Poster Abstracts
Annual Meeting 2007

Washington, DC
November 6 – November 8, 2007

Please refer to the *Poster Overview* to identify posters' location in the F. Scott Fitzgerald Ballroom.

Title: Achievement Standards Architecture in the NSDL

Abstract: A number of NSDL projects focus on development of tools and supporting infrastructure for generating and using achievement standards in metadata describing preK-12 educational resources. This poster will demonstrate how the products of these various projects interact to provide a coherent technical architecture for metadata generation containing achievement standards correlations and the deployment and use of that metadata in information systems in general and NSDL in particular. Organizations participating in the poster include ASN (JES & Co.), the Center for Natural Language Processing, Syracuse (CNLP), DLESE and WGBH.

Authors: Diny Golder (ASN) Anne Diekema (CNLP) Holly Devaul (DLESE) Karen Cariani (WGBH), Stuart Sutton (University of Washington)

Title: AMSER Pathway Overview

Abstract: This poster will provide an overview and update of the AMSER (Applied Math and Science Education Repository) Pathway project. AMSER is a portal of educational resources and services built specifically for use by those in Community and Technical Colleges but free for anyone to use; it is being created by a team of project partners led by Internet Scout.

Authors: Rachael Bower, Edward Almasy

Title: CWIS: Open-Source Portal Software for Digital Libraries

Abstract: CWIS is software to assemble, organize, and share collections of data about resources, like Yahoo! or Google Directory but conforming to international and academic standards for metadata. CWIS was specifically created to help build collections of Science, Technology, Engineering, and Math (STEM) resources and connect them into NSF's National Science Digital Library, but can be (and is being) used for a wide variety of other purposes. This poster will provide information about the latest version of CWIS - including new features and functionality.

Authors: Rachael Bower, Edward Almasy

Title NSDL Technology Usage Survey

Abstract: In fall 2007 the NSDL Technology Standing Committee conducted a survey of NSDL projects past and present, gathering information on their use of software and collection development tools and web technologies. This poster will present the results of that survey, including forward-looking projections on future directions for technology within the NSDL.

Authors: Edward Almasy, Jon L. Holmes

Title: An Overview of the Dataverse Network

Abstract: The Dataverse Network Project includes integrated developments in web application software, networking, data citation standards, and statistical methods designed to put some of the universe of data and data sharing practices on firmer ground. Dataverse Networks, which involve installations of our open source web application software, are hosted on computers at major institutions, such as archives, institutes, corporations, universities, and libraries. Individual dataverses, which are each served by a Dataverse Network, are self-contained data archives virtually hosted on the web sites of authors, teachers, scholarly journals, granting agencies, research centers, academic departments, and others. Dataverses are branded in the style of the web site where they are virtually hosted. The digital library services of each dataverse include data archiving, preservation formatting, cataloging, data citation, format conversion, subsetting, on-line statistical analysis, and dissemination. Each dataverse presents a hierarchical organization of a collection of data sets, which may include only studies produced by the dataverse creator (such as for an author or research project), those associated with published work (such as replication data sets for journal articles), or data sets in any collection of use to a particular community (such as for a journal's replication archive, or a college class or subfield).

Author: Micah Altman

Title: Cooperative Collection Building Using iVia Data Fountains

Abstract: This poster describes a collaboration involving three NSDL Projects: iVia Data Fountains Project, Materials Digital Library Pathway (MatDL), and the Middle School Portal. iVia is developing a suite of tools that provide automated and/or semi-automated Internet resource discovery (collection development), metadata generation and rich, full-text extraction. MatDL and the Middle School Portal are testing the use of iVia to streamline their metadata assignment process through automatic machine generated metadata. The goal of this project is to improve semi-automatic machine assisted metadata generation capability for portable document format (PDF) files and image files as well as automatic extraction of author metadata from PDF documents.

Authors: Anthony Moralez, Laura Bartolo, Cathy Lowe, Kim Lightle

Title: CSERD: Computational Science Education Reference Desk

Abstract: The Computational Science Education Reference Desk, a Pathways project of the National Science Digital Library and funded by the National Science Foundation, aims to help students learn about computational science and to help teachers incorporate it into the classroom. CSERD attempts to: -Collect a catalog of quality resources from across the internet. -Provide a forum for the Verification, Validation, and Accreditation of catalog items both by users and by expert reviewers. -Create original computational science resources for use in education.

Author: Patricia Jacobs, Robert M. Panoff, David Joiner, Jonathan Stuart-Moore

Title: Customizing NSDL resources

Abstract: Students are not one-size-fits-all when it comes to learning. NSDL repositories should not contain one type of resource for all types of students. In this targeted research project, we customized one NSDL library (Math Forum) to the abilities of each student (measured by a pretest) and to their ongoing perfomance. Available problems were color-coded to tell the student which problems were likely to be easy, just right, difficult, or very hard for that student based on level of skill and self-confidence. Each problem was augmented with material that broke the problem down into separate skills and served as training to help students build up their skills. Hints enabled students to work through more difficult problems. We are evaluating whether students are more engaged in and return more often to the customized version as compared to the original site. The project solicited teacher/student input about learning needs and characteristics and the effectiveness of resources. This project will result in more sensitive instruction that is responsive to individual differences, especially among underrepresented minorities and women and will unveil the extent to which students of different cognitive abilities learn with different forms of teaching.

Authors: Beverly Woolf, Ivon Arroyo, Steve Weimar

Title: Digital Library Sustainability

Abstract: Sustaining open access educational digital libraries presents unique challenges and opportunities, and some NSDL pathways are now facing these challenges. This poster describes the processes and strategies that were developed to address these challenges at the Digital Library for Earth System Education (DLESE), which has served as the geoscience pathway in NSDL. The authors reflect on their experiences and highlight which of these processes and strategies may be applicable to other digital library sustainability efforts.

Authors: Karon Kelly, Mary Marlino, Tamara Sumner, Michael Wright

Title: NSDL Science Literacy Maps for Science and Mathematics Education

Abstract: The NSDL Science Literacy Maps are an interactive graphical interface that helps K-12 teachers and students understand the relationships between science concepts and to find associated educational resources. The interactive maps are generated through a Web 2.0 API that lets developers embed the maps in their own Web sites and display educational resources and other information in the maps. The maps illustrate learning goals for different grades, and the relationships between goals, for K-12 students across a range of science, technology, engineering, and mathematics (STEM) disciplines.

