The Longevity Revolution:
How Science Centers Engage an Older America

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Background Materials
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Including
A Field Guide to Organizations and Programs in Aging
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Interviews of Science Institutions conducted by
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BACKGROUND MATERIALS

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A NOTE ON THIS COLLECTION

The following materials about the aging network, older Americans, science centers, and participation in science are intended to spark your thinking and begin the conversation. Included is a framework for action, background on demographics, issues and trends, possible outcomes of bringing together science centers and seniors, equity and accessibility issues, overviews of informal and adult learning, major organizations and structures in each of the fields, and a summary of the pre-conference surveys conducted with science centers.

This is a work in progress. It is not comprehensive, and we have surely left out key ideas and players, including some that by your estimation will be critically important. Please edit, suggest, react, and we will incorporate your feedback into the conference products.

Bringing two communities together challenges us each to try to figure out what we need to know about the other, and then to frame our joint venture in a way that respects our individual agendas while creating a new and powerful direction.

So please review with these questions in mind:

- What else do you need to know to a) make best use of the conference and b) move ahead to connect science centers and seniors?
- What is especially important that the other community (aging, science) know about your side?
- What have you found especially useful in shaping your thinking, planning, programming that might benefit others’ thinking?

Share your reactions with us before, during and after the conference. Our purpose is to support your efforts with the best resources and connections and help you make the most of the longevity revolution.
A FRAMEWORK FOR ACTION

How do we build true partnerships that capture our respective knowledge and resources? How do we serve both our own interests and the combined greater good?

The framework below was developed by Eric Jolly, now the president of Science Museum of Minnesota. He poses three questions that get at root issues in the development of programs, exhibits, and policy:

- **Who informs?** “Who sets the agenda for our work, sits on our advisory boards, and identifies the priorities, form, and substance of our programming?”

- **Who forms?** Who is directly involved in shaping the content of the programming and exhibitions, the strategic directions, the mission and goals?

- **Who benefits?** What are the anticipated outcomes and how will they matter, to whom, and under what conditions?

The framework is explained in the following article that focuses on anticipated changes in the makeup of the American population. We find it a useful tool for reflection and planning, a challenge to complacency and the status quo. Please feel free to share other approaches that you think might be helpful.
Confronting
Demographic Denial:
Retaining Relevance in the New Millennium

By Eric J. Jolly

Once in a great while, an event occurs that shifts our collective consciousness. This shift compels us, as individuals and as a society, to reexamine our assumptions and realign our perspectives on past, current, and possible future events. In the aftermath of September 11, many of the world’s cultural institutions are struggling to redefine their relevance. “Traditional” museum visitors are rethinking their priorities, especially in leisure opportunities. Likewise, major funders are reconsidering their funding focus.

Among the more immediate consequences in the United States (as of this November writing) has been up to a 50 percent decrease in general attendance at some of our major cultural institutions. In many of our cities, school visitation programs at science centers have all but come to a halt. In addition to these incredible and unforeseen forces, museums are also facing dramatic changes that were foreseeable—the shifting demographics of the communities they are charged to serve. These shifting demographics, and the social and financial realignment of the nation, require science centers to make a clear and unequivocal bid for relevance in the future.

Though many organizations have acknowledged for years that promoting diversity has been an important issue, it has never had a prominent place in their agendas. Now, more than ever, these institutions must broaden the community base that they serve.

What is diversity?

I have a phrase I often use when I talk about promoting diversity: Diversity isn’t about feeling good; it’s about doing good. In the wake of recent events, some of the implications of this aphorism bear examining.

Diversity isn’t about putting off the important work that needs to be done today because it’s only happening somewhere else. It’s about realizing that cities like Leicester, England (the first non-White-majority European city); Frankfurt, Germany (one-quarter immigrant); and Amsterdam (projected to be half immigrant by 2015) are snapshots of our future. What can we learn from what is, and is not, happening in these cities? How can we address the needs of the newest members of our communities, as well as those who are historically underserved?

Diversity isn’t about paying lip service to the results of the latest U.S. Census; it’s about understanding that 80 percent of the increase in the U.S. population over the last 10 years has occurred in what is identified as the “minority population.” There is research indicating that minority children account for as much as 98 percent of the increase in the under-18 population during the last decade (Table 1). What proactive measures will promote the science literacy of every child, so that she or he can advocate for the relevance of science centers to her or his life and to the community’s well-being?

Diversity isn’t about quick fixes; it’s about considering what it means that one in five U.S. children today is the child of immigrants, and that by the year 2040 that figure will be one in three. How will the United States, iden-
tified by the United Nations as one of eight "low-fertility countries" (along with France, Germany, Italy, Japan, Republic of Korea, Russian Federation, and the United Kingdom), ensure that the following observation by a U.N. official about the need for ongoing immigration (see Table 2) becomes a reality: "While international migrants would incur some costs, such as education and health care, studies show a net gain from workers, as opposed to a net loss."

Diversity isn’t about compliance; it’s about asking your science center’s web design and IT team, "How accessible are our web pages for the more than 2 million people who use text-recognition programs?" U.S. Census data suggest that the likelihood of experiencing a disability increases with age. How well-prepared are science centers for the geriatric boom that will occur between 2010 and 2030, resulting in more than 70 million older persons dealing with limitations in vision, mobility, and fine-motor coordination? What are science centers doing to begin creating multisensory experiences for all visitors?

These demographics are no longer trends; they are descriptions of what our world looks like now. In my work with science centers over the past five years, I have noticed that there are usually a few people on staff who have a sense of these demographic data and are concerned about the disparity between the backgrounds of who is in the community and who runs the science center. Too frequently, these individuals do not possess the power or position to implement the policies and practices that result in truly sustainable diversity—a concept that must be understood in terms of what it is, not as well as what it is.

Sustainable diversity entails:
- mutuality between the science center’s decision-makers and community leaders,
- ongoing relationships with current and potential audience members, and
- opportunities for all staff members to develop the skills to support the organization’s leadership.

Sustainable diversity is not:
- relying solely on outreach to work with underserved audiences,
- offering a heritage month event once a year, or
- expecting the community to be content with handouts in the form of finite programming tacked onto a grant award.

The crux of sustainable diversity is building the caliber of relationships that will enable leaders of today’s science centers to understand why community members do not, cannot, or will not visit the museum. It’s similar to the level of effort expended on cultivating and retaining funder support. We, as nonprofits, work long and hard to demonstrate how our mission fits with that of the funder. If the relationship breaks down, we work just as hard to restore it. We need to treat all our communities with the same level of regard.

The question affects the answer

Who informs, forms, and benefits from the work of a science center? Given that board and staff are both critical elements in a sustainable diversity equation, answering such questions means devoting equal resources to building the cultural competencies of current staff and board and recruiting and retaining new staff and board members.

Who informs our work?

More specifically, who sets the agenda for our work, sits on our advisory boards, and identifies the priorities, form, and substance of...
our programming? When those who inform our work are diversified, we will begin to address questions and concerns of greater relevance to even larger numbers of people.

It is probable that during this process we will find ourselves asking questions we hadn't previously considered. For example, what are the implications of the fact that the diabetes rate is more than 200 percent higher in the U.S. Latino population than in the White population? How will this inform the focus of our exhibits on health—not to mention such seemingly mundane issues as the balance of diet and nondiet beverages in soda machines, or the need for needle-disposal units in restrooms?

**Who forms our work?**

Until diversity is incorporated into the warp and weft of our institutions, efforts will continue to look like “diversity projects,” add-ons that fail to show a deep appreciation for the whole of the community. Actively incorporating the knowledge bases of people from different backgrounds—diverse language groups, multigenerational families, persons with disabilities, nontraditional families—is much likelier to produce sustainable diversity than input from a group of advisors.

**Who benefits from our work?**

Finally, we need to examine the outcome—the focus or goals of our institutional practices. Whom do we have in mind when we design programming? What assumptions do we make? What segments of a community benefit from outreach programs? What relevance does the programming hold for the intended recipients?

It is critical to consider who in the community is invited to participate and at what stages. Another critical component is to look at who conducts the evaluation. In the proceedings of a recent National Science Foundation workshop on educational evaluation, one of the first recommendations was that “cultural awareness of the environment from which the [program] participants are drawn must be emphasized.” The way the question is asked affects the answer.

**Pathways to engagement**

It’s all about service. Reaching whatever sustainable diversity goals an institution sets requires effortful enhancement of the institutional and individual capacities to serve. The goal of serving increasingly diverse communities is not distinct from the ongoing missions of science centers; it is simply that now is the time to create operational definitions and the corresponding commitment to activities and outcome measures.

There are many paths to constructively engage the diverse communities of our futures. Listed below is one set of simple principles that can help encourage engagement around the critical issues of who informs, forms, and benefits from our work.

These are not definitive answers to the myriad issues that confront each science center. They are simply one point of departure for beginning to examine these questions while attending to the institution’s mission-related needs.

- Make the unknown known.

Look at who is not coming, and find out what their reasons are. People unfamiliar with science centers may find it hard to imagine how these institutions come-
pare to others with which they are familiar: Is there a dress code? How should children conduct themselves? Will there be food? What are the real costs (is IMAX included in the price of admission) and benefits of the visit?

Make the culture of the science center or museum known by letting communities and families know what to expect. Identify and make allies of individuals who can act as intermediaries and convincingly convey information about the science center. For example, science centers could host breakfasts during which staff spend time getting to know religious and civic leaders. Place ads in community newsletters that answer these questions respectfully.

- Make the invitation to participate explicit and culturally appropriate.

Use the communication tools and strategies of the target populations. Find out who the information brokers in the community are. Is advertising through printed media always the best way to reach underserved populations? An Education Development Center project designed to promote health and literacy among minority women identified hair salons as one important setting for distributing the information. Learn the nuances of how language is used: “No” can also mean “We’re not sure if we can trust the science center.” Find out what cultural issues may be behind a decision to disengage.

- Ensure that the avenues for accepting and contributing are in place.

Be aware of holidays. Conflicts in scheduling can be construed as disregard for a community’s religious and cultural observances. Find out what community supports are available that would bring people to the science center if an invitation were extended. How could the 100 Black Men organization, for example, recognize and use the science center as a resource for their programs? Acknowledge special dietary needs, including religious needs. Are there vegetarian offerings on the menu?

- Create engaging experiences.

Address the “me” factor. Is the biodiversity of humanity incorporated into exhibitions? Will a child walking through the science center see the color of her or his skin reflected in the images, hear his or her accent among the staff? Does label text lump a visitor of color into a catch-all minority group, or simply disregard entire races and ethnicities? Will a young woman notice a preponderance of images depicting males as more active? Do demonstrators call on all children, or only the ones they assume will know the answer?

- Be aware of existing indicators of gate-keeping.

These take the form of often-unintended, small gestures signaling to underserved visitors they are not welcome: Can a person in a wheelchair use the same entrance as her friends? How does frontline staff greet young or minority visitors? Which materials have been translated, and where can they be found? Are there adequate seating arrangements where parents or guardians can rest while keeping an eye on their children?

“Free admission” does not always mean you are cordially invited; it may mean we assume you do not possess the means to provide enrichment experiences for your children. Gate-keeping also manifests itself in the way the science center treats job applicants.

- Have a follow-up program planned.

As entities, communities have long memories. There is a collective awareness of, and wariness about, a science center’s history of offering only episodic engagement. How can your museum plan for postfunding activities that will retain the interest and motivation of the community?

A follow-up program is about “in-reach.” It is programming and engagement. It is predicated on the assets that the community can bring to the museum, and it has identified stakeholders in both the community and the science center. A follow-up program builds
relationships; it does not simply annualize an event, like a Martin Luther King Jr. Day program.

Four elements of sustainable diversity

The ability to work effectively with underserved populations requires long-term commitment to systemic change. Every effort to build sustainable diversity must include four crucial elements:

- **Awareness.** Knowing who does and does not visit, work in, and support the science center is the starting point. The history of interactions with specific communities can explain a great deal about current interactions. An awareness of the needs and goals of the community can give relationships more width and breadth.

- **Knowledge.** Information about other ways of living and knowing needs to come from many sources—consultants, reading materials, community organizations, members, and visitors—and must be available to all staff. Before you can address diverse needs and goals, you have to know what they are. A diverse board and staff act as in-house resources and can help expand the institution’s understanding of different cultures.

- **Skills.** The development of truly inclusive facilities, exhibits, programs, and materials requires competencies in working across cultures. Ongoing opportunities for every science center employee to develop these competencies must be part of the foundation of every science center’s work.

- **Practices.** Skills that address everyone’s needs are incorporated as the norm and are no longer seen as special efforts. Because practices are based on awareness and knowledge, they continually evolve to meet the changing needs and capacities of the science center and communities.

To paraphrase Neil Postman, people sometimes prefer a problem that is familiar to a solution that is not. Creating relevance for the future generation of science center visitors, advocates, and financial supporters will require efforts that reach beyond the familiar.

Promoting diversity is effortful, but staying the course or narrowing our vision is also effortful—and counterproductive to the missions of science centers. Successfully reaching the next generation is not simply about relevance. It is our mission.

Notes

Eric J. Jolly is senior scientist and vice president of Education Development Center Inc. He currently chairs the Committee on Opportunities and Science of the American Association for the Advancement of Science. This article is based on a talk he gave at the 2001 ASTC Annual Conference.
ON LANGUAGE

As is often the case when we are trying to describe a portion of the population, the right words are difficult to find. We are not alone in this struggle as a publication by Experience Corps notes: “It’s safe to say that we don’t yet have the vocabulary we need to reach older adults.”

Focus groups with older adults revealed a “resistance to being thought of as old” and a rejection of descriptors connected to age, including “senior citizens,” “seniors,” “retirees,” “older people,” and “elderly people” as well as euphemisms like “golden years” and “maturity.” The term “experience,” however, got positive reactions, as did language that recognized accumulated wisdom.¹

In an examination of attitudes toward retirement among four ethnic minority communities, SPRY found that “elder” was a term of respect among native Americans, but did not necessarily correspond to advanced chronological age and was limited in some native communities to an earned status.²

With apologies, we have settled in these materials for language that does not seem able to transcend the negative connotations mainstream American society imposes on aging. If “senior” is a desirable modifier before terms like “vice president,” “scientist,” or “advisor,” why is it a negative on its own or before “citizen.” Until we resolve some of our ambivalence about aging, we expect that we will not find the solution to the language dilemma.

¹ Experience Corps, 2005, p. 7
² SPRY Foundation, March 2000, p. 20
RATIONALE AND TRENDS

Today, older Americans are living longer, healthier and more engaged lives than at any time in human history. The number of older adults will increase dramatically as the Baby Boomers, those born between 1946 and 1964, turn 60. “Just as they have redefined every other stage of life from childhood and adolescence to middle life, the boomers will redefine later life.” They will wield substantial political and economic power, as they already account for “nearly 50% of all retail spending, or about $2 trillion a year.” They represent new markets and new audiences. They are better off financially than any previous generation, but income disparities will be brought into sharp relief if the current trend of significantly higher poverty rates among racial/ethnic minorities and single women of all backgrounds continues.

At the same time, the country, world, and planet face increasing scientific, environmental, and technological challenges that require high levels of both expertise and public understanding. The United States continues to face shortages in the scientific and technical workforce as well as in the supply of qualified math and science teachers, a citizenry poorly informed about the nature of science, and continuing problems of under-representation of minorities, women, and persons with disabilities in science careers.

Informal science institutions play a significant role in addressing these issues. Engaging the children, families, and the public at large in the excitement of science is what science centers do especially well. Science museums have a fundamental commitment to promote lifelong learning. But while they seek to serve the full range of public audiences, they are often seen primarily as places for children. Overcoming this public perception will be one of the challenges to expanding partnerships with older Americans.

Science centers also have a commitment to community and outreach to all their publics, but there is an inherent tension between revenue and service. The “gate,” museum parlance for revenue from admission, gift shop, parking, special exhibits, space shows and giant screen theaters, represents the largest share of funding for the majority of science centers. Foundation and government sources have only recently begun to turn attention to the aging population and their involvement in science centers. How such partnerships will be supported in the near and long term needs to be explored.

The aging population has an enormous amount to contribute to science and science centers. They offer lifetimes of experience, expertise, and perspective, some specific to science, engineering, technology, and mathematics. They are

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3 AARP, 2005
4 Institute for the Future
5 Ibid
looking for meaningful work and roles. The MetLife/Civic Ventures survey provides concrete evidence that the next wave of older Americans plans to keep working, and that they are particularly interested in doing “good work.” This desire to contribute cuts across all economic and educational levels, with African Americans more likely than their white counterparts to seek roles that allow them to contribute to their communities. Patterns of work and retirement are changing significantly, and “60 is the new 40,” with people in better shape, more active, and ready for paying and volunteer careers in service. There is ample evidence that successful aging—better physical, mental, and cognitive health, social integration, and being an economic asset rather than a drain on the system— involves sustained engagement in cultural, educational, and civic activities.

The intersection between the desire of the upcoming population of older Americans to do good and the strong tradition of voluntarism in science museums presents a powerful opportunity for social change. David R. Jones, longtime president of the Community Service Society and founder in 1966 of RSVP (Retired & Senior Volunteer Program), contends that “tapping into the social networks, skills, and experience of older adults, particularly within communities of color, can be an extraordinarily effective weapon in the fight against poverty.”

