In 2011 the North Carolina Museum of Natural Sciences will open a new wing called the Nature Research Center. Its intention is to emphasize the process, rather than the products, of scientific research. The goals of the Nature Research Center focus on interpreting science and making it accessible for the layperson, and the plans include a small library. This paper makes recommendations for the design, collections, and services of this library, placing them in the context of the literature as well as the institution.

Headings:

North Carolina State Museum of Natural Sciences

Museum Libraries

Scientific and Technical Libraries
POSSIBILITIES FOR LIBRARY SERVICES AT THE NORTH CAROLINA
MUSEUM OF NATURAL SCIENCES NATURE RESEARCH CENTER

by
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Approved by

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Introduction

The need for improvement in Americans’ scientific literacy skills is taken for granted among most educators, and expressions of this need are frequently accompanied by sobering statistics. Scores on science tests are commonly among the lowest for state and national standardized tests, and North Carolina is no exception to this trend. While most scientific literacy interventions target schools exclusively, the underexplored realm of informal education and out-of-school learning holds promise. Libraries and science museums are important venues for improving scientific literacy, and this paper discusses the intersection of these two sites: a proposed library in a new wing of the North Carolina Museum of Natural Sciences. This library presents an opportunity to leverage inspiring experiences in the museum to launch visitors into further explorations of scientific topics. It is an attempt at mediating improvements in scientific literacy by reaching a greater cross section of the population (and in a far more joyful situation for the learner) than the formal efforts at raising test scores that are typically presented.

Before proceeding, it is necessary to define scientific literacy, a task that is not entirely simple. Maienschein and students (1999) begin by disambiguating the terms *science literacy* and *scientific literacy*, defining science literacy as pertaining to the expert knowledge of scientists and scientific literacy as the understanding of scientific “habits of mind” that can and should be achieved by everyone. (p. 75) By these definitions, it is primarily scientific literacy that is being discussed here, regardless of the terms used by other authors. Numerous organizations, such as the United States National
Academy of Sciences, United States National Science Foundation, American Association for the Advancement of Science, and International Center for the Advancement of Scientific Literacy, include improving scientific literacy among their primary goals, and their publications, along with countless others, offer definitions of the term.

The most common elements that emerge from these definitions are the abilities to apply scientific thinking to everyday life and to understand scientific issues for civic participation, meaning that “a person is scientifically literate if he or she can deal with scientific matters that come across the horizon of public life with the same ease an educated person would exhibit in dealing with matters political, legal, or economic.” (Trefil, 2003, p. 151) Almost all of these definitions include statements about understanding scientific methods and processes, how research is conducted and knowledge advanced. The definitions of scientific literacy vary mostly in the degree to which they include specific science content. Miller (1998) discusses the diversity of definitions and articulates a measurable construct of civic scientific literacy.

As might be expected after Miller’s (1998) explanation of the difficulty of measuring scientific literacy, however, there is relatively little data on its achievement among adults. The National Science Board devotes one section of its biennial Science and Engineering Indicators to “science and technology: public attitudes and understanding.” The most recent of these (National Science Board, 2008) depicts Americans who express confidence in scientists, endorse prior scientific achievements, and favor funding of scientific research, but give incorrect answers to basic questions about science and the scientific inquiry process.
There is far more data available on PreK-12 academic performance in the sciences. The results of one of the most authoritative sources of this data, the National Assessment of Educational Progress conducted by United States Department of Education, are analyzed in the Nation’s Report Card. The most recent Nation’s Report Card on science indicates that average scores have declined since the 1996 tests, and that by grade 12, only 54 percent of students scored at or above the “basic” level and 18 percent scored at or above the “proficient” level. (Grigg, Lauko, & Brockway, 2006) Of course, scoring poorly on a test is not necessarily a failure that matters beyond one’s school years. But these reports, when viewed as simplified surrogates for measuring scientific literacy, are indeed alarming. We must remember that the importance of scientific literacy goes deeper than academic achievement. It is valuable in both the idealistic sense, in that “[b]eing scientifically literate allows people to lead ‘better’ lives—in the philosophers’ sense of the ‘good life,’ which is more reflective, fulfilling, and worth living,” and in the pragmatic sense of producing economic advantages for the scientifically literate society. (Maienschein and students, 1999, p. 78)

Librarians know well that school is not the only, and perhaps not the best, institution for assisting people in realizing their full potential, intellectually and otherwise. The literature on the learning that takes place in educational settings other than school presents another cluster of ambiguous terminology. Though each has its own distinct connotations, the terms informal education, nonformal education, free-choice learning, and others, cover much of the same territory and may all include the learning that occurs in libraries and museums. Rennie (2007) hashes out some of the objections to each term, and settles upon a description that focuses on the difference in context, rather
than implying a difference in the kind of learning: “out-of-school learning environment.”
(pp. 126-127) Whatever the term used, what is being discussed is “learning that is self-
motivated, voluntary, and guided by the learner’s needs and interests, learning that is
engaged in throughout his or her life.” (Dierking, et al., 2003, p. 109) Clewis (1990) is
careful to note that this out-of-school learning is not a substitute for formal education in
the sciences, and that it functions most effectively in continuing education and in
providing an alternative that enhances science appreciation as much as scientific literacy.
(pp. 106-107)

