 1064.11013](#)

J. Théor. Nombres Bordx. 13, No. 1, 241-251 (2001).

J. C. Lagarias in [Pac. J. Math. 118, 449-461 (1985; [Zbl 0569.10003](#)); Pac. J. Math. 162, No. 2, 393-397 (1994; [Zbl 0790.11014](#))], posed a challenge problem to determine, under the GRH, the density of the set of prime numbers that occur as divisor of some term of the sequence  $\{x_n\}_{n \geq 1}$  defined by the linear recurrence  $x_{n+1} = x_n + x_{n-1}$  and the initial values  $x_0 = 3$  and  $x_1 = 1$ .

In the paper under review, the authors solve this problem by showing that the density in question is

$$\frac{1573727}{1569610} \cdot \prod_{p \text{ prime}} \left(1 - \frac{p}{p^2 - 1}\right).$$

In fact, this paper shows how to compute, under GRH, the density of the set of prime factors of any nondegenerate binary recurrent sequence  $\{x_n\}_{n \geq 1}$ . The method uses the Chebotarev Density Theorem and the principle of inclusion and exclusion to reduce the problem to the computation of a series involving degrees of algebraic number fields of the type  $\mathbb{Q}[\zeta_{ij}, r^{1/ij}, q^{1/ij}]$ , where  $r$  is the ratio of the roots of the recurrent sequence,  $q$  is its initial quotient, and  $\zeta_{ij}$  is a primitive root of unity of order  $ij$ . The analysis is quite complicated when  $r$  is of degree 2 (like in Lagarias's example), as there one has to separately consider split and inert primes, and several subtleties need to be taken care of at the prime 2. The authors result is that this density is

$$(c_{q,r}^+ + c_{q,r}^-) \prod_{p \text{ prime}} \left(1 - \frac{p}{p^2 - 1}\right),$$

where the "correction factors"  $c_{q,r}^+$  and  $c_{q,r}^-$  are rational numbers arising from the contributions of split and inert primes in  $\mathbb{Q}[r]$ , respectively. For the numerical example asked by Lagarias, the authors obtain  $c_{q,r}^+ = 712671/1569610$  and  $c_{q,r}^- = 61504/112115$ .

Reviewer: Florian Luca (Morelia)

MSC: 11B39 Fibonacci and Lucas numbers and polynomials and generalizations

Cited in 3 Documents

Keywords: Chebotarev density theorem; generalized Riemann hypothesis

PDF | BibTeX | XML | Cite Full Text: DOI | EMIS | Numdam | EuOML | arXiv

 WorldCat

References: [1] Ballot, C., Density of prime divisors of linear recurrent sequences. Mem. of the AMS51, 1995. · [Zbl 0827.11006](#) [2] Hasse, H., Über die Dichte der Primzahlen p, für die eine vorgegebene rationale Zahl a ≠ 0 von durch eine vorgegebene Primzahl l ≠

zbMATH Open has integrated already a large amount of diverse open resources, facilitating additional services like

- Scope definition
- Quality control
- (Title) translation
- Reference linking
- Author disambiguation
- Classification (semantics)
- Reviews
- Formulae search

Todo: Further extension, e.g., if applicable, to preprints!

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# Progress of connected services (VI) – OAI-PMH

Available (as of today):

OAI-PMH interface of zbMATH Open

<https://oai.zbmath.org/>

which provides a large subset of zbMATH data under CC-BY-SA 4.0 license, including all Jahrbuch data; editorial data from zbMATH (reviews, classification, author information); doi+further identifiers; publisher information if compatible with the license, including a large set of reference data

The screenshot shows a REST client interface with the following details:

- Method:** GET
- URL:** /?verb=GetRecord
- Parameters:**
  - identifier:** string (query), [required] e.g. oai:zbmath.org:2615555. Value: oai:zbmath.org:2615555
  - metadataPrefix:** string (query), [required] can be 'oai\_dc' or 'oai\_zb\_preview'. Value: oai\_zb\_preview
- Buttons:** Execute, Clear
- Response Content Type:** application/json
- Request URL:** https://zboai.formulasearchengine.com/v1/?verb=GetRecord&identifier=oai:3Azbmath.org:3A2615555&metadataPrefix=oai\_zb\_preview
- Server response:** 200
- Response body (XML):**

```
<?xml version="1.0" encoding="utf-8"?>
<OAI-PMH xmlns="http://www.openarchives.org/OAI/2.0/" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xsi:schemaLocation="http://www.openarchives.org/OAI/2.0/OAI-PMH.xsd">
  <responseDate>2021-05-04T09:03:10Z</responseDate>
  <request identifier="oai:zbmath.org:2615555" metadataPrefix="oai_zb_preview" verb="GetRecord">http://zboai.formulasearchengine.com/v1/</request>
  <GetRecord>
    <record>
      <header>
        <identifier>oai:zbmath.org:2615555</identifier>
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        <setSpec>JFM</setSpec>
      </header>
      <metadata>
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          </zbmath:author_id>
          <zbmath:document_title>The finiteness theorem for invariants of finite groups.</zbmath:document_title>
          <zbmath:source>Math. Ann. 77, 89-92 (1915).</zbmath:source>
          <zbmath:classification>
            <zbmath:classification>13A50</zbmath:classification>
          </zbmath:classification>
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          <zbmath:pagination>99-92</zbmath:pagination>
          <zbmath:doi>10.1007/BF01456211</zbmath:doi>
          <zbmath:spelling>Noether, Emmy; Noether, E.</zbmath:spelling>
        </oai_zb_preview:zbmath>
      </metadata>
    </record>
  </GetRecord>
</OAI-PMH>
```

# Progress of connected services (VII) – community interfaces

Saito, Masa-Hiko

On the infinitesimal Torelli problem of elliptic surfaces. (English) [Zbl 0532.14019](#)

J. Math. Kyoto Univ. 23, 441-460 (1983).

The author studies the injectivity of the map  $\delta : H^1(X, \Theta) \rightarrow \text{Hom}_{\mathbb{C}}(H^{2,0}(X), H^{1,1}(X))$  given by the cup-product  $H^0(X, \Omega^2) \otimes H^1(X, \Theta) \rightarrow H^1(X, \Omega^1)$  deduced from the contraction  $\Theta \otimes \Omega^2 \rightarrow \Omega^1$  for an elliptic surface  $\phi : X \rightarrow C$  with base curve  $C$ . He proves that:

$\delta$  is injective if  $h^{2,0}(X) > 0$  and one of the following three conditions holds: (i) the functional invariant  $J(X)$  is not constant; (ii)  $J(X)$  is constant, distinct from 0 and 1, and either  $C$  is  $\mathbb{P}_1(\mathbb{C})$  or (iii)  $\chi(X, \mathcal{O}_X) \geq 3$ .

If  $\phi : X \rightarrow C$  is an elliptic bundle, then: (i)  $\delta$  is injective if  $g(C) = h^{1,0}(C) = 1$ , (ii) if  $b_1(X)$  is even and  $g(C) \geq 2$ ,  $\delta$  is not injective iff  $g(C) > 2$  and  $C$  is hyperelliptic; (iii) if  $b_1(X)$  is odd and  $g(C) \geq 2$ ,  $\delta$  is never injective. - For Kodaira surfaces, the global Torelli does not hold, although the map  $\delta$  is injective.

Editorial remark: A. Ikeda constructed in [Adv. Math. 349, 125–161 (2019); Zbl 1414.14004] an elliptic surface  $Y$  and showed that the period map for the Hodge structure on  $H^2(Y, \mathbb{Z})$  has one dimensional fibers and the general fiber has two irreducible components, which contradicts the main theorem of this work.

Reviewer: F. Campana

MSC:

- 14J15 Moduli, classification: analytic theory; relations with modular forms
- 14C30 Transcendental methods, Hodge theory (algebraic-geometric aspects)
- 32J15 Compact complex surfaces
- 14J25 Special surfaces
- 32J25 Transcendental methods of algebraic geometry (complex-analytic aspects)
- 32G05 Deformations of complex structures

Cited in 1 Review  
Cited in 7 Documents

MathOverflow Questions:

Peer review 2.0

Widely accepted mathematical results that were later shown to be wrong?