What then will drive science centers to engage older Americans? What will draw seniors to science? What are the outcomes we seek? What do we want to be different as a result of our work? What is our value added?

How do we link the demographics, economics, and health of seniors to the demographics, economics, and health of science, and figure out what a partnership between science centers and the aging network can and should contribute? How do we measure these contributions? What should be our metrics for assessing progress, impact, success?

Following is a starting list of possible outcomes and incentives around which to mobilize action:

**For science centers:**
- Expanded and new audiences, keeping up with the new demographics
- Income and revenue
- Fulfilling mission: Lifelong learning, promoting stewardship, building public understanding of science
- Expertise (in business, science, design, teaching, working with the public…)
- A needed source of experienced labor
- A vastly expanded pool of highly committed and effective volunteers

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6 MetLife Foundation/Civic Ventures, 2005
7 Ibid
8 Jones, D., 2005, p. 8
For science and society:
- Increased public support for science
- Increased public understanding of science
- Workforce development and redressing under-representation, based on practices demonstrated to increase participation (e.g., as role models, mentors, and internship developers; as liaisons between underserved communities and networks within business and academe)
- Potential source of math and science teachers
- A means of addressing poverty
- Continued contributions to science innovation and education

For older Americans:
- Improved physical and cognitive health
- Opportunities to make a difference
- Mastery of new skills and essential knowledge
- Expanded relationships and networks
- New perspectives and “life-changing experiences”

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9 Sachatello-Sawyer, B. et al., 2002, p. 15
The boomers, good work, and the next stage of life

An essay by Marc Freedman

Marc Freedman is the president of Civic Ventures and author of Prime Time: How Baby Boomers Will Revolutionize Retirement and Transform America (PublicAffairs, 2002).

A succession of surveys over the past decade makes plain the plans of a new generation of older Americans to keep working. Most of this research reveals that four of five boomers are expecting to continue working at the point when earlier generations moved to the sidelines. Indeed, there is already evidence of shifting labor patterns on the part of the pre-boomers, as early retirement levels off and millions of older workers remain in the workforce. These polls also find that most people who keep working want more than an endless incarnation of midlife work. Instead, they are keen on renegotiating their relationship to work, looking for more flexibility and liberation from the long hours characterizing midlife labor in America today.

The MetLife Foundation/Civic Ventures New Face of Work Survey breaks important new ground, moving beyond the research to date by focusing on a set of central questions that have been little explored: What kind of work does the current and coming generation of Americans in their 50s and 60s actually want to do? What are these individuals looking to accomplish through work after the traditional working years? Do these priorities fit with where we are likely to need people? Or is there a great disjuncture between what the new generation of aging workers want and what the economy—and society—need?

The findings constitute the first in-depth look at the pre-boomers and leading-edge boomers’ priorities for the next stage of work, and offer heartening indications of what might well be a win-win opportunity of staggering proportions.
In analyzing this research, we see 10 critical trends:

1. The freedom to work. The pre-boomers and leading-edge boomers surveyed are poised to swap the old dream of the freedom from work for one that might be characterized as the freedom to work. When asked about whether this is a time to take a well-deserved rest or an opportunity to begin a new chapter characterized by making important contributions, they break with earlier generations in embracing engagement. And most are planning to do so through continued work: A full 65 percent of leading-edge boomers say work will continue to be a part of their life throughout what used to be the retirement years. These individuals appear to be inventing not only a new stage of life between the middle years and true old age, but a new stage of work.

2. Doing well by doing good. The desire to do work that enhances the well-being of others is widespread. Fully half of all adults age 50 to 70 (and 58% of those 50 to 59) aspire to work in seven areas that combine the seriousness, income, and other benefits associated with work with the desire to contribute to the greater good. Indeed, when asked specifically to name the kind of work they would prefer to do in the future, those surveyed named education and social services as two of their three top choices. Both finished just behind retail work—an area where much recruitment of aging Americans is underway. Health care jobs also finish high on the priority list.

3. The great connect. The widespread desire to do good work is enormously heartening news, indicating a good fit between the desires of a new generation of older Americans and some of the key sectors—education, health care, and social services—where we are wringing our hands wondering how to find the talent to fill growing human resource gaps. What’s even more encouraging is that this desire appears not only to run wide, but deep: More than one in five leading-edge boomers (21%) surveyed say they have a very strong interest in pursuing these options.

4. Beyond volunteering. Much debate over the social contribution of the boomers in their next stage has hinged on whether they will volunteer at levels comparable to their predecessors, most notably the greatest generation. There’s reason for concern, given the boomers’ mixed performance as joiners and volunteers during the middle years. But this survey suggests that when all is said and done, work that is not only personally meaningful but that means something important in service to the wider community may be the most important way that boomers choose to give back.

5. Beyond the retail model. If the old norm for retirement was the golden years focused on leisure, the new default position seems to be a part-time job in the retail sector. Wal-Mart, Home Depot, and others deserve considerable credit for recognizing this pool of talent and for actively recruiting a population most employers overlook. But survey findings show that a significant segment of Americans moving toward their 60s and 70s wants something distinct from a retail or fast-food work experience. They want to focus their accumulated time, talent, and experience on work that directly contributes to social renewal. Their disposition is a powerful reminder that we will need to do a much better job of opening up opportunities in the realm of good work—in education, health care, the social sector, among others—if we are to have any hope of fully capturing the potential contributions of this experience-rich generation.
6 A new career arc. It has become commonplace to think about retirement jobs as part-time employment, bridging the gap between middle work and later-life leisure—the work one does after the major body of work is over. As respondents to this survey emphasize, many leading-edge boomers are instead envisioning something that resembles a second half of work. Given that they want to shift toward good work now, not when they’re 65, they’ll have 10 or even 20 years to put into this second career. That makes the prospect of additional education and retraining more appealing for these individuals—as they would be investing in a new stage of work. It also creates a more viable arrangement for potential employers, who would see that those over 50 aren’t likely to be simply passing through on their way to retirement. While this second half of work might not be as long in duration as the first half, in the end, it might well weigh as much, producing a body of work equal in significance.

7 Not fading away. Running throughout these findings is a vision of the post-midlife years that is inimical to the notion of decline, whether that be the precipitous cliff of complete disengagement or the more prevalent notion these days of pulling back gradually but steadily, or phasing out. While those surveyed show strong interest in getting a better balance between work and life, shining through is a vision for work that suggests people believe some of their most important contributions may well lie ahead. In some ways, the patron saint here is Jimmy Carter, for whom the apex of midlife achievement, the presidency of the United States, was in many ways a prelude to the work we’ll remember him for, and for which he’s achieved his greatest recognition.

8 The pull of people and purpose. For all its uplifting qualities, simply knowing that there is wide and deep interest in good work is inadequate. The question “why” looms large. This new research reaffirms that additional income and a sense of idealism are important components of the drive toward good work, but perhaps even more important are people and purpose—the connections to others committed to similar goals, and a reason to get up in the morning. For a generation that derived a great deal of its identity and social networks from work—sociologist Arlie Hochschild argues that for this group in midlife, work became a refuge—these aspirations for the second half of work should come as no surprise.

9 All dressed up, but where to go? Despite strong interest in pursuing new work for the greater good, few of those surveyed thought it would be very easy to find this type of engagement. Their response was striking given the good potential fit between supply and demand in areas such as education and health care. Their answers suggest a pair of barriers: 1) We do a much better job helping people plan financially for the second half of life than we do helping them navigate their way from one phase of life and work to engagement in another. 2) There is as yet little evidence of receptivity by the nonprofit sector in tapping this coming population of aging boomers and pre-boomers. Indeed, a new study by the National Council on the Aging shows that indifference toward the contribution of this group is often the prevailing perspective of these organizations.
10 The second coming of barrier-busters. As this last point underscores, the drive toward good work comes largely from the people themselves—not the organizations that might use their time, talents, and experience. This drive contains many of the features of a social movement—and in many ways it resembles the women’s movement during the 1960s. There were few supportive policies, nor much impetus from employers at that juncture. All the dynamism came from the individuals themselves. It should be little surprise then that this survey reveals that the groups most ready to be pioneers in this new generation are none other than the boomer women and African Americans who broke down so many barriers earlier in their lives.

These survey results hold enormous allure—suggesting that, despite many challenges, the new demographics and the trend toward longer working lives contain the potential for both social and individual benefit.

Never before have so many Americans had so much experience—and so much time to do something with it. Will our society make the most of this potential windfall, recapturing years of investment in human and social capital and helping direct these human resources in ways that promise the greatest return for individuals and the nation? Or will we write off what may be our only increasing asset, the experience of a generation of Americans soon to represent nearly a quarter of the population?

Realizing the experience dividend will be neither easy nor automatic. Rather, it will require renewed creativity at all levels—new perspectives, new policies, new pathways, and most of all new opportunities to put to good use what individuals have learned through life. That can sound like a tall order, but then again, the history of aging in America is a history of spectacular innovation.

It must continue to be.

The payoff is nothing less than a society that makes sense, one that balances the joys and responsibility of engagement throughout the lifespan and across the generations. In other words, one that works better for everybody. ■
The following statistics may be useful as you plan, write proposals, and identify “who informs, forms, and benefits” from partnerships between the aging community and science institutions. Some of the numbers refer directly to the older population, while others imply gaps and roles that may be filled by seniors, such as mentoring younger people in math and science education and careers, addressing the shortage of qualified math and science teachers, or providing technical advice in their field of expertise.

**Population and demographics**

The senior population will more than double between now and 2050, with the biggest growth from 2010 to 2030. Baby boomers will start turning 65 in 2011. Adults 65 and older will constitute fully 20% of the population by 2030.¹

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of People 65 and Over</th>
</tr>
</thead>
<tbody>
<tr>
<td>1900</td>
<td>3.1 million</td>
</tr>
<tr>
<td>2003</td>
<td>35.9 million</td>
</tr>
<tr>
<td>2030</td>
<td>72 million</td>
</tr>
<tr>
<td>2050</td>
<td>87 million</td>
</tr>
</tbody>
</table>

The oldest old will be the fastest growing segment of the senior population:

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of People Over 85</th>
</tr>
</thead>
<tbody>
<tr>
<td>1900</td>
<td>100,000</td>
</tr>
<tr>
<td>2000</td>
<td>4.2 million</td>
</tr>
<tr>
<td>2050</td>
<td>21 million</td>
</tr>
</tbody>
</table>

The United States as a whole and the over 65 age group will become increasingly diverse. Racial and ethnic minorities will account for nearly 40% of the older population by the year 2050, compared to 17% in 2003.² The Census Bureau projects the following percentages for four of the major racial/ethnic groups:

<table>
<thead>
<tr>
<th>Group</th>
<th>2003 Percentage</th>
<th>2050 Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-Hispanic White</td>
<td>83% of U.S.</td>
<td>61%</td>
</tr>
<tr>
<td></td>
<td>older population</td>
<td></td>
</tr>
<tr>
<td>African American</td>
<td>8%</td>
<td>12%</td>
</tr>
<tr>
<td>Asian</td>
<td>3% (1 million)</td>
<td>8% (7 million)</td>
</tr>
<tr>
<td>Hispanic</td>
<td>6% (2 million)</td>
<td>18% (15 million)</td>
</tr>
</tbody>
</table>

**Geographic distribution**

- In 2000, the states with the highest proportions of 65 and older were Florida (17.6%), Pennsylvania (15.6%) and West Virginia (15.3%).³

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² Ibid, p. 4
³ U.S. Census Bureau, 2006, p. 2
Nine states had more than a million people aged 65 and older: California, Florida, New York, Texas, Pennsylvania, Ohio, Illinois, Michigan, and New Jersey.  

In 2004, 20% of Florida's population was 65 or older, the highest in the nation. By 2025, it will be only one of 39 states with that demographic.

In 2000, nearly 3/4 of all older Hispanics lived in four states: California, Texas, Florida, and New York, while two-thirds of older Asians lived in the West.

**Income and poverty**

There has been an increase in median income, but disparities continue. While the Baby Boomers are a formidable market, the gap between rich and poor elderly, and between white males and others, may continue to be a concern:

- In 1967, the median income for older people was $12,882 (in 2003 dollars). In 2003, the median income was $23,787.
- In 1959, 35.2% of older people lived in poverty. By 2003, that percentage had declined to 20%.
- In 2002, 8% of older non-Hispanic whites, 24% of older Blacks, and 21% of older Hispanics were living in poverty.
- Older women are more likely than older men to live in poverty, with 17 percent of non-Hispanic white women and 40 percent of Black and Hispanic women living in poverty.

**Labor force participation and retirement**

While there will be a surge in the number of people reaching retirement age in the coming decades, patterns of work among those over 65 are changing:

- Between 2003 and 2010, the size of the labor force that is aged 45 to 64 will grow by 7.4 million people. The fastest growing labor force group, those aged 55-64, will increase by over 20 percent by 2010. “Their decisions about whether to work past age 65 will affect the age composition of the labor force.”
- Baby Boomers will begin retiring in 2008 when they begin to turn 62 and qualify for Social Security; a major retirement wave is expected in 2010.
- Nearly half of employed men and two-thirds of women age 70 and over work part time. Part-time employment is often a bridge from full employment to retirement.

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4 Ibid, p. 2  
5 The National Council on the Aging, 2004, p. 2  
6 U.S. Census Bureau, 2006, p. 2  
7 Ibid, p. 100  
8 Ibid, p. 2  
10 U.S. Census Bureau, 2006, p. 106  
11 Ibid, p. 88  
12 Ibid, p. 2  
13 Ibid, p. 89
The majority of Baby Boomers expect to continue to work during their retirement years, some for interest and others for income.\textsuperscript{14} Late-life work patterns take many forms, including self-employment, reduced hours, or reverse retirement (reentry into the labor market).\textsuperscript{15} The MetLife Foundation/Civic Ventures survey found that 50% of adults age 50 to 70 "say they are interested in taking jobs now or in the future to help improve the quality of life in their communities."\textsuperscript{16} Five-five percent are interested in an education position, and 45% in working in a youth program.\textsuperscript{17} African-Americans of both genders are more likely than their white counterparts to say they are interested in second careers in service. This was true across education and income levels.\textsuperscript{18}

**Participation and under-representation in the scientific and engineering (S&E) labor force**

Growth in the S&E workforce has been substantial and rapid. Yet shortages in the S&E labor force, particularly among highly skilled scientific and technology workers, have been a source of concern in the United States for more than a decade. The U.S. has relied on special visas for foreign workers to fill this need, but other countries are now offering attractive opportunities and competing for this talent.

- In 2003, the size of the S&E workforce was 4.9 million in S&E occupations, but 12.9 million workers say they need at least a bachelor’s degree level of knowledge in a science field in their jobs.\textsuperscript{19}
- According to the Bureau of Labor Statistics, S&E occupations are expected to grow by 26% between 2002 and 2012, compared to 15% for employment in all occupations.\textsuperscript{20}
- The growth rate of S&E occupations is forecast to be 70% faster than the growth rate for all occupations. Three-quarters of those jobs are anticipated in computer-related occupations, and nearly as fast growth is projected for "postsecondary teacher" (all fields), rising from 1.6 million to 2.2 million in this period.\textsuperscript{21}
- The percentage of women and minorities in the S&E labor force has increased over time such that there are double to triple the numbers of women, Native American, Black, and Hispanics represented in the 40-44 age group compared to their representation in the 55-59 age group.\textsuperscript{22}
- Women, minorities, and persons with disabilities are still underrepresented in science and engineering compared to their percentages in the population at large. For example, women were 12% of those in S&E occupations in 1980.

\textsuperscript{14}Ibid, p. 94
\textsuperscript{15}Ibid, p. 89
\textsuperscript{16}MetLife Foundation/Civic Ventures, 2005
\textsuperscript{17}Ibid, p. 7
\textsuperscript{18}Ibid, p. 30-31
\textsuperscript{19}National Science Board, 2006a, p 3-4
\textsuperscript{20}Ibid, p. 3-8
\textsuperscript{21}Ibid, p. 3-8
\textsuperscript{22}National Science Board, 2006b, Table 3-13
and 25% in 2000, but their growth in representation was only 3%. Among Hispanics, representation increased from 2% to 3.2% but this is less than the increase in the Hispanic population overall.\textsuperscript{23}

- According to a report commissioned by the GE Fund, “If majority women and minority women and men were getting degrees in the quantitative disciplines, including math, economics, engineering, and computer and physical sciences, at the same rate as their representation in the general population, there would now be more than a million more workers in these fields.”\textsuperscript{24}

- Retirements from the S&E labor force are likely to increase significantly. Twenty-nine percent of all S&E degree holders in the labor force are age 50 or over. Among S&E doctorate holders in the labor force, 44% are age 50 or over.\textsuperscript{25} The S&E labor force is likely to become more diverse as the current pool is replaced by the next cohorts.