Authors: Sharon Clark, John Weatherly, Tammy Sumner, Faisal Ahmad, Lynne Davis

Title: JiTTDL - Just-in-Time Teaching Digital Library

Abstract: JiTTDL (www.jittdl.org) is a resource library and a virtual meeting place for the practitioners of Just-in-Time Teaching pedagogy. JiTT is an inductive teaching and learning strategy (ref: Journal of College Science Teaching, March/April 2007). Preparatory assignments, posted on the web, are completed by the students just before the lesson. The responses inform the subsequent classroom activities. The library includes a collection of pedagogical resources, a wiki, and a hosting service where faculty can post assignments and retrieve student responses. The library will be open to the community after the NSDL 2007 meeting.

Author: Gregor Novak, Evelyn T. Patterson

Title: NSDL Materials Digital Library Pathway: Creating an Evolvable Learning and Research Environment

Abstract: NSDL Materials Digital Library Pathway (MatDL.org) provides content and services to support the integration of education and research in materials science (MS). In addition to the MatDL Repository (http://matdl.org) of materials resources, MatDL provides collaborative tools, such as the Soft Matter Wiki, MatForge, and the Teaching Archive. The Soft Matter Wiki (http://matdl.org/matdlwiki/index.php/softmatter:Main_Page) is a publicly accessible, expert-community-driven site for scientific communication and dissemination within the sub-domain of soft matter. MatForge (http://matforge.org), a Subversion/TRAC workspace for open access development of modeling and simulation codes, hosts a number of research code projects with possible teaching applications including: FiPy administered by MSEL/NIST code developers; Carnegie Mellon University Computational Materials Science; and DOE Computational Materials Science Network Cooperative Research Team. Workspace has been established for collaborative development of core undergraduate MS teaching materials beginning with the Transport Phenomena collection (http://teaching.matdl.org). MatDL also offers remote virtual labs for introductory science courses, e.g. modules that illustrate how atomic arrangement influences materials properties (http://matdl.org/virtuallabs). MatDL and several Materials Research Science &

Engineering Centers have taken first steps in working together after participating in an NSF NSDL workshop to identify key issues and opportunities in the enhancement and integration of materials research and education.

Authors: Laura Bartolo, Sharon C. Glotzer; Donald R. Sadoway; James A. Warren; Matthew John M. Krane; Adam C. Powell IV; Krishna Rajan; Diane Geraci; Vinod K. Tewary; Cathy S. Lowe

Title: NSDL Persistent Archive

Abstract: A new crawl has been conducted of URLs registered into the NSDL persistent archive. The archive interface has been improved to provide better response, provide accounting information, and provide access to all archived versions of the web sites. We will present statistics about the crawl efficiency and the impact on participating NSDL sites. We will also present statistics on the material present at the URLS, a grade level assessment based on the vocabulary used within the material, and the properties of the archive itself. Currently more 77 million files are stored, comprising more than 7 Terabytes of data.

Author: Reagan Moore, Bing Zhu

Title: IntegraL: A Lightweight Integration System of Heterogeneous Digital Library Collections and Services

Abstract: IntegraL brings a plethora of relevant resources directly to the library user by providing a sustainable infrastructure for virtually integrating the collections and services of libraries nationwide. IntegraL provides a systematic "lightweight" approach for integrating library resources through linking. Users interact with their library system just as before. But in addition, they see extra link anchors. Upon selecting one, IntegraL automatically generates a list of links to relevant documents, services and metadata. Integration into the IntegraL infrastructure will allow library systems to act as information requesters (a customized set of links will be embedded in display screens for their users) and information providers (links in any display screen can lead to these systems' documents and services).

Authors: Min Song, Michael Bieber, Eric Koppel, Dawid Midura

Title: Sustainable Growth for the Analytical Sciences Digital Library

Abstract: The Analytical Sciences Digital Library has grown to provide several functions linked to pedagogy in the areas related to chemical measurements and instrumentation. Since its inception, publicly-accessible websites have been peer-reviewed and linked when of sufficient quality, level, and focus. In place of millions of Google hits, ASDLib provides a few hundred situation-appropriate links. ASDLib also Open Access publishes novel peer-reviewed articles and monographs as teaching modules, guides to best educational practices, and laboratory experiments. Workshops sponsored by the Library

have catalyzed generation of additional modules, which of course must pass peer review in order to be posted. To encourage undergraduates to communicate research findings even when only partially complete, we host an on-line poster session (with posters archived after 6 months) in addition to publishing peer-reviewed undergraduate research reports. In partnership with the Analytical Division (ANYL) of the American Chemical Society, we have recently opened a joint portal, www.analyticalsciences.org, in which ASDLib provides library content and ANYL provides information of service to its membership. This partnership between ASDL and ANYL assures long-term viability for ASDLib.

Author: Alexander Scheeline, T. Kuwana

Title: TeachEngineering.org - Resources for K-12

Abstract: TeachEngineering is an integral part of the engineering pathways and provides a free online digital library of hands-on, standards-based, classroom-tested K-12 engineering lessons and activities for science and math teachers. TeachEngineering curricula use engineering as a vehicle for integrating science and math fundamentals via hands-on engineering-based activities relevant to the lives of youth. The collection is searchable by subject area, grade level, educational standards, keywords and more. We've made strides in working with NSDL educational standards correlation tool providers and expect to offer searches by all 50 states' educational standards by spring 2008. The collection is organized into activities, lessons and multi-week curricular units, as well as real-world data sources via Living Labs. Contents are dynamic — evolving and growing over time — currently containing 421 activities, 227 lessons, 34 units in 13 subject areas. Each lesson and activity includes curricular components such as: summary, learning objectives, background information for teachers, correlating educational standards, activity prep/procedures, vocabulary/definitions, suggestions to scale up/down, time required, expendable cost per group, assessment activities and troubleshooting tips. Go to TeachEngineering.org and see!

