

Simplified Metadata

(To facilitate access to the digitized literature through Math Reviews and Zentralblatt)

Preamble

The nature of these "standards" has been misunderstood, largely because the original title (which referred to general standards) was misleading. The letter soliciting comments provided more explanation. It read in part:

We are writing to solicit your comments about some new proposed standards. As more and more of the past mathematical literature is digitized and made available online, it is increasingly important to integrate this material into the existing literature. One way to do this is to add the bibliographic material and associated links to the two reviewing databases, Math Reviews and Zentralblatt. In order to do this, those databases have jointly proposed standards for the metadata that will make it easy to add this information to the databases now and in the future.

The letter and the standards themselves should have specified more clearly what was being proposed, that is, the standards were meant to create a simple way to transfer data from digitization projects to Zentralblatt and Math Reviews. The purpose was to use these databases to search for and then access digitized articles. The revised draft standards now contain a more explicit statement of this goal, making it clear that the standards specify "transferable metadata," which is *derived* from the full metadata.

Reaching agreement on standards for complete metadata that encompasses *all* digitization projects is an enormous task — one that should involve representatives from across the community. The draft standards serve a much narrower purpose, aimed specifically at transferring useful data to the two major reviewing journals in mathematics. While this will affect the more general standards, these narrower standards are largely a matter of practicality. We hope to find a way to make the digitization projects available to a large portion of the mathematics community as quickly as possible.

Introduction

A number of different projects are underway to digitize major parts of the past mathematical research literature. For example, complete journal runs of some important mathematics journals, some going back to the nineteenth century, have been digitized by JSTOR, NUMDAM, and GDZ-Göttingen. The problem of integrating this material into the entire body of mathematical literature is described in a recent article by Allyn Jackson:

As helpful as resources like JSTOR, NUMDAM, and WDMML-Göttingen are, mathematicians do not want to have to stop and remember whether a particular journal is on this or that server. What is needed is some kind of centralized access. One natural idea, which was discussed at the Göttingen meeting, is to add the necessary links to the two main bibliographic databases, MathSciNet and Zentralblatt MATH. In fact, this has already begun to happen. For example, for any paper that has been reviewed in MR and is available on JSTOR, MR has added links. ... Similarly, links have been added from Zentralblatt MATH and from the *Jahrbuch* reviewing journal (which has been retrodigitized and is available online) to the materials available on WDMML-Göttingen. At the Göttingen meeting, there was an enthusiastic consensus that such linking should be expanded as much as possible. **During the meeting a small group of representatives from MR, Zentralblatt, and some retrodigitization projects agreed to confer on developing technical standards to facilitate this linking.**

Allyn Jackson, "The digital mathematics library", Notices Amer. Math. Soc. 50 (2003), no.8, 918–923.

This document proposes technical standards for the metadata (bibliographic data) that can be used to facilitate that linking.

These are *not* standards for the metadata associated to each project; setting those standards will be a much more difficult task. The "transferable metadata" needed by Zentralblatt and Mathematical Reviews must be *derived* from the more complete metadata associated to the individual projects. Of course, any standards for the transferable metadata will place constraints on the final standards for the more complete metadata. For that reason, the standards have to be simple and at the same time flexible. The transferred metadata have to provide enough information for adequate searching, but they should not be so complete that small projects are unable to derive the information. The standards below attempt to strike that balance.

Bibliographic data for items

For bibliographic data, use

- BibTeX, with mathematics and accents TeX encoded, or
- xmlbibtex, an equivalent XML schema.

There are several reasons for choosing BibTeX:

- It is a style of markup that is well known and has a long history among mathematicians.
- It is an elegant format for capturing bibliographic data about research mathematics.
- Within MathSciNet and Zentralblatt MATH any item already in the database can be displayed in BibTeX format. There are also some free tools for creating the bibliographic data in BibTeX format for items.

Those sites that are more XML oriented should use `xmlbibtex`, which is a direct translation of the BibTeX format into XML. An XML schema for creating data in XML is provided.

Here, the specification is given for journal articles only. Another advantage of BibTeX is that the specification can be readily extended to Books and Collections; this will be done in the near future.

There are three appendices to this document:

- a simple [XML schema](#), which describes and can be used to validate the XML files
- an example in [BibTeX format](#)
- an example in [XML format](#)

The examples are drawn from retrodigitization projects at NUMDAM, JSTOR, GDZ-Göttingen, and the Biblioteka Wirtualna Matematyki in Poland.