### The Science and Math Teaching Force

- Between 17 percent and 28 percent of public high school science teachers, and 20 percent of mathematics teachers lacked full certification in their field in 2002, and the problem was worse at the middle school level.\textsuperscript{26}

- In the coming decade alone, the United States will need at least 240,000 science and mathematics teachers in middle and high school. Yet more than one third of all new teachers leave the profession within 3 years and half leave within 5 years.\textsuperscript{27}

### Education

Educational levels have risen among older Americans, but disparities by race and ethnicity persist. In 2003,

- High school completion rates among those 65 and older were 76% for non-Hispanic Whites, 70% for Asians, 52% for Blacks, and 36% for Hispanics.\textsuperscript{28}

- Attainment of at least a bachelor’s degree among those 65 and older was highest among older Asians (29%), followed by 19% for non-Hispanic whites, 10% for Blacks, and 6% for Hispanics.\textsuperscript{29}

### Public understanding of science

Although not broken out by age, data about the public’s understanding of and attitude toward science are collected by the National Science Board as part of its key indicators:

\textsuperscript{23}National Science Board, 2006a, p 3-4
\textsuperscript{24}Campbell, P. et al, 2002, p. 1
\textsuperscript{25}National Science Board, 2006a, p. 3-4
\textsuperscript{26}National Science Board. 2006c, p. 3
\textsuperscript{27}National Science Board. 2006. America’s Pressing Challenge. P. 4
\textsuperscript{28}Federal Interagency Forum on Aging-Related Statistics, 2004, p. 7
\textsuperscript{29}Ibid, p. 7
• Americans have generally positive attitudes about science and technology,\textsuperscript{30} and “all indicators point to widespread public support for government funding of basic research in the United States and elsewhere. This has been the case since at least the mid-1980s.”\textsuperscript{31}

• “Most citizens do not have a firm grasp of basic scientific facts and concepts, nor do they have an understanding of the scientific process. In addition, belief in pseudoscience seems to be widespread…”\textsuperscript{32}

• While the public is interested in science and technology, only 15% of NSF survey respondents in 2004 said they felt well-informed “about new scientific discoveries and the use of new inventions and technologies…About one-third…considered themselves poorly informed.”\textsuperscript{33}

• Evolution is poorly understood by the American public, with only 44% answering true to the statement that “human beings, as we know them today, developed from earlier species of animals.”\textsuperscript{34}

• The quality of the environment was a concern for 65% of respondents.\textsuperscript{35} The public is divided on reports about global warming: in 2005, 31% believed that news reports generally exaggerated the problem, 29% thought the press was accurate, and 35% thought that the reports underestimated the seriousness of the threat. More than half, however, believe the effects of global warming are already evident.\textsuperscript{36}

• 53% of the public supported medical research using embryonic stem cells in 2004, while 36% opposed it.\textsuperscript{37}

• “People age 65 and older consistently vote in higher proportions than other age groups.”\textsuperscript{38}

Science Centers

The latest survey by the Association of Science-Technology Centers of its member institutions (science centers, natural history museums, zoos, botanical gardens, and children’s museums) reported:

• 342 science centers in the United States serve approximately 74.9 million visitors.\textsuperscript{39}

• Every state has at least one science museum; California has 42, New York and Florida between 21 and 25.\textsuperscript{40}

• Of the 154 respondents to the ASTC survey, nearly 30% offer programming for senior citizens.\textsuperscript{41}

\textsuperscript{30}Ibid, p 7-25
\textsuperscript{31}Ibid, p 7-25
\textsuperscript{32}National Science Board, 2006a, p. 7-17
\textsuperscript{33}Ibid, p. 7-16
\textsuperscript{34}Ibid, p. 7-19
\textsuperscript{35}Ibid, p. 7-26
\textsuperscript{36}Ibid, p. 7-26
\textsuperscript{37}Ibid, p. 7-33
\textsuperscript{38}US Census Bureau, 2006, p. 175
\textsuperscript{39}ASTC, 2005, p. 23
\textsuperscript{40}Ibid, p. 13
\textsuperscript{41}Ibid, p. 19
• 95.5% of US science centers have volunteer programs; the median number of
volunteers in an institution is 150. But 10% of the volunteers contributed
nearly 20% of the total hours.  

• The ASTC Survey, using the 2004 Independent Sector benchmark of $17.55
per hour as the value of volunteer time, estimated that among the 126 U.S.
institutions participating in the survey, the volunteer contribution was worth
$34.6 million.  

• Earned income accounted for 47.5% of U.S. respondents’ budgets, public
funds 23.8%, private funds 24.8% and the remainder endowment income.

Sources:
Association of Science-Technology Centers.  2005.  2005 ASTC Sourcebook of

research-based decision making to increase diversity in the quantitative
disciplines.  A report commissioned by the GE Fund.  Newton, MA:  Education
Development Center.

Americans 2004:  Key Indicators of Well-Being.  Federal Interagency Forum on

National Science Board, 2006.  Science and Engineering Indicators.  Two
volumes.  Arlington, VA: National Science Foundation.

National Science Board, 2006.  America’s Pressing Challenge – Building a
Arlington, VA: National Science Foundation.

U.S. Census Bureau, 2006, 65+ in the United States: 2005.  By He, W.,
Studies.  Washington D.C.

42Ibid, p. 47  
43Ibid, p. 48  
44Ibid, p. 49
EQUITY AND UNDERREPRESENTATION

Addressing the inequities that have kept people from learning and participating in science is a critical issue in science education. Women, minorities, and persons with disabilities are “underrepresented” in science: they are a significantly smaller portion of the scientific education and career force than their percentages in the population at large. Attention began to focus on this situation and its consequences in the early 1970s. Its direct relationship to the health of science and the increasing demands of a technological society for knowledge, highly skilled workers, and informed public support led Congress to take action.

The Science and Engineering Equal Opportunities Act of 1980, TITLE 42 > CHAPTER 16 > § 1885, is the Congressional statement of findings and declaration of policy respecting equal opportunities in science and engineering:

(a) The Congress finds that it is in the national interest to promote the full use of human resources in science and engineering and to insure the full development and use of the scientific and engineering talents and skills of men and women, equally, of all ethnic, racial, and economic backgrounds, including persons with disabilities.

(b) The Congress declares it is the policy of the United States to encourage men and women, equally, of all ethnic, racial, and economic backgrounds, including persons with disabilities, to acquire skills in science, engineering, and mathematics, to have equal opportunity in education, training, and employment in scientific and engineering fields, and thereby to promote scientific and engineering literacy and the full use of the human resources of the Nation in science and engineering. To this end, the Congress declares that the highest quality science and engineering over the long-term requires substantial support, from currently available research and educational funds, for increased participation in science and engineering by women, minorities, and persons with disabilities. The Congress further declares that the impact on women, minorities, and persons with disabilities which is produced by advances in science and engineering must be included as essential factors in national and international science, engineering, and economic policies.

Congress requires the NSF to monitor its progress through the Committee on Equal Opportunities in Science and Engineering (CEOSE) and to publish a report to the public on the participation of Women, Minorities, and Persons with Disabilities in Science and Engineering,45 which is now continuously updated on line.

The law is powerfully implemented through the NSF peer review process that assesses all funding requests on the basis of two equally-weighted criteria.

45National Science Foundation, 2004
Criterion 1, “intellectual merit,” refers to the quality of the science and its potential for advancing the field of knowledge. Criterion 2, “broader impact,” refers to the breadth of the project’s reach, and its potential for increasing the participation of underrepresented groups.

While we have made progress, the problems persist, from the early years of schooling through higher education and into the workforce. As the numbers indicate, the scientific workforce has grown more diverse with each decade, but the first waves of Baby Boomers still reflect the era before much attention or resources were dedicated to involving those other than white males.

To reach the spectrum of older Americans, our efforts need to:

- Engage those who have not had access to science and mathematics throughout their education and careers—a large segment of the current senior population as well as a significant portion of the Baby Boomers
- Reach out aggressively and involve the older women, men of color, and persons with disabilities who have been involved in science, and identify those who have deep knowledge and resources that may not have been acknowledged by the formal science or education communities.

There is an extensive body of research, interventions, and policy initiatives. There are numerous professional/educational science associations that either have chapters within or are wholly dedicated to a focus on under-representation, and some that are focused on retired scientists. But the bulk of attention in redressing under-representation has focused on the scientific pipeline and workforce, and has aimed at the part of the population from school age through mid career adult. There has been little examination of the condition or effects of under-representation with respect to the aging population.

What then are the most forceful drivers for engaging underserved older Americans?

We can make cogent arguments about the benefits to individuals and to communities. We can cite the Americans with Disabilities Act and the obligation of science centers as places of “public accommodation” to provide equal access to services. We can ask how science centers can afford to ignore what will arguably be one of the largest segments of their potential audience. We can acknowledge that older Americans vote in greater numbers, their numbers will double in the next 30 years, that a far greater percentage of that increased population will be minority, and that we need them to support scientific research and innovation, not to mention environmental stewardship and responsible scientific policy.

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46 See section on “Overview of Science Organizations” for examples.
Now is the time to expand the conversation, back it up with data, and make the connections among science, aging, and full inclusion of all parts of the aging population in the understanding, development, and protection of science.

ACCESSIBILITY

Accessibility becomes a mainstream issue for older people. Science centers have tended to attract much younger audiences, and may need to consider different approaches in planning for inclusion of seniors. As often happens when we move to “universal design,” we are likely to find that the accommodations we make for seniors have positive benefits for the public at large as well as for persons with disabilities. Lower noise levels, better sight lines, clearer and more limited text, multi-sensory exploration, places to sit and reflect and absorb may well promote more engaged and focused learning for all.

Excellent resources exist. Go first to the ASTC Accessible Practices website, a gold mine of information and links. Then review the following two articles from the issue of the *Journal of Museum Education* on Museums and the Aging Revolution:

- Morrell, Roger W., Echt, Katharina V. “Presenting Information to Older Adults.”
- Reich, Christine, and Borun, Minda. “Exhibition Accessibility and the Senior Visitor.”

Finally, review the suggestions of colleagues in the Summary of Pre-Conference Surveys at the end of these background materials.

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47 Design intended to be useable by as many people as possible regardless of age, ability, or situation. [http://www.udeducation.org/learn/aboutud.asp](http://www.udeducation.org/learn/aboutud.asp). For universal design as applied to education, see the Center for Applied Special Technology (CAST) at [http://www.cast.org/](http://www.cast.org/)
Presenting Information to Older Adults

ROGER W. MORRELL
AND KATHARINA V. ECHT

It is a fact that our society is growing older. Because people over the age of 60 constitute an increasing portion of museum visitors, museum professionals must consider the needs that even robust and healthy older adults have as a part of the normal aging process. To reach this older audience effectively, museums must present information so that it can be seen and comprehended easily by this age group.

As one ages, normal age-related declines in certain visual and cognitive abilities appear gradually over the years and do so in the absence of pathology. Only a small percentage of older adults will suffer total decline in one or both of these areas. Some of these factors, however, will manifest themselves to a mild or moderate degree in most adults over the age of 60. In this article we will discuss these age-related changes in vision and cognition and present guidelines on how they might be mediated in the design of exhibitions and of Web site text and graphics.

**Age-Related Changes in Vision**

Some visual changes may begin as early as middle age. It is most likely, however, that the greatest losses occur in later life. They include changes in the parts of the eye (e.g., cornea, pupil, iris, and lens) that may substantially decrease the amount of light that reaches the retina. Proper lighting of exhibitions and related signage is critical to make up for these changes.

Lighting should be placed carefully, however, because older adults have more difficulty with glare. Often portions of exhibits are covered in plexiglass or other transparent material to increase their durability. Some elements might be slanted in an exhibit for artistic purposes. Bright spotlights shining on these surfaces produce glare and should be positioned to avoid this problem. The loss of contrast sensitivity with age is another concern. It may be necessary to increase the degree of contrast between the focal object and its background for greater detectability by older viewers (use black objects on white or lightly colored backgrounds or light objects on black or dark backgrounds).

Diminished visual performance in older adults is related primarily to the loss of acuity, or the ability to perceive or detect fine details. Thus, the size and arrangement of relevant graphic details are important considerations in the design of textual materials for use by older adults. Findings from a number of studies have examined the effects of type variables on the readability of text by persons of differing ages with and without low vision. The implications of these results are that text design improvements may compensate, at least in part, for age-related visual changes. Further, designing text to account for age-related visual changes, as described in the next section, can improve comprehension of those materials.

**Designing Readable Text for Older Adults**

**Typeface**

Three general typeface styles are found in printed materials: serif, sans serif, and display types. (This paragraph is set in a serif typeface.) Display typefaces should be avoided in the design of text for older adults to read. (This is an example of display type.) Improvements have been reported in the reading performance of visually handicapped individuals with materials composed of sans serif typefaces. Helvetica (an example of a sans serif typeface) has been shown to be particularly effective with older adults.

**Type Size**

Headings are generally printed in 14-point type or larger. Most people can easily view this size from a usual reading distance (as when reading a book or a newspaper). Headings also usually consist of few words, which also contributes to their visibility. Bodies of text, however, may present other troubles. A review of 18 studies concluded that 12- to 14-point type is preferable for use by the elderly. Some exhibits may
have textual elements, such as signage, that are not within one or two feet of the reader. In this case, textual elements should be moved closer to the reader or the type size should be increased.

Type Weight
Medium or boldface type is most commonly presented for use by people with visual impairments. In addition, the sparing use of directive cues or elements that call attention to key words, phrases, or sections of text may facilitate readability in older adults. Examples of directive cues include underlining, uppercase letters, and italics in headlines only.

Uppercase and Lowercase Letters
The use of all uppercase letters in text has been shown to reduce legibility because readers do not have the necessary visual cues that make words recognizable. Text set in upper- and lowercase letters, however, forms words that are distinct and more easily recognized by the visual system.

Spacing
The spacing between lines of type (called leading) also affects readability. Lines that are closely presented may increase the occurrence of lateral masking, or a distraction that occurs as a function of the proximity of other letters. Older adults are especially susceptible to lateral masking. Therefore, text lines should have sufficient spacing—at least the equivalent of double-spacing—between lines.

Alignment
Alignment—how lines of text are positioned from left to right on a printed page—is another factor to consider. Left-aligned text is optimal for the layout of printed materials.

Color
A major concern when using color in printed material for older adults is the difficulty they have with color discrimination. The ability to discriminate between colors decreases with age and is particularly pronounced for pastels, blues, and greens. Consequently, labels or displays that require distinctions between colors should make use of rich, saturated tones instead of light color shades, blues, or greens.

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Age-Related Changes in Cognition
Not all cognitive processes decline with age. However, certain basic cognitive mechanisms have been shown to exhibit some age-related decrements. Among these are working memory, or the ability to simultaneously maintain and process new information. Spatial ability, or the ability to manipulate three-dimensional objects in space, has also been shown to increase during adolescence, reach a peak during the second or third decade of life, and then steadily decline. The implication of these declines is that text may become more difficult for older adults to understand relative to their younger counterparts.

Researchers in aging and cognition have recommended several ways to mediate these declines by the manner in which text is presented. Instructions for using interactive displays should be as simple as possible and clearly printed according to the guidelines listed above. Information should be presented in an explicit and familiar manner to increase comprehension in the elderly. Some additional ways to facilitate understanding of written information in older adults are:

• Organize the material in a standard format, usually relatively short, discrete segments.
• Write the text in simple language.
• Avoid negatives and inferences.
• Phrase the text in the active rather than the passive voice.

Presenting information in a list has been found to be effective, and older adults prefer this style. Conveying material in a consistent manner or in the same layout places fewer demands on cognitive processes.

Finally, the use of relevant illustrations has been shown to improve all age groups' comprehension of the material. Research has shown consistently that the information will be more elabo-

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Extending Design Principles to the World Wide Web
Many museums maintain Web sites with increasingly rich resources. According to the U.S. Department of Commerce, older adults are purchasing computers at a greater rate than any other age group. They also represent the fastest-growing segment of Web users, and many designers are becoming concerned that this population does not find their Web sites easy to use. It is time to make this connection, because older adults are very proficient at acquiring and retaining computer skills and very interested in the online community. Furthermore, a Final Rule by the Architectural and Transportation Barriers Compliance Board, in Section 508 of the Rehabilitation Act Amendments of 1998, requires that people with disabilities have access to information presented in an electronic format that is comparable to the information provided to individuals without disabilities.

Do the same guidelines that we have proposed for designing text and exhibitions for older adults apply to Web site design? To answer this question we must raise a caution about applying what we know about printed materials to computer monitors. Information on the computer screen is perceived differently from information on the printed page, primarily because of resolution differences. As a whole, however, many researchers maintain that some of the same rules apply, especially when certain aspects of the screen design
resemble similar features on paper. For this reason, there are additional guidelines to follow when designing Web sites for older adults’ use. Most of these points relate to how quickly the material is presented, because older adults perform more complex tasks more slowly than younger adults—especially as the tasks become more complex.

- Avoid scrolling text. Older adults generally have slower reading and word recognition rates. Therefore, avoid the use of automatically scrolling text on the page. If scrolling text must be used, offer a static text alternative that follows the guidelines outlined above.

- Allow for pages to be read again. Older readers comprehend text better if they are given the opportunity to reread certain portions. Incorporate buttons such as “back” and “forward” on each page.

- Provide short, concise pages. Many older adults have computers that have been “handed up” from children or grandchildren. These machines may have slower operating systems and browsers; pages with elaborate graphics or lots of text will require much longer to load, causing the user to lose patience or the system to freeze. Longer documents also require continuous scrolling to read.