Authors: Martha Cyr, Jackie Sullivan, René Reitsma, Paul Klenk, Mike Mooney, Nancy Shaw, Gary Ybarra

Title: Engineering Pathway: The Engineering Education Wing of NSDL

Abstract: The education of the engineering workforce has never been more compelling, nor more important than it is today. Engineers harness the spirit of innovation to create solutions to the worldwide challenges facing people and our planet. As articulated in NAE's Engineer of 2020 report, it is clear that today's engineering education does not begin at age 18 and end with a university degree. To support learning for broad and diverse communities, with audiences from elementary school to lifelong learners, the K-Gray Engineering Pathway provides a "one stop shopping" portal to comprehensive engineering education resources within the greater NSDL. The Engineering Pathway (EP) Digital

Library provides customized pedagogical engineering information and resources for different audiences and activities. Some of the exciting EP features include: - Targeted standards-based engineering curriculum searches tailored for K-12 teachers. – Aggeregation of the most significant K-12 engineering resources in one place – State-to-state educational content standards alignment for K-12 curricular resources – Resources for K-12 teacher professional development. – Disciplinary Communiy pages for all ABET-acredited disciplines. – Best practices for teaching engineering courses in higher education. – Information on ABET accreditation criteria and exemplars. – Resources and learning tools for engineering college students. – Information and resources on diversifying the engineering profession. – Seamless access for NSDL users through community single sign-on. – Premier Award for excellence in engineering education courseware. – Daily events feed on engineering innovations for every day of the year. – Engineering education news blog with highlights to EP resources.

Authors: Joseph Tront, Alice M. Agogino Jacquelyn Sullivan Andi Neiss

Title: Teachers' Domain Pathway Project

Abstract: Teachers' Domain is an NSDL Pathway project that provides rich media science resources for K-12 classrooms and online teacher professional development courses. Some new features in Teachers' Domain illustrated in our poster are open content resources, geosciences and IPY resources, additional professional development courses, metrics, and our marketing campaign.

Author: Karen Cariani, Ted Sicker

Title: Professional Development Institutes to Increase Afterschool Educators' Use of the NSDL

Abstract: The Exploratorium, a hands-on museum of art, science and perception, produces a vast array of unique resources for both K12 and informal science learning and teaching that are being made available through the National Science Digital Library. In partnership with the California School-Age Consortium (CalSAC), an established statewide after-school leader training network, new curricular modules and existing STEM resources found in the NSDL are used to create and offer professional development institutes for use by afterschool providers. A curricular module consists of hands-on activity, links to related web resources, digital videos, a concept map, and tips for educators. In addition to workshops, online professional development is also being developed for afterschool leaders and trainers.

Authors: Sherry Hsi, Rob Rothfarb, Aaron Kline

Title: The Exploratorium's Learning Resources Collection - An Exhibit-based Science Learning and Teaching Digital Library

Abstract: The Exploratorium, a museum of science, art, and human perception in San Francisco, has been a nexus of activity that nurtures experiential learning, informal science discovery, and personal inquiry with thoughtfully designed interactive exhibits. Educational materials, learning tools, and web-based resources continue to be developed at the Exploratorium to support exhibit-based science teaching, teacher professional development, and informal lifelong learning in STEM. Via a collections grant that began in 2003, digital resources have been reviewed and selected to be part of the Exploratorium's Learning Resources Collection and made interoperable with NSDL in collaboration with SMETE.org. Because a large image collection was already implemented using Canto Cumulus at the institution before the NSDL project began, this was used to organize and manage digital assets and metadata. Developers created Java-based middleware to make the collection interoperatble with NSDL.org. We are currently exploring open source solutions to migrate the library and leverage NSDL tools to sustain the collection. Teachers report that the library is easy to use. An embedded zipcode survey on the site found that users came from 52 states including Alaska, Hawaii, and Puerto Rico. While the project ended in 2006, the Exploratorium has committed to supporting the library as part of its on-going educational programs.

Authors: Sherry Hsi, Rob Rothfarb, Aaron Kline, Rose Falanga, Meg Bury

Title: Consider the Source: Primary Research Articles within an Educational Digital Library for Curriculum Enrichment and Online Collaboration

Abstract: It is widely accepted that authentic research from primary articles holds great value for augmenting curricula within disciplines centered on empirical investigation. The National Science Digital Library (NSDL), http://nsdl.org, has begun work on a program that will make primary research articles easily available for teaching in an array of institutional settings. The project further seeks to use Web 2.0 technology to support local and distributed collaboration by students, personalized collection building by instructors, and ongoing content development by Library editorial staff and outside experts.

Author: Mike Luby

Title: General Recommendation Engine (GRE) for NSDL

Abstract: This project proposes a comprehensive investigation on the impacts of recommendation systems on digital library users. Upon completion, this project should provide extensive understanding of: 1) whether and how recommendations improve digital library users' information search; 2) how recommendations change digital library users' information search behavior; and 3) whether a particular type of recommenda-tion and presentation method is more effective for a certain type of subject domain or information search. This will help digital library system developers plan more effective ways to

implement recommendation systems and present recommendations to their users in the future.

Authors: Yi-fang Wu, Il Im, Todd Will, Umar Qasim, Michael Bieber, Vincent Oria

Title: Content Clips

Abstract: The Content Clips web environment system can dynamically incorporate diverse resources from distributed digital libraries into online presentations. It grew from an NSDL research study that examined the feasibility of using Flash templates to assemble learning activities from individual clips, including images, audio, and video. The system features a Content Kit for teachers to find, create, and assign clips, activities, and sets. Students can manipulate assigned assets through a separate interface, which lets them control media playback, drag and drop, draw, and enter text. Although the study's focus was elementary life science, the system framework is content-independent, with wide applications for other grades and subjects. This poster highlights recent accomplishments, which include (1) classroom evaluation; (2) launching a public web site; (3) expanding the Content Clips collection by importing external NSDL metadata; and (4) an "add your own clip" feature that enables a mashup between user-selected content and clips from the cataloged collection. Additionally, "Telling STEM Stories through Content Clips," a new NSF-funded project (Research on Gender in Science and Engineering) will apply the framework and tools to create an online collection that highlights STEM careers and introduces strong role models through the personal stories of diverse women scientists.

Authors: Lois McLean, Rick Tessman

Title: Using Online Science & Math Resources in the Classroom

Abstract: The poster describes findings from two NSF grants (NSDL 0434892, TPC 055444) aimed at helping educators integrate NSDL resources into their classroom practices. Guided by a view of 'teaching as design', we have developed a flexible teacher professional development model that can be implemented within a range of workshop formats, including sustained (6-8 hours), overview (1 hour), abbreviated (4 hours), online and train-the-trainer (TTT). Using problem-based learning, the workshop helps participants learn to use the NSDL and the Instructional Architect (ia.usu.edu) to increase their design capacity with online learning resources. The workshop implementations use continuous evaluation to document impact of workshops on participant knowledge, behavior, and attitudes. In 2006/7, 480 educators participated in workshops, an increase of 18%. Since August 2003, over 2,400 users have registered with the IA, resulting in the creation of over 4,000 teacher projects using almost 17,000 online resources. These teacher projects have had over 219,000 visits. Project goals also include the development of a review rubric for online resources to: * Contribute teacher-designed learning activities from the IA into the NSDL: * Include contextual metadata supporting discovery and

(re)use; * Capitalize on social networking technology to enhance the utility of the reviews and to encourage interaction; and * Contribute to the career development of educators.