Specification for Journal articles

For journal articles (`entry_type=article`) the following fields will be used. Optional fields are marked and should be filled in when data are available. Other fields are allowed but will not be parsed.

AUTHOR: required

One or more author names, last name first, connected by ‘and’, such as “Brelot, Marcel and Choquet, Gustave”, as they appear on the title page.

TITLE: required

The title of the item as it appears on the title page.

JOURNAL: optional

An abbreviation for the journal name; it is recommended that the MR or ZBL abbreviation be used.

FJOURNAL: required

Full name of journal as it appears on the title page of the journal.

VOLUME; optional

The volume number; this may include multiple volume numbers, such as “34/35”.

YEAR: required

The year of publication; this may include multiple years, such as “1938-39”.

NUMBER: optional

The issue number; this may include multiple issues such as “2-3”.

PAGES: required

The paging string; this may include ranges such as ‘1–23’ or more complicated strings “xi–xii, 26–76”.

ISSN: optional

The International Standard Serial Number; this may include hyphens.

URL: required

The web location of this item.

NOTE: optional

For notes or miscellaneous information.

MRID: optional

The identifier used in MathSciNet.

ZBLID: optional

The identifier used in Zentralblatt MATH.

JFMID: optional

The identifier used in Jahrbuch über die Fortschritte der Mathematik (JFM).

An example

Hall, Marshall The position of the radical in an algebra. Trans. Amer. Math. Soc. 48 (1940), 391--404. [MR0002855](#); [Zbl 0025.39102](#)

In BibTeX

```
@article{
  AUTHOR = {Hall, Marshall},
  TITLE = {The position of the radical in an algebra},
  JOURNAL = {Trans. Amer. Math. Soc.},
  FJOURNAL = {Transactions of the American Mathematical Society},
  VOLUME = {48},
  YEAR = {1940},
  PAGES = {391--404},
  URL = {http://links.jstor.org/sici?sici=0002-
```

```

          947%28194011%2948%3A3%3C391%3ATPOTRI%3E2.0.CO%3B2-Q},
NOTE = {a straight-forward example},
MRID = {MR0002855},
ZBLID = {Zbl 0025.39102}
    }

```

In xmlbibtex

```

<bibitem entry_type="article">
  <author>Hall, Marshall</author>
  <title>The position of the radical in an algebra</title>
  <journal>Trans. Amer. Math. Soc.</journal>
  <fjournal>Transactions of the American Mathematical Society</fjournal>
  <volume>48</volume>
  <year>(1940)</year>
  <pages>391--404</pages>
  <url>http://links.jstor.org/sici?sici=0002-
947%28194011%2948%3A3%3C391%3ATPOTRI%3E2.0.CO%3B2-Q</url>
  <note>a straight-forward example</note>
</bibitem>

```

Item URLs

To facilitate linking to the digitized original, the item URL should be bibliographically derivable. That is, it should be based on a pattern including sufficient bibliographic elements to uniquely identify the item. Those elements include a base URL, an ISSN or journal identifier, volume, issue, year, initial page. Interleaved fixed strings are permissible.

For example, linking to items created by NUMDAM is based on the publication year, the volume number and the initial page. For the NUMDAM example

Poulsen, Ebbe Thue
 A simplex with dense extreme points. (English. French summary)
 Ann. Inst. Fourier. Grenoble 11, 1961, 83--87, XIV.

the URL is http://www.numdam.org/item?id=AIF_1961__11__83_0

The elements that make up the URL are:

http://www.numdam.org/item?id=.....	{base URL}
AIF	{journal id}
1961.....	{year}
11.....	{volume}
83.....	{initial page}
0.....	{fixed string}

Another bibliographically derivable system for URLs is used by the Institute of Physics for the Journal of High Energy Physics. For the IOP example

S. Hyun, S. and Park, S. D.
5D action for longitudinal five branes on a pp-wave
J. High Energy Phys. 2002, no. 11, 001, 18 pp.

The URL is <http://www.iop.org/EJ/abstract/1126-6708/2002/11/001>

The elements that make up the URL are:

http://www.iop.org/EJ/abstract	{base URL}
1126-6708	{ISSN}
2002.....	{year}
11.....	{number}
001.....	{first number in paging}

Each of these cases allows the creation of a simple rule to generate item links to that site.