Keywords:

compact complex surface; second cohomology; Hodge structure; infinitesimal Torelli problem; elliptic surfaces; elliptic bundle; Kodaira surfaces

PDF BibTeX XML Cite

Full Text: DOI

WorldCat

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two proofs. (...) The first proof concerns a more general situation, but contains a gap". – Matthieu Romagny Aug 28 '10 at 12:12

Show 5 more comments

▲ This [blog post](#), the previous one (linked inside) and the addendum caused by reader response, treat exactly this question, including Euler's polyhedra formula from Micah Miller's response. 5 Share Cite Improve this answer Follow answered Aug 22 '12 at 19:43 community wiki Vlad Niculae

▲ A recent example: The main theorem of [Masa-Hiko Saito, [On the infinitesimal Torelli problem of elliptic surfaces](#), J. Math. Kyoto Univ. 23, 441-460 (1983). [Zbl 0532.14019](#)] has been shown to be incorrect due to a counterexample in [Atsushi Ikeda, [Bielliptic curves of genus three and the Torelli problem for certain elliptic surfaces](#), Adv. Math. 349, 125-161 (2019). [Zbl 1414.14004](#)]. 5 Share Cite Improve this answer Follow edited Feb 15 at 19:19 community wiki 2 revs, 2 users 67% Olaf Teschke

▲ [This thread](#) on the Italian tradition in algebraic geometry contains some important examples. 4 Share Cite Improve this answer Follow edited Apr 13 '17 at 12:58 community wiki 2 revs Steven Landsburg

2 Yes, that thread was mentioned in KConrad's comment of 15 August. – Gerry Myerson Feb 25 '11 at 11:51

▲ I guess one major example is that unique factorisation doesn't always hold in rings of integers of number fields. 4 Classical attempts at solving Fermat's Last Theorem resulted in moving to cyclotomic fields  $\mathbb{Q}(\zeta_n)$  and noting that Fermat's equation factorises to give:

$$\prod_{k=0}^{n-1} (x + \zeta_n^k y) = z^n$$

# Progress of connected services (VIII) – DLMF

Currently, the most cited document in zbMATH is actually a research data reference, namely, the *Handbook of mathematical functions with formulas, graphs and mathematical tables* by Abramowitz and Stegun.

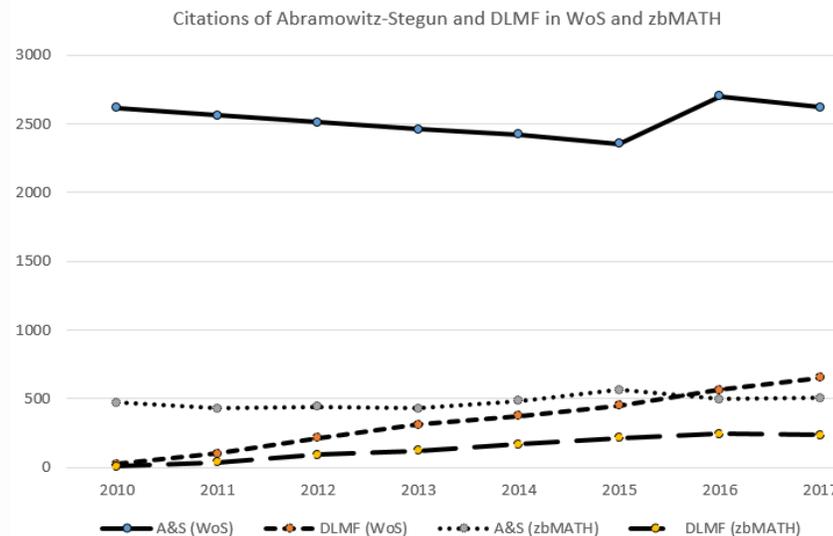
References only slowly migrate from literature to (much more useful) digital DLMF references