Authors: mimi recker, Kaye Howe, Sarah Giersch, Rena Janke, Andrew Walker

Title: DLConnect: Outreach Models Emerging from Michigan

Abstract: In its third year, then DLConnect project has delivered workshops to over 300 school library media specialists and teachers across Michigan. In addition to increasing awareness of NSDL, the workshops have also revealed implementation strategies and designs based on the integration of technology availability, school culture, and educator change and motivation. DLConnect has also served preservice teachers and media specialists. These workshops reflect the lessons learned from in-practice educators and impart strategies to ensure NSDL's use with new members of the teaching community. Now in its final year, the project will focus on articulating the workshop model and sharing project findings in publication and presentation venues.

Author: Marcia Mardis, Ellen Hoffman

Title: Reflections on Building the NSDL: Uncovering Lessons Learned

Abstract: NSDL is one of the largest and most complex collaborative educational projects funded by NSF to further Science, Technology, Engineering and Mathematics education. The community that defines NSDL is changing as the organization develops and matures. As the NSDL continues to evolve it is increasingly important to know from where we have come in order to better plan where we are going. NSDL's story of how it has developed and what the NSDL community has learned throughout that development is important to share with other agencies and organizations that are undertaking large-scale technology enhanced learning initiatives that involve multiple institutions or are collaborative in nature. The goal of this project is to capture the collective knowledge of that community to highlight the successes, experiences and sometimes failures of the builders of the NSDL. What stories and viewpoints do you have to tell about the making of NSDL? We'd love to hear more, so please stop by to learn about our plans to develop this important history of our community.

Authors: Brandon Muramatsu, Flora McMartin, Susan Jesuroga, Dave MacArthur

Title Dewey Digital Library

Abstract: In 1999, AAAS along with 11 other professional organizations established the BiosciEdNet (BEN) Collaborative with funding from NSF as an NSDL Pathway. The BEN Collaborative consists of 24 partners working together to provide an array of peer reviewed materials to the scientific community. The BEN portal site was developed to aggregate educational resources from contributing partners' digital libraries. The Dewey initiative has been taken to resolve the challenges most digital libraries faced—lack of synergy, high

maintenance costs, high start-up costs, and poor peer review systems. Dewey's goal is to provide customizable digital library software that is easy to install yet robust enough to handle complex tasks in a cost effective solution. Advances in web technology have allowed Dewey to become an easy to use metadata cataloging tool configurable by managers. The most important features include metadata structure management, input process management, and the new peer review system. With the adaptation of the Dewey Digital Library organizations will be able to better manage their resources, provide higher quality content, and share resources seamlessly.

Authors: Sergey Demidenko, Cal Collins, Shakib Mostafa

Title: Beyond Polar Bears and Penguins: Integrating Literacy and IPY in K-5 Classrooms

Abstract: This poster describes a NSF-funded International Polar Year (IPY) collaborative project between Ohio State University, the OSU Byrd Polar Research Center, Ohio Resource Center, COSI, Cornell University, and UCAR. The goal of the project is to increase the science and polar literacy of students and teachers by increasing the amount and quality of science teaching that occurs in elementary classrooms. Twenty issues of an e-zine entitled "Beyond Polar Bears and Penguins" will be developed. A limited set of highly generative and powerful discipline specific concepts, such as Ice, Conservation, Biomes, and Populations, will be the focus of each issue. The project will take advantage of emerging Web 2.0 tools and applications in developing the user interface and make available an IPY Learning Objects Repository that will allow other developers to tap into a wealth of IPY resources.

Authors: Kimberly Lightle, Susan Van Gundy; Carol Minton Morris; Elly Cramer; Dean Krafft; Roger Cunningham

Title: Contributing NSTA Content to the NSDL Metadata Repository

Abstract: This poster describes the collaborative project between the National Science Teachers Association (NSTA) and Ohio State University. The overall goal of the project is to connect the substantial storehouse of NSTA vetted materials and resources to the NSDL, extending both the number of educators it serves and the number and kinds of resources it offers. The objectives of the project are to prioritize resources to be connected to the NSDL and Pathways projects; develop an e-publication model; establish adequate metadata for all resources; explore the use of Shibboleth or similar software in the context of the single login work being done by the NSDL Core Integration team; and build the infrastructure and software needed to create, sustain, and provide access to a fee-based collection of resources. All of these activities are designed to support interoperability, reusability, and persistence. Over 1800 records of NSTA articles and book chapters are now available to be searched in the NSDL repository.

Authors: Al Byers, Kimberly Lightle

Title: NSDL Middle School Portal

Abstract: The NSDL Middle School Portal (http://msteacher.org) continues to evolve with new publications and functionalities. A new blog entitled "Connecting News and National Science Education Standards" was launched September 5, 2007. The purpose of the blog is to encourage teachers to use current events as teaching opportunities. Every Thursday, MSP staff link a current news article to related NSDL teaching resources that connect specific content standards to that event. The related middle level, grades 5-8 content standards of the National Science Education Standards are included along with links to additional information such as lessons, reference articles, and definitions. The blog can be found on the Science Pathway page of the MSP at http://msteacher.org/science.aspx. Users can read Explore in Depth and Quick Takes publications, search and browse, and register for email notification of new content.