Though libraries and science museums are each recognized as powerful out-of-
school learning environments, Rennie (2007) notes

some disagreement about the educational effectiveness of places like museums, 
disagreement that seems to be underpinned by three myths about learning in 
museums: (a) that playing and learning cannot occur at the same time; (b) that if 
learning occurs, it must be at the museum; and (c) that what people learn is 
predictable and therefore easily measureable. (p. 132)

While all are interesting, it is the second of these myths, and Rennie’s debunking of it,
that shines the most light on this project. In libraries, it is assumed and encouraged that
much of the user’s learning will occur outside institutional walls. Indeed, all learning, at
least deep and persistent learning, is cumulative and integrated into the learner’s life,
such “that the [museum] visit might simply have produced a readiness to learn.” (Rennie,
2007, p. 134) Librarians are expert facilitators of the independent learning experience.
They do not typically dictate any curriculum, but are in the habit of responding to users
and accommodating them on their own terms. Libraries and librarians are bridges
between where the user is and what the user knows, and where the user would like to be
or needs to understand. What potential lies in bringing the library practice of giving
learners something to take away with them into the science museum setting, with all of its rich sensory experiences? If these museum experiences produce a readiness to learn, how might an associated library provide the tools to actually accomplish this learning?
Literature Review

Libraries and Scientific Literacy

The overwhelming majority of literature on libraries and scientific information focuses exclusively on scholarly communication in the sciences and bibliographic instruction in formal academic settings. The role of libraries in facilitating informal and adult learning in the sciences remains underexplored. The closest that most scholarly sources come to a relevant treatment of the intersection of libraries and scientific literacy are discussions of information literacy in the context of science education. This focus is exemplified by Manuel’s (2004) article in *Science and Technology Libraries*. She articulates well the need for librarians to conceive of information literacy skills in ways that are specific to the sciences when delivering bibliographic instruction, but her exclusive focus on higher education places the research outside the scope of this paper. Even so, Manuel and others are useful here in their exposition of the complexity of scientific information sources and the potentially valuable function of the librarian as intermediary between scientific information and learners.

One outstanding exception that is indeed highly relevant to this discussion is Dolence and Gilmour’s (2006) “Libraries, Information, and Amateur Scientists.” This study analyzes the results of their survey of the information-seeking behaviors of non-expert science enthusiasts. Dolence and Gilmour (2006) define amateurs as “a person with a scientific interest or hobby whose primary source of income is not related to that interest,” and they attempted to sample amateurs with interests across all scientific disciplines. (p. 5) The survey was conducted online; contained 18 questions total, about the scientific interests of the respondent, the information resources the respondent uses,
the format and mode of access to the resources, and the importance and level of satisfaction the respondent assigns to the resources, as well as room for additional comments; and received 180 valid responses. They summarize the results as follows:

The results of this survey suggest that amateur scientists have diverse information needs that straddle the boundary between the realms of academic and public libraries and include electronic and print resources. Major trends include:

- a tendency of amateur scientists to purchase rather than borrow materials,
- heavy use of and satisfaction with the Web as an information source, and
- heavy use of books relative to the use of journals and magazines.

(Dolence & Gilmour, 2006, pp. 9-10)

The patterns identified here suggest that the amateur scientists are independent information seekers, but that there is still an important role for libraries and librarians in assisting them. Their preference to purchase materials and their proficiency with using the Internet reflect larger cultural trends and evoke the alarmist predictions of the obsolescence of libraries.

The predicted death of the library has become less common in the current economic downturn. There is renewed interest in the economies of shared community resources such as libraries, and the public library remains the key point of access to the Internet for a large number of Americans. The Institute of Museum and Library Services’ most recent Public Libraries Survey, published in June 2009, shows United States per capita library visits and book circulation steadily increasing from 1998 through 2007 (the entire period for which data is presented), and reports from public library systems across the country suggest that 2008 and 2009 will show even greater increases in use.

(Henderson, et al., 2009) Even Dolence and Gilmour’s (2006) amateur scientists could benefit from librarians’ expertise in navigating print and electronic resources, and the final bullet point mentioned above – the use of books over journals and magazines –
suggests an opportunity to promote amateurs’ engagement with periodical literature (which is often expensive and out of reach for the layperson).

While Dolence and Gilmour’s (2006) study informs this paper, it is important to remember that most visitors to science museums are considerably less knowledgeable than the amateur scientists that they studied. Dolence and Gilmour solicited study participants in science enthusiast Internet groups and listservs, predisposing their respondents to be highly interested science learners with above average skills in and access to technology. Visitors to science museums span the entire range of scientific literacy levels and information-seeking skills, and many will benefit from more basic instruction and materials than would interest the Dolence and Gilmour study participants.