Proposed May 2004
Jane Kister, Math Reviews
Bernd Wegner, Zentralblatt

Appendix 1: An XML Schema

```

element biblist {

# =====
#     American Mathematical Society, biblist
#
#     Describing journal article entries
#     A Relax NG Compact Schema literally corresponding to BibTeX
#
#     Created by:     Drew Burton                drb@ams.org
# =====

  element bibitem {
    attribute entry_type { text } ,
    element author { text } ,
    element title { text } ,
    element journal { text }?,
    element fjournal { text } ,
    element volume { text } ? ,
    element year { text } ,
    element number { text } ? ,
    element pages { text } ,
    element issn { text } ? ,
    element url { text } ,
    element note { text } ?,
    element mrid { text } ?,
    element zblid { text } ?,
    element jfmid { text } ?
  }+
}

```

Appendix 2: An example in BibTeX

```

@article {
  AUTHOR = {Birkhoff, Garrett},
  TITLE = {On the combination of topologies},
  JOURNAL = {Fund. Math.},
  FJOURNAL = {Polska Akademia Nauk. Fundamenta Mathematicae},
  VOLUME = {26},
  YEAR = {1936},
  PAGES = {156--166},
  ISSN = {0016-2736},
  URL = {http://matwbn.icm.edu.pl/ksiazki/fm/fm26/fm2616.pdf},
  NOTE = {Polish site; a straight-forward example},
  ZBLID = {Zbl 0014.28002},
}
@article {
  AUTHOR = {Brunner, Otto},
  TITLE = {Weiterer Untersuchungen \ "uber die kubische diophantische
Gleichung  $z^3 - y^2 = D$ .},
  JOURNAL = {Comment. Math. Helv.},
  FJOURNAL = {Commentarii Mathematici Helvetici},
  VOLUME = {7},
  YEAR = {1934/35},
  PAGES = {67--79},
  ISSN = {0010-2571},
  URL =
{http://134.76.163.65/servlet/digbib?template=view.html&id=169830&start
page=71&endpage=84&image-path=http://134.76.176.141/cgi-
bin/letgifsfly.cgi&image-subpath=/4319&image-
subpath=4319&pagenumber=71&imageset-id=4319},
  NOTE = {G"ottingen site; notice the math representation in the
title; multiple years of publication},
  ZBLID = {Zbl 0009.39603}
}
@article {
  AUTHOR = {Fresnel, Jean},
  TITLE = {Nombres de {B}ernoulli et fonctions  $\{L\}$   $\{p\}$ -adiques},
  JOURNAL = {Ann. Inst. Fourier (Grenoble)},
  FJOURNAL = {Universit\ 'e de Grenoble. Annales de l'Institut Fourier},
  VOLUME = {17},
  YEAR = {1967},
  NUMBER = {fasc. 2},
  PAGES = {281--333},
  ISSN = {0373-0956},
  URL = {http://www.numdam.org/item?id=AIF_1967__17_2_281_0},
  NOTE = {NUMDAM; notice the text in the issue number},
  MRID = {MR0224570},
  ZBLID = {Zbl 0157.10302}
}
@article {
  AUTHOR = {Natanson, W\l.},
  TITLE = {Study nad prawem Clerk-Maxwell'a},
  JOURNAL = {Prace Mat.-Fiz.},
  FJOURNAL = {Prace matematyczno-fizyczne},