Authors: Kimberly Lightle, Roger Cunningham

Title: Blog-Wiki-Doc-a-Palooza: Synching Communications Objectives With the Right NSDL Semantic Digital Library Service

Abstract: NSDL is pleased to offer three ways for users to contribute their knowledge and expertise to the Library. Expert Voices, NSDL's blogosphere, NSDL Wiki, a collaborative space for creating, annotating and organizing information, and On Ramp, NSDL's institutional digital repository content management system for publications, research, and teaching materials, are currently available. Purposeful and serendipitous examples of library use that range from teachers who need just-in-time resources aligned with standards along with suggestions for classroom use, to at-large science buffs conducting research around personal interests are supported by NCore semantic digital library services that are "plugged in" to the NSDL Data Repository. This poster presents a roadmap for matching semantic services with communications objectives. These services represent three distinct tiers of communications—short news and information items, to mid-sized editable articles, to long, durable scholarly publications. This poster describes each tier, along with communications use cases for internal and external audiences that expose dynamic views of the Library through user-created semantic layers of meaning. 1. Expert Voices (http://expertvoices.nsdl.org/) is based on Word Press Open Source blogging system. Word Press is a popular Web open source technology that supports a "website where entries are written in chronological order and commonly displayed in reverse chronological order."1 Search engines are "tuned" to detect Word Press content because they are interested in presenting new content, and understand that this software is partially responsible for generating the more than 106 million blogs currently available on the Web.2 "A typical blog combines text, images, and links to other blogs, web pages, and other media related to its topic. The ability for readers to leave comments in an interactive

format is an important part of many blogs. Most blogs are primarily textual, although some focus on art (artlog), photographs (photoblog), sketchblog, videos (vlog), music (MP3 blog), audio (podcasting) and are part of a wider network of social media."1 Example of a successful NSDL Expert Voices blog: Connecting News with National Science Standards http://expertvoices.nsdl.org/connectingnews/ The NSDL Middle School Portal Pathway at Ohio State University posts a weekly annotated news item for science teachers that makes it easy to blend current events into the regular curriculum. Project staff link a current news article to related teaching resources that connect specific content standards to the event. Articles may be appropriate for students to read in the blog, or they may serve as background knowledge for teachers and inspiration for subsequent instructional activities. The articles aim at a grade 5-8 audience and include links to lessons, reference articles, and definitions. Currently this blog hosts the most visitors to NSDL's blogosphere. Consider using an NSDL Expert Voices blog if you plan to present: --Timely information --Brief, single-author items --Items for public comment --Regular weekly posts --Lots of external links to resources and to the NSDL Data Repository --Focused content for a specialized audience --Standardized content model, example: 1. Story introduction or premise 2. How to turn this news event into an inquiry-based, standards-related lesson 3. Same length each time you post 2. NSDL Wiki (http://wiki.nsdl.org) provides a collaborative online environment based on Media Wiki, another popular open source Web-based software, that allows users to organize, create, and annotate resources. Vetted articles and referenced resources can then be added back to the library for search and discovery on nsdl.org. "Wikis are often used to create collaborative websites, power community websites, and are increasingly being installed by businesses to provide affordable and effective Intranets or for use in Knowledge Management. Ward Cunningham, developer of the first wiki, WikiWikiWeb, originally described it as "the simplest online database that could possibly work"."3 Example of a successful NSDL Wiki The Beyond Penguins and Polar Bears (BPPB) Project http://wiki.nsdl.org/index.php/Community:Polar This collaborative effort is being developed by an interdisciplinary team from Ohio State University (OSU), College of Education and Human Ecology; the Ohio Resource Center (ORC) for Mathematics, Science, and Reading; the Byrd Polar Research Center; COSI (Center for Science and Industry) Columbus; and the National Science Digital Library (NSDL) Core Integration team at Cornell University and University Corporation for Atmospheric Research (UCAR). The wiki is being used to develop and document project deliverables that include creating 20 issues of a multimedia "ezine" with a combined focus on inquiry-based science and content-rich literacy learning. Consider using an NSDL Wiki if you plan to present: --Information that is not time-sensitive --Multiple author items --Collaborative iterations of documents --Documents and information for a group of collaborators --Mid-sized documents --Documents and information with drill-down links to additional materials On Ramp (http://onramp.nsdl.org/) is NSDL's institutional digital repository content management system for publications, research, and teaching materials based on the Fedora-based Fez.

Durable document management and facilities for reuse, recombination and eventually automated dissemination are provided by On Ramp. Any type or size of content may be stored in On Ramp. “Content Management is a set of processes and technologies that support the evolutionary life cycle of digital information. This digital information is often referred to as content or, to be precise, digital content. Digital content may take the form of text, such as documents, multimedia files, such as audio or video files, or any other file type which follows a content lifecycle which requires management.”4 Example of successfully managed content in On Ramp: NSDL Documentation http://onramp.nsdl.org/list.php?community_pid=changeme:47 The ongoing NSDL documentation effort can be managed, and versions of evolving documents can be tracked using On Ramp. Each document has a permanent URI that can be referenced by Expert Voices or NSDL Wiki or by any other web site. Consider using On Ramp if you plan to present: --Information that is not time-sensitive --All versions should be preserved --Information and materials that will be accessed and reused by others --Collaborative iterations of documents --Long or very large documents --Information and resources that should be managed over time 1 http://en.wikipedia.org/wiki/Blog 2 http://technorati.com/about/ 3 http://en.wikipedia.org/wiki/Wiki 4 http://en.wikipedia.org/wiki/Content_management

Authors: Carol Minton Morris, Elly Cramer Lynette Rayle

Title: Building Digital Libraries with NCore

Abstract: NCore is the new name for the suite of technologies and standards that power NSDL's core infrastructure. It was designed to replace NSDL's previous metadata record-based paradigm, and allow greater flexibility in collaborating and creating context around library resources. In its first phase, NSDL successfully implemented its existing services on top of NCore in our production environment - a change that was largely invisible to the outside world. Now, NSDL is beginning to take advantage of what this platform has to offer in developing next-generation library services and collaborative tools. Throughout this process, the NCore suite of technologies and services have grown and improved through an iterative process. NCore is evolving into a general platform for building digital libraries united by a common data model and interoperable applications. Recently, DLESE (Digital Library for Earth Science Education) ported their existing infrastructure to NCore. They were able to overlay their data model on top of the NCore model, allowing specialized DLESE services to continue without loss of functionality and co-exist alongside, but independent from, NSDL contents. Because NCore is a general, Fedora-based open source platform that is becoming useful beyond NSDL, Core Integration developers at Cornell have made it available for download as a project on sourceforge (http://sourceforge.net/projects/nsdl-core) in the hopes that it will continue grow and suit the needs of new, existing, or evolving digital libraries.