Another potentially relevant source is by Clewis (1990), who synthesizes the conclusions of Jon D. Miller’s surveys of scientific literacy in the 1970s and 1980s and includes some dissenting voices and alternative definitions of scientific literacy. Most interesting in the context of this paper, she goes on to briefly discuss the implications of this work for librarians. Using Miller’s categorization of the public as “attentive,” “interested,” or “non-attentive” in their attitude toward scientific developments, Clewis (1990) calls the attention of librarians to these groups’ differing needs. Members of the attentive group will require materials that are more advanced than typical mass media, while users who are merely interested would be best served by popular materials on the level of *National Geographic*. (Clewis, 1990, p. 108) While categorizing actual library users in this way has little value, the plea for collecting diverse and sophisticated scientific materials – and for attending to differing levels of needs – should not go unheeded.
While scholarship in the area of libraries and public understanding of science may be less than robust, there are some more practical sources written for an audience of librarians that may be instructive. Sapp’s *Building a Popular Science Library Collection for High School to Adult Learners: Issues and Recommended Resources* (1995) is one such title. While his subject guides have fallen somewhat out of date, Sapp makes the case for librarians’ role as interpreters of scientific information for nonscientist audiences. He discusses the identification of high quality popular science materials and the pitfalls of poorly executed popularizations of scientific information. The numerous how-to style articles and books targeting librarians that include treatments of science information resources, but that focus exclusively on PreK-12 media centers or on academic libraries, are less useful here, as their goals are so tied to specific curricula. Scholarship on science education in out-of-school settings is rather more developed, but has failed to include libraries with anything more than passing acknowledgement. Rennie (2007), which is discussed in the introduction to this paper, reviews this literature.

**Museum Libraries**

As with the literature on libraries and scientific literacy, most scholarship on museum libraries is not an ideal match with this project. Scholarly sources tend to focus on art museum libraries. The handful of articles published in the last ten years that treat science museum libraries discuss the unique collections of two exceptional British institutions, the Museum Library and Archives at the Natural History Museum and the Science Museum Library, both in London. There are a few relatively recent sources that treat museum libraries more generally and theoretically, most relevant among them
Bierbaum (1996), Koot (2001), and van der Wateren (1999). Bierbaum (1996) analyzes the results of a large survey of diverse museum libraries, and compares them to her own earlier survey (Bierbaum, 1984) and one by Hull and Fearnley (1976). Bierbaum (1996) uses three dimensions to measure the status of museum libraries: funding, staffing, and utilization. Though there are some improvements over the three surveys, particularly in cataloging and services offered, the overall picture is bleak, including a worrisome decline in full-time staff. Bierbaum (1996) concludes that museum libraries, with the notable exception of those in art museums, are underfunded, understaffed, underused, and undervalued.

Koot (2001) places the library and the librarian in the organizational ecosystem of the museum. His concerns are primarily about the relationships between museum departments and the roles of museum staff, exploring potential collaborations and how best to put to use librarians’ expertise in information management and access. Koot (2001) sees museum librarians as key partners in researching, recording, digitizing, and publishing information about the museum collection. He does not explicitly discuss the interaction of museum librarians with museum visitors, but does touch on out-of-school learning, noting that visitors choose their own route through the information embodied in the objects, and through the museum’s knowledge resources. There is a growing group of informal learners who set their own targets about what they want to know. Meeting objectives that relate to the needs of informal, self-directing learners is one of the most interesting challenges in information management. (Koot, 2001, p. 253)

Meanwhile, van der Wateren (1999) gives a history and contemporary description of the art museum library. Despite his focus on art museums, van der Wateren expresses clearly some important ideas about museum libraries in general. He writes,
Museum libraries see themselves as part of an information environment at their museum. A researcher may be referred from one part of that environment to another, from the library to an office where they are compiling an inventory, or to the photo archive. But the library is the fulcrum, where the researcher can start their research and be forwarded onward. (van der Wateren, 1999, pp. 197-198)

The ideas of the information environment of the museum and of the library as a central agency of information referral will return in this paper. Van der Wateren also acknowledges the general public as a growing user population for museum libraries.

Additionally, there are various practice-oriented books and essays written for an audience of library and museum professionals. Bierbaum’s (2000) Museum Librarianship is good primer and introduction to issues in the field. Art Museum Libraries and Librarianship contains some material that is relevant to libraries in all kinds of museums. (Benedetti, 2007) The essay collection Presence of Mind: Museums and the Spirit of Learning explores the museum as a site of out-of-school learning, but makes no mention of museum libraries and their potential role. (Pitman, 1999) Indeed, Pitman’s omission of the role libraries is, unfortunately, typical of the literature on museum learning. A more open and theoretical discussion of the possibilities of libraries and museums, sometimes drawing out the congruities and contrasts between the institutions and the ways that they can function synergistically, can be found in Carr’s The Promise of Cultural Institutions (2003) and A Place Not a Place: Reflection and Possibility in Museums and Libraries (2006). The same author also provides a compelling description of a museum library that was created to serve the public and grew into a partnership with the public library system. (Carr, 1996)
Defining the Situation

