

COLLEX: semantic collections & exhibits for the remixable web

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Collex is a set of tools designed to aid students and scholars working in networked archives and federated repositories of humanities materials: a sophisticated collections and exhibits mechanism for the semantic web. It allows users to collect, annotate, and tag online objects and to repurpose them in illustrated, interlinked essays or exhibits. Collex functions within any modern web browser without recourse to plugins or downloads and is fully networked as a server-side application. By saving information about user activity (the construction of annotated collections and exhibits) as “remixable” metadata, the Collex system writes current practice into the scholarly record and permits knowledge discovery based not only on the characteristics or “facets” of digital objects, but also on the contexts in which they are placed by a community of scholars. Collex builds on the same semantic web technologies that drive MIT’s SIMILE project and it brings folksonomy tagging to trusted, peer-reviewed scholarly archives. Its exhibits-builder is analogous to high-end digital curation tools currently affordable only to large institutions like the Smithsonian. Collex is free, generalizable, and open source and is presently being implemented in a large-scale pilot project under the auspices of NINES.

The need to develop advanced interpretive and analytic tools for humanities scholars was underscored by a recently convened international digital “Tools Summit” at the University of Virginia. More than 80 scholars and stakeholders met in September 2005 to discuss how to address problems and opportunities in humanities research. That event clarifies the purpose of Collex, and of its sister projects Juxta and IVANHOE, which form a basic suite of tools meant

to promote and expand the regular practice of professionally-sanctioned digital scholarship in the humanities. The need to develop a culture of regular scholarly practice of this kind is widely acknowledged, as we see from the current ACLS commission on cyberinfrastructure in the humanities and social sciences, due to release its report in 2006. Collex is constructed with pragmatic scholarly needs in mind, and under the assumption that

the general field of humanities education and scholarship will not take the use of digital technology seriously until one demonstrates how its tools improve the ways we *explore* and *explain* our cultural inheritance – until, that is, they *expand* our interpretational procedures. (McGann, *Radiant Textuality* xii; *my emphasis*)

Collex facilitates primary interpretive gestures of *exploration* and *explanation* in a broad and socially-networked manner, and aims to form a locus for further *expansion* of interpretive methods in digital humanities.

The first formal iteration of Collex (to be completed in early December 2005) is being tested with more than 20,000 digital objects of 19th-century literature, art, culture and criticism from six major online journals, archives, and repositories. This pilot project will form the core of NINES, the Networked Infrastructure for Nineteenth-century Electronic Scholarship, a trans-Atlantic federation of scholars (nearly fifty of whom currently sit on three editorial boards, ready to vet submissions in the Victorian, Romantic, and American long nineteenth century) and of peer-reviewed primary and secondary materials constituting a federated collective. Endorsed by the NINES steering committee and under development for the past year at ARP, the University of Virginia's Applied Research in Patacriticism lab, Collex is both the central clearing-house for NINES and the interpretive hub around which we hope a vital community of scholars and students will coalesce.

Conceptual Development

Collex did not *begin* as a generalizable toolset for fostering collaboration within a semantic network of richly-described digital objects from archives, journals, and research collections all over the world. It was not at first imagined as a *tool* at all, but was rather an outline for face-to-face collaboration between an individual humanities scholar and a technical advisor in the context of one rich, online archive. We're striving, as we construct an interface for the larger Collex system, to preserve the sense of individuality that characterizes smaller-scale collaborative production. This section of the proposal outlines the conceptual development of Collex and describes the conditions of networked digital archives that call for such a system.

