The CellML Metadata 1.0 Specification

Working Draft - 2 November 2001

5 Citations

5.1 Introduction

The BQS data model draws extensively from the [Dublin Core metadata element set](1)[1]. Therefore, the RDF serialization of these elements is used wherever possible. The following sections define the CellML recommended RDF serialization of the **DSLSRBibObjects** Module from [OMG's Bibliographic Query Service Draft Specification](2)[2].

5.2 The **BibliographicReference** Class

The **BibliographicReference** class is the root class for all reference information. It is represented in RDF by the **<bqs:reference>** element. This element creates a reference resource. All further content of this element provides metadata about the reference resource itself.

5.2.1 The **identifier** attribute

The **identifier** attribute on the **BibliographicReference** class provides a way to identify a cited reference using a database identifier (such as a Medline UI) instead of by providing the complete reference details.

The CellML Metadata Specification recommends the use of the following databases:

- **Medline** for the identifier that is common to all implementations of the Medline database.
- **PubMed** for the identifier used only by the PubMed implementation of the Medline database.
- **CAS** for the identifier used by the Chemical Abstract Service database.

The BQS data model uses a structured string to store the identifier data. The first part of this string indicates the kind of identifier being used (i.e., "Medline"). The second part of the string provides the actual identifier (i.e., "9067300"). The two parts of the string are separated by a slash ("/").

RDF does not allow us to enforce the structured string format of the identifier attribute. However, as Figure 25 shows, this data can still be serialized into RDF using separate database elements: **<bqs:Medline_id>**, **<bqs:PubMed_id>**, and **<bqs:CAS_id>**. To reference a resource not listed above, an **rdf:resource** attribute with a URI value identifying the resource may be placed on a **<dc:identifier>** element.

5.2.2 The **cross_references** attribute

The **cross_references** attribute on the **BibliographicReference** class is intended to store alternative identifers for the reference represented by the contents of the identifier attribute. This can be represented by the use of a second database identifier element qualified by a nested **<bqs:alternative>** element, as shown in Figure 26.

---

[1]http://dublincore.org/documents/dces/
[2]http://www.omg.org/cgi-bin/doc?lifesci/00-99-14.pdf

```xml
<rdf:RDF
    xmlns:bqs="http://www.cellml.org/bqs/1.0#"
    xmlns:dc="http://purl.org/dc/elements/1.1/"
    xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#">

  <rdf:Description rdf:about="#cellml_element_id">
    <bqs:reference>
      <bqs:Medline_id>97219925</bqs:Medline_id>
    </bqs:reference>
  </rdf:Description>
</rdf:RDF>
```

FIGURE 25: Serialization of the **BibliographicReference** class's **identifier** attribute.

```xml
<rdf:RDF
    xmlns:bqs="http://www.cellml.org/bqs/1.0#"
    xmlns:dc="http://purl.org/dc/elements/1.1/"
    xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#">

  <rdf:Description rdf:about="#cellml_element_id">
    <bqs:reference rdf:parseType="Resource">
      <bqs:Medline>97219925</bqs:Medline>
      <bqs:PubMed>
        <bqs:alternative>9067300</bqs:alternative>
      </bqs:PubMed>
    </bqs:reference>
  </rdf:Description>
</rdf:RDF>
```

FIGURE 26: The reference information in Figure 25 is extended to include a cross reference. This cross reference provides the PubMed identifier for the same reference.

5.2.3 The type attribute

The **type** attribute on the **BibliographicReference** class identifies the "genre" of the cited resource. The BQS data model provides constructs for the following types of references:

- "Article" (subclassed into "JournalArticle", for journal articles, and "BookArticle", for book chapters).

- "Book"

- "Patent"

- "Proceeding"

- "TechReport" (note that this can be used for unpublished reports)

- "Thesis"

- "WebResource"

Note that it is possible to create additional types of references using the BQS data model. The basic information would be provided by the **BibliographicReference** class. Information specific to the new type of reference would need to be provided as a subclass by the person wishing to create the new reference type.

Each of the above genres is given its own element inside the **bqs** namespace. Figure 27 shows the use of the **<bqs:JournalArticle>** element.

```
<rdf:RDF
    xmlns:bqs="http://www.cellml.org/bqs/1.0#"
    xmlns:dc="http://purl.org/dc/elements/1.1/"
    xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#">

  <rdf:Description rdf:about="#cellml_element_id">
    <bqs:JournalArticle rdf:parseType="Resource">

      ...

    </bqs:JournalArticle>
  </rdf:Description>
</rdf:RDF>
```

FIGURE 27: Serialization of reference type information using type=JournalArticle as an example. See text for more info. The description of a journal article is left out for the time being.

5.2.4 The title attribute

The title attribute on the **BibliographicReference** class is used to store the title of the resource being referenced. For instance, if the referenced resource is a book chapter, the title metadata would be the title of the chapter.

The title metadata is identified with the Dublin Core **<dc:title>** element, as shown in Figure 28. Note that an **xml:lang** attribute could be used to indicate the language of the title.

```
<rdf:RDF
    xmlns:bqs="http://www.cellml.org/bqs/1.0#"
    xmlns:dc="http://purl.org/dc/elements/1.1/"
    xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#">

  <rdf:Description rdf:about="#cellml_element_id">
    <bqs:reference rdf:parseType="Resource">
      <dc:title>
         Inhibition of cardiac potassium currents by the vesnarinone
         analog OPC-18790: comparison with quinidine and dofetilide
      </dc:title>
    </bqs:reference>
  </rdf:Description>
</rdf:RDF>
```

FIGURE 28: Serialization of reference title information.

5.2.5 The **rights** attribute

The **rights** attribute on the **BibliographicReference** class provides information about the rights over the cited resource. This attribute would typically contain either a statement of the rights, or a reference to a resource (such as a web page) that states the rights. Rights information may include intellectual property rights and copyrights. No assumptions can be made about the rights on the resource in the absence of this attribute.

This rights attribute maps directly to the Dublin Core **<dc:rights>** element. The serialization is shown in Figure 29.

```
<rdf:RDF
    xmlns:bqs="http://www.cellml.org/bqs/1.0#"
    xmlns:dc="http://purl.org/dc/elements/1.1/"
    xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#">

  <rdf:Description rdf:about="#cellml_element_id">
    <bqs:reference rdf:parseType="Resource">
      <dc:rights>Physiome Sciences, 2001</dc:rights>
    </bqs:reference>
  </rdf:Description>
</rdf:RDF>
```

FIGURE 29: Serialization of reference rights information.

5.2.6 The **language** attribute

The **language** attribute on the **BibliographicReference** class defines the language of the cited resource. The CellML development team, as well as the BQS data model, recommends using the RFC1766 encoding

scheme for this information. Language metadata can be stored using the qualified Dublin Core language qualifier **`<dcq:RFC1766>`** element, as shown in Figure 30.

```
<rdf:RDF
    xmlns:bqs="http://www.cellml.org/bqs/1.0#"
    xmlns:dcq="http://purl.org/dc/terms/"
    xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#">

  <rdf:Description rdf:about="#cellml_element_id">
    <bqs:reference>
      <dcq:RFC1766>en-uk</dcq:RFC1766>
    </bqs:reference>
  </rdf:Description>
</rdf:RDF>
```

FIGURE 30: Serialization of language information. This metadata indicates the content of the cited resource is written in United Kingdom English.