The North Carolina Museum of Natural Sciences

The North Carolina State Museum of Natural Sciences (the name was changed from the “North Carolina State Museum” in 1986) was created in 1879 through legislation combining the collections of State Geologist Washington Carunthers Kerr and Commissioner of Agriculture Colonel Leonidas LaFayette Polk (Martin, 2001, p. 10). The museum’s primary intention was to showcase the natural resources of the state in order to generate business interest and investment (Martin, 2001, pp. 10-11). As Martin (2001) explains, however, even in those early years, museum leaders expressed the dual goals of “educating and entertaining the public through exhibits and programs, and maintaining collections that served the needs of commerce, agriculture, and the natural sciences” (p. 13). Brothers Herbert Hutchinson Brimley and Clement Samuel Brimley guided the early period of the museum’s development. While C. S. Brimley is responsible for building important collections, H. H. Brimley shaped exhibitions and programming (Martin, 2001, p. 13). It is H. H. Brimley’s resistance to the Board of Agriculture’s pressure to focus on issues directly pertaining to farming that led the museum toward an emphasis on natural history over agriculture (Martin, 2001, p. 14).

The North Carolina Museum of Natural Sciences is now an internationally important center for research as well as hosting an average of more than 700,000 visitors a year. (Cowans, 2007, p. 28) The museum currently states its goals as follows:

The mission of the North Carolina Museum of Natural Sciences is to enhance the public’s understanding and appreciation of the environment in ways that emphasize the natural diversity of North Carolina and the southeastern United States and relate the region to the world as a whole. (North Carolina Museum of Natural Sciences, About us . . . )
Located in downtown Raleigh and home to more than 1.7 million specimens, “the 200,000-square-foot facility is now the largest natural sciences museum in Southeast, the most visited museum in the state, the #1 field trip destination in the state, and one of top 10 natural history museums in North America.” (Cowans, 2007, p. 28)

The Museum also manages a field station in west Raleigh called Prairie Ridge Ecostation. Prairie Ridge contains almost 40 acres of restored Piedmont prairie and other habitats where visitors may make field observations and collect data for citizen science projects. Both the main museum building and Prairie Ridge Ecostation house libraries. The library at Prairie Ridge is a very small satellite collection (less than 100 volumes) of the H. H. Brimley Memorial Library, the primary collection located in the basement of the Museum in downtown Raleigh. The Brimley Library contains over 17,500 monographic volumes, including a range of popular and scholarly scientific works, as well as a significant serials collection. It serves to meet research and program needs of Museum staff and volunteers. The general public may visit the Brimley Library, but it is not located in the publicly accessible part of the museum and is not prepared to serve more than the occasional external user. Another noteworthy feature of the Museum is an educational collection of approximately 10,000 specimens called the Naturalist Center. In addition to specimens, the Naturalist Center contains over 500 field guides and other reference books that are matched with relevant specimens. Other information resources in the Museum include over 370 books in the children’s Discovery Room and a nearly 900 volume offsite Research Lab Library.
The Nature Research Center

In 2011 the Museum is scheduled to open a new wing with a different emphasis.

As the Museum website states,

The focus of the Museum has been to showcase what we know, with exhibits and programs highlighting scientific knowledge gleaned from long-term research. With the construction of the Nature Research Center, Museum staff plans to share **how we know it** [emphasis added] — bringing scientific research to the forefront. Students, teachers and the general public will have the unprecedented opportunity to see for themselves how research is conducted. By bringing research scientists and their work to the layperson’s everyday world, staff will demystify what may have seemed to be an intimidating field of study. (North Carolina Museum of Natural Sciences, *Nature Research Center: North...*)

Very succinctly, the mission of the Nature Research Center “is to engage the public in understanding the scientific research that affects their daily lives.” (North Carolina Museum of Natural Sciences, *Nature Research Center fact...*) This is further articulated in specific objectives:

The NRC will:
- engage the public in research projects through creative and innovative methods;
- improve the ability of teachers to teach science and enhance science education for all students;
- advance environmental education’s role in North Carolina’s K–16 science curriculum;
- foster collaborative, interdisciplinary natural sciences research with universities, museums and industry; and
- encourage the use of new technology and communications media to make science and environmental information available to all communities — across the state and nation.

(North Carolina Museum of Natural Sciences, *Nature Research Center fact...*)

This description of the Nature Research Center evokes a dichotomy of modern science museums, with more conventional natural history museums on one side and more
experiential science centers on the other. As Lewis and Martin (2006) describe the trend toward science centers in recent decades,

> [t]hese new institutions were not collection based but were designed to actively engage the visitor through hands-on, interactive experiences. They paved the way for a new approach to learning by utilizing exhibits, programs, and demonstrations that made science and technology accessible to everyone. (p. 107)

While the science center model is far more popular for new museums, it has not entirely supplanted the natural history museum. There are many examples of vibrant museums exemplifying each style, such as the aptly named and highly experiential Exploratorium in San Francisco, but also the traditional Field Museum in Chicago and American Museum of Natural History in New York. With the creation of the Nature Research Center, the North Carolina Museum of Natural Sciences places itself at the intersection of these institutional models, a potentially dynamic crossroads.