Author: Aaron Birkland, Jim Blake, Tim Cornwell, Elly Cramer, Dean Krafft, Jonathan Ostwald

Title: NSDL Content Standing Committee

Abstract: The mission of the Content Standing Committee (CSC) is to develop, recommend and implement policies for the creation, development, inclusion and maintenance of content within the NSDL. The CSC will work to ensure that STEM content of the NSDL is of high quality, is appropriate and persistent, has educational impact and technical integrity, and is appropriate for use by global audiences of learners and educators from K-12, college, university communities and the general public. The work this year has revolved around compiling and disseminating information about controlled vocabularies. This work includes providing guidelines and support for NSDL Pathways and Collections projects that are in need of developing and implementing vocabularies that will support cataloging and search efforts.

Author: Kimberly Lightle

Title: Starting Point Pedagogic Services: Linking Pedagogic Information to Library Resources Across the NSDL

Abstract: The Starting Point Pedagogic Services project allows institutions and digital libraries partners to integrate information about effective pedagogy into their websites. The service is built on a core of set of pedagogic modules each of which describes the what, why and how of a particular teaching method. Each pedagogic module is combined with a collection of teaching activities that exemplify that particular teaching method. The service allows our partners to create a customized version of this information: with a graphic look-and-feel that integrates with their existing website, and with a set of teaching activities appropriate for their particular audience. Standardized interfaces allow our partners to seamlessly integrate this pedagogic perspective into their existing sites and collections. This poster demonstrates a new view of the complete interdisciplinary library as well as implementations of the service in the CAUSEweb statistics education library, the COMPADRE physics education library, the biology and math community portals in MERLOT, the Enduring Resources for Earth Science Education library, and the Microbial Life Education Resources library as well as the Perlman Center for Learning and Teaching website at Carleton College, the Spreadsheets Across the Curriculum project and the MNStep project for teacher professional development.

Authors: Manduca, Fox, Bruihler, Iverson

Title: Chemical Education Digital Library (ChemEd DL)

Abstract: ChemEd DL, a Pathways project of NSDL, aims to provide an online library experience devoted to the teaching and learning of chemistry. In addition to providing information about chemistry education resources and tools to discover those resources, we provide social networking tools to foster community development, content management tools to organize the content of

the library, and course management tools to deliver the content and assess learning in a educational setting. ChemEd DL intends to communicate chemistry in an engaging manner that provokes curiosity and excitement while at the same time providing accurate and up-to-date chemical information. ChemEd DL Textbook Tables of Contents links library content with publishers' textbooks in a manner accessible to even novice learners of chemistry. Connecting the world's largest scientific professional organization, American Chemical Society, the world's premiere peer-reviewed Journal of Chemical Education, and the innovative tools of The ChemCollective, with NSDL, ChemEd DL provides its patrons a world-class digital library intent on teaching chemistry to the world.

Authors: Jon Holmes, Mary M. Kirchhoff, John W. Moore, David Yaron

Title: Building a community for physics education research

Abstract: This poster serves as a progress report on the development of the Physics Education Research - Community Enhancing Network for Teaching, Research And Learning project (PER-CENTRAL) and the Physical Review Special Topics – Physics Education Research journal (PRST-PER). The PER-CENTRAL website is designed specifically to serve as an informational touchpoint and online community for "producers" and "consumers" of physics education research. Along with a database of PER articles and dissertations, there are links to research groups, PER-based curricular materials, news and events, grant opportunities, and many other things of interest to our community. PER-CENTRAL is provided by the American Association of Physics Teachers, and is supported, in part, by the National Science Foundation and their National Science Digital Library Initiative. The PRST-PER journal is a peer reviewed electronic-only journal. The scope of the journal is the full range of experimental and theoretical research on the teaching and/or learning of physics. Review articles, replication studies, descriptions of the development and use of new assessment tools, presentation of research techniques, and methodology comparisons/critiques are also welcome. PRST-PER is sponsored by the American Association of Physics Teachers and the American Physical Society’s Forum on Education.

Author: Hsia-Po Vincent Kuo

Title: PRISMS: Phenomena and Representations for the Instruction of Science in Middle Schools

Abstract: Project 2061’s evaluations of science textbooks2 highlight the need for better phenomena and representations in middle grades materials. NSDL collections are a potential source; however, they are mainly geared towards high school and undergraduate education. MMSA staff, trained by AAAS Project 2061, are

working with teams of middle school teachers to analyze approximately 1,000 digital phenomena and representations for their alignment to middle grades content standards and for the quality of their instructional support for teachers. Reviews of these resources are being assembled into a collection called PRISMS (Phenomena and Representations for the Instruction of Science in Middle Schools), designed to increase the number of quality K-12 science educational resources accessible through digital libraries.

Authors: Francis Molina, Page Keeley, Francis Eberle, Joyce Tugel, and Ted Willard

Title: ABLE: A Resource for Inquiry-based Laboratory Activities for Undergraduate Biology Courses

Abstract: ABLE (Association for Biology Laboratory Education) is a part of the BEN collaborative. This resource includes classroom and instructor-tested inquiry-based laboratory activities for use in undergraduate biology courses. Each activity has example student handouts and notes to instructors on preparing for and implementing the activity. All materials are freely available and can be adapted for local use. The activities are contributed by faculty across a range of institution types (65 % from research institutions, 15% each from regional and liberal arts colleges). %). Approximately 60% of the activities are geared towards the introductory level. In addition, they are fairly evenly distributed across the sub-disciplines of organismal biology (18%), ecology and evolution (29%), cell biology (21%), molecular biology (19%) and scientific inquiry/ pedagogy (13 Possible future directions for the resource include linking experimental results and student assessments to particular lab activities and allowing users to discuss lab activities.

Authors: Karin Readel, Univ. of Maryland, Baltimore County, Christopher Beck, Department of Biology, Emory University Michael O'Donnell, Department of Biology, Trinity College

Title: What You Can Do At Curriki

Abstract: Curriki seeks to achieve its mission—ending the education divide—by employing two strategies: 1) building a repository of free, high-quality, editable, open-source educational resources, available in an open source format; and 2) enabling social networking and collaboration around curricular topics, using Curriki's open source tools. The poster will address our mission and our tools.

