



LIVING REVIEWS IN RELATIVITY

Thinking and Developing Electronically

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This is not the first time Living Reviews in Relativity has appeared in the Journal of Electronic Publishing. In September 1997, Schutz and Wheary wrote about their then-unproduced solely electronic journal of reviews of physics research. As we return to their story, Schutz and Wheary, along with their coauthors, explore how their ideas and their publication have evolved over the past year.

The main thing we have learned over the past year is that we cannot look at "publications" as isolated pieces. Print and online journals, e-mail lists, books, databases, Web sites -- all the places scholars gather, work out, and communicate their ideas -- are collections of information. Taken as a group and integrated into an electronic environment, those various forms of communication can become a scholarly information system, a loose and changing collection of data and resources that serves the research needs of the scholarly community. Because electronic information can be collated, processed, and presented in multiple ways, it can become a scholarly information system, the central core of the scientific-information and technical-information packages of the future.

We need to improve our skills at recognizing and incorporating such information. Libraries and librarians have a natural role here, and so does the e-journal. The e-journal can provide links and discussion of

other information resources as ways to understand a field. Building on the tradition of print journals, the e-journal can be a forum where scholars articulate their information needs -- by writing, editing, and refereeing articles that evaluate and contextualize important resources. Scholars do this in print journals as well, but in an electronic

format the resources can be hyperlinked and thus immediately integrated for the readers.

Living Reviews is a key part of a complex information system that includes both print and electronic resources. The journal has a central role in this system. That role is organizational, evaluative, and educational. Authors are able to select, explain, and link (in both hyper- and conceptual senses) the most important research and resources in the field.

The Role of *Living Reviews*

Living Reviews exists solely on the World Wide Web; the journal is electronic only. We are not chained to paper and so can think in new terms about what a scholarly journal can be in an electronic environment. We are building a research tool for our users, and so we focus on the ways information can be used, because in an electronic-publishing environment, a journal can become a multi-faceted, dynamic information resource.

Multi-faceted, dynamic information resource. The phrase has a nice ring to it. Let's consider for a moment what it actually might mean in practice:

- *Multi-faceted* is about an e-journal being many things to many people. Because information is electronically stored and processed, the e-journal can present the same information in multiple ways for a variety of purposes. Making the references cited in an online journal available and searchable in various ways is one example of developing multiple presentations of the same information. We will discuss this *Living Reviews* feature in greater detail below.
- *Dynamic* refers to the potential for purposeful presentation of multiple forms of information. That makes the e-journal something that adapts to users' needs and to the electronic media as they develop.
- *Information resource* is harder to define because information can be presented in a variety of ways for a variety of purposes, and both presentation and purpose evolve over time. The underlying theme is that something is a resource because it can be used, and that the utility of that resource can and should evolve

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over time.

We have coined the word "utilizability" to describe an electronic-information characteristic we discussed in our original JEP article. Utilizability is about a resource's movement, activity, and employment. In an electronic-publishing environment, documents become databases. They contain different types of data that can be prepared, stored, presented, searched, and read in multiple ways. With *Living Reviews*, utilizability of information was a design goal. When a document is prepared, stored, and presented electronically, the potentials for integrating, categorizing and offering the data it contains are greatly enriched. The job of the electronic-resource developer is to think about how to make the variety of data within a document, and within a document collection as a whole, accessible and meaningful.

One main example of the utilizability of *Living Reviews* is the way we process the references in articles. As with other journals that select authors who are experts in a subject and that publish peer-reviewed articles, we strive to insure that references cited in *Living Reviews* are of high quality. But we go farther than most other journals in that we recognize that our readers might want to use those references. We therefore add more information to them than most other publishers do.

We ask authors to keyword each reference cited in their articles. References cited in *Living Reviews* are collected into our reference archive, which may be

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searched by author, keyword, title, journal, year, and published format. Search results can be viewed on the screen (in a Web browser), or they can be mailed to the user directly in a variety of formats: plain text, BibTeX, or HTML. (BibTeX is a database that can be used in conjunction with LaTeX .) Any URLs listed in our reference archive are active links in the

HTML report form; we should also note that we have given special consideration to citing URLs as completely as possible. Citations to electronic information include: author (or responsible party), title, information type (article in an online journal or an HTML document, for example), date the information was published, date the URL was cited, and, of course, the URL itself.