**Information Services in the Nature Research Center**

In keeping with its goals to engage visitors in the processes of scientific research and to incorporate new technology and communications media, plans for the Nature Research Center include a small Resource Center library. It was the planners’ earlier desire to move the Museum’s Brimley Library from the basement of the museum into the Nature Research Center, but it was determined that there would not be adequate room. The Nature Research Center’s physical space is part of a larger building called the Green Square development. In addition to the Nature Research Center, Green Square will house various other Department of Environment and Natural Resources offices, one of these being the Office of Environmental Education.
A very small and relatively young division of the Department of Environment and Natural Resources, the Office of Environmental Education takes as its mission to encourage, support and promote environmental education programs, facilities and resources in North Carolina for the purpose of improving the public's environmental literacy and stewardship of natural resources through planning, policy development, community involvement, innovative partnerships and collaboration. (North Carolina Office of Environmental Education)

The Office coordinates with other state agencies concerned with formal (PreK-12 and post-secondary) and informal (state parks and other environmental education centers) education. The Office of Environmental Education does not create curriculum, but much of its work is in serving as a clearinghouse to “identify, evaluate and promote” existing resources. (North Carolina Office of Environmental Education) As part of fulfilling this resource selection and promotion function, it is appropriate that the Department of Environment and Natural Resources Library comes under the administration of the Office of Environmental Education. This library currently serves primarily Department of Environment and Natural Resources staff. The Library is composed of a large government documents collection; a smaller collection of environmental education materials including teaching materials, popular science materials, juvenile materials, and videos; and some science and education periodicals. It is this library, significantly smaller than the Brimley Library, that is to become the Resource Center mentioned above.

The Department of Environment and Natural Resources Library is undergoing major changes as it prepares to move to the Green Square building and be reborn as the Nature Research Center’s Resource Center. The government documents collection will not be transferred to the new space, and the Department of Environment and Natural Resources Librarian began dispersing the collection, primarily to the State Library and to
libraries of the state university system, in spring 2009. During this same period, the librarian and other Office of Environmental Education staff began weeding the environmental education collection. Meetings were held to discuss the new direction of the library, attended by the Department of Environment and Natural Resources librarian, Mary Tucker; director of the Office of Environmental Education, Lisa Tolley; librarian of the North Carolina Museum of Natural Sciences Brimley Library, Janet Edgerton; Brimley Library assistant, Margaret Cotrufo; coordinator of the Naturalist Center, John Connors; curator of the Naturalist Center, Colin Brammer; and the researcher. Recurring topics in these meetings were the physical space of the Resource Center, user outreach, and user services.

In the Green Square building, the Resource Center will be adjacent to the keycard-protected Department of Environment and Natural Resources offices, but facing out toward the public space of the Nature Research Center and accessible to museum visitors. Early architectural plans placed the Resource Center within the closed offices, but relevant Office of Environmental Education and Museum staff requested that the Resource Center be on the public side of the locked door. This intentional orientation toward interaction with and service to museum visitors is key to setting the tone for this library. The existing Department of Environment and Natural Resources Library is tucked away in a state government office building, and visits from the general public are extremely rare.

In its current state, the bulk of library services consist of interlibrary borrowing for Department of Environment and Natural Resources researchers and Department staff use of the juvenile and popular science materials for themselves and their families. The
librarian promotes bibliographies of recommended environmental education resources and attempts to collaborate with PreK-12 school media coordinators to enhance their collections, but these services are underused. The move to Green Square and proximity to the museum would bring about a striking change in user populations and a reorientation away from a primarily internal Department of Environment and Natural Resources audience toward a more external one. Potential new library users include PreK-12 teachers, PreK-12 students, home schoolers, parents, and other museum visitors. Of course, the library would still be located with other Department of Environment and Natural Resources offices, and could continue to serve environmental educators, researchers, and other Department staff.

As of June 2009, the architectural plans for the Nature Research Center allocate a single room of approximately 500 square feet to the Resource Center. The June plans include shelving around the perimeter of the room, a staff desk with computer, a Smartboard and digital projector, and six public access computers. (See Figure 1)
Figure 1: Resource Center Floor Plan (spring 2009)
The vision for collections and services in the Resource Center continues to be in flux, due in large part to ongoing uncertainty of the future of the Office of Environmental Education. In spring 2009, North Carolina Governor Beverly Perdue proposed the elimination of the Office in the fiscal year beginning July 2009 as part of her plan to make up budget shortfalls. This proposal retained one position as coordinator of environmental education, to be transferred to the administration of the North Carolina Museum of Natural Sciences, while eliminating all other functions of the Office, including the Department of Environment and Natural Resources Library. As of June 2009, after hearing the appeals of concerned citizens, word from the legislature is that the Office will probably remain open but that the library will be closed and librarian position eliminated. The Resource Center remains in the Nature Research Center plans, but the fate of the Office of Environmental Education in the state budget remains of concern. If the librarian position is eliminated as planned, it is likely that Resource Center will be inadequately staffed.
Problem Statement

Museums are essential institutions for transmitting cultural heritage and accomplishing lifelong learning. Their popularity is one indicator of their importance, with a 1999 study reporting an average of 865 million visits to museums in the United States each year. (American Association of Museums, 1999) As indicated in this paper, the North Carolina Museum of Natural Sciences alone averages more than 700,000 annual visits, and this figure will only rise. (Cowans, 2007, p. 28) This paper also presents the key role of museums as sites of out-of-school learning, and the potential of science museums in particular for increasing scientific literacy.