In January of 2004, as I was putting final touches to a dissertation on interpretative tools for digital humanities, I was invited by Professor Jerome McGann, who had recently won the Andrew W. Mellon Foundation's Distinguished Achievement Award, to oversee the redesign of the Rossetti Archive for inclusion in a nascent NINES collective. The Rossetti Archive was the first major online research collection to treat the cumulative life's work of a poet and painter, and therefore to tackle issues of markup and digital representation of texts and artworks on a large scale. I had previously served as Design Editor of the Rossetti Archive, shepherding its first manifestation on the Web in 1998. My perspective on digital humanities was profoundly shaped by problems we experienced in translating into accessible form what had previously existed only as a technical, SGML infrastructure for representing the complex relations among works, their documentary witnesses, and the scholarly commentaries that surround them in electronic editions. The conceptual complexity of the Rossetti Archive was a huge challenge to interface design, particularly in consequence of the limitations of SGML delivery software. While we had succeeded in bringing the Archive to users on the

Web, only a whole-scale conversion of our files to XML, conducted in 2003, would make it possible to excavate important Rossettian objects and clarify their relations at depths that were adequate to the Archive's design.

This was the scene to which I returned in 2004. I began work at a Rossetti redesign by interviewing researchers, teachers, and student users of the resource to identify problems with its current interface. A common theme was the dismaying depth of the Archive, the complexity of operations involved in locating primary objects (texts and images) in a dense network of commentary, and the monolithic nature of that commentary, embodying as it did a single perspective on Rossetti: the editor's. These problems were not as apparent to the Archive's developers, or to "power-users," who knew its structures intimately, and who recognized that the Rossetti Archive embodied a flexible, mungible system for interpretation, and that multiple perspectives on its material (if unrealized in the interface) were still embedded in its markup.

I therefore took the task of redesign to mean: 1. excavation for users of digital "objects" at appropriate levels (conceptual works, digitized documents, or individually-encoded subsets of a document, such as a single poem in an anthology); 2. exposure of existing encoded relations among objects and commentary; and 3. the enabling of multiple perspectives on the Rossetti Archive and its contents, made real in the interface in the form of guided tours or curated exhibits by distinguished scholars. This last item seemed crucial to me, as it served the first two so explicitly and satisfied our own desires to expose the Archive (and by extension all complex digital research collections) as multivalent machines for meaning. As a first pass at this aspect of the redesign, I prepared to invite an art historian to spend a week in residence at UVA, receiving training on the technical structure of the Archive and on means of producing online "exhibits."

At the same time, we were heavily engaged in finding viable publication venues for

online scholarship through NINES, and in setting up the social and technical structures that could bring a vast collection of 19th-century artifacts and criticism under a single roof, for search and analysis using common tools. The response to NINES on the part of the scholarly and technical community was overwhelming, and it soon became evident that whatever problems of depth and complexity we experienced in the Rossetti Archive would be realized a thousand-fold in NINES. By the same token, we were about to be presented with an unparalleled opportunity to nudge digital scholarship in arts and letters in a fruitful direction, by creating (if we could do it) an environment in which users and contributors would play a transformative role. New technologies in open archives, modeling, and semantic analysis began to suggest a research collective not organized around passive access to online resources, but rather sensitive to the uses to which those resources are put, to the ways in which they are continually re-interpreted.

Instructors, researchers, and students using a massive, federated research collective like NINES would perform, in essence, the same tasks as an individual “guest curator” of the Rossetti Archive. They would also require the same characteristics of archives and archived resources: that collectible objects be defined and made discoverable to them, that there be a means of forming collections and annotating objects, and that a system be in place for assisting a public presentation of scholarship on those objects, interlinked with the objects themselves as they appear *in situ*. The collective nature of NINES, and its clear appeal to large numbers of scholarly users, also implied a strong potential for social-software applications within this matrix. Once basic elements of the Rossetti redesign project were in place, we turned our minds to a generalizable, open-source toolset that would combine the best elements of social bookmarking or collecting systems like Connotea and Del.icio.us, and of specialized online curation and exhibit services, like those currently built by high-end design firms and only

affordable to large institutions such as the Smithsonian.