5.2.7 The **format** attribute

The **format** attribute on the **BibliographicReference** class describes the "physical or digital manifestation of the cited resource". The value of this attribute will depend heavily on the reference type. For instance, a web resource reference might have format values of `application/pdf` or `text/html`. This serialization of the BQS data model will not attempt to extend the values of this attribute beyond what is provided by the Dublin Core.

The Dublin Core recommends using the Internet Media Type (IMT) encoding scheme for formats, commonly called MIME types. A list of these types[3] is provided by the Information Sciences Institute at the University of Southern California. The format metadata is serialized using the qualified Dublin Core format qualifier **`<dcq:medium>`** element, which is further qualified with a nested **`<dcq:IMT>`**, as shown in Figure 31.

5.2.8 The **date** attribute

The **date** attribute on the **BibliographicReference** class "defines a date associated with an event in the life cycle of the cited resource". For public resources, this should be the publication date. For private resources (such as unpublished technical reports), this should be the creation date.

Date metadata can be stored in a date-qualified Dublin Core element, as shown in Figure 32.

5.2.9 The **authors** attribute

The **authors** attribute stores information about the authors of the cited reference. Its value is an instance of the **Provider** class. The serialization of this class is discussed in Section 5.3. If there is more than one author for the reference, the BQS data model requires that these authors be stored in an ordered list.

The **authors** attribute can be serialized using the Dublin Core **`<dc:creator>`** element. Multiple authors can be stored in an **`<rdf:Seq>`** container, which creates an ordered list.

Figure 33 demonstrates how to store author metadata. All of the authors are people.

---

[3]http://www.isi.edu/in-notes/iana/assignments/media-types/media-types

```
<rdf:RDF
    xmlns:bqs="http://www.cellml.org/bqs/1.0#"
    xmlns:dcq="http://purl.org/dc/terms/"
    xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#">

  <rdf:Description rdf:about="#cellml_element_id">
    <bqs:reference>
      <dcq:medium>
        <dcq:IMT>application/pdf</dcq:IMT>
      </dcq:medium>
    </bqs:reference>
  </rdf:Description>
</rdf:RDF>
```

FIGURE 31: Serialization of format information. This metadata indicates the content of the cited resource is in the PDF format.

```
<rdf:RDF
    xmlns:bqs="http://www.cellml.org/bqs/1.0#"
    xmlns:dc="http://purl.org/dc/elements/1.1/"
    xmlns:dcq="http://purl.org/dc/terms/"
    xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#">

  <rdf:Description rdf:about="#cellml_element_id">
    <bqs:reference rdf:parseType="Resource">
      <dcq:issued>
        <dcq:W3CDTF>1997</dcq:W3CDTF>
      </dcq:issued>
    </bqs:reference>
  </rdf:Description>
</rdf:RDF>
```

FIGURE 32: Serialization of date information. This metadata indicates the cited resource was published in 1997 (note that the W3C-DTF encoding allows full dates, month/year dates, and year-only dates).

```
<rdf:RDF
    xmlns:bqs="http://www.cellml.org/bqs/1.0#"
    xmlns:dc="http://purl.org/dc/elements/1.1/"
    xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
    xmlns:vCard="http://www.w3.org/2001/vcard-rdf/3.0#">

  <rdf:Description rdf:about="#cellml_element_id">
    <bqs:reference rdf:parseType="Resource">
      <dc:creator>
        <rdf:Seq>
          <rdf:li>
            <bqs:Person rdf:parseType="Resource">
              <vCard:N rdf:parseType="Resource">
                <vCard:Family>Yang</vCard:Family>
                <vCard:Given>T</vCard:Given>
              </vCard:N>
              <vCard:EMAIL rdf:parseType="Resource">
                <rdf:value>phoney@nowhere.com</rdf:value>
                <rdf:type rdf:resource="http://imc.org/vCard/3.0#internet" />
              </vCard:EMAIL>
            </bqs:Person>
          </rdf:li>
          <rdf:li>
            <bqs:Person rdf:parseType="Resource">
              <vCard:N rdf:parseType="Resource">
                <vCard:Family>Snyders</vCard:Family>
                <vCard:Given>D</vCard:Given>
                <vCard:Other>J</vCard:Other>
              </vCard:N>
              <vCard:ORG rdf:parseType="Resource">
                <vCard:Orgname>
                  Vanderbilt University School of Medicine
                </vCard:Orgname>
                <vCard:Orgunit>Department of Pharmacology</vCard:Orgunit>
              </vCard:ORG>
            </bqs:Person>
          </rdf:li>
          <rdf:li>
            <bqs:Person rdf:parseType="Resource">
              <vCard:N rdf:parseType="Resource">
                <vCard:Family>Roden</vCard:Family>
                <vCard:Given>D</vCard:Given>
                <vCard:Other>M</vCard:Other>
              </vCard:N>
              <vCard:ADR rdf:parseType="Resource">
                <vCard:Extadd>
                  Dept. of Pharmacology,
                  Vanderbilt University School of Medicine
                </vCard:Extadd>
                <vCard:Locality>Nashville</vCard:Locality>
                <vCard:Region>TN</vCard:Region>
                <vCard:Pcode>37232-6602</vCard:Pcode>
                <vCard:Country>USA</vCard:Country>
              </vCard:ADR>
            </bqs:Person>
          </rdf:li>
        </rdf:Seq>
      </dc:creator>
    </bqs:reference>
  </rdf:Description>
</rdf:RDF>
```

FIGURE 33: Serialization of author information. The `<rdf:Seq>` container creates an ordered list of authors. Information about the authors is stored using vCard. To save space in this example, the first author is given an e-mail address, the second author an affiliation, and the third author a postal address. For an actual reference, all authors could have all three types of information. Alternatively, only the authors' names might be available.

5.2.10   The **contributors** attribute

The **contributors** class can be used to store information about a person or entity that contributed to, but did not create, the reference. It can be serialized using the Dublin Core **`<dc:contributor>`** element, as shown in Figure 34. If there is more than one contributor, the **`<rdf:Seq>`** container can be used to create an ordered list, as was done for the **authors** class.

```
<rdf:RDF
    xmlns:bqs="http://www.cellml.org/bqs/1.0#"
    xmlns:dc="http://purl.org/dc/elements/1.1/"
    xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#">

  <rdf:Description rdf:about="#cellml_element_id">
    <bqs:reference rdf:parseType="Resource">
      <dc:contributor rdf:parseType="Resource">
        <bqs:Organization>Super Scientific Graphics, Inc.</bqs:Organization>
      </dc:contributor>
    </bqs:reference>
  </rdf:Description>
</rdf:RDF>
```

FIGURE 34: Serialization of contributor information. An organization (in this example, a company) is listed. This company may have provided graphics work for the cited reference. In this example, there is only one contributor. However, an **`<rdf:Seq>`** container could be used to create an ordered list of contributors, as was done in the author example. If the contributors were people, information about them could be stored using vCard, as shown in the authors example.