In the archive, we have recently started to keep track of where references have been cited in *Living Reviews*. That is, when users search the reference archive, one of the fields in each returned record is "cited in." That field provides an active link to the place in each article where a given reference first appears. This is a powerful navigation tool. It means that users can immediately view the references in which they

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are interested, in the context of the article itself. Moreover, if the reference is cited multiple times in the article, the reader can use a small icon next to the reference to navigate to all its subsequent locations within the article.

With Perl scripts to automatically process that information, it takes little time and effort on the part of authors and on the part of the editorial staff to create the reference archive.

Keeping the Journal Live

Living Reviews journal went live in January 1998. Since then, two authors have asked to update their articles because they want to use the format better and because new developments in the field need to be included in their work. The authors will be changing their original texts significantly and adding new information. We consider those updates to be new articles that must go through the peer-referee process again.

Living Reviews is published in yearly volumes; articles are published as they are ready. Within each volume, we assign each article a publication number. The publication number is unique and is built as follows: YEAR-ARTICLE# (e.g., 1998-1, 1999-2). URLs for articles are built by adding the author's last name to the publication number: 1998-1rovelli, 1998-2anninos, 1998-3reula. Articles that have been updated in a significant way (for example, in the two cases noted above, where the articles will go through the refereeing process again), will be assigned new publication numbers. For archival purposes, we will keep all versions of articles available. We distinguish updated versions from their originals. We note in our index which publication number is the most current version and make this version the main access point to our coverage of the given topic.

Administration Software

Living Reviews is a dynamic journal not just in terms of evolving article content but also in how the journal is actually constructed and maintained.

If one browses articles in *Living Reviews*, it soon becomes evident that they possess a liberal quantity of dynamic HTML. (JavaScript is our scripting language of choice.) Each article has numerous pop-up windows that users can activate to display footnotes, equations and references. Users also have the ability to navigate through all the locations of any chosen reference in the article. Currently there are, on average, just under five hundred links (484, to be exact) in each article. Of those, 10 percent are external (to http addresses), and the remaining are self-referential (links that call up a separate part of the article). Such an intensely self-referential document comes largely through the use of dynamic pop-up equations and footnotes, and especially through the ability to navigate between citation locations of a reference.

To build such articles by hand would be highly time consuming and would be a process inevitably prone to errors. Moreover, since articles are continually being updated by their authors (who write their changes in LaTeX and not in HTML), updating an article

every few months is not feasible. *Living Reviews* has a small staff, and we would like to keep our numbers -- and our production costs -- down. To serve that goal, and to build the journal presentation and functionality we wanted, we needed to automate as much of our article processing as possible. We needed to be able to devote time to editing articles, and then to be able to quickly go from LaTeX source to final HTML presentation. We also needed to be able to proof and automatically extract and build an archive of references. Finally, we needed to be able to automatically build and update the journal index.

Therefore, in parallel to the development of the journal itself, we have been developing an administrative framework to choreograph all aspects of the processing of articles and the preparation of the Internet journal. This administrative software already has at its core the basic functionality to process articles and references and to do some maintenance.

The choice of languages to write the administrative framework was fairly self-evident: Perl has undisputed power with regard to text-manipulation and regular-expression support. That made Perl our natural choice for the processing and maintenance of the journal. Perl has one drawback, however. We did not want the staff of *Living Reviews* to have to wade through a directory of Perl tools (scripts), with their myriad of command line options, each time they processed and updated the journal. So a Java Graphical User Interface (GUI) running on a UNIX machine was placed over the suite of scripts. It provides a very simple interface between the scripts and the user. Instead of typing commands at a UNIX or DOS prompt, the user executes all commands via the interface. The administrative software has two basic roles: processing articles and references and updating and validating the journal.

Currently, articles are converted from LaTeX to HTML using the 96.1 version of Nikos Drakos's LaTeX2HTML converter (also a Perl script). However, the HTML output from that script was substantially below our design requirements for articles in *Living Reviews*. We therefore created a second Perl script to post-process the HTML. That script separates a contents table that is shown in a frame on the left side of the screen, and is dynamically linked to the text on the right. It allows readers to click on a heading, and go right to the appropriate text, while keeping the table of contents on the screen at all times.

