Ongoing Work on a

European Virtual Library of Mathematics

General presentation

Thierry Bouche

Cellule MathDoc & institut Fourier,
Université de Grenoble

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Math literature
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Math E-literature
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DML
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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- Old results are not superseded by newer ones: they are their foundation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)

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

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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

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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)

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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

$\implies$ Managing an exhaustive and up-to-date access requires zillions of subscriptions, and superhuman monitoring capabilities

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The Virtual Library of Mathematics
Vision ($\simeq$ Cornell, 2002)

A reference digital mathematics library should asemble 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

Challenge: define the hilighted terms in such a way that a sufficient diversity of stakeholders representing a critical mass commit themselves to the envisioned effort.

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)

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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