5.2.11   The **publisher** attribute

The **publisher** attribute stores information about the publisher of the reference. It can be serialized using the Dublin Core **`<dc:publisher>`** element, as shown in Figure 35. Only one publisher is allowed, so no RDF containers may be used in this element.

5.3   The **Provider** class

The **Provider** class is the base class for the **Person**, **Organization** and **Service** classes. These classes are used by the **authors**, **contributors** and **publisher** attributes on the **BibliographicReference** class. The BQS data model allows only one publisher and requires that the authors and contributors be provided as an ordered list.

   The **Provider** class is serialized by embedding the information directly in the RDF element that serializes the **authors**, **contributors**, **publisher**, or **editor** attribute. Multiple providers are supported using an **`<rdf:Seq>`** container. The subclass of provider is given its own element . The valid values are **`<bqs:Person>`**, **`<bqs:Organization>`** (or **`<bqs:Organisation>`**), and **`<bqs:Service>`**.

```
<rdf:RDF
    xmlns:bqs="http://www.cellml.org/bqs/1.0#"
    xmlns:dc="http://purl.org/dc/elements/1.1/"
    xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#">

  <rdf:Description rdf:about="#cellml_element_id">
    <bqs:reference rdf:parseType="Resource">
      <dc:publisher rdf:parseType="Resource">
        <bqs:Service>my software service</bqs:Service>
      </dc:publisher>
    </bqs:reference>
  </rdf:Description>
</rdf:RDF>
```

FIGURE 35: Serialization of publisher information. A software service is the publisher of the reference in this example.

5.3.1 The **Person** subclass

Structured information about a person can be stored using the appropriate vCard constructs. See Section 2.3[4] for more information on vCard in CellML Metadata. Figure 33 demonstrates the use of the **<bqs:Person>** element.

5.3.2 The **Organization** and **Service** subclasses

The organisation and service information is a name stored as a string. This can be entered directly as the content of an RDF element. However, in some cases it is useful to provide the geographic location of the organization. For instance, this information is usually provided for the publisher of a book. This can be supported using the **Property** class, as discussed in Section 5.9. In this case, the name of the organisation is stored as element content contained in the **<dc:publisher>** element. Examples of the use of the **Organization** and **Service** subclasses are shown in Figure 34 and Figure 35.

5.4 The **BibRefSubject** class

The **BibRefSubject** class defines the topic of the resource. It has three attributes, **keywords**, **subheadings** and **codes**, which provide a means to store keywords, subject headings, and classification codes about the cited resource, respectively.

An example demonstrating the serialization of subject metadata is shown in Figure 36.

The formal mapping of the attributes in the **BibRefSubject** class to RDF is as follows:

- **keywords**: **<bqs:keyword>** value of keyword, no Dublin Core Qualifier elements.

- **subheadings**: **<bqs:subject_heading>**, Dublin Core Qualifier elements of **<dcq:LCSH>** (Library of Congress Subject Headings) or **<dcq:MESH>** (Medical Subject Headings).

- **codes**: **<bqs:classification_code>**, Dublin Core Qualifier elements of **<dcq:DDC>** (Dewey Decimal Classification), LCC (Library of Congress Classification), or **<dcq:UDC>** (Universal Decimal Classification).

---

[4]http://www.cellml.org/public/metadata/20011102/cellml_metadata_specification.html#sec_vCard_intro

```
<rdf:RDF
    xmlns:bqs="http://www.cellml.org/bqs/1.0#"
    xmlns:dc="http://purl.org/dc/elements/1.1/"
    xmlns:dcq="http://purl.org/dc/terms/"
    xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#">

  <rdf:Description rdf:about="#cellml_element_id">
    <bqs:reference rdf:parseType="Resource">
      <bqs:subject_heading>
        <dcq:MESH>
          <rdf:Bag>
            <rdf:li>Signal Transduction</rdf:li>
            <rdf:li>Ion Transport</rdf:li>
          </rdf:Bag>
        </dcq:MESH>
      </bqs:subject_heading>
      <bqs:classification_code>
        <dcq:DDC>572</dcq:DDC>
      </bqs:classification_code>
      <bqs:keyword>
        <rdf:Seq>
          <rdf:li>calcium signaling</rdf:li>
          <rdf:li>calcium import</rdf:li>
        </rdf:Seq>
      </bqs:keyword>
    </bqs:reference>
  </rdf:Description>
</rdf:RDF>
```

FIGURE 36: Serialization of subject information. The three types of subject information are shown. First, an unordered group of subject headings is provided, ecnoding in the MeSH controlled vocabulary. Next, the Dewey Decimal System classification code is provided. Finally, an ordered group of uncontrolled keywords is provided.

In all cases, multiple values should be stored in the appropriate RDF container.

5.5   The **BibRefDescription** class

The **BibRefDescription** class allows storage of a summary of the contents of the cited reference. This summary could be an abstract or a table of contents and may be in a language different from that of the actual reference. More than one summary may be stored about a reference. The BQS Specification[5] states that the contents of the abstract and table of contents attributes may be more than just plain text and proposes using MIME types to identify the format of these contents.

The **the_abstract** and **table_of_contents** attributes can be serialized using a **<dc:description>** element. This element can be qualified with type information to indicate whether the description is an abstract or a table of contents. This is done by using a **<dcq:abstract>** element and a **<dcq:tableOfContents>** element. These qualifier elements are taken from the document Expressing Qualified Dublin Core in RDF/XML[6]. The **language** attribute can be indicated by an **xml:lang** attribute. Note that an **<rdf:Alt>** container can be used to provide the description in various languages.

The **abstract_type** and **toc_type** attributes can be serialized with the Dublin Core **<dcq:IMT>** element (this indicates the use of a MIME type for the value of the format element). The full serialization of description metadata is shown in Figure 37.

If the abstract or table of contents is supplied by a URL, the URL should be entered as the value of the **<dc:description>** element, and the value of the enclosed **<dcq:IMT>** element should be **text/url**. This is shown for the abstract information in Figure 37.

5.6   The **BibRefScope** class

The **BibRefScope** class is used to provide information about the intended scope or extent of the cited reference. It can include spatial location information and/or temporal period information in its **spatial_location** and **temporal_period** attributes.

This metadata can be mapped directly to the Dublin Core **<dc:coverage>** element, qualified to indicate whether the coverage is spatial or temporal, and to provide the encoding scheme of the content. The qualifiers **<dcq:spatial>** and **<dcq:temporal>** and a number of encoding schemes are defined in the Dublin Core Qualifiers specification. Two instances of this element can be used to include both spatial and temporal information.

Figure 38 shows the serialization of the scope metadata.

