



Proposal for a  
Forward Look  
on a  
*European Virtual  
Library of Mathematics*

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# The mathematical literature

## Stakes

- Mathematical *validated* literature never becomes obsolete
- Old results are not superseded by newer ones: they are their foundation
- It's valid only as a *whole*, building a wide network of references
- It's useful to other sciences in an *asynchronous* fashion
- It must be carefully archived, indexed and preserved
- It must be accessible over the long term

# The mathematical literature

## The reference library

We thus need a reference library, which should be

- exhaustive
- up-to-date
- well organized
- widely open
- easy to use for non-mathematicians

**Paper** OK? (libraries, ILL, doc. delivery, union catalogs, reviewing DB. . .)

**Electronic** Still a dream! (WDML)

⇒ **EVLML**

# The mathematical literature

## Time scale

- Instant preprint circulation (labs, arXiv, email, home pages)
- Actual publication delayed 1-2 years
- Publication's goals: prestige, attribution, quality rating. . .  
To secure the version of the work suitable for further reference
- About 50% of citations in today's bibliographies are more than 10 years old
- About 25% of citations in today's bibliographies are more than 20 years old

# The mathematical literature

## Size

A rough estimate on the size of the whole corpus of written mathematics in the occidental scientific tradition since Euclid:

- 3 million items were published spanning  $< 100$  million pages
- 100,000 new items appear each year
- $< 20\%$  published before 1900
- $> 50\%$  published after 1950
- 80% journal articles, 10% chapters in collective books, 10% books
- 600 math-only journals alive, 2000 with math articles
- 15 million pages digitised? 65% of core journals available digitally?

# The mathematical E-literature Needs

- Going electronic *should* be a wonderful asset for opening new ways of using the mathematical corpus beyond old boundaries.
- The main infrastructure required would provide the basic features of the reference library, plus e-only add-ons
- This means
  - A global (distributed) facility dedicated to archive newly published or digitised material
  - An up-to-date registry of all available resources
  - Mechanisms for interlinking the holdings with existing and future infrastructures
  - Seamless navigation across the whole corpus

# The mathematical E-literature

## The digital downside

Electronic media has downsides for scholars and librarians

- Costs increase!
- Many new access barriers (copyright, licences, DRMs)
- No standards for interfaces, file formats, etc.
- Mainstream publishing is not adapted to mathematical content. . .
- “Value” is measured by counts (*not* scientific value)

# The mathematical E-literature

## Disorganization

- Many paper items are missing a digital counterpart, *but*
  - Many digital items are duplicated among various providers, *while*
  - Many collections are split across providers, *and*
  - Collection holders are very volatile
- ⇒ Managing an exhaustive and up-to-date access requires zillions of subscriptions, and superhuman monitoring capabilities



# The Virtual Library of Mathematics

## Vision ( $\simeq$ Cornell, 2002)

A reference digital mathematics library should assemble as much as possible of the digital mathematical corpus in order to

- **preserve** it over the long term,
- make it **available online**
- at **reasonable cost**,
- in the form of an **authoritative** and **enduring** digital collection,
- **growing** continuously with publisher supplied new content,
- **augmented** with sophisticated search interfaces and interoperability services,
- developed and curated by a network of **institutions**

# The Virtual Library of Mathematics

## Previous work on coordination

- John Ewing. “Twenty Centuries of Mathematics: Digitizing and Disseminating the Past Mathematical Literature”. *Notices of the AMS*, 49(7):771–777, August 2002.
- Digital Mathematics Library. NSF planning project (2002–2003, Cornell University Library) “toward the establishment of a comprehensive, international, distributed collection of digital information and published knowledge in mathematics”.
- Mathematical Knowledge Management meetings (2001–) + DML workshops (2008–): technical challenges.
- EMS’ EoI to the European Commission (2003), supported pilot implementation proposals to EC programmes (2003–2009: FP6, eContentplus, CIP ICT PSP. . .)
- AMS/MSRI proposal to the Moore foundation (2005)
- IMU support (2002–2006: Vision, Best practices)

# The Virtual Library of Mathematics

## Existing content

**America** JSTOR (260,000 items), project Euclid (100,000), CMS (4,000)

**Asia** DML-JP (30,000 items), China ??

**Europe** EuDML? (190,000 items)

**Germany** ERAM/JFM, GDZ, ELibM (85,000 items)

**France** Gallica-Math, NUMDAM, CEDRAM, TEL (50,000 items)

**Poland** ICM/BWM (13,000 items)

**Portugal** SPM/BNP (2,000 items)

**Spain** DML-E (5,000 items)

**Czech Rep.** DML-CZ (11,000 items)

**Russia** RusDML (13,000 items)

**Bulgaria** BulDML (2,500 items)

**Serbia** No formalised project (3,700 items)

**Switzerland** SwissDML (5,000 items)

**Commercial** 700,000 items?

**Small/medium** CUP 20 journals, OUP 30, Hindawi 18, WdG 13, Wiley 42, T&F 58. . .

**Elsevier** 4 journals in NUMDAM, 63 in Backfiles, 100 alive (320,000 items)

**Springer** 14 journals in GDZ, 1+2 in NUMDAM, 120 in Online Archives,  
179 alive (300,000 items)

# *The Virtual Library of Mathematics*

## *What remains to be done?*

- Give up the world-wide top-down approach to the effort
- Identify a core group of stakeholders with different backgrounds willing to go ahead
- Learn from success stories of existing projects and generalise them
- Call the scientific community to support and help shape the effort
- Define balanced, inclusive policies for an ever-growing sustainable infrastructure
- Get much better return on investment for Research organizations through European momentum
- Give a new impetus to research communities in Digital libraries and Mathematical knowledge management to design a much more powerful yet reliable research environment

# The European Virtual Library of Mathematics

## Forward Look proposal: Outline

**Committee** European Mathematical Society's Electronic Publishing Committee:  
Pavel EXNER (EC liaison), Ulf REHMANN (Chair), Brian DAVIES (Vice-chair)  
Thierry BOUCHE, Keith DENNIS, Enrique MACÍAS VIRGÓS,  
Jiří RÁKOSNIK, José Francisco RODRIGUES

**Stakeholders** Funding organisations, learned societies, (digital) libraries, publishers (independent, society, not-for-profit, commercial), information service providers and technical consultants

**Work plan** A one year long consultation of stakeholders, aimed at designing a working model and implementation plan for the EVLM.  
2 working groups will develop policy recommendations from users and content providers.  
2 working groups will investigate the technical challenges involved.

# *The European Virtual Library of Mathematics*

## *Forward Look proposal: Working groups*

### **WG1 Content providers policies**

Formulate balanced policies for sharing mathematical content and metadata among a critical mass of stakeholders, long term preservation, reasonably open accessibility to the digital mathematical corpus.

### **WG2 Technical challenges**

#### **A. Architecture design**

Network infrastructure interoperability model.

Estimation of recurrent work load and resources needed.

#### **B. Semantic-oriented Web for the mathematical literature**

Identification of state-of-the-art techniques, and yet unsolved problems whose solution could effect a paradigmatic shift, for accessibility or usability of mathematical content.

### **WG3 User panel**

Survey on current mathematical web usability and usage. Identification of some key impeding factors and recommendations to overcome them.