With the opening of the Nature Research Center, the Museum enters a new stage in its institutional life. The expanded museum will incorporate the features of the traditional natural history museum with those of a hands-on science center, and further seeks to become a hub of scientific communication. The staff of the Nature Research Center will include both experts in science and experts in communicating science to the public. The Museum then acts as a bridge that links current research with the lived experiences of North Carolinians. This is accomplished when the tools of science, both intellectual and physical, are made available and comprehensible to visitors.

In the course of this research, three guiding questions have emerged:

- What changes in society does a hybrid institution such as this (natural history museum/science center/center for communication of scientific ideas) seek to effect?
- What is the value of thinking like a librarian when envisioning this institution?
• What would be a librarian/library’s practical role in the operation of this institution?

This paper is an initial attempt at a response.
Methodology

During the spring 2009 semester, I completed a field experience jointly in the North Carolina Museum of Natural Sciences and the Department of Environment and Natural Resources Library. I participated in the planning meetings for the Resource Center and assisted the librarian of the Department of Natural Resources Library in decision making processes related to the transition, including analyzing the results of a state-wide survey of PreK-12 school media coordinators. These experiences allowed me to hear the perspectives of librarians, curators, and museum educators and administrators; they provided insight into both the possibilities and practical limitations of the project. In addition to this participant observation, I researched the literature on scientific literacy, libraries and science information for the general public, and libraries in museums.

I am also informed by many hours of formal and informal observation in the following institutions: American Museum of Natural History (New York, NY), Fernbank Museum of Natural History (Atlanta, GA), Fernbank Science Center (Atlanta, GA), New York Hall of Science (Queens, NY), North Carolina Museum of Life and Science (Durham, NC), and North Carolina Museum of Natural Sciences (Raleigh, NC). I approached these observations from the perspective of a science educator and student of library science, using educational observation techniques learned in the Emory University Master of Arts in Teaching program combined with knowledge of user education and library service provision gleaned from coursework in the University of North Carolina at Chapel Hill Master of Science in Library Science program. I compiled and interpreted my observation journals under the supervision of David Carr and through his suggested readings, especially Duckworth (2006), Smith (1990), and Carr (2006).
Recommendations

This paper is intended to articulate design and service ideas for a new library at the North Carolina Museum of Natural Sciences. I propose to view the forthcoming Resource Center as part of the “information environment” of the museum, in the sense that van der Wateren (1999) used the term. In the case of the North Carolina Museum of Natural Sciences, my view is that the collections-based exhibits are complemented by the information-based features of the Brimley Library; the Naturalist Center; and the small libraries in the Discovery Room, at Prairie Ridge, and elsewhere. These departments interact with each other at the organizational level and through the individual information-seeking paths constructed by Museum affiliates and visitors. The Resource Center should be thoughtfully integrated into this web of interaction to maximize the benefit to the organization and to the public. It is important that its history as the Department of Environment and Natural Resources Library not become a hindrance to its necessary transformation as part of this integration into the Museum’s information environment.

The Brimley Library serves as a centralized provider of technical services for the information resources of other museum departments, cataloging and documenting the book collections of the offsite Research Lab Library, Prairie Ridge Ecostation, Naturalist Center, Discovery Room, and others. Spaces such as the Naturalist Center and Prairie Ridge Ecostation have unique functions, for which their information resources provide specific support. The Naturalist Center, for example, is primarily a hands-on specimen collection, with a secondary collection of books to enrich visitor interaction with the specimens themselves. It is efficient and logical to use the expertise of the one staff
librarian to manage all of the satellite collections. These practices could be extended to the administration of the Resource Center collection. It is worth mentioning the State Library of North Carolina as another potential partner for technical services, as they currently have such a relationship with the Department of Environment and Natural Resources Library.

Public services in the Brimley Library are focused on internal Museum users; in contrast, the Resource Center will be readily accessible to visitors, and could serve as a public face for the information resources of the entire museum. While the Brimley Library centralizes technical services, the Resource Center could centralize public services, acting as a guide for visitors to various resources within and beyond the museum. At an extreme, the Resource Center collection could be completely integrated with the Brimley Library collection, with a rotating selection of library materials featured in the Resource Center space.