5.7   The **EntryStatus** class

The **EntryStatus** class provides information about the citation, as opposed to the cited reference. It has three attributes. The **last_modified_date** attribute defines the date on which the citation was last changed. The **subset** attribute defines the subset of the bibliographic repository from which the current citation was taken. The **properties** attribute is a member of the Property class and takes the form property name: property value. The **properties** attribute can be used to supply general properties about the citation. For instance, it could be used to provide a version number for the citation. The Property class will be dealt with in Section 5.9.

This metadata is about the citation, not the reference. Therefore, it must be contained in a new RDF resource. To remain consistent with the class name we use the element **<bqs:entry_status>**. This resource can have three types of metadata:

---

[5]http://www.omg.org/cgi-bin/doc?dtc/01-03-02
[6]http://dublincore.org/documents/dcq-rdf-xml/

```
<rdf:RDF
    xmlns:bqs="http://www.cellml.org/bqs/1.0#"
    xmlns:dc="http://purl.org/dc/elements/1.1/"
    xmlns:dcq="http://purl.org/dc/terms/"
    xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#">

  <rdf:Description rdf:about="#cellml_element_id">
    <bqs:reference rdf:parseType="Resource">
      <dc:description rdf:parseType="Resource" xml:lang="en">
        <dcq:abstract>
          <dcq:IMT>text/url</dcq:IMT>
          <rdf:value>
            http://www.abstractsRus.com/abstract567843
          </rdf:value>
        </dcq:abstract>
      </dc:description>
      <dc:description rdf:parseType="Resource" xml:lang="en">
        <dcq:tableOfContents>
          <dcq:IMT>text/html</dcq:IMT>
        </dcq:tableOfContents>
        <rdf:value rdf:parseType="Literal">
          <p> ... table of contents info here ...</p>
        </rdf:value>
      </dc:description>
    </bqs:reference>
  </rdf:Description>
</rdf:RDF>
```

FIGURE 37: Serialization of description information. In this example, the abstract is provided as a URL, and the table of contents is provided inline, in HTML.

```
<rdf:RDF
    xmlns:bqs="http://www.cellml.org/bqs/1.0#"
    xmlns:dc="http://purl.org/dc/elements/1.1/"
    xmlns:dcq="http://purl.org/dc/terms/"
    xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#">

  <rdf:Description rdf:about="#cellml_element_id">
    <bqs:reference rdf:parseType="Resource">
      <dcq:temporal>
        <dcq:W3CDTF>1997</dcq:W3CDTF>
      </dcq:temporal>
      <dcq:spatial>
        <dcq:ISO3166>BS</dcq:ISO3166>
      </dcq:spatial>
    </bqs:reference>
  </rdf:Description>
</rdf:RDF>
```

FIGURE 38: Serialization of scope information. This metadata indicates the cited resource has a temporal scope of one year (1997) and a spatial scope of a single country (the Bahamas).

- A last modified date, stored in a qualified Dublin Core **<dcq:modified>** element, as shown in Figure 39

- A subset, stored in a **<bqs:subset>** element, as shown in Figure 39

- A property, stored as defined in Section 5.9

5.8 The **Journal** class

The **Journal** class stores information about journals and is referenced by the **JournalArticle**, a subclass of the **BibliographicReference** class. The **Journal** class has three attributes: **issn** (the International Standard Serial Number for the journal), **name** (the full name of the journal), and **abbreviation** (an abbreviation for the journal).

There are two possible uses for this class. One is to create a list of journals, which can be referenced by citations of type `"JournalArticle"`. The other is to actually indicate the journal for a particular bibliographic reference. The same serialization can be used in both cases. In the latter case, it is likely that only the name or abbreviation of the journal would be provided.

Journal information is stored in a **<bqs:Journal>** element. The attributes of the **Journal** class are serialized with the Dublin Core **<dc:title>** element for the name of the journal, a **<bqs:issn>** element for the ISSN, and a **<bqs:abbreviation>** element for the abbreviation.

A **<dc:identifier>** could be used to store the ISSN. However, this could lead to confusion with the use of the **<dc:identifier>** element to store a database UI (the **identifier** and **cross_references** attributes on the **BibliographicReference** class). Therefore, in this serialization of the BQS data model, the **<dc:identifier>** element is used to store the identifier of the *citation*, not the identifier of the cited *resource*. A new **<bqs:issn>** element is created to store the identifier of the journal resource.

The **<bqs:abbreviation>** element is qualified by a **<bqs:abbreviation_scheme>** element. This is necessary because there is not a single list of standard journal abbreviations. This element may take on any value. However, we recommend the use of the following:

```
<rdf:RDF
    xmlns:bqs="http://www.cellml.org/bqs/1.0#"
    xmlns:dcq="http://purl.org/dc/terms/"
    xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#">

  <rdf:Description rdf:about="#cellml_element_id">
    <bqs:reference rdf:parseType="Resource">
      <bqs:entry_status rdf:parseType="Resource">
        <dcq:modified>
          <dcq:W3CDTF>2001-04-06</dcq:W3CDTF>
        </dcq:modified>
        <bqs:subset>312-A</bqs:subset>
      </bqs:entry_status>
    </bqs:reference>
  </rdf:Description>
</rdf:RDF>
```

FIGURE 39: Serialization of entry status information. The last modified date is stored using standard Dublin Core elements. The subset information is stored in a BQS-specific element. The subset in this example is completely fictitious.

- `Medline`: Most biological and medical journals are indexed by Medline, which provides a [downloadable list of its journals][7].
- `CAS`: The Chemical Abstract Service abstracts chemical journals.

Use of the **`<bqs:abbreviation>`** element without a **`<bqs:abbreviation_scheme>`** element can be inferred to mean that the abbreviation is not necessarily taken from a standard list. In this case, the full name of the journal or the ISSN should also be provided.

Figure 40 demonstrates the definition of information about a journal. Note that this example is **not** part of a **`<bqs:reference>`** resource. This means that the journal is being defined as its own resource. By giving the **`<rdf:Description>`** element that contains the **`<bqs:journal>`** element an **`rdf:id`** attribute, we allow other resources to refer to this one. For instance, we could create a collection of journals, and refer to a journal in this collection in a reference of type `"JournalArticle"` using the value of the **`id`** attribute of the journal.

Examples in Section 5.10.2 will demonstrate possible methods for referring to journals in journal article references.

5.9   The **Property** class

The **Property** class can be referenced by the **BibliographicReference**, **Journal**, **Provider**, **BibRefScope**, and **EntryStatus** classes to add properties to the data model. The **Property** class provides a general way to extend the data model. Note that the data model can also be extended by creating new RDF elements in a non-BQS namespace.