Collaboration, Access, and Preservation

We began work on Collex under the auspices of NINES and in the midst of collaboration with the UVA Library's "Sustaining Digital Scholarship" initiative, an exploration of methods for preserving and offering open access to digital tools and scholarly resources through federated repository systems like FEDORA. Our work was funded by Jerome McGann's Mellon award, which was used to support other NINES-related tools and initiatives such as Ivanhoe, Juxta, and a series of summer workshops for fledgling electronic editions. In addition to my work at the Rossetti Archive, I participated in all these activities as a designer, consultant, and instructor. With the hiring of noted search engine and web application developer Erik Hatcher in November of 2004, I began to turn my attention more closely to Collex as a structuring system for NINES. By the spring of the following year, my role had shifted from that of post-doctoral fellow to full-time member of the general faculty of UVA, based in Media Studies but with primary responsibilities centering on research and development at ARP.

ARP is the development arm of SpecLab, a think-tank offshoot of IATH, the Institute for Advanced Technology in the Humanities at UVA. Under the close direction of Jerome McGann, ARP employs three full-time programmers, a doctoral fellow, a project manager, and me. We are fully grant funded and all of our products are freely available and open source. We have consulting and collaborative relationships with: SpecLab; IATH; the UVA Digital Library; Rotunda, the digital imprint of the UVA Press; UVA's ITC Sakai development group, SIMILE at MIT; U. of Nebraska's Center for Digital Research in the Humanities; and MITH, the Maryland Institute for Technology in the Humanities, all of which serve not only to

advance our work practically and intellectually, but to ensure the long-term use and preservation of our tools. The UVA Library, through its legal counsel, Madelyn Wessel, has been particularly helpful in guiding us through intellectual property issues surrounding the fair use of resources in NINES and Collex. We regularly present our findings and technical work in progress to the NINES steering committee, and ARP's digital tools (particularly Collex, which stands at the center of all our work) will be distributed through NINES and the established institution in which NINES is ultimately housed.

Work on Collex currently takes place on a stable, dedicated ARP server, maintained by UVA's information technology service. By May 2006, when our current funding cycle ends, we will have established a 1.0 version of Collex, integrated it into a publicly-available NINES pilot project, and released an extendable, open-source Collex package to developers. While the software will be adequately documented for implementation by developers unconnected to us and our work, we hope to consult personally on implementation with select groups, such as the DLF team building Aquifer and MIT's SIMILE project, as well as with our collaborators in IATH, ITC's Sakai group, and in the UVA Library's SDS project. Some basic training in the deployment of Collex in these contexts will assure penetration of the tool into the scholarly, pedagogical, and archival communities it is meant to serve.

Collex 1.0 and the NINES Pilot

Six major projects in digital humanities are contributing materials in Collex-ready form to the December 2005 pilot: the Rossetti Archive, the Walt Whitman Archive, *Romantic Circles*, the Swinburne Project, *The Poetess Tradition*, and the online journal *Romanticism on the Net*. Important supplemental materials (like the annual Keats-Shelley bibliography) and additional journals and online collections wait in the wings to be included after our preliminary

implementation of Collex/NINES. At the time of this writing (late October 2005), we have full integration into the Collex system of the Rossetti and Whitman archives and of the Poetess project, and are on schedule for completion of the pilot in December and further Collex development in the Spring of 2006.

“Full integration” means that each of the participating resources has contributed a package of metadata representing all of the digital objects they wish to make browseable, collectible, and available to users for re-purposing within Collex. An important innovation of Collex lies in the way these objects are defined by their contributing editors. Collex uses a Dublin Core flavor of RDF, the resource description framework of the semantic web, to define collectible “objects” without limiting them to their expression as web pages. Where other social bookmarking tools (like Del.icio.us or Connotea) are designed to allow collection and annotation of whole web pages, Collex allows contributors of resources to make finer-grained distinctions, and users of the system to build collections and exhibits more attuned to the patterns of attention in humanities scholarship.