- Use a consistent layout. A consistent design—with the same typeface, type size, icons, and means of navigation—facilitates the use of a site and enables users to learn how the pages are organized and to become comfortable with the site. The style and size of icons are also important. Include graphics and text in an icon, and use a size that does not require precise mouse movements for clicking.

- Minimize mouse movement. For those with unsteady or arthritic hands, using a mouse can be difficult. When designing a Web site, be conscious that minimizing the number of clicks needed to access information will make it more usable.

- Keep navigation simple. Navigation is the path that users take to move around the site as well as to link to related sites. The larger the site is, the simpler the navigation should be. Linear navigation is best for older adults. Links should be clearly labeled, identifying that they are links and giving the user an accurate idea about where they lead.

- Use illustrations and animations. Adults of all ages remember and understand information better when it is provided in both a written and illustrated form. If possible, illustrations on a Web site should be simple line drawings to avoid long download times. If they are not directly related to the text, they will merely serve as distractions. If Web pages give instructions on how to fill out a form, find information, locate an office, or any other step-by-step operation, simple animated instructions help users retain information. However, they should always be accompanied by text for those users unable to view graphic images.

Conclusion

In this article we have suggested that age-related declines in vision and certain cognitive mechanisms can be mediated by the manner in which text and other information is presented in print, in textual elements of exhibitions, and in Web site design. We have presented a series of guidelines to follow in the construction of these materials. Above all, we have tried to stress the importance of adapting these materials to the needs of older individuals, as there is no doubt that our society is growing older. If text materials are easier for older adults to see and understand, this improvement benefits younger people who will also be better able to see and understand them.

NOTES


FURTHER READING


How do you create a science center exhibition that appeals to a senior audience? Do the needs and interests of seniors differ from those of the general audience? Can you truly create an exhibition that works for everyone? The Museum of Science, Boston, asked these questions when starting to develop a traveling exhibition called Secrets of Aging, which targeted seniors as a potential audience along with the traditional science center audience of families and school groups.

Traditionally, seniors do not attend science centers in large numbers, and little is known about their needs in a science center environment. To learn more, the Museum of Science held assessment sessions to study the ways existing exhibitions worked for seniors. The findings were incorporated into the design of Secrets of Aging and were reexamined during formative and summative evaluation.

How the Study Was Conducted
Three groups of seniors visited permanent exhibitions at the Museum of Science and evaluated the design and content. The groups were asked to complete a rating sheet for each exhibition they visited. Afterward, they shared their thoughts with evaluators in a group discussion.

Three groups of seniors participated, including adults from a local senior center, graduates of a local university gerontology program geared toward the older learner, and participants in an international program that provides low-cost educational travel opportunities for seniors. The participants were generally between 65 and 85 years old.

Assessment Session Formats
The senior center and university assessment sessions were held on a weekend when few other visitors were present. Each group of 10 seniors spent two hours in the exhibitions.

Due to the structure of the international travel program, the third assessment session took place over the course of a week. Seniors were briefed on the project goals on Tuesday and explored the museum during their free time from Tuesday through Thursday, completing rating sheets on the three test exhibitions. Approximately 30 seniors attended the group discussion on Thursday afternoon. However, the highest number of rating sheets collected from this group for any one exhibition was 13.

Distinguishing Characteristics
The characteristics of each group should be taken into consideration when reviewing the assessment results. The senior center group was the most diverse in terms of ability. Some seniors were quite active, while others were more limited in their ability to navigate within their environment. Seniors in the university group, having recently received a graduate certificate in gerontology, were more aware of senior issues and the biological changes associated with age. In addition, they tended to be more affluent and had fewer mobility limitations than the senior center group. The educational travel program group came to the museum to take part in a specific program and had the opportunity to explore a wider variety of museum programs and exhibitions. These seniors appeared to have fewer mobility limitations and were more likely to be involved in cultural activities, such as visiting museums, than seniors in the other two groups.

Exhibitions
Each group was asked to review up to three exhibitions that varied in design, content, and pedagogical style:

- **The Observatory: Seeing the Unseen** is a highly interactive exhibition with multiple hands-on components that focuses on engaging visitors in the scientific process of observing.

- **Human Body Discovery Space** is also highly interactive. Its content—the biology of human beings—is similar to that of Secrets of Aging. This exhibition is also one of the few areas where inter-

Christine Reich is an exhibit planner at the Museum of Science, Boston, who served as both a planner and an evaluator on the Secrets of Aging exhibit team. She has a special interest in creating universally designed exhibits that provide meaningful and educational experiences for people of all ages and levels of ability.

Minda Borun is director of research and evaluation at the Franklin Institute Science Museum in Philadelphia. She has published numerous articles and four monographs on studies of visitor learning in the museum setting. Borun is also a consultant on exhibit and program evaluation. She was project evaluator for Secrets of Aging.
About Secrets of Aging

Secrets of Aging, a 6,500-square-foot traveling exhibition developed by the Museum of Science, Boston, in collaboration with the Science Museum Exhibit Collaborative, explores what the latest scientific research reveals about a process that affects us all. Designed for visitors of all ages and abilities, Secrets of Aging addresses four main topics:

- Body: What physical changes occur as we age, and what can we do to influence those changes?
- Mind: How does aging affect that very complex organ, the brain?
- Society: How do the people and ideas that surround us affect our experience of aging?
- Longevity: Will scientists find ways to extend the human life span?

Perhaps the biggest secret of aging is that there are more questions than answers about living a longer and better life. Scientists have just begun exploring life in our later years. There is much to learn in the years to come.

Major funding for Secrets of Aging was provided by a grant from the National Science Foundation. The exhibition was produced by the Museum of Science, Boston, in conjunction with the Massachusetts General Hospital Geriatric Medicine Unit and in affiliation with the American Psychological Association. The Science Museum Exhibit Collaborative is a group of science centers that share resources to create exhibits that travel to each institution. The collaborative's other members are the California Science Center, COSI—Columbus, the Fort Worth Museum of Science and History, the Franklin Institute Science Museum, and the Science Museum of Minnesota.

Interpreters are always present to assist visitors in their scientific exploration.

- Insects tends to be more object-based and less interactive than the other exhibitions that the seniors reviewed. The use of natural light makes the design of this space unique for the Museum of Science.

Summary of Findings

During the assessment sessions, a few key issues surfaced as areas for consideration: seating, label typeface size, exhibition organization and layout, lighting, height of labels, exhibition content, and instructions for the interactives. In many cases, these issues reappeared during formative and summative evaluation of Secrets of Aging, thus confirming the initial findings.

The results reported here are based only on the contributions of senior visitors. We do not have comparable data for visitors of other age groups. It is not known whether these findings are unique to visitors over age 65.

Seating

The need for additional seating was the design issue that the seniors most often reported as a concern. Seating was particularly stressed during the group discussions. Some seniors remembered and remarked on the noticeable absence of seating in past exhibitions at the Museum of Science. On 18 percent of the rating sheets, they also cited "not enough seating" as a cause for discomfort in the exhibitions.

Seniors reported the need for three different types of seating: stools at interactive exhibit components, benches throughout the exhibition, and seating in the halls between exhibitions. With regard to seating at exhibit components, the seniors said that they preferred stools rather than upholstered chairs.

These findings led the exhibit team to incorporate numerous areas for resting into the design of Secrets of Aging. When the completed exhibition was tested with a senior audience, the visitors no longer mentioned lack of seating as a cause for discomfort. The seniors commended the museum for including ample seating, citing the presence of stools and "comfy" resting chairs as one of their favorite features.

Label Typeface Size

Many seniors said that they had difficulties reading the exhibition label text due to the size of the typeface. Seniors reported typeface size as a problem on 23 percent of the rating sheets. Of these, 77 percent said that the typeface size was too small.

During formative evaluation of Secrets of Aging exhibit prototypes, the use of small typeface sizes continued to be a barrier for access. Increasing the size on one of the prototype labels (from 24-point to 60-point) decreased the percentage of seniors who reported that the interactive instructions were "confusing." Since the formative evaluation helped to identify areas where larger typeface size was needed, the performance of the final exhibition was improved. Seniors rarely cited label text legibility as a problem during summative evaluation. (Note that the choice of size depended on lighting, typeface, position, and label purpose.)

Organization

Seniors from the university and the senior center repeatedly expressed the need for a clearer organizational structure in the three test exhibitions. While their proposed solutions varied, the seniors were uncomfortable with random access and wanted structure. Examples of their suggested improvements included more advance organizers (such as a written or audio description of the exhibit layout), "headlining" for the different exhibition areas, a clearer visitor path, and a map showing the placement of each exhibition component.

During summative evaluation of Secrets of Aging, the lack of a clear organizational structure and the use of a random-access design scheme con-
continued to be a source of frustration. The seniors did report, however, that the use of “street signs” identifying the major exhibition areas was a helpful addition.

In contrast, the educational travel program participants appeared comfortable with the use of random access in the three test exhibitions and in Secrets of Aging. This result demonstrates that, when testing exhibits with a senior audience, findings can differ depending upon the type of population interviewed, since the needs and ability levels of the audience are varied.

Layout
Seniors reported during the assessment sessions that the three test exhibitions appeared too cluttered (11 percent of the rating sheets). Responses that the exhibition “was too busy with too many things” suggest that the density per section of individual components, along with the organization of these components, plays a role in senior visitors’ comfort in the science center environment. In contrast to these initial results, seniors reported that there was adequate space between the components of Secrets of Aging.

Spacing components too far apart can also have a negative impact on the senior visitor, particularly those with severe mobility limitations. Seniors from an assisted living facility who tested the completed Secrets of Aging exhibition liked the limited amount of space between the interactive components. They felt that the relative closeness of the interactive made it easier for them to move from one interactive station (and stool) to another with limited effort.

Lighting
Lighting appeared to play an important role in the seniors’ comfort and in their ability to read the labels in the test exhibitions. In The Observatory: Seeing the Unseen, the most common complaint was that the lighting was too low. In Insects, the natural sunlight caused problems with glare and reflection. On 18 percent of the rating sheets for the three test exhibitions, seniors also reported that lighting affected their ability to read labels.

These findings led the museum staff to make a special effort to provide extra lighting for the Secrets of Aging labels, especially those printed in a small type size. This change appeared to have a positive effect, as seniors did not report significant difficulty with the lighting in the exhibition.

Height of Activities and Labels
The group discussions and rating sheets revealed that senior visitors experienced some difficulties with the height of the components and labels in the three test exhibitions. The most frequent complaint was that the labels or hands-on activities were too low to the ground. The senior visitors assumed that these interactive were designed to work well for children, but the needs of wheelchair users had also been taken into consideration.

In the final design and set-up of Secrets of Aging, extra care was taken to ensure that the labels and the interactive were placed at a comfortable height for seniors. This effort had an impact, as the senior visitors did not mention this complaint during the summative evaluation. Instead, they remarked that the placement of the labels, slightly below eye level, was helpful for people who wear bifocals. This placement also appeared to improve access for visitors in wheelchairs.

Interactive Exhibits
Most seniors enjoyed working with interactive components during the assessment sessions, and they often cited particular interactives as their favorite part of the exhibitions. They did experience difficulties, however, in operating some of the interactives. Seniors reported this problem on 35 percent of the rating sheets, and almost all attributed it to poor labeling.

During formative evaluation of Secrets of Aging, seniors were more likely than younger visitors to say that the instructions for the exhibit prototypes were “confusing” or “unclear.” With some prototypes, cultural differences across generations (such as the familiarity with technology or with a particular expression) appeared to play a role. With others, increasing the legibility of the labels seemed to decrease the level of confusion. Despite the identification of this problem during formative evaluation, seniors continued to report during summative evaluation that they had difficulty understanding the instructions for the interactives. Further work is needed to determine ways to improve the clarity of interactive instructions when creating exhibits for a senior audience.

Exhibition Content
The content of the three test exhibitions played a significant role in the seniors’ enjoyment. During the assessment sessions, most reported that the content was a main reason they favored a particular exhibition. During group discussions, seniors overwhelmingly cited Human Body Discovery Space as their favorite because it was “about them.” They enjoyed learning more about their bodies and their health. The seniors from the local university and educational travel program expressed the wish that more of the exhibition would deal with issues important to seniors, such as hearing aids, blood pressure, and alcoholism.

During formative and summative evaluation of Secrets of Aging, content continued to play an important role in the senior visitors’ enjoyment. Seniors reported that the exhibition was not just for them but also about them. They reacted negatively when the content of an interactive did not resonate with aging as they had experienced it. In contrast, seniors enjoyed the interactives that they found useful, such as exercises that can be done in the home, and those that closely matched their individual ideas about aging.

Conclusions
As part of the summative evaluation, seniors were invited to visit Secrets of Aging. They were asked to complete a rating sheet and participate in a group discussion, using a format similar to the

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Listening to Voices of Experience: A National Study of Adult Museum Programs

BONNIE SACHATELLO-SAWYER AND ROBERT FELLENZ

FURTHER READING


Adult participation in museum programs and leisure time activities is reaching unprecedented levels, in part because middle-aged baby-boomers and their senior parents are healthier, better educated, busier, more mobile, and wealthier than ever before. Many have considerable disposable incomes. They recognize the value of their time. What is particularly distinctive in the 21st century, however, is the abundance of American adults who are willing and able to pay others to enhance the quality of their lives. As business consultant Joseph Pine writes,

People are working longer and harder and have more disposable income, which means that rather than relying on their own resources, they are more willing to pay somebody else to take care of their needs. We used to be responsible for all of our own services, like cooking, but now going out to eat is commonplace. We used to change the oil in our cars, and now we pay someone to do that. The entire history of economic progress is one of charging a fee for what once was free. In the same way, where we used to be responsible for our own experiences, we now pay other people to stage those experiences for us.

Almost all museums offer some type of adult program, such as lectures, classes, workshops, and gallery tours. As these programs are organized, program planners are not typically creating curriculum; they are designing meaningful experiences. Excellent learning experiences allow adults and children to observe or encounter something that is significant to them. The value of the experience in the end is personal; its worth is determined by its individual impact.

While many museums are realizing a great deal of success creating meaningful experiences for adults, others are not. Some museum educators are not able to market or deliver programs that adults are interested in and willing to pay for. The key to creating and
INFORMAL SCIENCE EDUCATION AND ADULT LEARNING

In this section we refer you to several extensive bodies of literature that are relevant to connecting older adults and science centers. We provide some initial links and names, and again, caution that this is just a way to get you started rather than a comprehensive review.

“Informal” and “free choice” are terms applied to the notion that we learn all the time, in all settings and contexts. “Informal science education” is the phrase used by the National Science Foundation, and the NSF was the first to recognize the role of community organizations, museums, and media in supporting science learning and public understanding. In 1984, the NSF created the Division of Informal Science Education, based on the recommendation of a groundbreaking publication, *Educating Americans for the 21st Century: A Report to the American People and the National Science Board* (NSB, 1983).

The more recent phrase “free choice learning” was introduced by John Falk and Lynn Dierking at the Institute for Learning Innovation (ILI) as “the learning that individuals engage in throughout their lives when they have the opportunity to choose what, where, when and with whom to learn.”¹ They emphasize the voluntary nature of the experience and the characteristics of learning rather than its place or contrast with formal education. They have been active in conducting research, convening, promoting the application of research to practice, and legitimizing voluntary learning as a field worthy of research and development.

The National Research Council has recently undertaken a study of learning science in informal environments involving key leaders in the field. It will consolidate the existing research and suggest future directions that are likely to provide a useful foundation for the design of effective ways to engage seniors with science (www.nas.edu/bose).

The informalscience.org website, maintained by the University of Pittsburgh’s Center for Learning in Out of School Environments (UPCLOSE), is a primary reference point for the field, a “place to share knowledge and support a community of learners to informal science learning standards and practices.”

**Lifelong learning** is embraced by both the science center and aging communities. In recent years, the Internet and advances in technology have dramatically opened up learning opportunities in every field, at the convenience, schedule, and preferences of the learner. Lifelong learning is no longer an ideal rhetorical phrase but a concrete possibility that is easy to pursue. The notion that one can explore a new field at any point in one’s life has moved into the public consciousness.² The phrase appears in the majority of science centers’ mission statements, and is a fundamental precept for most aging organizations.

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¹ Falk, J., et al, p. 2
² The Wikipedia entry, [http://en.wikipedia.org/wiki/Lifelong_learning](http://en.wikipedia.org/wiki/Lifelong_learning), provides useful links to the field
In the past fifteen years, cognitive science has made major advances in our understanding of learning. The publication of *How People Learn* (Bransford et al., 1999) made thirty years of research accessible to the public and had a major impact on educational practice, especially math and science education.

Malcolm Knowles’ introduction of the term “andragogy” positions adult learning as distinct from pedagogy—teaching and learning for children. For Knowles, adult learning is characterized by:

- A movement from dependency to self-direction
- A reservoir of experience
- A readiness to learn connected to the tasks of a person’s social roles
- A focus on the immediate application of knowledge to a problem or question

Sachatello-Sawyer *et al* cite adult education expert Rosemary Caffarella’s list of critical aspects of adult learning, noting that adults:

- Want to learn
- Bring a rich background of knowledge and experience that must be acknowledged
- Are motivated by both internal and external factors
- Have preferred learning styles that vary from person to person
- Come with personal learning goals that may not be the same as the program’s
- Learn both independently and in social, collaborative context

And like learners of all ages, they

- Prefer to be actively involved rather than passive recipients
- Learn better when they are physically and psychologically comfortable

The SPRY Foundation expanded on the adult education literature to focus on how older adults learn. In 1999, SPRY conducted a meta-analysis of 300 research journal articles on aging with support from the Robert Wood Johnson Foundation (Bridging Principles of Older Adult Learning), and in 2002 published a practical guide (Benbow, Communicating With Older Adults) translating the research findings to practice. We have included relevant excerpts include them in the following pages. The first highlights the research findings from medical science, adult education, and communication technologies; and the second presents a chart of the findings and their implications for older adult learning and instruction.