Author: Meredith Phillips, Diane Danielek, Bobbi Kurshan

Title: Extending CITIDEL with a Computing Syllabus Collection

Abstract: The syllabus collection serves faculty by finding examples of courses similar to ones they are preparing and allowing comparison of topic coverage and reference materials. The particular implementation described in this project focuses on syllabi for computing courses, but the techniques could be applied to

any discipline. Our newest collection was created as a result of a web crawl looking for computing syllabi. As a result we collected > 4500 syllabi, mostly from US institutions. We then automatically tagged all using the top level categories from the Computing Curricula 2001. The result is a collection of syllabi that can be searched or browsed by computing classification. Our site allows users to compare two syllabi using the CC2001 categories. Anybody can submit their syllabi to our collection by pasting a URL directly at our site or by using a bookmarklet browser button available at our site. The collection is available through Google Co-op, the CITIDEL site, and the NSDL site (coming soon). We also provide top news stories that deal with Computing Education collected from the web using RSS feeds off traditional sites.

Author: Dr. Lillian Cassel, Dr. Manuel Pérez-Quiñones, Dr. Edward Fox, Dr. Weiguo Fan, Manas Tungare, Xiaoyan Yu, Phaneendra Divakaruni, William Cameron

Title: Measuring Reuse

Abstract: Reuse of learning objects is a core value proposition of digital collections. Data on reuse and repurposing is needed to evaluate how content in digital libraries are used, to foster understanding of design and how it impacts reuse, and to make the case of continued support of the NSDL and other educational digital library projects. This project seeks to understand how often learning objects found through the NSDL/Pathways are adopted and how difficult it is for end users to reuse such objects. Data will be collected by spidering selected collections, integrating with popular open-source content management systems, and through surveys of end users. The data will then be compared with factors such as resource size, education level, and complexity to determine the factors that affect the reuse and the impact of reuse on authors, teachers, and students.

Author: Thomas Wrensch, Martin Hald, Robby Robson

Title: Bringing Earth Science Data, Expeditions and Inquiry into the Classroom with the ERESE Project

Abstract: Combining the resources of Scripps Institution of Oceanography and the expertise of practicing educators provides (1) hot-off-the-presses Earth science data and images, (2) links to archived and ongoing field expeditions with daily image galleries, reports and video clips, (3) inquiry lessons designed and implemented by our partner teachers, and (4) access to meteorological, geophysical and oceanographic data from over 800 research cruises. Data and images in the collections can be discovered by exploring 50+ earth science topics through both keyword and geospatial searches. Classrooms have participated virtually in field expeditions to uncharted seamounts in the South Pacific, to investigate the Earth's magnetic field on the ice in Antarctica, and most recently to understand rust-forming microbes by diving in a submersible in Hawaii. The Enduring Resources for Earth Science Education (ERESE) Project bridges the gap between research and education through two NSDL collections: Earthref.org (http://www.Earthref.org/ERESE) and SIOExplorer

(http://SIOExplorer.ucsd.edu). A new collaboration with SERC's Pedagogy in Action Project, http://serc.carleton.edu/sp/index.html, enhances the presentation and accessibility of ERESE's classroom lessons, with a library of modules allowing users to browse ERESE's collections by pedagogic method as well as by Earth science content.

Authors: Christina Massell Symons, Anthony Koppers, Hubert Staudigel, John Helly, Stephen Miller, Margaret Helly

Title: MicrobeLibrary.org Develops Author Community to Sustain and Grow Collections

Abstract: The MicrobeLibrary (ML) is an online collection of over 1700 peer-reviewed resources for teaching undergraduate biology. The site, supported by the American Society for Microbiology, is subscription-based, although visual resources are freely available. As of September 2007, ML has 1566 paid subscribers. ML efforts are driven by the community of biology educators as authors and subscribers. ASM continuously develops programs meant to build capacity in publishing field. In 2005, ASM created the ASM Scholars-in-Residence Program. This year-long virtual residency program focuses on developing biologists' knowledge and skills in evidenced-based research in learning. Scholars develop (1) an understanding of evidence-based research in biology education (2) skills to create, design and implement an experiment to assess student learning and (3) access to a community of practice. Scholars have published results in peer-reviewed publications including the ML's Journal of Microbiology and Biology Education (JMBE). In this poster we will present the benefits of this initiative, particularly how it contributes to the growth of the MicrobeLibrary collections. Based upon the success of the first three cohorts, the life sciences professional societies established the NSF supported Biology Scholars Program, a multiyear leadership program for college biology faculty to bring about reforms in undergraduate education.

Author: Jean Kayira, Kelly Gull

Title: Sustainability of an NSDL Project: The Earth Exploration Toolbook

Abstract: The Earth Exploration Toolbook (EET) is an online resource for teachers and students. It is a collection within both the National Science Digital Library (NSDL) and the Digital Library for Earth System Education (DLESE). The EET consists of computer-based learning activities or "chapters" that provide step-by-step instructions for accessing specific data and for using a software analysis tool to explore issues or concepts in science, technology, and mathematics. EET chapters use a variety of analysis tools, including geographic information systems (GIS), image processing programs, spreadsheet applications, and other independent and integrated analysis tools. In addition to providing learning activities, the EET project team also offers professional development training for educators via the EET Workshops project. Through the development of EET chapters, TERC's Earth Exploration Toolbook project

provides support to other organizations and non-NSDL-funded projects. Some of these include RODES, focused on data collected from mid-ocean ridges, EarthScope, focused on the geologic structure and evolution of the North American continent, and Project REDI focused on wind and solar energy data. Partnering with other organizations and providing professional development services are two avenues for sustainability that have been explored by the EET project team.

Author: Carla McAuliffe, Tamara Ledley, LuAnn Dahlman, Nick Haddad

Title: Ecoed.net: ESA's Digital Library for Ecology Education

Abstract: Ecoed.net is the Ecological Society of America (ESA)'s digital library. Ecoed.net focuses on resources for teaching ecology at the undergraduate level and emphasizes high quality, accurate scientific content, and clear pedagogical use. As a partner in the BiosciEdNet (BEN) collaborative, one of ESA's goals is to place educators at the center of resource development. To this end, ESA has recently implemented Dewey, a web-based cataloging tool developed by Isovera. Ecoed.net's metadata structure and resource submission forms can now be directly changed by ESA staff in response to user feedback. To date, Ecoed.net's development has mostly focused on building the technical infrastructure to catalog teaching resources. In November 2007, Ecoed.net will begin active peer review of user-submitted ecological images, and peer review will expand to include more complex teaching resources during 2008. The current catalog has been seeded with contributions from ESA staff and members, including cover photographs from ESA's scientific journals and student-active resources from Teaching Issues and Experiments in Ecology (TIEE). The long-term goal for Ecoed.net is to build and maintain a catalog of user-developed teaching resources, and, through the process of peer review and citation, to raise the scholarship of teaching in ecology at all levels of education.

