

WDML: THE WORLD DIGITAL MATHEMATICS LIBRARY

**The Evolution of Mathematical Communication in the Age of
Digital Libraries**

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THE GOAL of the WDML

Digitize all past mathematical literature,
link it to the present literature,
and make it clickable.

This is a brief report of its status as of Fall 2006

INITIATORS include

- Bernd Wegner with ZentralblattMath and EMANI and ERAM
 - Keith Dennis with MathSciNet and Euclid
 - Paul Ginsparg with arXiv.org
- among a longer list of early visionaries

The MATH INVENTORY

- 2,300 journals and periodical publications
- 2,000,000 items identified since 1868
- 80,000 additional items per year
(in comparison: 1,500 additional monographs per year)

The Mathematical Legacy

- New science depends critically on old mathematics
 - 50% of current references are to pre-1990 papers
 - 25% to pre-1980

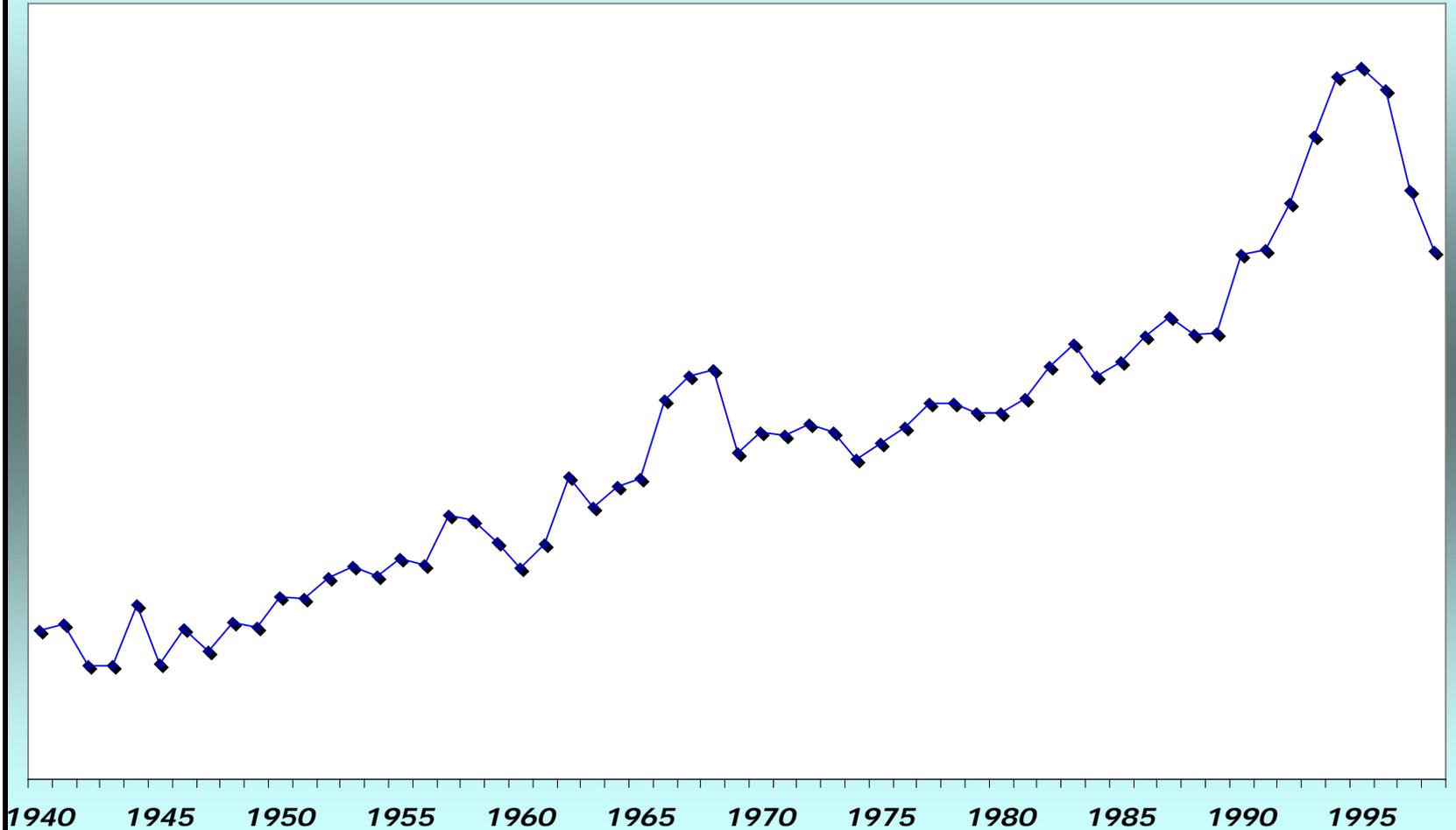


- The literature is the mathematician's genome database



Importance of older math literature

Analysis of 500,000 citations in recent papers



*Proportion of citations referring to a given year, normalized by number of papers published that year

What will the WDML do?