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3 Knowles, M., 1980
literature, practices and programs, with advice on designing excellent museum programs for adults (available from www.altamirapress.com).

“A Taxonomy of Learning Outcomes,” (Sachatello-Sawyer and Felenz, 2003) follows this section. It presents a pyramid framework that can help to articulate goals and understand potential effects, including:

- Knowledge and skill acquisition
- Expanded relationships
- Increased appreciation or meaningfulness
- Changed attitude or emotion
- Transformed perspective
- Life-changing experience
HIGHLIGHTS OF RESEARCH FINDINGS

From the Medical Sciences:
- Stimulating environments have been linked to the continued growth of older adult brain cells, and to learning and memory.

(Normal aging does not always involve significant cognitive decline and dementia.)

- Older adult brains have a high degree of plasticity and the ability to rebound following trauma.

(The adult brain does not have a fixed capacity that declines with age, reducing learning ability.)

From Adult Education:
- Older adults use their experience, skills, and knowledge in processing new information and making decisions.

(Older adults know where to get additional information; they have a network of social structures and friends that assists with their learning and decision-making.)

- Third-party validation helps older adults make decisions.

(The use of legitimate “authority/trust” persons—family members, neighbors, nurses, etc.—provides a basis for learning and decision-making that can be important.)

From Communication Technologies:
- New technologies can facilitate the ability of older adults to learn new information.

(Computer/Internet-based learning can be customized or specially designed to meet an individual’s learning style and needs.)

- New technologies allow tremendous flexibility and power in adapting the learning environment to the capacity of the older individual.

(Internet technologies can be designed to adapt to the sensory needs and memory strategies of older adults, as well as to their learning methods at each step in a training program.)

### RESEARCH FINDINGS AND STRATEGIES FOR OLDER ADULT LEARNING

Ann E. Benbow, Ph.D. and SPRY Foundation, 2002

<table>
<thead>
<tr>
<th>Research finding (from Bridging Principles of Adult Learning)</th>
<th>Implications for instruction</th>
</tr>
</thead>
<tbody>
<tr>
<td>There are links between stimulating environments, continued growth of older adult brain cells, and learning and memory</td>
<td>Instruction should take place in stimulating environments; e.g., hands-on settings, group learning, high interactivity with the curriculum, many and varied visuals, tailored feedback, intergenerational situations</td>
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<tr>
<td>Older adults develop compensatory strategies— as some learning functions wear down, others take over.</td>
<td>Instruction needs to be designed for a variety of compensatory methods. For example, if an older adult has memory problems, he/she should be able to access reminders/content as many times as necessary in the course of performing a task or learning a skill. Those who are visual learners, yet have reduced eyesight, should be provided with larger text and images, as well as auditory back-up.</td>
</tr>
<tr>
<td>Older adults use their experience, skills, and knowledge in processing new information and making decisions.</td>
<td>Instruction/communication needs to take into account that older adults base their learning and decisions on a lifetime of experience, knowledge, and skills. This may mean that they can enter instruction at a higher level than younger people. It can also mean, if their existing knowledge base in some areas is flawed, they may need to “unlearn” and “relearn” some concepts. Pre-assessments can help to determine an older adult’s entry level into instruction</td>
</tr>
<tr>
<td>Strategies for encoding, storage, and retrieval of information can help older adults learn effectively.</td>
<td>Instruction for older adults should include guidance on how to encode, store, and retrieve new information. This may take the form of using mnemonics or icons to stimulate recall and recognition.</td>
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<tr>
<td>Lifelong learning stimulates the cognitive process in older adults and provides them with a sense of control over their environment.</td>
<td>Communication/instruction for older adults should be structured to promote curiosity and learning. The communication should not merely “feed” information to the older adult, but stimulate the learning of that and related information. Asking the question, “Want to know more?” as an option is an example of how to extend opportunities for learning.</td>
</tr>
<tr>
<td>Beliefs and attitudes about memory (metamemory) have a significant impact on cognitive functioning</td>
<td>In designing instruction, it is important to instill in older adults the feeling that they can remember such things as the steps of tasks they are learning to perform (self-efficacy). This feeling can be developed and reinforced by the opportunity to practice the task as many times as necessary, and to apply the skills learned from the task to a new situation as soon as possible. The feeling can also be strengthened by the use of memory monitoring tactics, memory clues, or refresher options</td>
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<tr>
<td>Research finding (from <em>Bridging Principles of Adult Learning</em>)</td>
<td>Implications for instruction</td>
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<tr>
<td>There are seven areas that must be addressed when looking at factors that affect older adult learning: 1. Changes in physical capacities 2. Changes in sensory capacities 3. Changes related to speed and timing 4. Attitudinal changes 5. Learning capacity and performance 6. Changes in memory 7. Changes in adjustment abilities and morale</td>
<td>Implications for instruction include:  • Avoidance of long learning session  • Capacity for self-paced instruction  • Stress-free learning situations  • Minimized demands for speed  • More structured activity  • Comfortable, non-threatening environment  • Presence of friends or family members in learning environment  • Early success in the instruction  • Building on older adults’ skills and abilities  • Meaningful and relevant tasks  • Reassurance of their abilities  • Peer teaching  • Memory cues  • Time for practice and rehearsal  • Links to relevant experiences  • Organizing strategies and frequent summations  • Many opportunities to develop abilities  • Reinforcement on competencies  • Assistance in coping with changes</td>
</tr>
<tr>
<td>Many older adults are “centered” with an outwardly directed, altruistic orientation.</td>
<td>Instruction for older adults should be designed to show clear connections between what they are learning and its impact on the outside world (lives of others).</td>
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<tr>
<td>Older adults have strong emotional bonds toward other people, objects, and beliefs.</td>
<td>One way to build on older adults’ strong emotional bonds to others is to use case studies of “real people” to illustrate concepts and to develop skills.</td>
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Adult Museum Programs: 
A Taxonomy of Learning Outcomes

By Bonnie Sachatello-Sawyer and Robert A. Fellenz

In a national study of adult museum programs conducted from 1996 to 1999 at Montana State University (MSU), researchers asked 508 program participants if a particular program had changed them in any way. The study—funded by the U.S. Department of Education’s Field-Initiated Studies Program and led by Bonnie Sachatello-Sawyer and Robert A. Fellenz—clearly documented that museum programs can change adult lives and lead to transformative learning and meaning-making in participants. The following taxonomy of learning outcomes, based on the study findings, appears in the research team’s 2002 final report, Adult Museum Programs: Designing Meaningful Experiences, published by AltaMira Press.

Visualize the qualities or levels of informal adult learning as a pyramid. Our study findings show that the acquisition of skills and knowledge is the most common and basic outcome of adult learning in museums, while life-changing experiences stand at the pinnacle.

Knowledge and Skill Acquisition

When adults acquire and use new information, they are incorporating learning into their lives. As one program participant put it, “I’ve gone canoeing since taking this class, and now I hit fewer rocks.” Not surprisingly, he deemed the program a success. Along with exercising new skills, participants in a successful program are likely to be open to new ideas, pursue further study, and obtain follow-up materials.

Expanded Relationships

Expanded relationships include making new friends, developing community contacts, and sharing ideas with family, friends, and co-workers. As many participants say, “It’s great to be with people of similar interest and enthusiasm.” They often ask for more opportunities to discuss presentations with other participants.

Increased Appreciation or Meaningfulness

Museum programs can offer avenues for reflection and foster deeper appreciation of the arts and sciences or community issues. A participant in an art class said, “Drawing gives me a sense of peace and relaxation and appreciation of life. It’s a chance to step away from a busy life and appreciate the finer things.” Developing new perspectives and greater appreciation are dramatic examples of ways museum programs can broaden horizons and open people’s minds to new ideas. In fact, many museum program participants felt inspired to pursue further study. Adult learners used museum programs to exercise underdeveloped talents and discover new ones. Many adults who

Life-Changing Experience

- Making major changes in lifestyle
- Seeing things in a whole new way
- Developing a system for interpreting aspects of reality
- Giving back to community and helping others
- Contributing to efforts to change social patterns

Transformed Perspective

- Trusting in one’s own creativity
- Greater acceptance of other ways of life
- Speaking about the experience as a whole
- Becoming more engaged with the museum
- Making new meaning in the participants’ lives
- Accepting greater responsibility for social issues

Changed Attitude or Emotion

- Heightened self-confidence
- Exhibiting new attitudes
- Leading discussions or activities
- Pursuing activities on one’s own

Increased Appreciation or Meaningfulness

- Reporting new insights or appreciation
- Engaging in similar or follow-up learning experiences
- Increased awareness of social issues
- Discussing subject with knowledgeable individuals

Expanded Relationships

- Developing community contacts
- Making new friends
- Sharing ideas with others

Knowledge and Skill Acquisition

- Information expanded
- Interest in or rejection of new topic
- Knowledge expanded globally
- New skills incorporated into life
- Obtaining follow-up materials
Initially had only a vague idea of what to expect from museum programs found them interesting, even transformative. When participants walk out of a program saying, “I will buy the supplies and keep going with it at home,” they exhibit a measurable indicator of personal change.

**Changed Attitude or Emotion**

Self-confidence, emotional development, new attitudes, and spiritual and personal growth can all be measurable affective results of participation in a museum program. Frequently, grateful participants openly acknowledge such development—for instance, docents who cite newfound abilities to speak in public. Personal development also can be glimpsed in the continuing behavior of learners. They may engage in similar or follow-up learning experiences, as did the participant in one science camp who said, “The class definitely changed me. I am more likely to take on camping experiences now. . . . I have more confidence camping alone.”

Other changed participants may go on to discuss relevant subjects with knowledgeable individuals, and describe new insights or appreciation. Occasionally, such learners volunteer to help at the museum. Heightened social competence is also evidenced. Participants develop interpersonal relationships, promote cultural and community values, and demonstrate civic pride.

**Transformed Perspective**

Increased tolerance of others, trust in one’s own creativity, and acceptance of greater responsibility for social issues all indicate that perspectives have been transformed and meaning making has taken place. These sorts of internal changes are revealed through such remarks as, “I never thought of it that way,” or “I’ve never seen that before in this painting.”

Frequently, such learners speak about their experience. Some become more engaged with the museum as a result. When participants describe gaining a greater worldview or a new set of connections and correlations between various dimensions of museum experiences, they are articulating an awakening to new ideas. As Patricia Cranton writes in her book *Understanding and Promoting Transformative Learning*, such transformations happen “through a process of examining, questioning, validating, and revising” personal perspectives.

**Life-Changing Experience**

Museum programs that inspire participants to the point that their entire lives are changed afterward are truly the epitome of transformative learning. A particularly powerful example comes from a docent at a natural history museum who told our team, “The docent program had a definite impact on me; I left physics. Astrophysics has taken a backstage to anthropology. It has opened up an entirely new world for me. The program changed how I spend my time. Before this I had never spent a second on life science.” Such a statement clearly demonstrates the possible impact museum programs can have on participants.

Program participants who have had life-changing experiences may make major changes in their lifestyle that are quite evident to others. They may speak of seeing things in a whole new way or tell stories about new meaning in their lives. As one program participant said, “Floating the Grand Canyon was a life-altering experience. I realized that I had a place in the cosmos and was part of the timeless nature of the canyon.” Some develop a system for interpreting aspects of reality or contribute to efforts to change social patterns.

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*MORE READINGS ON “LIFELONG LEARNING”*


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*Compiled by Carolyn Sutterfield*
1. The “Aging Network”
   Older Americans Act
   Administration on Aging
   State Units on Aging
   Area Agencies on Aging
   Senior Center/Senior Service Providers

2. National Membership/Advocacy Organizations
   AARP/NRTA
   Alliance for Retired Americans
   National Committee to Preserve Social Security

3. Professional Organizations in Aging
   American Society on Aging
   Gerontological Society of America
   Leadership Council of Aging Organizations
   National Council on Aging

4. Minority Elders
   Asociacion Nacional pro Personas Mayores
   National Asian Pacific Center on Aging
   National Caucus and Center on Black Aged
   National Hispanic Council on Aging
   National Indian Council on Aging

5. Intergenerational Programs
   Generations United
   Center for Intergenerational Learning

6. Senior Employment Programs
   Senior Community Service Employment Program
   Senior Environmental Employment

7. Volunteering/Civic Engagement
   Civic Ventures
   Senior Corps

8. Education
   Elderhostel
   OASIS
   Osher Lifelong Learning Institutes
   SeniorNet

9. Health/Disability
   Aging & Disability Resource Centers

10. Research Organizations
    Alliance for Aging Research
    Andrus Gerontology Center
    Buck Institute for Age Research
    International Longevity Center
    MIT AgeLab
    National Institute on Aging
    SPRY Foundation
    Stanford Center on Longevity
11. Senior Housing
   American Association of Homes and Services for the Aging
   American Senior Housing Association

12. Foundations
   Grantmakers in Aging
   The Foundation Center
1. The “Aging Network”

The “aging network” generally describes the federal, state and local organizations funded principally by the Older Americans Act that provide a variety of services to older adults in the U.S. The Act and the network of agencies that it helped create are described below.

Older Americans Act

The Older Americans Act was signed into law by President Lyndon B. Johnson in 1965. The Act created the federal Administration on Aging (AoA) and provided funding to states for community planning and services programs, and for research, demonstration and training projects in the field of aging. Later amendments to the Act added grants to Area Agencies on Aging for local needs identification, planning, and funding of services for older adults. The Act also provides funding for senior centers, nutrition programs for the elderly, senior employment programs, national senior volunteer programs and Native American aging programs to meet the needs of older American Indians, Aleuts, Eskimos and Hawaiians.

In FY 2005, total funding under the Older Americans Act was $1.4 billion.
Units on Aging, 655 local Area Agencies on Aging, 236 Tribal and Native organizations representing 300 American Indian and Alaska Native Tribal organizations, and two organizations serving Native Hawaiians, plus thousands of service providers, adult care centers, caregivers, and volunteers.

The AoA publishes a Resource Directory for Older People that lists several hundred organizations in the field and includes a list of all of the state units on aging (www.aoa.gov/press/publications/rd2006.pdf).
THE AGING SERVICES NETWORK

ADMINISTRATION ON AGING
Established by and serves as the chief administrator of the Older Americans Act.

STATE UNITS ON AGING
57 state and territorial governmental agencies on aging.

AREA AGENCIES ON AGING
655 AAAs + 230 Native American agencies

SENIOR CENTERS
15,000 senior centers; 6,000 receive funding from Older Americans Act

SENIOR SERVICES PROVIDERS
Adult day programs, meals on wheels, in-home support services, employment programs, etc.
State Units on Aging

List of State Aging Agencies:
http://retireplan.about.com/cs/retirement/a/aging_agencies.htm

There are currently 56 State/Territorial Units on Aging. These units are agencies of state and territorial governments designated by governors and state legislatures to administer benefits, programs and services for the elderly and their families and, in many states, for adults with physical disabilities. The term "state unit on aging" is a general term: the specific title and organization of the governmental unit will vary from state to state and may be called a Department, Office, Bureau, Commission, Council or Board for the elderly, seniors, aging, older adults and/or adults with physical disabilities. Since 1965 all State Units on Aging have administered the Older Americans Act (OAA) in their states.

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Areas Agencies on Aging (AAAs)

Directory of Local AAAs: www.mfaaa.org/AreaAging.aspx

National Association of Area Agencies on Aging (N4As): www.n4a.org

Area Agencies on Aging (AAAs) were established in every state in the country under the Older Americans Act (OAA) in 1973 to respond to the needs of Americans aged 60 and over. These 655 agencies coordinate and support a wide range of services including information and referral, home-delivered and congregate meals, transportation, employment services, senior centers, adult day care and a long-term care ombudsman program. Some AAAs are city or county government agencies while others are independent non-profit community organizations.

The National Association of Area Agencies on Aging (N4As) is the national organization that represent the area agencies.

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Senior Centers/Local Service Providers

The first senior center in the U.S. opened in New York City in 1943 under city sponsorship. There are now some 15,000 senior centers in urban, suburban and rural locations across the country, serving close to 10 million older adults.
annually. Many centers are supported by local government or by non-profit organizations such as the YMCA, United Way and Catholic Charities; others operate as independent non-profit organizations. Since 1965, the Older Americans Act has provided funding for program activities at over 6,000 senior centers.

Senior centers typically provide nutrition (low cost meals), recreation, health and wellness, social and educational programs, and information and referral services. Many centers offer travel programs, including day trips, and have introduced new programs such as fitness activities and Internet training.

The National Institute of Senior Centers (NISC) is a program of the National Council on Aging (NCOA) that provides senior centers with national coordination, communication and guidance. In 1999, NISC began an accreditation program for senior centers. As of January 2006, 116 centers had been accredited by NISC.