The Property class can be serialized with a qualified **`<bqs:property>`** attribute, as follows:

- **property_name** = **`<bqs:property_type>`**

---

[7]http://www.ncbi.nlm.nih.gov/entrez/getids_help.htm#JournalLists

```
<rdf:RDF
    xmlns:bqs="http://www.cellml.org/bqs/1.0#"
    xmlns:dc="http://purl.org/dc/elements/1.1/"
    xmlns:dcq="http://purl.org/dc/terms/"
    xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#">

  <rdf:Description rdf:id="journal1">
    <bqs:journal rdf:parseType="Resource">
      <dc:title>Journal of Biological Chemistry</dc:title>
      <bqs:issn>0021-9258</bqs:issn>
      <bqs:abbreviation rdf:parseType="Resource">
        <bqs:abbreviation_scheme>Medline</bqs:abbreviation_scheme>
        <rdf:value>J Biol Chem</rdf:value>
      </bqs:abbreviation>
    </bqs:journal>
  </rdf:Description>
</rdf:RDF>
```

FIGURE 40: Serialization of journal information. This example shows how to create a new journal resource to which other RDF resources may refer.

- **property_value** = **<rdf:value>**

If format information is required, a Dublin Core **<dc:format>** element is used, as described for the **BibRefDescription** class.

Figure 41 shows the serialization of the **Property** class.

Figure 42 shows the use of a **<bqs:property>** element to store the location of a publisher. This information is commonly provided when referencing a book.

5.10 Subclasses of the **BibliographicReference** Class

The BQS data model provides seven basic subclasses of the **BibligraphicReference** class, one of which is further subclassed. In addition, users can create their own type of **BibliographicReference**. To do this in the RDF serialization, the user would supply a new value for the **type** attribute on the **BibliographicReference** class, and provide any additional information either by using the **Property** class (discussed in Section 5.9) or by defining his/her own RDF schema for that reference type.

The **Thesis**, **Proceeding**, and **TechReport** subclasses do not define any additional attributes. The other subclasses are discussed in the following subsections.

5.10.1 The **Book** subclass

The **Book** subclass has five attributes, which are mapped onto BQS elements as follows:

- **isbn** (the International Standard Book Number) = **<bqs:isbn>** (Note that a **<dc:identifier>** element could be used to store the ISBN. However, this could lead to confusion with the use of the **<dc:identifier>** element to store a database UI (the **identifier** and **cross_references** attributes on the BibliographicReference class). Therefore, in this serialization of the BQS data model, the **<dc:identifier>** element is used to store the identifier of the *citation*, not the identifier of the cited *resource*. A new **<bqs:isbn>** element is created to store the identifier of the book resource.)

```
<rdf:RDF
    xmlns:bqs="http://www.cellml.org/bqs/1.0#"
    xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#">

  <rdf:Description rdf:about="#cellml_element_id">
    <bqs:reference>
      <bqs:property rdf:parseType="Resource">
        <bqs:property_type>online</bqs:property_type>
        <rdf:value>yes</rdf:value>
      </bqs:property>
    </bqs:reference>
  </rdf:Description>
</rdf:RDF>
```

FIGURE 41: Serialization of property information. In this example, a new property called "online" is introduced. This propertry indicates whether or not the full text of the article is available online.

```
<rdf:RDF
    xmlns:bqs="http://www.cellml.org/bqs/1.0#"
    xmlns:dc="http://purl.org/dc/elements/1.1/"
    xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#">

  <rdf:Description rdf:about="#cellml_element_id">
    <bqs:reference>
      <dc:publisher rdf:parseType="Resource">
        <bqs:Organization>O'Reilly and Associates, Inc.</bqs:Organization>
        <bqs:property rdf:parseType="Resource">
          <bqs:property_type>location</bqs:property_type>
          <rdf:value>Sebastopol, CA</rdf:value>
        </bqs:property>
      </dc:publisher>
    </bqs:reference>
  </rdf:Description>
</rdf:RDF>
```

FIGURE 42: The use of a property to provide the location of a publisher.

- **volume** = **`<bqs:volume>`** (note: this element is also used in the serialization of the **JournalArticle** subclass)

- **edition** = **`<bqs:edition>`**

- **series** (the title of the series of which the book is a member) = **`<bqs:series>`**

- **editor** = **`<bqs:editor>`**. Personal information about the editor (name, e-mail, etc.) is provided by the serialization of the **Provider** class (see Section 5.3).

Figure 43 demonstrates the storage of book information. Note that a real reference to a book would also include elements from the **BibliographicReference** class. Section 5.11 has several complete reference examples that demonstrate the use of information from the various BQS data model classes.

5.10.2 The **Article** subclass and its subclasses

The **Article** class has two attributes: **first_page** and **last_page**. In addition, it has two further subclasses: **JournalArticle**, which has **volume**, **issue**, **issue_supplement** and **from_journal** attributes, and **BookArticle**, which has a **from_book** attribute.

The attributes on the **Article**, **JournalArticle** and **BookArticle** classes can be serialized using the same elements:

- **first_page** = **`<bqs:first_page>`**.

- **last_page** = **`<bqs:last_page>`**.

- **volume** = **`<bqs:volume>`** (note that this element is also used in the serialization of the Book subclass).

- **issue** = **`<bqs:issue>`**.

- **issue_supplement** = **`<bqs:issue_supplement>`**.

- **from_journal** = **`<bqs:Journal>`**, as described in Section 5.8.

- **from_book** = **`<bqs:Book>`**.

Figure 44 shows the definition of journal article metadata. In this example, the journal information is included inline. Figure 45 shows the definition of journal article metadata. In this example, the journal information is included by reference to another resource (such as a journal definition as shown in Figure 40). Figure 46 shows the definiton of book chapter metadata. Note that these examples only show the metadata specific for these subclasses of BibliographicReference. Section 5.11 will provide several examples of complete citations.

5.10.3 The **Patent** subclass

Serialization of this subclass is postponed pending further information.

5.10.4 The **WebResource** subclass

The **WebResource** subclass has three attributes, which can be serialized as follows:

- **url** = **`<bqs:url>`** (Note that a **`<dc:identifier>`** element could be used to store this information. However, this could lead to confusion with the use of the **`<dc:identifier>`** element to store a database UI (the **identifier** and **cross_references** attributes on the **BibliographicReference** class). Therefore, in this serialization of the BQS data model, the **`<dc:identifier>`** element is used to store the identifier of the *citation*, not the identifier of the cited *resource*. A new **`<bqs:url>`** element is created to store the identifier of the web resource.).

```xml
<rdf:RDF
    xmlns:bqs="http://www.cellml.org/bqs/1.0#"
    xmlns:dc="http://purl.org/dc/elements/1.1/"
    xmlns:dcq="http://purl.org/dc/terms/"
    xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
    xmlns:vCard="http://www.w3.org/2001/vcard-rdf/3.0#">

  <rdf:Description rdf:about="#cellml_element_id">
    <bqs:Book>
      <bqs:isbn>9-999-99999-X</bqs:isbn>
      <bqs:volume>5</bqs:volume>
      <bqs:edition>2nd</bqs:edition>
      <bqs:editor>
        <rdf:Seq>
          <rdf:li>
            <bqs:Person>
              <vCard:N rdf:parseType="Resource">
                <vCard:Family>Doe</vCard:Family>
                <vCard:Given>John</vCard:Given>
              </vCard:N>
            </bqs:Person>
          </rdf:li>
          <rdf:li rdf:parseType="Resource">
            <bqs:Person>
              <vCard:N rdf:parseType="Resource">
                <vCard:Family>Smith</vCard:Family>
                <vCard:Given>Suzy</vCard:Given>
              </vCard:N>
            </bqs:Person>
          </rdf:li>
        </rdf:Seq>
      </bqs:editor>
    </bqs:Book>
  </rdf:Description>
</rdf:RDF>
```