Improvement made possible by zbMATH Links API

● Abramowitz, Milton, and Irene A. Stegun (edited by): *Handbook of mathematical functions with formulas, graphs, and mathematical tables*. (National Bureau of Standards. Applied Mathematics Series. 55.) Washington: U.S. Department of Commerce 1964. XIV, 1046 p. \$ 6.50. Table Errata. *Math. Comput.* **21**, 747 (1967).  
Dieses umfassende Werk über das Gebiet der speziellen Funktionen vereint eine Vielzahl von Tafeln und dazugehörigen Formeln. 29 Kapitel wurden von 28 Autoren bearbeitet. Die Tafeln sind teilweise von sehr hoher Genauigkeit, z. B. sind die trigonometrischen Funktionen mit 23 Stellen wiedergegeben. Im einzelnen sind in dem Buch Tafeln enthalten über mathematische und physikalische Konstanten, elementare transzendente Funktionen, Integralsinus und verwandte Funktionen, Gammafunktionen und Verwandte, Fehlerintegral und Fresnelsche Integrale, Legendresche Funktionen, Besselsche Funktionen und Integrale, Struvesche Funktionen und Verwandte, hypergeometrische und konfluente hypergeometrische Funktionen, elliptische Funktionen und Integrale, parabolische Zylinderfunktionen und eine Anzahl weiterer spezieller Funktionen. Ein Kapitel unter der Überschrift „Elementare analytische Methoden“ enthält eine nützliche Formelsammlung und Tafeln von Potenzen und Wurzeln. Ein weiteres Kapitel ist der numerischen Integration, Differentiation und Interpolation gewidmet und enthält ebenfalls eine Anzahl von Tafeln, etwa die Lagrangeschen Interpolationskoeffizienten bis achter Ordnung oder Abzissen und Gewichte der Gaußschen Quadraturformeln auf 20 Stellen. In weiteren Kapiteln werden Mathieusche Funktionen, Orthogonalpolynome, Bernoullische und Eulersche Polynome sowie die Riemannsche Zetafunktion, statistische Verteilungsfunktionen und Laplace-Transformationen behandelt. Ein umfangreiches Kapitel ist der Kombinatorik und zahlentheoretischen Funktionen gewidmet. Mit diesem Buch dürfte das Standardtafelwerk vorliegen, das für viele Zwecke spezielle und umfangreiche Tafeln und Formelsammlungen ersetzen kann oder sogar übertrifft.  
K.-H. Bachmann.

Zentralblatt für Mathematik. 171.

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*Phys.* **46** (2), pp. 159-170.

**W. H. Reid (1997a)** *Integral representations for products of Airy functions. II. Cubic products.* *Z. Angew. Math. Phys.* **48** (4), pp. 646-655.

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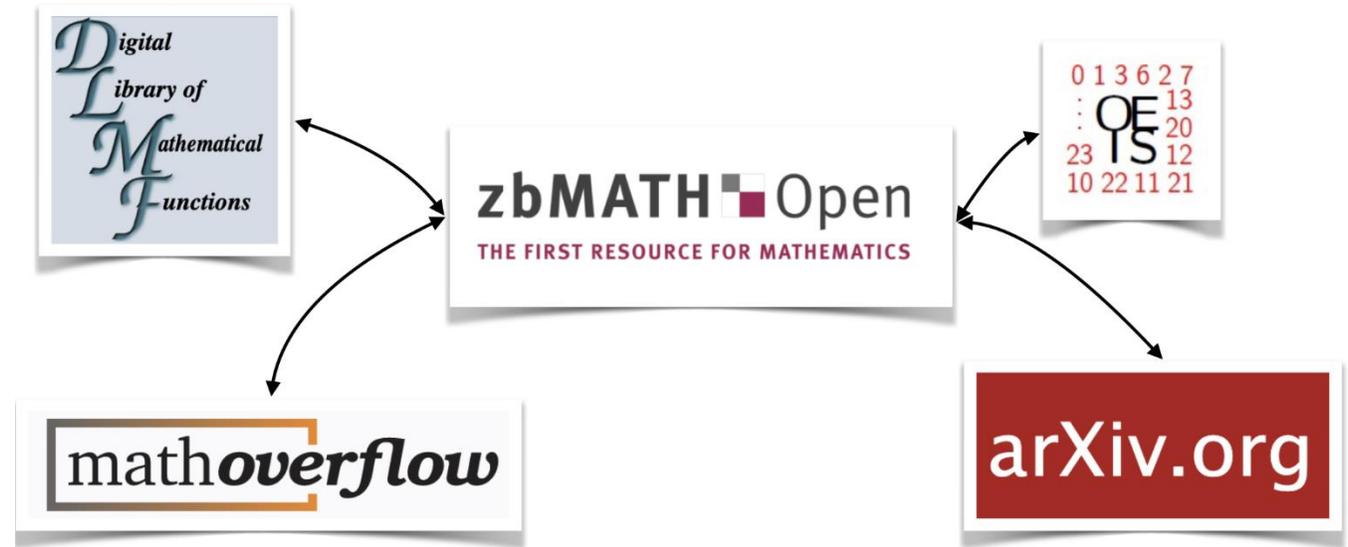
**B. Riemann (1899)** *Elliptische Functionen.* Teubner, Leipzig.