Most communities also have a variety of specialized agencies that provide services to seniors. These include adult day programs, meals on wheels, and in-home supportive services. Some are associated with senior centers, while others are independent agencies.

### National Membership/Advocacy Organizations

**AARP/NRTA**

601 E Street NW  
Washington, DC 20049  
202-434-2277  
www.aarp.org

State office locator: www.aarp.org/states

William Novelli, CEO  
Annette Norsman, Director National Retired Teachers Association

With over 35 million members, AARP is the largest membership organization for people age 50 and over in the United States.

Membership in AARP is open to any person age 50 or above. Nearly half of all Americans in this age bracket are AARP members. People do not have to be retired to join. In fact, 44 percent of AARP members work part time or full time. For these reasons, AARP shortened its name in 1999 from the American Association of Retired Persons to just AARP. The median age of AARP members
is 65, and slightly more than half are women.

AARP is widely known for defending the interests of older people through its lobbying efforts at the state and national levels. AARP’s Services division negotiates and offers members reduced rates at various tourist attractions, automobile rental companies, motel and hotel chains, etc. ASI also co-markets health care, automobile, life and long-term care insurance, as well as various financial services. The organization provides members with free or low-cost legal assistance, tax preparation services, job training, and driver education. AARP also sponsors research and publishes AARP Magazine, the largest circulation magazine in the U.S.

In addition to operating nationally, AARP maintains offices in all 50 states.

The National Retired Teachers’ Association (NRTA) is a component of AARP that is made up of adults and organizations who have been or are involved with education and learning. NRTA members share a commitment to learning, voluntary service, and civic participation. The NRTA sponsors several programs, including “Staying Sharp,” designed to increase awareness of brain function and brain health in later life. NRTA community service initiatives bring together retired educators with youth to work on community problems.

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Alliance for Retired Americans
815 16th Street, NW, 4th Floor
Washington, DC 20006
202-637-5399
www.retiredamericans.org

The Alliance, which is allied with and supported by U.S. labor unions, advocates for policies that support seniors, strengthen families and build safe communities. The Alliance focuses particularly on issues related to health care, economic security and housing.

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National Committee to Preserve Social Security
10 G Street Northeast, Suite 600
Washington, D.C. 20004
202-216-0420
www.ncpssm.org

Barbara B. Kennelly, President and CEO

The mission of the National Committee to Preserve Social Security and Medicare, a membership organization, is to protect, preserve, promote, and
ensure the financial security, health, and the wellbeing of current and future generations of maturing Americans.

Professional Organizations in Aging

**American Society on Aging (ASA)**

833 Market Street, Suite 511
San Francisco, CA 94103
800-537-9728

Gloria Cavanaugh, President

Founded in 1954 as the Western Gerontological Association, ASA is a professional association for individuals interested in all aspects of aging. Members include practitioners, educators, administrators, policymakers, business people, researchers, students, and more.

ASA members participate in a number of special interest constituent groups, including the **Lifelong Education and Renewal Network (LEARN)**, for individuals who are involved with or interested in adult education.

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**Gerontological Society of America (GSA)**

1030 15th St. NW, Suite 250
Washington, DC 20005
202-842-1275

Carol Ann Schutz, Executive Director
Greg O'Neill, Director, National Academy for an Aging Society

The Gerontological Society of America (GSA) was founded in 1945 and is the oldest and largest national multidisciplinary scientific organization devoted to the advancement of gerontological research. Its membership includes some 5,000 researchers, educators, practitioners, and other professionals in the field of aging. The Society's principal missions are to promote research and education in aging and to encourage the dissemination of research results to other scientists, decision makers, and practitioners.

The **National Academy for an Aging Society** is a public policy institute operated by GSA. The Academy conducts research on issues related to population aging and provides information to the public, the press, policymakers,
and the academic community.

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Leadership Council of Aging Organizations
202-216-8380
www.lcao.org

This Washington, DC based coalition is made up of the leadership of 53 different national organizations in aging. The purpose of the LCAO is to foster communication and resource sharing among its member organizations, to serve as a source of information about issues affecting older persons, to initiate joint advocacy strategies as appropriate, and to provide leadership and vision as America meets the challenges and opportunities presented by its aging society.

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National Council on Aging (NCOA)
300 D Street, SW, Suite 801
Washington, D.C.  20024
202-479-1200
www.ncoa.org

James P. Firman, President and CEO
Constance Todd, Director, NISC

Founded in 1950, the National Council on Aging (NCOA) is dedicated to improving the health and independence of older persons and increasing their continuing contributions to communities, society, and future generations.

NCOA’s 3,800 members include senior centers, area agencies on aging, adult day service centers, and faith-based service organizations, senior housing facilities, employment services, consumer groups and leaders from academia, business and labor. The National Institute of Senior Centers (NISC, described above) is a program of NCOA.

Minority Elders

Asociacion Nacional pro Personas Mayores
(National Association for Hispanic Elderly)
234 East Colorado Blvd. Suite 300
Pasadena, CA  91101
626-564-1988

Carmela G. Lacayo, President and CEO
The Association provides a variety of services for older Hispanic people. Resources include a national Hispanic research center, research and consultation for organizations seeking to reach older Spanish-speaking people, and dissemination of materials in English and Spanish.

**National Asian Pacific Center on Aging**
1511 Third Avenue, Suite 914
Seattle, WA  98101
206-624-1221
www.napca.org

Clayton Fong, President and CEO

The National Asian Pacific Center on Aging is the national advocacy organization for the dignity, well-being and quality of life of Asian Pacific Americans in their senior years.

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**National Caucus and Center on Black Aged**
1220 L Street NW, Suite 800
Washington, DC 20005
202-637-8400
www.ncba-aged.org

Karyne Jones, President and CEO

The National Caucus on the Black Aged was established as an advocacy group in 1972. The National Center on Black Aged was established in 1973 to administer an SCSEP grant from the Administration on Aging. In 1981, the two groups merged and became The National Caucus and Center on Black Aged. The organization currently works on issues related to economic security, employment, housing and health.

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**National Hispanic Council on Aging**
1341 Connecticut Ave.
4th Floor, Suite 4.2
Washington, DC 20036
202-429-0787
www.nhcoa.org

Yanira Cruz, President and CEO

The mission of NHCOA is to improve the quality of life for Latino elderly, families, and communities. Its priorities are to improve the health, economic security and the availability of affordable housing for its constituents.
In Indian communities, elders are honored for their wisdom, their leadership, and their knowledge. Indians see their elders as the keepers of their cultures, their languages, and their heritage. NICOA represents the interests of some 250,000 American Indian and Alaska Native Elders.

Intergenerational Programs

Generations United
1333 H Street NW, Suite 500W
Washington, DC 20005
202-289-3979

Donna Butts, Executive Director

Generations United (GU) works to improve the lives of children, youth, and older people through intergenerational strategies, programs, and public policies. GU’s membership includes more than 100 national, state, and local organizations and individuals representing more than 70 million Americans. Since 1986, GU has served as a resource for educating policymakers and the public about the benefits of intergenerational cooperation.

Center for Intergenerational Learning
Temple University
1601 North Broad Street, Room 206
Philadelphia, PA 19122
215-204-6970

Nancy Henkin, Executive Director

Established in 1979, the Center is a national resource for intergenerational programming. The Center develops model programs, provides training and technical assistance, conducts research and develops materials that support intergenerational activities.
6. Senior Employment Programs

**Senior Community Service Employment Program (SCSEP)**

Employment and Training Administration  
U.S. Department of Labor  
200 Constitution Avenue, NW  
Washington, DC 20210  
877-972-5627  
www.doleta.gov/seniors

The Senior Community Service Employment Program (SCSEP) is a community service and work based training program for older workers administered nationally by the U.S. Department of Labor. It was authorized in Title V of the Older Americans Act of 1965 to provide subsidized, part-time, community service work based training for low-income persons age 55 or older.

The SCSEP program is administered by 13 national nonprofit organizations (AARP Foundation, Asociacion Nacional Pro Personas Mayores, Easter Seals, Experience Works, Mature Services, National Able Network, National Asian Pacific Center on Aging, National Caucus and Center on Black Aged, National Council on the Aging, National Indian Council on Aging, Senior Service America, SER-Jobs for Progress National and USDA Forest Service) and 56 state/territorial agencies. In most states, the State Office on Aging administers the program. States often sub-grant with Area Agencies on Aging or with community-based organizations to operate local projects.

Based on funding of $438 million for FY 2005, more than 61,000 participant slots are supported by SCSEP, but as a result of job placements and other turnover, more than 100,000 people participated nationwide.

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**Senior Environmental Employment (SEE)**

US Environmental Protection Agency  
1200 Pennsylvania Avenue, NW, MC: 3650A  
Washington, DC 20460  
202-564-0420  
www.epa.gov/epahrist/see/brochure/index.htm

The Senior Environmental Employment (SEE) Program enables retired and unemployed older adults age 55 and over to share their expertise with the Environmental Protection Agency (EPA). The program provides older workers
with an opportunity to remain active using their matured skills in meaningful tasks that support a wide variety of environmental programs. Jobs provided under the SEE program include clerical, technical and professional positions.

7. Volunteering/Civic Engagement

Civic Ventures
139 Townsend Street, Suite 505
San Francisco, CA 94107
415-430-0141  www.civicventures.org

Experience Corps:  www.experiencecorps.org

Marc Freedman, President
John Gomperts, CEO, Experience Corps

Civic Ventures is a non-profit organization that is attempting to reframe the debate about aging in America and redefine the second half of life as a source of social and individual renewal. Through research, publishing, conferences, and media outreach, Civic Ventures reports on the growth of the experience movement.

Civic Ventures operates the national office of Experience Corps (located in Washington DC), which has recruited 1,800 older adults to serve as literacy tutors and mentors for children in urban public schools and after-school programs in 14 cities.

The organization also sponsors the Next Chapter initiative, which is promoting the development of programs that are designed to help baby boomers make the transition from mid-life to later life. Core components of Next Chapter programs include support for life planning, civic engagement, lifelong learning, and connections to peers and community. Next Chapter programs are currently under development in at least a dozen communities around the country.

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SeniorCorps
1201 New York Avenue, NW
Washington, DC 20525
202-606-5000  www.seniorcorps.gov

Tess Scannell, Director
Senior Corps is a program of the Corporation for National and Community Service, an independent federal agency. Conceived during John F. Kennedy's presidency, Senior Corps currently operates three programs that connect more than 500,000 older Americans to opportunities to serve in their communities:

- **The Foster Grandparent Program** connects volunteers age 60 and over with needy children and young people. Volunteers mentor, support, and help some of the most vulnerable children in the United States. To become a Foster Grandparent, volunteers must meet certain income eligibility guidelines and be able to serve between 15 and 40 hours a week.

- **The Senior Companion Program** brings together volunteers age 60 and over with adults in their community who have difficulty with the tasks of day-to-day living. Companions help by assisting with shopping and light chores, interacting with doctors, or just making a friendly visit. To participate in the Senior Companions program, volunteers must be 60 or over and be able to serve between 15 and 40 hours a week.

- **RSVP** connects volunteers age 55 and over with service opportunities in their communities that match their skills and availability.

### 8. Education

**Elderhostel**

11 Avenue de Lafayette  
Boston, MA 02111  
800-454-5768  
www.elderhostel.org

James Moses, President

Founded in 1975, Elderhostel is the world's largest provider of lifelong learning programs for adults age 55 and over. Each year, approximately 170,000 people participate in nearly 8,000 Elderhostel travel/study programs throughout the United States and Canada and in more than 90 countries around the world. In 2004, Elderhostel launched Road Scholar, an innovative educational program for adults of all ages.

The **Elderhostel Institute Network** is a voluntary association of Lifelong Learning Institutes (LLIs), campus-based educational programs that provide non-credit classes for community residents. The Institute for Retired Professionals, created in 1962 in New York City under the sponsorship of the New School for Social Research is generally considered to be the first
LLI in the United States. Today, more than 200 LLIs are in operation around the country, serving more than 100,000 older learners.

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**OASIS**

The OASIS Institute  
7710 Carondelet Avenue  
St. Louis, MO 63105  
314-862-2933  
www.oasisnet.org

Marilyn Mann, Chairman

OASIS is a national nonprofit educational organization for mature adults. OASIS offers programs in the arts, humanities, wellness, technology and volunteer service. Founded in 1982, OASIS now offers programs in 26 cities that serve more than 350,000 older adults annually.

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**Osher Lifelong Learning Institutes**

National OLLI Resource Center  
University of Southern Maine  
P.O. Box 9300  
Portland, ME 0414  
207-780-4128  
www.usm.maine.edu/olli/national

Kali Lightfoot, National Coordinator

The Osher Lifelong Learning Institutes (OLLIs) are a network of college- and university-based educational programs for older adults established with support from the Bernard Osher Foundation. In a typical OLLI, non-credit courses are peer taught, there are no entrance requirements, grades or tests, and no college background is needed to participate. Many OLLIs also offer travel-study trips for members. But each Osher Institute reflects the culture of its own university and its learning community.

The first OLLI was established at the University of Southern Maine in 1997. Since then, 73 OLLIs have been established on campuses in 31 states. Most of these are entirely new programs, while a few OLLIs were developed from existing lifelong learning programs. The largest number of OLLIs, 30, is in California (including most of the campuses of the California State University). Seven states have two or three OLLIS, while the rest of the states have one OLLI.
The OLLI network has been created with support from the Bernard Osher Foundation, which also supports the National OLLI Resource Center located at the University of Southern Maine.

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**SeniorNet**

1171 Homestead Road, Suite 280
Santa Clara, CA 95050
Tel: 408-615-0699  
www.seniornet.org

Kristin Fabos, Executive Director

SeniorNet is a national nonprofit organization whose mission is to provide older adults education for and access to computer technologies. Founded in 1986, SeniorNet supports over 240 Learning Centers throughout the U.S. and in other countries; publishes newsletters and curriculum used in its Learning Centers; offers discounts on computer-related products and services; holds regional conferences; and collaborates in research on older adults and technology.

In 2005, SeniorNet launched the **Retired Technology Volunteer** program to match Internet- and technology-savvy adults over age 50 with nonprofit organizations to help nonprofits expand their technology capacity. The program is supported by the UPS Foundation and Senior Corps.

9. Health/Disability

**Aging & Disability Resource Centers**


The Aging and Disability Resource Center (ADRC) Grant Program, a cooperative effort of the Administration on Aging (AoA) and the Centers for Medicare & Medicaid Services (CMS), was developed to assist states in creating a single, coordinated system of information and access for persons seeking long term support. Since 2003 43 states have received ADRC initiative grants.
10. Research Organizations

**Alliance for Aging Research**

2021 K Street, NW, Suite 305  
Washington, DC 20006  
202/293-2856  
www.agingresearch.org

Daniel Perry, Executive Director

The Alliance for Aging Research was founded in 1986 to promote medical and behavioral research into the aging process. The Alliance is a non-partisan non-profit advocacy organization for improving the health and independence of Americans as they age. As the explosion of the Senior Boom approaches, the Alliance has become the voice for Baby Boomer health by developing, implementing and advocating programs in research, professional and consumer health education and public policy.

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**Andrus Gerontology Center**

University of Southern California  
3715 McClintock Avenue  
Los Angeles, CA 90089  
213-40-6060  
www.usc.edu/dept/gero/researchServices.shtml

Elizabeth Zelinski, Executive Director.

The Andrus Gerontology Center is the research arm of the Leonard Davis School of Gerontology at USC. Its mission is to encourage basic and applied research in aging. Faculty conduct interdisciplinary projects in neurobiology, molecular biology, cognitive psychology, biodemography, family studies, long term care, and other topics.

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**Buck Institute for Age Research**

8001 Redwood Boulevard  
Novato, CA 94945  
415-209-2000  
www.buckinstitute.org

Dale Bredesen, MD, CEO

The Buck Institute for Age Research is the first independent research facility in the country focused solely on aging and age-related disease. Scientists at the Buck Institute are working on developing diagnostic tests and treatments that will
prevent or delay diseases such as Alzheimer’s, Parkinson’s, cancer, stroke, and arthritis.

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International Longevity Center
60 E. 86th Street
New York, NY 10028
Tel: 212-288-1468
www.ilcusa.org

Robert Butler, M.D., President and CEO

The International Longevity Center-USA (ILC-USA) is a not-for-profit, nonpartisan research, policy and education organization devoted to science-based policy development on the aging of populations. It is affiliated with ILCs in Japan, United Kingdom, France, Dominican Republic, India, Sub-Saharan Africa and Argentina.

MIT AgeLab
Massachusetts Institute of Technology
One Amherst Street, Room E40-279
Cambridge, MA 02142
Tel: 617-253-0753
http://mit.edu/agelab/index.shtml

Joseph Coughlin, Director

The MIT AgeLab was established in 1999 within MIT’s School of Engineering’s Engineering Systems Division. The AgeLab has assembled a multi-disciplinary team of researchers, business partners, universities, and the aging community to design, develop and deploy innovations to improve quality of life for older adults. Areas of focus for research and development include driving and mobility, wellness and health and independent living and caregiving.