The Resource Center collection should reflect its role as a public point of access to information, with materials that serve the diverse needs and interests of museum visitors. These visitors range from young children to advanced science enthusiasts. The Department of Environment and Natural Resources Library environmental education collection provides a useful seed; that collection contains many materials targeting children and educators. It has a need for growth in reference and popular science materials, especially filling the gap described by Dolence and Gilmour (2006) between those found in public and in academic libraries. Resource Center materials are not currently planned to circulate to the public due to legal and logistical difficulties. (B. Bennett, personal communication, April 27, 2009) While this circulation policy should
influence collection decisions, it would be disappointing to devote the entire collection to
typical reference and browsing materials. High quality popular science works are in short
supply at most public libraries, and this is an ideal opportunity to connect them with their
potential readers, even if they finally leave with a citation rather than the book itself.
Electronic resources are another important collection development area. The Department
of Environment and Natural Resources Library does not have adequate funding to
purchase access to subscription databases or other online content, relying on the
Department’s researchers’ likely status as adjunct faculty at colleges and universities. (M.
Tucker, personal communication, March 16, 2009) With the recent inclusion of public
access computers in the Resource Center plans, a very favorable development, I urge the
 provision of as many electronic resources as possible, perhaps through cooperation with
NC Live.

The Resource Center could also potentially manage some nontraditional
materials, such as the educational kits currently handled by the Naturalist Center. These
kits include specimens and supporting materials and are mostly loaned to teachers and
home schoolers. Similar kits are extremely popular loan items at the New York Hall of
Science, where they are circulated through the library. (R. Reitz, personal
communication, June 11, 2008)

The size constraints placed on the Resource Center will lead to some difficult
decisions about which functions and materials should be prioritized. These decisions
must be made intentionally, and should privilege the goals and mission of the new
endeavor over the history of the collection. The aggressive weeding of the existing
Department of Environment and Natural Resources environmental education collection is
a step in this direction, and has allowed for book shelving space to be reduced to make room for public access computers. Ideally, the space would also include a display of current periodicals and some comfortable seating, but there is no additional room to add features. Perhaps periodicals could be displayed along the wall near the entrance or behind the Smartboard if a mobile model were purchased. While there isn’t room for additional seating, perhaps the arrangement of the computer work area and its seating could be configured to accommodate browsing print materials.

Arguably more important than the collection and physical space are the services provided in the Resource Center. The physical and temporal proximity to the visitor’s interaction with the museum exhibits is, after all, this library’s unique feature and greatest potential strength, no matter what books are or are not present. If visitors arrive with their curiosity piqued by museum exhibits, their time in the Resource Center can both help them formulate their information need and begin to fill it. Results of a survey of North Carolina school media coordinators conducted in spring 2009 by the Office of Environmental Education shed some light on demand for services, at least to that user population. The survey included questions about interlibrary lending from the Department of Environment and Natural Resources Library, finding overwhelmingly that these users do not have a budget for interlibrary borrowing nor are they particularly interested in it. This supports the suggestion that the value of the Resource Center may be found in its instructional services more than its actual collection of books, and that the probable absence of circulating materials may not be a problem. The Department of Environment and Natural Resources Library services to non-Department users are currently underutilized; indeed, the survey found that less than five percent of
respondents use the Department of Environment and Natural Resources Library recommendations when making collection decisions. (See Appendix)

This underuse reflects the library’s current physical and Internet presence as a little-known internal library of a government agency. The move to Green Square and greater exposure to the public should signal a new emphasis in public services. In addition to reference, there will be opportunities for bibliographic instruction and even a form of readers’ advisory, described below. The successful provision of these services, of course, relies upon the presence of a librarian. An information professional would have the knowledge and skills to assist visitors in navigating complex resources, as well as providing continuity and consistency in services. Bierbaum (1996, 2000) warns against attempting to staff museum libraries with volunteers or even part-time staff. The lack of full-time professional staffing would suppress the potential of the library at best, and doom it to obsolescence and failure at worst. Koot (2001) expresses both the centrality of the museum library as well as the importance of professional staff, concluding that

the need for staffed information services, combined with the importance of books, highlights the library as the best location for the museum information centre. Moreover, librarians are trained and experienced mediators between individual users and the knowledge stored in their museums. (p. 254)

In the case of the North Carolina Museum of Natural Sciences, the Brimley Library and Resource Center have the complementary functions of technical services and public services, and are likely to require librarians’ expertise to complete each.

A sample of possible Resource Center services is illustrated by the following scenarios.
• The Resource Center librarian compiles bibliographies that are relevant to various museum exhibits. These bibliographies are placed in the exhibit halls as handouts or small bookmarks, as well as being distributed to educators planning group visits and being made available on the Museum website. These bibliographies include a variety of resources, from books to websites, and information about how to access them, whether in the Resource Center, at local public libraries, for sale in the Museum store, or elsewhere.

• A family visiting the Astro Lab (a planned exhibit in the Nature Research Center) becomes fascinated with astronomy and wants to learn more. A sign directs them to the Resource Center, where they sit down and browse astronomy books for all ages, reading one picture book aloud for their youngest child. The librarian gives them a seasonally appropriate guide to the night sky and calendar of Morehead Planetarium’s skywatching events at Jordan Lake to take home.