- The World Digital Math Library will bring the enduring mathematical legacy to researchers worldwide.
- This basic mathematical knowledge is key to progress in all science and technology.
- Nobody has the kind of access that will be possible, for all, through the WDML

Impact of Digitization

- Large body of math freely available
- Increasing use of historical materials
- Changing model of scholarly communication
- Global collaboration with trend toward distributed, integrated resource
- Accelerated application of math to respond to challenges in science and engineering

Who will be the users?

- In the years 1992-2002, Math Reviews has treated papers from 223,911 distinct authors in the mathematical sciences
- Currently only a privileged elite have access to the actual material; with the WDML, we move toward universal access
- Infrastructure supporting science of the world to come



WDML Model

- The product:
 - Digitize journals
 - OCR for searching
 - Links in references
- Return material to publishers and libraries, for addition to current collections
- The Proposition: added value for them; free access for the public

Contrast with open access model?

- WDML complements efforts at open access to current literature (“author pays” model)



- Provides free access to **legacy material**
- Encourages publishers to make **older literature freely available** with moving wall

ISSUES

- Content – which material
 - Format –precise standards
 - Metadata –specifying a DTD
 - Copyright – approaching the owners
 - Long-term archiving –costs
 - Interoperability –connect different systems
 - Internationality –prevent harmful rivalry
 - Compatibility –interface with other disciplines
 - Sustainability –adding new literature
-
- Many problems have been solved

STANDARDS

- Some progress made by NSF-funded planning grant
- Ongoing work guided by International Mathematical Union (IMU), through Committee on Electronic Information



BEST PRACTICES

- CEIC Copyright Recommendations

http://www.ceic.math.ca/Publications/Recommendations/7_copyright.shtml

- CEIC Best Current Practice documents

http://www.ceic.math.ca/Publications/Recommendations/3_best_practices.shtml

- CEIC Standards for Retrodigitization

http://www.ceic.math.ca/Publications/Recommendations/retro_best_practices.pdf

User Access

Mathematics has two well-used web portals:

- **MathSciNet**
- **Zentralblatt MATH**
- Integrate new data into these (standards created)



Digital Mathematics Library

- 50 M pages
- Mathematical scholarship highly dispersed, making selection challenging
- 90% under copyright
- Mixture of open source and proprietary formats
- Issues: enduring access; digital preservation
- Benefits for the developing world

SOME DATA

- Math Reviews identifies 1245 math journals or math related serials of some form (reviews ~700 cover to cover)

- Number of math journals published by:

Springer	150	SIAM	13
Elsevier	101	AMS	9
Taylor and Francis	41	EMS	8
Wiley-Blackwell	29 + ?	MAA	4
		LMS	3

What is already digitized

- 211 journal/seminar titles in the Digitization Registry at the Niedersaechsische Staats- und Universitaetsbibliothek Goettingen (as of November 2006) (over 4 M pages).
- 327 journal titles in MathSciNet (as of August 2006).
 - **An estimated 10 M already online**

IMPLEMENTORS include

Hans Becker, Pierre Berard, Jonathan Borwein, Thierry Bouche, Keith Dennis, Teresa Ehling, David Eisenbud, John Ewing, Thomas Fischer, Laurent Guillope, Rolf Jeltsch, Yves Laurent, Ulf Rehmann, Steve Rockey, David Ruddy, Bernd Wegner
(and many others)

Examples of Digitized Journals

- ERAM 30 (estim., free)
- JSTOR 11 (toll) (stopped math digitization)
- Euclid 45 (30 free, 15 toll)
- Numdam 14 (free)
- AMS some free, some toll
- SIAM 13 (toll)
- LMS 3 (toll)

(toll refers to access to legacy material;

numbers refer to Fall 2006;

more digitization projects are coming online soon)

PROBLEMS

(all related to copyright issue)

Three main **types of math publishers**, with differing main priorities:

- commercial publishers (return on capital)
- professional societies (stewardship)
- individual journals or small clusters (distribution)

News items relevant to **pricing** (Fall 2006)

- Topology Editorial Board (Elsevier) resigns Aug 2006 protesting Elsevier pricing policy
- Wiley acquires Blackwell Nov 2006 (high pricing publisher acquires low pricing publisher)
- Bundling Strategy (loss of disciplinary control)

SUMMARY

- Make mankind's mathematical legacy available in clickable form
- Gradually reform math publishing
- Provide model for other science publishing
- Create the library of the future using evolving technology

REFERENCES

- WDML, an IMU website on the subject
<http://www.ceic.math.ca/WDML/index.shtml>
- Best Practices, CEIC Working Group Documents (all under
<http://www.ceic.math.ca/Publications/Recommendations;>
with url's as on slide 14)
- Digital Mathematics Library, Cornell University
<http://www.library.cornell.edu/dmlib/>

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