In the article itself, JavaScript is introduced to allow equations, footnotes, and references to pop up at a mouse click. Our post-processing also adds the ability to navigate to all locations of a reference in the text. Such processing takes only a few seconds on current Pentium II processors. That ability to build and rebuild articles in a matter of moments means that adding new features to the HTML output, or reprocessing the article because of additions or corrections by an author, is a painless, quick, and foolproof task.

With the article's text converted to HTML, our next step is to proof and extract the

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references from the LaTeX article and place them in our searchable archive database. The administration software allows us to check the completeness of reference information. We use a computer program to break the information contained in references into fields (such as author, title, date, journal name) and build records that can be imported into a database. In order to be able to extract each piece of information in a given reference in the right order and in a way that allows us to build a complete record in a bibliographic database, we must use software to carefully review references to ensure that they are in the correct format, with beginning- and end-page numbers, correct keywords, etc.

With the articles converted to the *Living Reviews* HTML format and the new reference incorporated into the archive, we then update the indices on our Web site. Our indices list articles by author, publication number, and subject. Adding new articles to these lists, and adding links to their HTML versions, are both fully automated. Details of each article's title, author, and publication number are entered into the administration software, and the scripts take care of the necessary updates of the Web pages.

Development of Documents as Databases

When we were developing *Living Reviews*, we concentrated on a core set of ideas necessary to put a worthwhile scientific publication on the World Wide Web. We studied the resources already available to physicists and tried to develop a publication structure that would let authors -- the real experts in the information most valuable to understanding their field -- select and present the most valuable resources. As individual authors took the basic structure we had developed and started to use it to communicate, they brought us the opportunity to refine our thinking. The appearance of *Living Reviews* has evolved since its debut in January 1998.

No two articles we have published have exactly the same format. Authors have different writing styles and write about varied subjects. But authors also interpret and use our format differently. Carlo Rovelli, for example, used the fact that articles are broken down into different sections, each a separate HTML document, to create a document that could be read in different ways by different users. Rovelli recommends different paths through the article, based on readers' interests, experiences, and technical backgrounds. His article, "[Loop Quantum Gravity](#)", gave us a lot to think about regarding how the same information could be put together in different ways for different purposes.

Each article, in fact, gives us something new to think about. Our presentation has evolved over time. For example, originally, we were placing full-size graphics within the text. A recent submission, which incorporates more than twenty pictures and several movies (simulations of pulsars), forced us to come up with a more efficient way to present graphics within articles. We no longer place full-size graphics in an article. Instead, within the article text, we place thumbnails and stills, which users can click on

to view the full-size pictures or the movies.

Authors' desires to incorporate new types of information also push us to rethink how to present articles on the Web. For example, two authors just recently asked for guidance on how to include computer programs in their articles, so that users could engage the software during their reading experience to visualize data. In trying to work through how -- and if -- we should include such a feature in our articles, we have to consider how the presentation of that new information interacts with other information already in the article. We also have to consider the extent to which the new feature would add utility, as opposed to clutter, to the journal.

In our first year of publication we have learned that maintaining and developing an online journal is a constant process. If we introduce a new feature in articles, we have to consider the value and effort necessary to incorporate that feature into every article we have published. For example, when we decided to go to thumbnails to represent graphics and movie stills, we had to assess the value of going through articles published in the past to make them consistent with this new way of doing things. Because we felt that the modification streamlines and improves article presentation, we decided to modify past articles to incorporate thumbnails.

Another lesson we learned is how tempting it is, in the pursuit of developing a new publication in a new medium, to concentrate on *innovations* and to overlook the day-to-day administrative details of running a publication. Following up with authors and referees who have missed deadlines is not nearly as exciting as designing a new feature to incorporate into the journal. But that is our job as electronic publishers: to do both the mundane work that insures quality, and to present the new features that insure excitement. That has always been the job of publishers, and it does not change in the electronic environment.

Links from this article:

Living Reviews in Relativity, <http://www.livingreviews.org/>

Carlo Rovelli, "Loop Quantum Gravity," *Living Reviews in Relativity* 1(1998). <http://www.livingreviews.org/Articles/Volume1/1998-1rovelli/>

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