A clear example of interpretive modeling through object definition is the Collex representation of a book of poetry in the Rossetti Archive. Using XSLT transformations, we have created RDF metadata for intellectual and material “objects” at differing levels in this book. One RDF object (typed as a secondary resource, with supplemental genre and date identifiers) expresses the editor’s commentary on the book as a concept. Another object, also articulated in metadata, expresses one particular edition of the book. Within that high-level expression, each page of the book has been shared with Collex users as a collectible object, as has each poem on each page. This fine disambiguation ensures that Collex users can locate, annotate, and exhibit objects specifically suited to the scholarship they wish to perform – whether their attention is focused on bibliographic, social, or textual matters. It also ensures

that archive maintainers have the fullest control, in the Collex environment, over the use of their intellectual property and the artifacts they minister.

Because RDF objects share a common (and relatively simple) metadata scheme, they are discoverable through “facets” in Collex’s search and faceted browsing interface. Faceted classification is a non-hierarchical means of expressing ontological relationships. Any given object will share a number of facets with other objects – common dates, genres, authors, etc. Exposing these facets makes it possible not only for users to manually “drill down” into certain categories or explore lateral relationships, it also opens possibilities for algorithmic serendipity in research. In other words, Collex can exploit formally-expressed facets to offer more options and avenues to users interested in a particular object: “more like this” – more objects in the repository sharing one or more attributes with a researcher’s subject of attention.

Even more interesting is the ability of Collex to record and analyze user activity, and to translate the products of user interaction into RDF objects within the system itself. In this way, in addition to “more like this,” Collex can suggest to recent collectors of a particular object that they view the published collections and exhibits into which other users have placed the object, or objects like it. Because this content can be expressed as subscription-based RSS feeds, a web service, or an API through Collex’s underlying Nutch, Lucene, and Kowari RDF systems, it is possible for the maintainers of scholarly resources to patch into Collex directly from their individual web or listserv interfaces, offering information about user annotations and re-mediations for any given object without reference to Collex at all.

These latter functions – automated suggesting and connecting of resources, and the web services interface to Collex – are present in the current tool in rudimentary form. Their fuller development could continue in an ACLS fellowship year. At present, Collex allows NINES users: 1. to locate objects of interest through a faceted browsing and full-text search

environment that takes advantage of shared metadata, yet does not require federated resources to share a common markup scheme or interface; 2. to collect, tag, and annotate trusted objects (digital texts and images vetted for scholarly integrity within an “open” archive) directly from the archive’s web pages, using a bookmarklet pop-up window; 3. to comment upon and organize their own collected objects into relevant subsets using folksonomy tagging (a loose categorization protocol that comes from the social-software world); and 4. to browse their own and others’ objects by tag and through facets, within a Collex “sidebar” in any modern web browser.

Our work is now focused on testing and optimizing the user interface, incorporating more RDF objects into the pilot system, and laying the groundwork for further development, particularly of export- and exhibits features of Collex. By May 2006, we expect to offer Collex users the ability to share their collections (which will be easily transformable in XML format) in a variety of output modes and through knowledge-discovery automations. Also in prototype form and expected to be at a 1.0 development level by May is the Collex exhibit-builder. This tool will allow users, without any special technical training, to produce drag-and-drop, interlinked online and print “exhibits” using a set of professional WYSIWYG design templates. Exhibits, like user collections, will be housed on the NINES server, and may be submitted to NINES for peer review and formal inclusion into the federated body of scholarly materials. Each of these elements of Collex will require intensive testing, refinement, and scalability analysis, as well as further collaboration with NINES boards and contributors to ensure that the tool best serves their pedagogical and research interests. The “Project Plan” appended to this document contains further details about the proposed development of Collex, both within the context of NINES and as a tool ready for deployment in other contexts. It outlines technological requirements and goals for each component of the system, as well as our plans for

publicizing and demonstrating Collex in public fora.