```

DRAFT 4.0

```

VOLUME = {1},
YEAR = {1888},
PAGES = {26--45},
URL = {http://matwbn.icm.edu.pl/ksiazki/pmf/pmf01/pmf0103.pdf},
NOTE = {Polish site}
}
@article {
AUTHOR = {Laguerre},
TITLE = {Sur la représentation sur un plan de la surface du
troisi\`eme
ordre qui est a
r\`eciproque de la surface de Steiner},
JOURNAL = {Bull. Soc. Math. France},
FJOURNAL = {Bulletin de la Soci\`et\`e Math\`ematique de France},
VOLUME = {1},
YEAR = {1872-1873},
PAGES = {21--27},
URL = {http://archive.numdam.org/item?id=BSMF_1872-
1873__1__21_0},
NOTE = {NUMDAM; multiple years}
}
@article {
AUTHOR = {L\"uroth, J.},
TITLE = {Einige Eigenschaften einer gewissen Gattung von Curven
vierter
Ordnung},
JOURNAL = {Math. Ann.},
FJOURNAL = {Mathematische Annalen},
VOLUME = {1},
YEAR = {1869},
NUMBER = {1. Heft},
PAGES = {37--53},
URL =
{http://134.76.163.65/servlet/digbib?template=view.html&id=25926&startp
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bin/letgifsfly.cgi&image-subpath=/1338&image-
subpath=1338&pagenumber=44&imageset-id=1338},
NOTE = {G\`ottigen site; from first issue of Math. Ann.}
}
@article {
AUTHOR = {Hall, Asaph},
TITLE = {The determination of the mass of a planet from the rela-
tive position of two satellites},
JOURNAL = {Ann. of Math.},
FJOURNAL = {Annals of Mathematics},
VOLUME = {1},
YEAR = {1884},
NUMBER = {1},
PAGES = {1--4},
URL = {http://links.jstor.org/sici?sici=0003-
486X%28188403%291%3A1%3A1%3C1%3ATDOTMO%3E2.0.CO%3B2-N},
NOTE = {JSTOR; the beginning of Ann. of Math.},
MRID = {MR1502000},
JFMID = {JFM 16.1110.02}
}
@article {
AUTHOR = {White, Henry S.},

```

DRAFT 4.0

```

    TITLE = {Conics and cubics connected with a plane cubic by certain
covariant relations},
    JOURNAL = {Trans. Amer. Math. Soc.},
    FJOURNAL = {Transactions of the American Mathematical Society},
    VOLUME = {1},
    YEAR = {1900},
    NUMBER = {1},
    PAGES = {1--8},
    URL = {http://links.jstor.org/sici?sici=0002-
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    NOTE = {JSTOR; the first item in Trans. Amer. Math. Soc},
    MRID = {MR1500517},
    JFMID = {JFM 31.0589.01}
}
@article {
    AUTHOR = {Weber, H.},
    TITLE = {\ "Uber die Integration der partiellen Differential-
gleichung: $\frac{d^2 u}{dx^2} + \frac{d^2 u}{dy^2} + k^2 u = 0$},
    JOURNAL = {Math. Ann.},
    FJOURNAL = {Mathematische Annalen},
    VOLUME = {1},
    YEAR = {1869},
    PAGES = {1--36},
    URL =
{http://134.76.163.65/servlet/digbib?template=view.html&id=25925&startp
age=8&endpage=43&image-path=http://134.76.176.141/cgi-
bin/letgifsfly.cgi&image-subpath=/1338&image-
subpath=1338&pagenumber=8&imageset-id=1338},
    NOTE = {Goettingen site; note the math in the title;the beginning
of Math. Ann.}
}