FIGURE 43: Serialization of book information. This example is fictitious.

```xml
<rdf:RDF
    xmlns:bqs="http://www.cellml.org/bqs/1.0#"
    xmlns:dc="http://purl.org/dc/elements/1.1/"
    xmlns:dcq="http://purl.org/dc/terms/"
    xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
    xmlns:vCard="http://www.w3.org/2001/vcard-rdf/3.0#">

  <rdf:Description rdf:about="#cellml_element_id">
    <bqs:JournalArticle>
      <bqs:first_page>56</bqs:first_page>
      <bqs:last_page>62</bqs:last_page>
      <bqs:volume>356</bqs:volume>
      <bqs:issue>6</bqs:issue>
      <bqs:issue_supplement>A</bqs:issue_supplement>
      <bqs:Journal rdf:parseType="Resource">
        <dc:title>Journal of Biological Chemistry</dc:title>
        <bqs:Medline>J Biol Chem</bqs:Medline>
      </bqs:Journal>
    </bqs:JournalArticle>
  </rdf:Description>
</rdf:RDF>
```

FIGURE 44: Serialization of journal article information. In this example, the journal information is provided inline.

```xml
<rdf:RDF
    xmlns:bqs="http://www.cellml.org/bqs/1.0#"
    xmlns:dc="http://purl.org/dc/elements/1.1/"
    xmlns:dcq="http://purl.org/dc/terms/"
    xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
    xmlns:vCard="http://www.w3.org/2001/vcard-rdf/3.0#">

  <rdf:Description rdf:about="#cellml_element_id">
    <bqs:JournalArticle>
      <bqs:first_page>56</bqs:first_page>
      <bqs:last_page>62</bqs:last_page>
      <bqs:volume>356</bqs:volume>
      <bqs:issue>6</bqs:issue>
      <bqs:issue_supplement>A</bqs:issue_supplement>
      <bqs:Journal rdf:resource="#journal1" />
    </bqs:JournalArticle>
  </rdf:Description>
</rdf:RDF>
```

FIGURE 45: Serialization of journal article information. In this example, the journal information is provided by referring to the resource created in Figure 40.

```
<rdf:RDF
    xmlns:bqs="http://www.cellml.org/bqs/1.0#"
    xmlns:dc="http://purl.org/dc/elements/1.1/"
    xmlns:dcq="http://purl.org/dc/terms/"
    xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
    xmlns:vCard="http://www.w3.org/2001/vcard-rdf/3.0#">

  <rdf:Description rdf:about="#cellml_element_id">
    <bqs:BookArticle>
      <bqs:first_page>56</bqs:first_page>
      <bqs:last_page>62</bqs:last_page>
      <bqs:Book>
        <bqs:isbn>9-999-99999-X</bqs:isbn>
        <bqs:volume>5</bqs:volume>
        <bqs:edition>2nd</bqs:edition>
        <bqs:editor>
          <rdf:Seq>
            <rdf:li rdf:parseType="Resource">
              <bqs:Person>
                <vCard:N rdf:parseType="Resource">
                  <vCard:Family>Doe</vCard:Family>
                  <vCard:Given>John</vCard:Given>
                </vCard:N>
              </bqs:Person>
            </rdf:li>
            <rdf:li rdf:parseType="Resource">
              <bqs:Person>
                <vCard:N rdf:parseType="Resource">
                  <vCard:Family>Smith</vCard:Family>
                  <vCard:Given>Suzy</vCard:Given>
                </vCard:N>
              </bqs:Person>
            </rdf:li>
          </rdf:Seq>
        </bqs:editor>
      </bqs:Book>
    </bqs:BookArticle>
  </rdf:Description>
</rdf:RDF>
```

FIGURE 46: Serialization of book article information. This example is a chapter from the book shown in Figure 43. The second **<bqs:reference>** element in this example stores information about the book.

- **estimated_size** = **`<bqs:estimated_size>`**. The units of the estimated size can be stored in **`<bqs:property>`** element (see Section 5.9 for more information on this element).

- **cost** = **`<bqs:cost>`**. The units of the cost can be stored in **`<bqs:property>`** element (see Section 5.9 for more information on this element).

Figure 47 shows the definition of information about a web resource.

```
<rdf:RDF
    xmlns:bqs="http://www.cellml.org/bqs/1.0#"
    xmlns:dc="http://purl.org/dc/elements/1.1/"
    xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#">

  <rdf:Description rdf:about="#cellml_element_id">
    <bqs:WebResource>
      <bqs:url>http://www.some_website.com/</bqs:url>
      <bqs:estimated_size rdf:parseType="Resource">
        <rdf:value>100</rdf:value>
        <bqs:property rdf:parseType="Resource">
          <bqs:property_type>units</bqs:property_type>
          <rdf:value>kilobytes</rdf:value>
        </bqs:property>
      </bqs:estimated_size>
      <bqs:cost rdf:parseType="Resource">
        <rdf:value>100</rdf:value>
        <bqs:property rdf:parseType="Resource">
          <bqs:property_type>units</bqs:property_type>
          <rdf:value>kilobytes</rdf:value>
        </bqs:property>
      </bqs:cost>
    </bqs:WebResource>
  </rdf:Description>
</rdf:RDF>
```

FIGURE 47: Serialization of web resource information.

5.11   Complete Examples

This section provides several complete citation examples.

5.11.1   Journal Article with Inline Journal Definition

Figure 48 demonstrates the definition of a reference to a journal article, with the journal information included inline. The cited reference is:

Jafri, M.S., Rice, J.J., Winslow, R.L. "Cardiac Ca2+ dynamics: the role of ryanodine receptor adaptation and sarcoplasmic reticulum load" (1998) *Biophys J* **74**: 1149-1168.