Notes: Based on notes of lectures by B. Riemann edited and published by H. Stahl. Reprinted by UMI Books on Demand (Ann Arbor, MI, USA).  
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# Progress of connected services (IX) – zbMATH Links API

This interlinking is made possible through the zbMATH Links API, currently extended to integrate also services like NIST DLMF, OEIS, ... (see more on DLMF interlinking in next EMS Magazine).

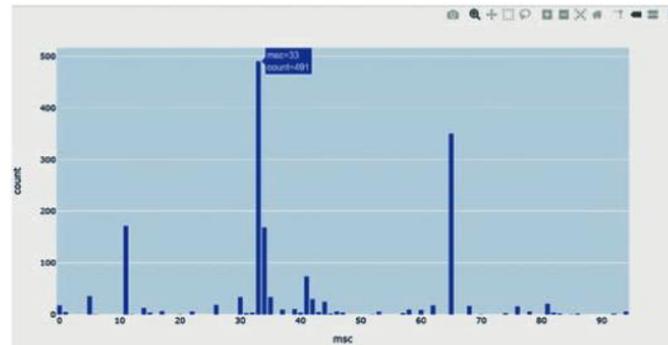
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import pandas as pd
pd.options.plotting.backend = "plotly"
msc = pd.read_json(
    'https://zblink.formulasearchengine.com/links_api/statistics/msc/')
msc = msc.rename(columns={msc.columns[0]: 'msc', msc.columns[1]: 'count'})
msc = msc.set_index('msc')
msc.head(2)

count
msc
33 491
65 351

fig=msc.plot(y='count', kind='bar')
fig.show()
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# Progress of connected services (X) – mathematical software

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Shafai, Bahram

**System identification and adaptive control (to appear).** (English) [Zbl 06210591](#)

New York, NY: Springer (ISBN 978-1-4614-3202-9/hbk; 978-1-4614-3203-6/ebook). 500 p. (2024).

MSC: 93-02 93-01 93C40 62P30

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Loftus, Stephen C.

**Basic statistics with R. Reaching decisions with data.** (English) [Zbl 07308117](#)

Amsterdam: Elsevier/Academic Press (ISBN 978-0-12-820788-8/pbk; 978-0-12-820926-4/ebook). xix, 283 p. (2022).

MSC: 62-02 62C10 62R07 62-08

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Berlin: De Gruyter (ISBN 978-3-11-052605-9/hbk). xx, 300 p. (2022).

MSC: 92-02 92E10 81V55

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**Residues, modularity, and the Cardy limit of the  $4d \mathcal{N} = 4$  superconformal index.** (English) [Zbl 07358165](#)

J. High Energy Phys. 2021, No. 4, Paper No. 216, 44 p. (2021).

MSC: 81E60 70S15 83C57

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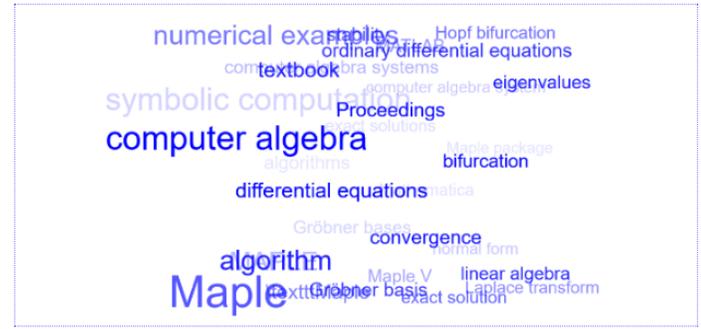
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2. Aslan, Reşat; İzgi, Aydın: Approximation by one and two variables of the Bernstein-Schurer-type operators and associated GBS operators on symmetrical mobile interval (2021)

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