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National Institute on Aging (NIA)
Building 31C, 31 Center Drive,
Bethesda, Maryland
301-496-9265
www.nia.nih.gov

Dr. Richard J. Hodes, Director

The NIA is one of the 27 Institutes and Centers of the federal National Institutes of Health. It leads a scientific effort to understand the nature of aging and to extend the healthy, active years of life. NIA was established in 1974 when Congress granted authority for it to provide leadership in aging research, training, health information dissemination, and other programs relevant to aging and older people. The NIA’s mission includes a mandate to disseminate information and
communicate with the public and interested groups on health and research advances and on new directions for research.

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**SPRY Foundation**

10 G Street, NE, Suite 600  
Washington, DC 20002  
Tel: 202-216-8466  
www.spry.org

Russell Morgan, President

The SPRY (Setting Priorities for Retirement Years) Foundation is an independent, non-profit research and education organization that helps people prepare for successful aging. SPRY emphasizes planning and prevention-oriented strategies in four areas: health and wellness; mental health; financial security; and life engagement.

**Stanford Center on Longevity**

Stanford University  
Stanford, CA 94305  
http://longevity.stanford.edu/index.html

Prof. Laura Carstensen, Acting Director

The Stanford Center on Longevity is a new research and teaching enterprise whose goal is to stimulate interdisciplinary research, bridging the social and natural sciences, aimed at solving fundamental physical and social problems associated with extended life expectancy. The Center Is also designed to initiate and sustain public dialogues nationwide about cultural transformations required to optimize added years of life, so that quality of life is improved at all ages.

10. Senior Housing

**American Association of Homes & Services for the Aging**

2519 Connecticut Avenue, NW  
Washington, DC 20008-1520  
202-783-2242  
www.aahsa.org

William L. (Larry) Minnix, Jr., President and Chief Executive Officer

AAHSA represents not-for-profit organizations that operate senior housing, assisted living residences, continuing care retirement communities, and nursing
homes, adult day services, home health, and community services. (Not-for-profit organizations manage approximately three-quarters of the nation’s 2,240 continuing care retirement communities that typically offer a continuum of independent living, assisted living, and nursing home care in a single community.)

AAHSA’s **Center for Aging Services Technology (CAST)** is a national coalition of more than 400 technology companies, aging services organizations, research universities, and government representatives interested in the development and deployment of new technologies that can improve the aging experience in America. Russell Bodoff is the executive director of CAST.

The **Institute for the Future of Aging Services (IFAR)** is a policy research institute sponsored by AAHSA. The Institute provides a forum for professionals, policymakers and the public to explore policies and programs that will meet the needs of an aging society through the development of healthy aging communities. The executive director of IFAR is Robyn Stone.

**American Senior Housing Association**
5100 Wisconsin Avenue, NW, Suite 307
Washington, DC 20016
202-237-0900
www.asha.org

David S. Schless, President

Members of ASHA are involved in the operation, development and finance of the entire spectrum of seniors housing – senior apartments, independent living communities, assisted living residences, and continuing care retirement communities. ASHA’s membership consists of both for-profit and not-for-profit operators, lenders and investors, and other professionals. The Association’s membership owns and/or manages 500,000 units of senior housing in the U.S.

**11. Foundations**

**Grantmakers in Aging**
7333 Paragon Road, Suite 220
Dayton, OH 45459
937-435-3156
www.giaging.org

Carol Farquahar, Director

The mission of GIA is to promote and strengthen grantmaking for an aging society. GIA’s membership includes staff and trustees approximately 100 grantmaking organizations involved directly or indirectly with aging.
The standard source for information about sources of funding. The Center publishes the Foundation Directory both in print and online. The director can be searched by “aging” to find foundations that have an interest in supporting senior programs.
OVERVIEW OF SCIENCE ORGANIZATIONS

The United States has a vast science-technology infrastructure. In this section, we highlight some of the key organizations and policies that most directly relate to potential partnerships between the aging network and science centers. Use these as places to start your search and refine your categories of thinking about whom you need to involve.

1. The National Science Foundation

The current infrastructure supporting scientific research, education, and public understanding dates to post World War II. The National Science Foundation Act of 1950 established the National Science Foundation "to promote the progress of science; to advance the national health, prosperity and welfare; and to secure the national defense." The NSF is divided into seven directorates that support science and engineering research and education, (Biological Sciences, Computer and Information Science and Engineering, Engineering, Geosciences, Mathematics and Physical Sciences, Social, Behavioral and Economic Sciences, and Education and Human Resources-EHR). The division of Informal Science Education, established in 1984, is located within Elementary, Secondary and Informal Education (ESIE), part of the EHR Directorate. www.nsf.gov

2. National Membership Organizations - Museums

The Association of Science-Technology Centers
Founded in 1973, ASTC now numbers more than 540 members in 40 countries, and includes science-technology centers and science museums, nature centers, aquariums, planetariums, zoos, botanical gardens, space theaters, and natural history and children’s museums. It sponsors an annual conference, professional development workshops, and multi-museum projects; publishes a bi-monthly journal, ASTC Dimensions; tracks trends in the science center field, manages traveling exhibitions, and represents the interests of the informal science community before the U.S. Congress and federal agencies. ASTC promotes equity and diversity by helping its members to increase the number of women, people with disabilities, and members of underrepresented ethnic and racial groups who visit and work in museums.

American Association of Museums
Founded in 1906, the American Association of Museums (AAM) represents all types of museums. Its 3,100 institutional members include art, history, science, military and maritime, and youth museums, as well as aquariums, zoos, botanical gardens, arboretums, historic sites, and science and technology centers. It also has 11,500 individual members and 1,700 corporate members.
**Association of Children’s Museums**
Founded in 1962 as a support group for directors, The Association of Children’s Museums (ACM) now has 411 members, including 299 children’s museums in 21 countries. Its annual meeting is usually held immediately preceding the AAM meeting.

3. **Professional Associations of Scientists, Engineers, Technologists, and Mathematicians**

**The American Association for the Advancement of Science (AAAS)**
Founded in 1848, AAAS (“triple A S”) serves 272 affiliated societies and academies of science and publishes the peer-reviewed general science journal *Science*. The non-profit AAAS is open to all and fulfills its mission to "advance science and serve society" through initiatives that include science policy, international programs, science education, and public understanding of science. The Education and Human Resources Directorate (EHR) includes AAAS programs in education, activities for underrepresented groups, and public understanding of science and technology. [www.aaas.org](http://www.aaas.org)

**Associations focused on retirees**

**Senior Scientists and Engineers (SSE)**
The Senior Scientists and Engineers (SSE) is an organization of scientists, engineers, educators, physicians, and other professionals who volunteer their services to support the needs of government, education, and the community. SSE is sponsored by the American Association for the Advancement of Science. Most SSE members are retirees from positions in government, academia, business, industry, or public service. A directory includes members’ disciplines. [www.sse@aaas.org](http://www.sse@aaas.org)

**RE-SEED: Retirees Enhancing Science Education through Experiments and Demonstrations**
RE-SEED is a program of Northeastern University that prepares engineers, scientists, and other individuals with science backgrounds to work as volunteers, providing in-classroom support to upper elementary and middle school science teachers with teaching the physical sciences.

**Organizations focused on Women, Minorities, and Persons with Disabilities in Science and Engineering**
Given the centrality of increasing representation, nearly every professional association has a chapter or initiative focused on one or more underrepresented groups. In addition, there are separate organizations that may be cross-discipline (e.g., Association of Women in Science) or targeted (Society of Black Engineers). We provide a sample listing here to give you an idea of the breadth of the field:
- Association of Women in Science ([www.awis.org](http://www.awis.org))
- Association of Women in Mathematics (www.awm-math.org)
- Society for the Advancement of Chicanos and Native Americans in Science (www.sacnas.org)
- National Action Council for Minorities in Engineering (www.nacme.org)
- Society of Professional Hispanic Engineers (http://oneshpe.shpe.org/wps/portal/national)
- National Society of Black Engineers (www.nsbe.org)
- Society of Women Engineers (www.swe.org)
- American Indian Science and Engineering Society (www.aises.org)

**Associations for Amateur Scientists**

**Society for Amateur Scientists**
Ten years old, the mission of the Society for Amateur Scientists (SAS) is to remove the roadblocks that prevent ordinary people, of all ages, from participating in extraordinary science. SAS is run by a consortium of professional and amateur scientists. SAS has local chapters throughout the country.

There are also discipline-specific organizations, and among the most active are the amateur astronomers, who have multiple national and local organizations as their members typically make significant contributions to astronomical research and observation, and the professional astronomy community relies on them as part of their research infrastructure.

**4. Science and Mathematics Education Associations**

**National Science Teachers Association (NSTA)**
The National Science Teachers Association (NSTA), founded in 1944 and headquartered in Arlington, Virginia, has a membership of 55,000 that includes science teachers, science supervisors, administrators, scientists, business and industry representatives, and others involved in and committed to science education. NSTA sponsors a national conference as well as regional conferences annually, publishes four journals, and offers an array of on-line services and links to curricula, programs, and other resources. www.nsta.org

**National Council of Teachers of Mathematics (NCTM)**
Founded in 1920, NCTM is the world’s largest mathematics education organization, with 100,000 members and 250 affiliates throughout the United States and Canada. NCTM’s Principles and Standards for School Mathematics, published in 2000, provides guidelines for excellence in mathematics education and issues a call for all students to engage in more challenging mathematics. NCTM publishes five professional journals, and conducts professional development workshop and policy activities. www.nctm.org

Like the scientist association structure, there are discipline-specific associations of teachers, usually organized both at the national as well as state level.
5. Science and Mathematics Education Standards

Within the science education enterprise, the effort to improve the quality of science and math education and to prepare a larger pool of students to continue on to careers has dominated reform efforts since the early 1960s. Since the late 1980s, the focus on standards—what students should know and be able to do—has shaped curriculum as well as out-of-school programs. The standards seek to identify the important processes and content of science and mathematics, and recommend pedagogical approaches designed to foster scientific habits of mind. These foundational ideas can be useful in the design of learning environments and programs, regardless of age or setting.


6. Curriculum development and intermediary organizations

A good deal of the development of curricula, programs, professional development, and reform strategies in math and science education is conducted by “intermediary” organizations that function at the intersection of government systems (e.g., departments of education) and service providers (e.g., schools, community organizations), or between federal systems and state or local municipalities. Among the primary developers of math and science programs, curricula, and strategies are:

**Education Development Center, Inc. (EDC)**

Founded in 1958 by Jerrold Zacharias and other physics professors from MIT and Harvard, EDC created some of the earliest NSF-funded curricula, including PSSC Physics, and the social science program about what makes us human, Man: A Course of Study. An international organization, its U.S. work in science, mathematics and technology encompasses research, curriculum development, professional development, and policy, as well as clearinghouses and technical centers, including the NSF-funded center that supports informal science projects in information technologies. www.edc.org

**TERC**

TERC’s work in mathematics and science education includes research, curriculum and technology development, and implementation support in the form of professional development and assistance to districts and schools. Programs span pre-kindergarten through college, and include adult basic education and informal learning at museums, at home, and in after-school programs.
was founded in 1965 by Arthur Nelson, a lawyer and businessman with a background in physics, and Edward Van Dusen, the head of Wentworth Institute of Technology. The early years focused on the training of technically skilled workers to meet the demands of the rapidly changing technology-dependent industries, hence TERC’s original name as Technical Education and Research Center. www.terc.edu

Regional Educational Laboratories
Dating back to the first Elementary and Secondary Education Act in 1965, these regional laboratories were established to support innovation and provide a link between research and practice. Contracted by the U.S. Department of Education to carry out research, development, dissemination, training, and technical assistance activities, the most recent 5-year contracts were awarded in October 2005 to:

- Appalachia: The CNA Corporation, Alexandria, Va., $26.6 million.
- Central: Mid-Continent Research for Education and Learning, Denver, Colo., $26 million.
- Mid-Atlantic: Pennsylvania State University, State College, Pa., $29.5 million.
- Midwest: Learning Point Associates, Naperville, Ill., $39.9 million.
- Northeast: Education Development Center, Newton, Mass., $42.1 million.
- Northwest: Northwest Regional Educational Laboratory, Portland, Ore., $24.6 million.
- Pacific: Pacific Resources for Education and Learning, Honolulu, Hawaii, $20.7 million.
- Southeast: University of North Carolina at Greensboro, N.C., $37.7 million.
- Southwest: Edvance Research Inc., Austin, Texas, $37.9 million.
- West: WestEd, San Francisco, Calif., $41 million.

9. Research and Evaluation organizations

The following entries were excerpted from the informalscience.org website:

American Educational Research Association (AERA)
The American Educational Research Association is concerned with improving the educational process by encouraging scholarly inquiry related to education and by promoting the dissemination and practical application of research results. Its 20,000 members are educators; administrators; directors of research, testing or evaluation in federal, state and local agencies; counselors; evaluators; graduate students; and behavioral scientists. The broad range of disciplines represented by the membership includes education, psychology, statistics, sociology, history, economics, philosophy, anthropology, and political science.

American Evaluation Association
The American Evaluation Association is an international professional association of evaluators devoted to the application and exploration of program evaluation, personnel evaluation, technology, and many other forms of evaluation.
Evaluation involves assessing the strengths and weaknesses of programs, policies, personnel, products, and organizations to improve their effectiveness.

**Australian Museum Audience Research Center**
The Australian Museum Audience Research Centre undertakes a broad range of visitor research and evaluation projects. Objectives include: undertake and facilitate innovative research into visitor experiences and learning issues in museums generally; feed information into program development, policy and planning; serve as a networking hub linking the Museum with other organizations, universities and research institutions that are undertaking research in complementary areas; generate funding for audience research through grants and commercial work; publicize and disseminate research results; and act as an

**The Evaluation Exchange (Periodical)**
Harvard Family Research Project's evaluation periodical addresses current issues facing program evaluators of all levels, with articles written by prominent evaluators in the field. Designed as an ongoing discussion among evaluators, program practitioners, funders, and policymakers, The Evaluation Exchange highlights innovative methods and approaches to evaluation, emerging trends in evaluation practice, and practical applications of evaluation theory. Published quarterly.

**Informal Learning Environments Research SIG (SIG-ILER)**
The Informal Learning Environments Research SIG is a special interest group within the American Educational Research Association (AERA)

**Museum Education Roundtable (Journal)**
The Journal of Museum Education is the premier publication promoting and reporting on theory, training, and practice in the museum education field. Journal articles, written by museum, education, and research professionals, explore such relevant topics as learning theory; visitor evaluation; teaching strategies for art, science, and history museums; and the responsibilities of museums as public institutions. Published three times a year.

**Visitor Studies Association**
The Visitor Studies Association was incorporated in 1992 to provide a forum for the exchange of information in the field of visitor studies. The association sponsors the annual Visitor Studies Conference where people from all over the world come together to share their knowledge and questions about the visitor experience. VSA welcomes all professionals who are interested in understanding and making use of new knowledge about the visiting public.
SUMMARY OF PRE-CONFERENCE INTERVIEWS: WHAT SCIENCE CENTERS ARE DOING

To prepare for the conference, SPRY conducted a survey of science centers. The Association of Science-Technology Centers (ASTC) provided a list of centers that by their own account were working with seniors, and SPRY sought referrals to others. Forty-one centers agreed to complete a telephone interview.

The research was not exhaustive nor was it a picture of the field as a whole, as only centers with senior programs were contacted. Centers were asked about their programs, opportunities, and challenges, and what they hoped to gain from the conference. This section shares insights and comments from respondents on the following topics:

- What science centers are offering seniors
- Marketing, recruitment and outreach
- Strategies, challenges, and needs

WHAT SCIENCE CENTERS ARE OFFERING SENIORS

Science centers provide extensive opportunities for older Americans to engage in meaningful roles as volunteers, experts, and advisors. Seniors are providers of service and education, and integral to the operation of the institution.

Science centers also serve seniors as part of their audience. They offer tours, lectures, courses and lectures, intergenerational experiences, and exhibits at the museum, in the field, and in the community.

Participation by seniors in the institution: Volunteer corps, retired experts, paid staff

Volunteers are an essential part of many institutions’ workforce and a well-established tradition in science museums. Thirty-four of the museums contacted have volunteer programs, and seniors typically make up between 50 and 90 percent of the volunteer corps. Of the 5,350 seniors reported to be volunteering in these 34 centers, 5,040 are managed by the 12 largest museums. With some exceptions, volunteers tend to be white, well-educated, and from middle and higher socioeconomic groups.

The majority of museums reported having an infrastructure with staff, budget, training, incentives and rewards, and human resource policies. Training can be extensive, especially for those volunteers in collections, research, or communicating science and technology to students or the public.

- The National Air and Space Museum conducts a highly structured 11-week training for volunteers. “The longer they stay the more they learn.”
Docents at the New Mexico Museum of Natural History participate in a 6-week training, and those in the fossil preparation lab have a 3-month training with an apprenticeship.

Retention rates can be quite high. At the Museum of Science, 74% of the volunteers have been there for more than two years, and 50% more than 5. “The older volunteers stay the longest.” Science Museum of Minnesota reports volunteers who have been there 15, 20 and 40 years or more. “Senior volunteers are devoted to the museum and stay until they are unable to work any longer.” (New Mexico Museum of Natural History)

Volunteers serve across the institution, and the surveys revealed a plethora of creative opportunities that include but go well beyond the traditional friendly interface with the public at the information desk, ticket counters, and gift shop.