5.11.2   Journal Article with a Reference to a Journal Definition

Figure 49 demonstrates the definition of a reference to a journal article, with the journal information included by reference to a resource defined elsewhere. Figure 50 demonstrates the definition of the journal

```xml
<rdf:RDF
    xmlns:bqs="http://www.cellml.org/bqs/1.0#"
    xmlns:dc="http://purl.org/dc/elements/1.1/"
    xmlns:dcq="http://purl.org/dc/terms/"
    xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
    xmlns:vCard="http://www.w3.org/2001/vcard-rdf/3.0#">

  <rdf:Description rdf:about="#cellml_element_id">
    <bqs:JournalArticle>
      <dc:creator>
        <rdf:Seq>
          <rdf:li>
            <bqs:Person>
              <vCard:N rdf:parseType="Resource">
                <vCard:Family>Jafri</vCard:Family>
                <vCard:Given>M</vCard:Given>
                <vCard:Other>S</vCard:Other>
              </vCard:N>
            </bqs:Person>
          </rdf:li>
          <rdf:li rdf:parseType="Resource">
            <bqs:Person>
              <vCard:N rdf:parseType="Resource">
                <vCard:Family>Rice</vCard:Family>
                <vCard:Given>J</vCard:Given>
                <vCard:Other>J</vCard:Other>
              </vCard:N>
            </bqs:Person>
          </rdf:li>
          <rdf:li>
            <bqs:Person>
              <vCard:N rdf:parseType="Resource">
                <vCard:Family>Winslow</vCard:Family>
                <vCard:Given>R</vCard:Given>
                <vCard:Other>L</vCard:Other>
              </vCard:N>
            </bqs:Person>
          </rdf:li>
        </rdf:Seq>
      </dc:creator>
      <dc:title>
        Cardiac Ca2+ dynamics: the role of ryanodine receptor
        adaptation and sarcoplasmic reticulum load
      </dc:title>
      <dcq:issued>
        <dcq:W3CDTF>1998</dcq:W3CDTF>
      </dcq:issued>
      <bqs:Journal rdf:parseType="Resource">
        <dc:title>Biophysical Journal</dc:title>
        <bqs:Medline>Biophys J</bqs:Medline>
      </bqs:Journal>
      <bqs:volume>74</bqs:volume>
      <bqs:first_page>1149</bqs:first_page>
      <bqs:last_page>1168</bqs:last_page>
    </bqs:JournalArticle>
  </rdf:Description>
</rdf:RDF>
```

FIGURE 48: A complete journal article reference. Information about the journal itself is embedded within the reference.

information. The cited reference is the same as that in Section 5.11.1.

5.11.3   Citation by Unique Identifier

Figure 51 demonstrates the citation of a reference using a database unique identifer. In this example, a Medline unique identifier is used. An abstract is also included, by reference to a URL.

5.11.4   Complete Book

Figure 52 shows a relatively simple complete book reference. The cited reference is:
   Branden, C., Tooze, J. "Introduction to Protein Structure" (1991) Garland Publishing, Inc., New York.
   Figure 53 shows a more complicated reference to a book. The cited reference is:
   Brody, J.S., Center, D.M., Tkachuk, V.A., Eds. "Signal Transduction in Lung Cells" (1993) *Lung Biology in Health and Disease*, **65**. Marcel Dekker, Inc. New York.

5.11.5   Book Chapter

Figure 54 shows a complete book chapter reference. The cited reference is:
   Rogers, M.S., Strehler, E.E. "Calmodulin-like proteins" in *Guidebook to the Calcium-Binding Proteins*, Celio, M.R., Pauls, T., Schwaller, B., eds. (1996) Oxford University Press, Oxford. pp. 41-43.

```xml
<rdf:RDF
    xmlns:bqs="http://www.cellml.org/bqs/1.0#"
    xmlns:dc="http://purl.org/dc/elements/1.1/"
    xmlns:dcq="http://purl.org/dc/terms/"
    xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
    xmlns:vCard="http://www.w3.org/2001/vcard-rdf/3.0#">

  <rdf:Description rdf:about="#cellml_element_id">
    <bqs:JournalArticle>
      <dc:creator>
        <rdf:Seq>
          <rdf:li>
            <bqs:Person>
              <vCard:N rdf:parseType="Resource">
                <vCard:Family>Jafri</vCard:Family>
                <vCard:Given>M</vCard:Given>
                <vCard:Other>S</vCard:Other>
              </vCard:N>
            </bqs:Person>
          </rdf:li>
          <rdf:li>
            <bqs:Person>
              <vCard:N rdf:parseType="Resource">
                <vCard:Family>Rice</vCard:Family>
                <vCard:Given>J</vCard:Given>
                <vCard:Other>J</vCard:Other>
              </vCard:N>
            </bqs:Person>
          </rdf:li>
          <rdf:li>
            <bqs:Person>
              <vCard:N rdf:parseType="Resource">
                <vCard:Family>Winslow</vCard:Family>
                <vCard:Given>R</vCard:Given>
                <vCard:Other>L</vCard:Other>
              </vCard:N>
            </bqs:Person>
          </rdf:li>
        </rdf:Seq>
      </dc:creator>
      <dc:title>
        Cardiac Ca2+ dynamics: the role of ryanodine receptor
        adaptation and sarcoplasmic reticulum load
      </dc:title>
      <dcq:issued>
        <dcq:W3CDTF>1998</dcq:W3CDTF>
      </dcq:issued>
      <bqs:Journal
          rdf:resource="http://www.example.org/journals#BiophysJ" />
      <bqs:volume>74</bqs:volume>
      <bqs:first_page>1149</bqs:first_page>
      <bqs:last_page>1168</bqs:last_page>
    </bqs:JournalArticle>
  </rdf:Description>
</rdf:RDF>
```

FIGURE 49: A complete journal article reference that refers to a different resource for information about the journal. The definition of the journal information is shown in Figure 50.

```xml
<!--
  This RDF is part of the file http://www.example.org/journals
-->
<rdf:RDF
    xmlns:bqs="http://www.cellml.org/bqs/1.0#"
    xmlns:dc="http://purl.org/dc/elements/1.1/"
    xmlns:dcq="http://purl.org/dc/terms/"
    xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#">

  <rdf:Description rdf:id="BiophysJ">
    <bqs:journal rdf:parseType="Resource">
      <dc:title>Biophysical Journal</dc:title>
      <bqs:Medline>Biophys J</bqs:Medline>
      <bqs:issn>0006-3495</bqs:issn>
    </bqs:journal>
  </rdf:Description>

  <rdf:Description rdf:id="JBiolChem">
    <bqs:journal rdf:parseType="Resource">
      <dc:title>Journal of Biological Chemistry</dc:title>
      <bqs:Medline>J Biol Chem</bqs:Medline>
      <bqs:issn>0021-9258</bqs:issn>
    </bqs:journal>
  </rdf:Description>

</rdf:RDF>
```

FIGURE 50: Information about two journals. This information could be referenced by bibliographic citations defined in the **`<bqs:reference>`** element.

```
<rdf:RDF
    xmlns:bqs="http://www.cellml.org/bqs/1.0#"
    xmlns:dc="http://purl.org/dc/elements/1.1/"
    xmlns:dcq="http://purl.org/dc/terms/"
    xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#">

  <rdf:Description rdf:about="#cellml_element_id">
    <bqs:reference rdf:parseType="Resource">
      <bqs:Medline_id>97219925</bqs:Medline_id>
      <dcq:abstract>
        <dcq:IMT>text/url</dcq:IMT>
        <!--
          Note that the URI below, would not normally be split over two lines.
          It has been split so that it fits on a page
        -->
        <rdf:value>
          http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?
            cmd=Retrieve&db=PubMed&list_uids=9067300&dopt=Abstract
        </rdf:value>
      </dcq:abstract>
    </bqs:reference>
  </rdf:Description>
</rdf:RDF>
```