• A visitor wanders into the Resource Center without any particular information need. He becomes engrossed in a beautifully illustrated guide to fungi. He asks the librarian about a flyer on the bulletin board (or in a scrolling set of announcements on the Smartboard) promoting the Triangle Area Mushroom Club’s upcoming morel hunt, and the librarian sits down at a public access computer and shows the visitor online forums for mushroom foragers.
• A high school student becomes interested in cellular slime molds when her AP Biology teacher mentions them in class. During a school visit to the Museum, she gets permission from a chaperone to go to the Resource Center, where the librarian finds a current article in a scholarly journal about a new discovery involving molecular signaling in cellular slime molds. The librarian also shows the student how to search online databases to find more articles, and how to access them from her school media center or public library.

• A North Carolina public library system receives a grant to expand their nonfiction collection. Tight budgets have meant that they haven’t been purchasing science materials for several years. They don’t want to just buy current titles featured by vendors, so they contact the Resource Center librarian for a list of recommended natural sciences materials from the last few years.

• An exceptionally dangerous strain of influenza is transmitted from livestock to humans and begins to spread through the Southeastern United States. The public is concerned and some are panicking, while initial media reports are sensational and perpetuate misconceptions about the science behind the disease. The Resource Center librarian works with Nature Research Center scientists and communications experts to create frequently updated collections of authoritative sources of information about the flu strain, targeting both members of the public and of the media.
Conclusion

At this juncture in the history of the North Carolina Museum of Natural Sciences, as it realizes the Nature Research Center concept and takes as its task to elucidate how science is done in addition to what we know as a result of that process, library perspectives and practices are relevant and have great potential to enrich the project. The Museum seeks to include North Carolinians in the work of scientific research and to empower them to understand their own lives and environment in that context; it sets out to interpret the seemingly arcane realm of science and make it comprehensible to outsiders. These functions – interpreting complex information, empowering novices to navigate that information, facilitating independent learning experiences – are those at which librarians excel. The theoretical orientation of contemporary librarianship is well matched to the goals of the Nature Research Center, and it should be allowed to inform the development of this institution.

The inclusion of the Resource Center in the museum plans is an acknowledgement of the value of a library in this setting. In order to reach its highest potential, it should be thoughtfully integrated into information environment of the Museum and open to readjustment and reinterpretation as the life of the institution unfolds. The Resource Center can fill the gap between public and academic libraries in providing scientific materials to the layperson and amateur enthusiast. The Resource Center librarian is an ideal partner for Museum staff whose goals are to communicate scientific information to the public, an information educator paired with science educators. It is the librarian practices of focusing on the user’s own needs and interests, developing the user’s independence as an information seeker and learner, and habit of giving the user
something to take away beyond the day at the library/museum, that can help the Nature Research Center reach new heights.
Notes

1. Results on the 2005 National Assessment of Educational Progress: Science are as follows.
   - In grade 4, North Carolina students’ average overall score matched the national average, and 35% of North Carolina students scored in the “below basic” range, 40% scored in the “basic” range, 23% in the “proficient” range, and 2% in the “advanced” range.
   - In grade 8, North Carolina students’ average overall score was below the national average, and 47% of North Carolina students scored in the “below basic” range, 31% scored in the “basic” range, 20% in the “proficient” range, and 2% in the advanced range.
   - State data is not available for grade 12 scores, but national scores declined since the 1996 test and held steady since the 2000 test.


2. Citizen science occurs when members of the general public who have not received formal training as scientists collect data that is used in scientific research. Some of the best known examples of citizen science are collaborations between the Cornell Lab of Ornithology and amateur birdwatchers, as in the
ongoing eBird project, annual Great Backyard Bird Count, FeederWatch and NestWatch projects, and others.

3. Factual statements in this section about the collections of the various Museum-affiliated libraries and Naturalist Center are from personal communication with J. Edgerton and C. Brammer, May 2009.
References


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Appendix:

Selected Data from Department of Environment and Natural Resources

Library Survey of North Carolina School Media Coordinators

(216 total respondents)

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<thead>
<tr>
<th>If you need environmental education instructional materials where do you go for recommendations? (check all that apply)</th>
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</thead>
<tbody>
<tr>
<td>Other</td>
</tr>
<tr>
<td>NC DENR library</td>
</tr>
<tr>
<td>Teacher recommendations</td>
</tr>
<tr>
<td>Reviewing sources such as School Library Journal</td>
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<tr>
<td>NSTA publications</td>
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<tr>
<td>Follett or other jobber booklists</td>
</tr>
<tr>
<td>DPI recommendations and database</td>
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</tbody>
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<table>
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<tr>
<th>Would you be willing to participate in a mail borrowing system where we send you environmental education materials free and you pay the return rate?</th>
</tr>
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<tbody>
<tr>
<td>No Response</td>
</tr>
<tr>
<td>Don't Know</td>
</tr>
<tr>
<td>No</td>
</tr>
<tr>
<td>Yes</td>
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<table>
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<th>Does your school have a budget for interlibrary loans?</th>
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<tbody>
<tr>
<td>No Response</td>
</tr>
<tr>
<td>No</td>
</tr>
<tr>
<td>Yes</td>
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