Author: Jennifer, Riem, Teresa Mourad

Title: Metasearch XML Gateway Services

Abstract: The University of Illinois at Urbana-Champaign and Purdue University libraries are developing and implementing a set of metasearch XML gateway services for the NSDL community. This project will address the clearly identified need for enhanced access to publisher and vendor information resources--particularly the vast array of scholarly and popular journal articles--that are outside the NSDL Core Integration and Pathways collections. The project will use broadcast search technologies to provide integrated access to selected publisher full-text repositories, abstracting and indexing services, university institutional repositories, and full-text journal and report sites. These metasearch gateway services will be utilized by the NSDL Core Integration group, the Pathways projects, and the NSDL community at large to enhance search functionality by providing custom access to key distributed remote information resources. The

metasearch services will use standards-based frameworks such as the NISO MXG (Metasearch XML Gateway) specification, the OpenSearch 1.1 standard, and the nascent OASIS Search Web Services work. In addition, the project will collaborate with researchers from the Digital Library Federation (DLF) Aquifer project and two Joint Information Systems Committee (JISC) funded initiatives in the United Kingdom: the PerX project at Heriot-Watt University and the CREE project headquartered at the University of Hull.

Authors: William Mischo, Mary C. Schlembach Michael A. Norman Paul J. Bracke Thomas G. Habing

Title: NSDL Community Services Committee

Abstract: The goal of the community services committee is to help keep projects informed about one another (inreach) and to help coordinate project's efforts to support the user community (outreach). Our primary inreach activity has been web conferences called “tooltimes”. These interactive online presentations allow projects to demonstrate their services and collections. There have been 3 tooltimes this past year; you can view them on the community services webpage: http://commserv.comm.nsdl.org/ Please watch your email for announcements of upcoming tooltimes, and consider volunteering to host one if you have something you would like to share. (There will also be a sign-up sheet on our poster.) The committee will be meeting during the annual meeting, to discuss other ways in which we can better coordinate efforts of individual projects and help the NSDL as a whole. We hope you'll be able to join us.

Author: David Yaron

Title: ComPADRE Collaborations and Partnerships

Abstract: ComPADRE, the Pathway for Physics and Astronomy, supports a broad range of audiences covering many different topics and types of learners. We have been working on partnerships and collaborations that will help us provide tools and resources for our diverse communities. This poster will outline these efforts involving federation of catalogs, content development, outreach, and tool building.

Author: Bruce Mason, Lyle Barbato

Title: Evaluating ComPADRE's Collections - Usage and Content

Abstract: Evaluation of the usability of the ComPADRE Pathway's web site and the appeal of our resources is critical to ensure success. We use the webmetrics tool Site Catalyst-Omniture to collect traffic pattern data. These data coupled with collection content analyses provide insights into the relationships between a collection's usage and content and thereby suggest areas for enhancement and improvement. This poster highlights the use and content of three collections: Physical Sciences Resource Center, The Physics Front, and The Nucleus, each intended for a different user group. The poster shows two Page Views Reports

for each collection, indicating popularity, traffic patterns, and the number of users who view the catalog entries of the collections' items. Also shown is the Page Summary of each collection's homepage visualizing user paths and providing numbers for further investigation. These data are accompanied by the content analysis of each collection arranged by subject and target audience. Taken together the webmetric and the content analyses data make it possible to understand if the information needs of each collections' target audience are being met. Examples of how this information aids in the improvement of page design and collection development will be given.

Author: Bruce Mason, Jutta Wunder, Elizabeth Bolton, Cecelia Brown

Title: Making your content accessible to a wider audience

Abstract: Digital libraries are making an effort to align their resources to educational standards in order to enhance access for students and teachers. While most resources only have national standards assigned, teachers prefer alignment to their (local) state standards. TeachEngineering is completing a major push to get state standards aligned to all the resources in its digital library. By the end of 2007 all its 600+ K-12 engineering learning objects are expected to be aligned to the K-12 math, science and technology standards of all 50 states. Since manually aligning and periodically updating all state standards would take a prohibitive amount of time, TeachEngineering uses the computer-assisted standards assignment and alignment tools (CAT & SAT) from the Center for Natural Language Processing. This poster describes a feasible solution to a common problem of making your content accessible to a wider audience.

Author: Anne Diekema, Martha Cyr , Rene Reitsma, Jacquelyn Sullivan

Title: Linking NSDL and OpenCourseWare Respositories

Abstract: Would you believe one simple line of javascript can dramatically increase the reach of collections and Pathways in the NSDL? Find out the simple to implement and simple to use service that we've developed to link NSDL and OpenCourseWare repositories. We've tested it out with select Pathways and collections, as well as a number of OCW repositories. For collections and Pathways we've written as simple javascript that you can include on your web site to recommend related resources. Also individuals can take advantage of this powerful service by adding a simple extension to Firefox web browsers. Stop by to see what we're doing or check out www.oerrecommender.org.

Author: Brandon Muramatsu, Joel Duffin, Justin Ball

Title: The NSDL Policy Committee

Abstract: The Policy Committee is a voice for the NSDL projects in advising the CI team, other NSF grantees, and NSF on operational strategies, policies and implementation priorities. Among the policies are ones that define the NSDL

"community" and determine any constraints on NSDL usage and contents that are necessary to ensure that its mission is fulfilled. The Policy Committee acts on behalf of the Assembly to work with NSF and the CI team in coordinating the activities of the Standing Committees, Subcommittees, Taskforces, etc., and individual projects.

Author: Rachael Bower, Martin Halbert

Title: MAISON: Middleware for Accessible Information Spaces on NSDL

Abstract: Increased participation by the blind and sight impaired individuals in NSDL is resulting from the development of Middleware for Accessible Information Spaces on NSDL (MAISON). The software is enhancing the accessibility of NSDL, its internal and external resources, and existing services such as stand maps and community tools like blogs, wiki, and RSS newsfeeds by supporting user interaction through screen readers such as Window-Eyes, Dolphin and JAWS. MAISON is providing task oriented, individualized information exploration including information filtering, ranking and summarization. When accessing strand maps the user is listening and navigating through and across strand maps via hotkeys.

Author: K.S. Candan, H. Davulcu, T. Hedgpeth, Q. Li, M.L. Sapino, H. Sundaram