FIGURE 51: Citation by Medline unique identifier and inclusion of a reference to an abstract.

```xml
<rdf:RDF
    xmlns:bqs="http://www.cellml.org/bqs/1.0#"
    xmlns:dc="http://purl.org/dc/elements/1.1/"
    xmlns:dcq="http://purl.org/dc/terms/"
    xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
    xmlns:vCard="http://www.w3.org/2001/vcard-rdf/3.0#">

  <rdf:Description rdf:about="#cellml_element_id">
    <bqs:Book>
      <dc:creator>
        <rdf:Seq>
          <rdf:li>
            <bqs:Person>
              <vCard:N rdf:parseType="Resource">
                <vCard:Family>Branden</vCard:Family>
                <vCard:Given>Carl</vCard:Given>
              </vCard:N>
            </bqs:Person>
          </rdf:li>
          <rdf:li rdf:parseType="Resource">
            <bqs:Person>
              <vCard:N rdf:parseType="Resource">
                <vCard:Family>Tooze</vCard:Family>
                <vCard:Given>John</vCard:Given>
              </vCard:N>
            </bqs:Person>
          </rdf:li>
        </rdf:Seq>
      </dc:creator>
      <dc:title>Introduction to Protein Structure</dc:title>
      <dcq:issued>
        <dcq:W3CDTF>1991</dcq:W3CDTF>
      </dcq:issued>
      <dc:publisher rdf:parseType="Resource">
        <bqs:Organization>Garland Publishing, Inc.</bqs:Organization>
        <bqs:property rdf:parseType="Resource">
          <bqs:property_type>location</bqs:property_type>
          <rdf:value>New York</rdf:value>
        </bqs:property>
      </dc:publisher>
    </bqs:Book>
  </rdf:Description>
</rdf:RDF>
```

FIGURE 52: A complete book reference. Note the use of the **Property** class to provide the location of the publisher.

```
<rdf:RDF
    xmlns:bqs="http://www.cellml.org/bqs/1.0#"
    xmlns:dc="http://purl.org/dc/elements/1.1/"
    xmlns:dcq="http://purl.org/dc/terms/"
    xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
    xmlns:vCard="http://www.w3.org/2001/vcard-rdf/3.0#">

  <rdf:Description rdf:about="#cellml_element_id">
    <bqs:Book>
      <bqs:editor>
        <rdf:Seq>
          <rdf:li>
            <bqs:Person>
              <vCard:N rdf:parseType="Resource">
                <vCard:Family>Brody</vCard:Family>
                <vCard:Given>Jerome</vCard:Given>
                <vCard:Other>S</vCard:Other>
              </vCard:N>
            </bqs:Person>
          </rdf:li>
          <rdf:li>
            <bqs:Person>
              <vCard:N rdf:parseType="Resource">
                <vCard:Family>Center</vCard:Family>
                <vCard:Given>David</vCard:Given>
                <vCard:Other>M</vCard:Other>
              </vCard:N>
            </bqs:Person>
          </rdf:li>
          <rdf:li>
            <bqs:Person>
              <vCard:N rdf:parseType="Resource">
                <vCard:Family>Tkachuk</vCard:Family>
                <vCard:Given>Vsevolod</vCard:Given>
                <vCard:Other>A</vCard:Other>
              </vCard:N>
            </bqs:Person>
          </rdf:li>
        </rdf:Seq>
      </bqs:editor>
      <dc:title>Signal Transduction in Lung Cells</dc:title>
      <dcq:issued>
        <dcq:W3CDTF>1993</dcq:W3CDTF>
      </dcq:issued>
      <bqs:series>Lung Biology in Health and Disease</bqs:series>
      <bqs:volume>65</bqs:volume>
      <dc:publisher>
        <bqs:Organization rdf:parseType="Resource">
          <rdf:value>Marcel Dekker, Inc.</rdf:value>
          <bqs:property rdf:parseType="Resource">
            <bqs:property_type>location</bqs:property_type>
            <rdf:value>New York</rdf:value>
          </bqs:property>
        </bqs:Organization>
      </dc:publisher>
    </bqs:Book>
  </rdf:Description>
</rdf:RDF>
```

FIGURE 53: A more complicated complete book reference.

```xml
<rdf:RDF
    xmlns:bqs="http://www.cellml.org/bqs/1.0#"
    xmlns:dc="http://purl.org/dc/elements/1.1/"
    xmlns:dcq="http://purl.org/dc/terms/"
    xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
    xmlns:vCard="http://www.w3.org/2001/vcard-rdf/3.0#">
  <rdf:Description rdf:about="#cellml_element_id">
    <bqs:BookArticle>
      <dc:creator>
        <rdf:Seq>
          <rdf:li>
            <bqs:Person>
              <vCard:N rdf:parseType="Resource">
                <vCard:Family>Rogers</vCard:Family>
                <vCard:Given>Michael</vCard:Given>
                <vCard:Other>S</vCard:Other>
              </vCard:N>
            </bqs:Person>
          </rdf:li>
          <rdf:li>
            <bqs:Person>
              <vCard:N rdf:parseType="Resource">
                <vCard:Family>Strehler</vCard:Family>
                <vCard:Given>Emanuel</vCard:Given>
                <vCard:Other>E</vCard:Other>
              </vCard:N>
            </bqs:Person>
          </rdf:li>
        </rdf:Seq>
      </dc:creator>
      <bqs:first_page>41</bqs:first_page>
      <bqs:last_page>43</bqs:last_page>
      <dcq:issued>
        <dcq:W3CDTF>1996</dcq:W3CDTF>
      </dcq:issued>
      <bqs:Book>
        <dc:title>Guidebook to the Calcium-Binding Proteins</dc:title>
        <bqs:editor>
          <rdf:Seq>
            <rdf:li>
              <bqs:Person>
                <vCard:N rdf:parseType="Resource">
                  <vCard:Family>Celio</vCard:Family>
                  <vCard:Given>Marco</vCard:Given>
                  <vCard:Other>R</vCard:Other>
                </vCard:N>
              </bqs:Person>
            </rdf:li>
            <rdf:li>
              <bqs:Person>
                <vCard:N rdf:parseType="Resource">
                  <vCard:Family>Pauls</vCard:Family>
                  <vCard:Given>Thomas</vCard:Given>
                </vCard:N>
              </bqs:Person>
            </rdf:li>
            <rdf:li>
              <bqs:Person>
                <vCard:N rdf:parseType="Resource">
                  <vCard:Family>Schwaller</vCard:Family>
                  <vCard:Given>Beat</vCard:Given>
                </vCard:N>
              </bqs:Person>
            </rdf:li>
          </rdf:Seq>
        </bqs:editor>
        <dc:publisher rdf:parseType="Resource">
          <bqs:Organization>
            <rdf:value>Oxford University Press</rdf:value>
            <bqs:property rdf:parseType="Resource">
              <bqs:property_type>location</bqs:property_type>
              <rdf:value>Oxford</rdf:value>
            </bqs:property>
          </bqs:Organization>
        </dc:publisher>
      </bqs:Book>
    </bqs:BookArticle>
  </rdf:Description>
</rdf:RDF>
```

FIGURE 54: A book chapter reference. (Some whitespace has been removed in order to fit the example on a single page.)