```

Appendix 3: An example in XML

```

- <biblist>
- <bibitem entry_type="article">
  <author>Birkhoff, Garrett</author>
  <title>On the combination of topologies</title>
  <journal>Fund. Math.</journal>
  <fjournal>Polska Akademia Nauk. Fundamenta Mathematicae</fjournal>
  <volume>26</volume>
  <year>1936</year>
  <pages>156--166</pages>
  <issn>0016-2736</issn>
  <url>http://matwbn.icm.edu.pl/ksiazki/fm/fm26/fm2616.pdf</url>
  <note>Polish site; a straight-forward example</note>
  <zblid>Zbl 0014.28002</zblid>
  </bibitem>
- <bibitem entry_type="article">
  <author>Brunner, Otto</author>
  <title>Weiterer Untersuchungen über die kubische diophantische Gleichung
     $z^3 - y^2 = D.$ </title>
  <journal>Comment. Math. Helv.</journal>
  <fjournal>Commentarii Mathematici Helvetici</fjournal>
  <volume>7</volume>
  <year>1934/35</year>
  <pages>67--79</pages>
  <issn>0010-2571</issn>

  <url>http://134.76.163.65/servlet/digbib?template=view.html&id=169830
    &startpage=71&endpage=84&image-path=http://134.76.176.141/cgi-
    bin/letgifsfly.cgi&image-subpath=/4319&image-
    subpath=4319&pagenumber=71&imageset-id=4319</url>
  <note>Göttingen site; notice the math representation in the title; multiple
    years of publication</note>
  <zblid>Zbl 0009.39603</zblid>
  </bibitem>
- <bibitem entry_type="article">
  <author>Fresnel, Jean</author>
  <title>Nombres de Bernoulli et fonctions L p-adiques</title>
  <journal>Ann. Inst. Fourier (Grenoble)</journal>
  <fjournal>Université de Grenoble. Annales de l'Institut Fourier</fjournal>
  <volume>17</volume>
  <year>1967</year>
  <number>fasc. 2</number>
  <pages>281--333</pages>
  <issn>0373-0956</issn>
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  <note>NUMDAM; notice the text in the issue number</note>
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- <zblid>**Zbl 0157.10302**</zblid>
 </bibitem>
- = <bibitem entry_type="article">
 <author>**Natanson, W.**</author>
 <title>**Study nad prawem Clerk-Maxwell'a**</title>
 <journal>**Prace Mat.-Fiz.**</journal>
 <fjournal>**Prace matematyczno-fizyczne**</fjournal>
 <volume>**1**</volume>
 <year>**1888**</year>
 <pages>**26--45**</pages>
 <url>**<http://matwbn.icm.edu.pl/ksiazki/pmf/pmf01/pmf0103.pdf>**</url>
 <note>**Polish site**</note>
 </bibitem>
- = <bibitem entry_type="article">
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 <title>**Sur la représentation sur un plan de la surface du troisième ordre qui est
 a réciproque de la surface de Steiner**</title>
 <journal>**Bull. Soc. Math. France**</journal>
 <fjournal>**Bulletin de la Société Mathématique de France**</fjournal>
 <volume>**1**</volume>
 <year>**1872-1873**</year>
 <pages>**21--27**</pages>
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 <author>**Lüroth, J.**</author>
 <title>**Einige Eigenschaften einer gewissen Gattung von Curven vierter Ord-
 nung**</title>
 <journal>**Math. Ann.**</journal>
 <fjournal>**Mathematische Annalen**</fjournal>
 <volume>**1**</volume>
 <year>**1869**</year>
 <number>**1. Heft**</number>
 <pages>**37-53**</pages>
- <url>**[http://134.76.163.65/servlet/digbib?template=view.html&id=25926
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 subpath=1338&pagenumber=44&imageset-id=1338](http://134.76.163.65/servlet/digbib?template=view.html&id=25926&startpage=44&endpage=60&image-path=http://134.76.176.141/cgi-bin/letgifsfly.cgi&image-subpath=/1338&image-subpath=1338&pagenumber=44&imageset-id=1338)**</url>
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 <author>**Hall, Asaph**</author>
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 <volume>**1**</volume>
 <year>**1884**</year>

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<pages>1--4</pages>
<url>http://links.jstor.org/sici?sici=0003-
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<note>JSTOR; the beginning of Ann. of Math.</note>
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<jfmid>JFM 16.1110.02</jfmid>
  </bibitem>
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  <author>White, Henry S.</author>
  <title>Conics and cubics connected with a plane cubic by certain covariant
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  <journal>Trans. Amer. Math. Soc.</journal>
  <fjournal>Transactions of the American Mathematical Society</fjournal>
  <volume>1</volume>
  <year>1</year>
  <number>1</number>
  <pages>1--8</pages>
  <url>http://links.jstor.org/sici?sici=0002-
    9947%28190001%291%3A1%3C1%3ACACCWA%3E2.0.CO%3B2-M</url>
  <note>JSTOR; the first item in Trans. Amer. Math. Soc.</note>
  <mrid>MR1500517</mrid>
  <jfmid>JFM 31.0589.01</jfmid>
    </bibitem>
- <bibitem entry_type="article">
  <author>Weber, H.</author>
  <title>Über die Integration der partiellen Differentialgleichung:  $\partial^2 u / \partial x^2 +$ 
     $\partial^2 u / \partial y^2 + k^2 u = 0$ </title>
  <journal>Math. Ann.</journal>
  <fjournal>Mathematische Annalen</fjournal>
  <volume>1</volume>
  <year>1869</year>
  <pages>1--36</pages>

  <url>http://134.76.163.65/servlet/digbib?template=view.html&#38;id=25
    925&#38;startpage=8&#38;endpage=43&#38;image-
    path=http://134.76.176.141/cgi-bin/letgifsfly.cgi&#38;image-
    subpath=/1338&#38;image-
    subpath=1338&#38;pagenumber=8&#38;imageset-id=1338</url>
  <note>Göttingen site; note the math in the title; the first item of Math.
    Ann.</note>
  </bibitem>
</biblist>

```