All Collex activity takes place within the ordinary web-browsing environment that scholars presently use to access digital resources, and will require nothing in the way of plugins or downloads. The overhead (in terms of initial metadata production) for contributors of resources to the federated collections in which Collex can operate has also been kept purposely low, and is thoroughly compatible with Open Archives protocols. We predict that both of these factors – combined with the strong endorsement and example of NINES – will facilitate the adoption of Collex into day-to-day practices of humanities scholars in networked research and publishing environments.

SUPPLEMENTAL MATERIALS:

Selected Collex/NINES Bibliography

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PROJECT PLAN

Rough time estimates (in terms of days, weeks, or months) have been provided for each feature or activity. Some items will be developed concurrently or in an ongoing fashion (documentation, etc.), and all features listed here are to be developed by Erik Hatcher and Bethany Nowviskie. Work listed under "Collex 1.0" below represents continuing development effort from Fall 2005 to Spring 2006, supported by the Mellon Foundation and meant to lay the groundwork for Collex 2.0. Work listed under "Collex 2.0" is proposed for July 2006 to June 2007, pending grant funding.

Collex 1.0

- Complete integration of Collex with the NINES federated search interface (1w)
- More sophisticated folksonomy views in the sidebar (1w, 2d)
 - Cloud visualization of facet terms
 - List view of objects by tag and facet (my tags and all users' tags)
 - For a given object, browse all user collections in which it is found (3d)
- Tabbed interface for search results in NINES browser (1d)
- Updated documentation and content at www.nines.org (3d)
- Continued consultation to bring six pilot projects live in December 2005 (1m)
- Polish basic collection functionality and interface (2w)

- Knowledge discovery or “more like this” functionality to expose semantically related objects or objects that share facets and patterns of use (2w)
- Basic demos and tutorials for Collex in NINES (2w)
- Facility to export Collex collections in XML format for further transformation (1w)
- Basic user account creation and password management (2d)
- Devise a scheme for display and collection of page images from primary sources (2w)

Collex 2.0

- Integrate NINES full-text indexing and search at the object level (1w)
- Leverage encoded RDF relations (parent/child) for display and visualization (2w)
- Implement optional privacy features for user annotations (3d)
- Self-service user load & test interface for RDF contribution to Collex environment (2w)
- Collex exhibit functionality and interface (at least 2 months)
 - Templates for component-oriented page layout
 - Drag and drop interface, via AJAX and DHTML
 - Image cropping and resizing for open-access thumbnails
 - WYSIWYG text editors via AJAX and Ruby on Rails
 - Limit hyperlinks to peer-collected (and peer reviewed) objects in NINES
 - Preview feature for exhibit publishing
- Web services to support community/folksonomy functionality and integration of Collex information into formerly static web archives: (3w)
 - List of tags for a given object
 - List of all objects tagged by a given user
 - All exhibits for a given object

- All exhibits containing objects tagged “x”
 - All exhibits tagged “y”
- New output formats from the exhibit maker (course syllabi, annotated bibliographies, print through XSL-FO, etc.) (1m)
- Notification services (RSS feeds on particular tags, facets; email alerts) (1m)
- Graphic design refinements and a formal usability study (6w)
- Performance testing for scalability issues (2w)
- Support for two levels of exhibit sharing: (1w)
 - Peer reviewed, available to all users for search and collection
 - User-created (Wild West), distinct from the peer-reviewed NINES collection
- Information visualization: layered relations of NINES objects, Collex collections and exhibits, and users (goal: to bring digital patterns of use into the scholarly record) (3m)
- Generalizable administrative interface features (3w)
 - Promotion of regular exhibit to peer reviewed status in NINES
 - User account approval and management of users
- Documentation, community support, presentations to scholars and archivists, and continuing user testing (2m)
- Prepare Collex for open-sourcing and stand-alone use outside of NINES (1m)