In education and programs for children, seniors:
- Staff the after-school club house at the Museum of Science and mentor young people who are at risk of negative behaviors.
- Lead hands-on activities at the Children’s Museum of Indianapolis. As groups of 130 children participate as Curious Science Investigators, the senior “Museum Friends” work with them in small groups to support inquiry, discovery, and focused exploration.
- Teach students at the Ocean Institute about marine life with hands-on examination of local tide-pool creatures, microscope work and dissection.

As docents and promoters of public understanding of science, seniors:
- Interpret current science topics and findings from studies by the National Academy of Sciences at the Marian Koshland Museum in Washington DC;
- Conduct VIP tours for congress, movie stars, and heads of state at the National Air and Space Museum;
- Staff new and traveling exhibitions.

In restoration, engineering, animal husbandry, and collections, seniors:
- Tend to the 6,000 injured and orphaned wildlife that the Lindsay Wildlife Museum hospital takes in each year;
- Prepare fossils at the New Mexico Museum of Natural History and at the National Museum of Natural History where they also help with collections management and research;
- Maintain and sail the tall ships as part of the Tall ship Crew at the Ocean Institute, and teach young people to sail;
- Build and restore aircraft and run flight simulators at the San Diego Air & Space Museum;
- Install, repair and break down exhibits at Science Station in Cedar Rapids, Iowa, through a partnership with Rockwell Collins, a major Cedar Rapids employer, and their Retiree Volunteers program. Retired engineers carried out a design documentation product for a traveling exhibition from the
Exploratorium, taking photographs, compiling parts lists for the different items in the exhibit, doing auto-cast drawings for part, and compiling the information into a manual for other users of the temporary exhibit.

Science centers have recruited retired scientists, engineers, and medical professionals from local area industries as advisors, instructors, and speakers. California Science Center involves retirees from Hughes Aircraft, Dupont donates a volunteer every Friday to the New Detroit Science Center, the Schenectady Museum uses former GE employees, and Science Station in Cedar Rapids, Iowa partners with Rockwell Collins Retiree Volunteers (RCRV).

Several science centers actively seek retirees as regular paid staff:
- AARP sends seniors to work at The Museum of Science and Industry (MOSI) in Tampa and pays them for a 3-6 month period; if they work out, MOSI hires them.
- The Health Adventure in Asheville, NC has a formal "retirees welcome" hiring policy
- Operation Able trains and provides seniors with a stipend to work at the National Plastics Museum in Leominster, Maine.

Programs and exhibits for seniors

Science centers attract seniors through tours, lectures and courses, and exhibits. These activities may be developed specifically for seniors, for a larger adult audience, or as part of family and intergenerational experiences.

Tours:
- The San Diego Air & Space Museum is part of the Elderhostel program of weeklong tours that feature the "fabulous museums of Balboa Park." Seniors run the tour and participants visit the restoration area, build and fly a plane, and do hands-on activities on the four forces of flight. The tours are offered by Elderhostel every month.
- The National Plastics Museum conducts tours for seniors on plastics and medicine, joint replacement and other medical conditions of aging. The history of plastics is of particular interest, as the materials came of age along with the current generation of older adults.
- Science Museum of Virginia invites seniors to “tea with scientists,” followed by tours of new galleries by the exhibit developers.

Programs, courses and lectures:
- Inspired by an ASTC Dimensions article, the Lindsay Wildlife Museum started offering lectures for seniors in the morning, before the museum opens to the public at noon. Content is related to the foci of this natural history center: birding is an especially popular lecture.
• The six-week astronomy course at the Osher Lifelong Learning Institute in Dayton Ohio is offered through a partnership with the Boonshoft Museum of Discovery and limited to adults age 50 and older.
• A selection of 29 hour-long interactive classes using inquiry methods engages seniors at Explora in Albuquerque in “discovering digital art,” the “recipe for photosynthesis,” and “shake it up” investigations of liquid nitrogen.
• Bio-Trek at the University of Wisconsin-Madison shares current research and practice with seniors in its Wednesday night at the lab program, a pilot that they are hoping to expand.
• The National Museum of Natural History offers courses and training in paleontology by a professor at George Washington University who adapted his college level course and followed it with exposure to current research and field trips that built both hands-on experience and camaraderie.
• Health Adventure is in the second year of a contract with the Land of Sky Regional Council and the local Area on Aging to develop and present health/science education on location at senior centers, assisted living facilities, and community meal sites in a four-county area. The average program attendance is 20 participants, and program delivery is coordinated with meal times and social activities. Programs cover topics such as nutrition, improving your memory, medication management, and sensory changes in aging.
• A computer lab and classes for seniors set up by the Arizona Science Center started off with an excellent turnout, but attendance dwindled during the six sessions. The trip to downtown Phoenix from retirement communities 40 miles outside proved impractical for senior participation.
• Lunchbreak Science at the Science Museum of Virginia offers a 45-60 minute lecture every Wednesday, on topics ranging from particle physics to plant genetics, drawing about 25 people. Mini-medical school is a series of lectures given by physicians, held in the evenings, drawing an average of 70 people.
• San Diego Air and Space Museum hosts a lecture series in the spring and fall for an adult audience that is largely seniors. A reception at 6:30 is followed by a lecture at 7:30, a Q/A and, if there is a book being featured, a signing by the author. In the last series, 1354 people participated. The museum also hosts symposia on weekend mornings, recognizing that seniors don’t like to drive at night. The panel discussion lasts 3-4 hours. A program about Russian women pilots involved panelists who were World War II veterans and attracted more than 400 people.
• A monthly Brown Bag Lunch Lecture Series at The Cincinnati Museum of Science is organized and presented by forty senior volunteers from the Museum’s Heritage Program around topics of interests to older adults. Attendance is 100-150 at each session. The Museum also offers evening science lectures that attract a substantial number of seniors to topics like “Was Mars ever a biological planet?” and “Ice Adventures: Tracking Evidence of Global Warming Around the World.”
• The New Mexico Museum of Natural History has piloted a six-week “enrichment class” for seniors, with lectures and field trips on topics such as the geology of New Mexico.
Exhibits:
Several museums have developed exhibits attractive to seniors or focused on topics related to aging.

- Reuben H. Fleet Science Center developed the Aging for Ages exhibition with funding from the MetLife Foundation’s special initiative for ASTC members. Covering the biology of aging, healthy aging, and attitudes of aging, it was a “true community effort,” with a community advisory committee established to create and review content. The committee members represented medical, social service and neighborhood constituencies. The exhibit opened in May 2006 with a special reception for seniors and accompanying lecture on the Aging Brain.

- The Children’s Museum of Memphis partnered with a local non-profit, Senior Services, to create Grandma’s Attic as part of their annual grandparents month in January, so the senior generation could show children things they had never seen before, from “when I was a kid.”

- The Science Museum of Virginia is located in an historic railroad building. People who grew up there have an emotional connection to the museum. There is great senior interest in the building itself and one room in the museum is dedicated to presenting its history. The yearly model railroad show is a major event and attracts a large audience of seniors.

And at least one museum found that the blockbuster exhibit Titanic was extremely popular with older adults.

MARKETING, OUTREACH, AND PARTNERSHIPS

Marketing to adults and to the older segment of the adult population requires aggressive effort on the part of science centers. Science museums are generally perceived as places for children, and this perception seems to apply not just to the hands-on science centers that identify their target audience as children and young adolescents. Some natural history museums with substantial research capacity and collections find they too have to address their public persona as places that adults come to only with children. Others, such as The New Mexico Museum of Natural History, report that the museum “is a draw for seniors.”

At least two museums in the survey are directed at adults. The MIT Museum engages its visitors in the ongoing research at the university, and conducts a public forum they call Soap Box to debate issues of science and technology policy. The Marian Koshland Museum, part of the National Academy of Sciences, was endowed by the Koshlands as a resource for adults to learn about science. It focuses on current science content and translates the research and technical reports from the Academy to the public through exhibits and programs. Other museums have deliberately targeted adult and senior audiences when they recognize a potential market. The Field Museum advertises its lucrative group
tours program to seniors and reaches 30,000-40,000 people annually. And the National Plastics Museum found that developing programs for seniors led to expanding audiences overall.

The pre-conference survey revealed a number of strategies to build the senior audience including special days and discounts (most museums charge their lowest rate for senior admission), going to senior centers and retirement communities, and outreach to underrepresented groups.

**Special days and months for seniors:**
- Senior Discount Mondays at the Reuben H. Fleet Science Center advertises on the websites to adults over 65: “Seniors are invited to visit on The Fleet Center’s quietest day of the week and enjoy our five Exhibit Galleries, Educational Programming and one IMAX film for the fantastic price of only $5!” In 2005, the Center started Senior Celebration, a month long event of activities for older adults. “The Science center opened its doors, not just in dollars but in public perception.”
- New Mexico Museum of Natural History and Science is free to New Mexico seniors age 60 and over every Wednesday.
- The Science Museum of Minnesota refrains from booking school groups on two Tuesdays each month, creating a less frenetic environment for older adults to visit.
- January is grandparents month at the Children’s Museum of Memphis.
- The second Saturday of each month is Family Day at the San Diego Air and Space Museum, and besides parents and children, seniors come with their grandchildren as well as their adult children. They use recycled robots to build new robots, hot air balloons, and rockets. It is particularly effective at producing return visitation.

**Reaching out to poor and underrepresented groups**

The majority of science centers reported reaching seniors both as audience and volunteers who were primarily white and relatively well off. Many of the museums expressed a desire to achieve more ethnic and racial diversity as well to reach lower income groups, especially where they noted a discrepancy between the demographics of their local populations and who attends the science center. For example, Avampato Discovery Museum in West Virginia is acutely aware that the state has a large population over 55 that the museum is not tapping, and that its present audience is probably earning upwards of $50,000/year, well above the average state income.

The interviews contained only a few examples of actual strategies, however. The New Detroit Science Center reached out to African American as well as women’s engineering professional associations to increase the diversity of their volunteers. The Museum of Science networks with disability groups to recruit people with
special needs, and works with community groups from Chinatown and the YMCA Black Achievers program.

The survey did not ask museums about their outreach to younger people from underrepresented groups. But it appears that there has yet not been concentrated effort to apply what we know about reaching underserved populations to seniors, and it would be worth examining both the barriers (e.g., lack of funding or policy emphasis on older underrepresented groups) and the opportunities (e.g., large scale collaboration with area agencies on aging or other organizations that serve low-income and minority seniors).

**Outreach: Going to them**

A number of science museums reported success in bringing programs to where seniors are:

- The National Plastics Museum gives talks on the history of plastics in senior centers.
- The Heritage Program at the Cincinnati Museum of Science conducts programs in senior centers, and also picks seniors up at the centers and takes them on field trips.
- The Arizona Science Center presents science talks at local Kiwanis and Rotary clubs; sometimes they meet at restaurants and the food is an added draw.
- The National Air and Space Museum goes to retirement facilities and military retirement associations like the Tuskegee Airmen.
- Health Adventure provides health and science education programs at senior centers, assisted living facilities and community meal sites.

But others, such as Health Adventure, felt that as a hands-on science center, participants needed to have direct access and that the experience could not be duplicated through outreach.

**Partnerships: A growing list**

Science centers are increasingly joining forces with aging organizations:

- Elderhostel, the largest provider of lifelong learning programs for adults over 55, partners with Museum of Science and Industry in Tampa, Museum of Science in Boston, and the San Diego Air and Space Museum.
- OASIS, a developer and provider of programs in 26 cities, has relationships with the St. Louis Science Center and the Arizona Science Center.
- RSVP, Retired and Senior Volunteer Program, is a regular partner of the Science Museum of Minnesota as well as the Denver Museum of Nature and Science and the Reuben H. Fleet Science Center.
- AARP is part of the network supporting Museum of Science and Industry and the Science Museum of Virginia.
• YouZeum is partnering with the Osher Lifelong Learning Institute at the University of Missouri, and the Boonshoft Discovery Center with the University of Dayton’s Osher Lifelong Learning Institute for Learning in Retirement.
• The National Plastics Museum identified Operation Able, which provides seniors to non-profit companies, through their community partner, the Leominster Senior Center.
• Health Adventure’s programs are carried out in collaboration with the local Area Agency on Aging and the Land of Sky Regional Council.

Limited mentioned was made of local Areas on Aging, the main network serving low-income seniors, and no respondents mentioned relationships with organizations focused on seniors from ethnic and racial minorities.

STRATEGIES, CHALLENGES AND NEEDS

Science centers had a good deal to say about what is working, how to create accessible and welcoming environments for seniors, and what they need to learn to advance this agenda.

As a caveat, it is important to note that there has been limited evaluation beyond measures of satisfaction. Relatively few institutions appear to have conducted systematic needs assessments or formative evaluations, and none reported outcome evaluations. The practices listed here are good suggestions and based on positive experience, but more research and evaluation is needed before they can qualify as “promising” or “best.” That will be one of the essential strategic tasks that science centers and the aging network will need to take on together.

Elements for success
Science centers are motivated by mission, demographics, and a fundamental appreciation of human potential. Respondents identified guiding principles and philosophy. They said:

• Tap into experience: The older you get the more experience you have. (Museum of Science and Industry)
• Capitalize on their commitment. They love to learn. (National Air and Space Museum)
• Include seniors in the planning every step of the way. (Museum of Science and Industry)
• Recognize their benefit to the science center: Dynamic seniors liven up the place and inspire us with their work. (Reuben H. Fleet Science Center)

Specific strategies and insights break down into the following categories:
• Teaching, learning, and professional development approaches
• Accessibility and developmental considerations
• Logistics and comfort
• Rewards and incentives
Social interaction and community

Teaching, learning, and professional development
Both the literature and respondents emphasize that active participation, hands-on learning, and inquiry are key to engaging seniors in science.
- Break out of lecture style. Encourage people to tinker and investigate. (St. Louis Science Center)
- Acknowledge a broad range of experience and background, and different levels of learning that people can and want to engage in. (HealthSpace Cleveland)
- Let them tell their stories! Humor helps. (Health Adventure)
- Treat them like professionals. (Science Museum of Minnesota) Create structure: handbooks, policies and procedures, let people know what is expected of them. (National Air and Space Museum)
- Take the education of the volunteers seriously and make sure they are always learning. (National Air and Space Museum)

Address accessibility and developmental issues
Accessible spaces and practices as defined by the Americans with Disabilities Act are a given, and while most institutions are “in compliance,” there are additional steps that museums may need to take to be fully accessible for an aging audience. Respondents suggested attention to:
- Comfortable seating—and lots of it. Build in adequate time to stop and rest.
- Acoustics. Make sure speakers are turned up enough for those with hearing loss; reduce ambient noise. Use amplified sound even in small rooms. For those seniors who will be leading tours, provide microphones. Have a tyy.
- Too loud and dizzying: Be attentive to the volume and potential motion sickness from watching IMAX and planetaria shows.
- Physical limitations: Recognize strengths and weaknesses and assign tasks appropriately, e.g., don’t expect they’ll be able to break down exhibits.
- Have elevators rather than stairs.
- Temperature: Keep room warm.
- Stamina and attention span: Consider shorter programs than for other audiences. Don’t be offended if they fall asleep.
- Memory: Use cue cards with museum hours, simple facts.
- Adequate space and aisles that can accommodate canes, walkers, and wheelchairs.
- Time: Move slowly, have patience, be willing to wait.
- Aging process: “Recognize that the aging process moves in stages. Notice something that might be different about them that day. Be perceptive: gain the skills to ask the hard questions. Many have ill spouses; make accommodations so they can bring their spouse who is using a wheelchair or losing mental capacity.” (National Air and Space Museum)
Attend to logistics and comfort
- “Provide coffee and brew extra decaf.” (Reuben H. Fleet Science Center)
- Food is a draw and linking activities to meals is attractive—tea with scientists, breakfast and a movie.
- Transportation: plan for how seniors will travel, provide transportation when possible.
- Parking: Free and close is best.
- Schedule during hours when it is light; don’t ask seniors to drive or travel at night.

Provide rewards and Incentives
- Recognition events: Annual luncheon, dinner, parties, awards ceremonies attended by president/CEO and board members (Denver Museum of Nature and Science) (Science Museum of Minnesota)
- Free tickets and perqs: “They appreciate extra touches such as giveaways or contests.” (Reuben H. Fleet Science Center)
- Access to continuous learning: “They love to learn about collection and anything related to it. We give them information about new artifacts. Curators give 20 minute lectures about an artifact.” (National Air and Space Museum)
- “An intellectual community: We offer them things they can’t get elsewhere.” (National Museum of Natural History)

Recognize the social context
- “Seniors plan ahead, arrive early, and enjoy personal interaction with staff and speakers. They like to hear about what is going on in our personal lives. They come because they want to be involved and have the feeling that someone needs them and misses them when they are gone.” (Reuben H. Fleet Science Center)
- “If they don’t show up, call and check on them. We maintain social contact and serve as a major focal point in some folks’ lives.” (San Diego Air and Space Museum)
- “We have an open door to our volunteers. They can come in and talk any time.” (Science Museum of Minnesota)
- “Docents start arriving from 7 a.m. on. I’m out on the floor to notice the changes, look for problems. They like to come and talk; many live alone. We have a nice space for them. It’s worth investing time and money.” (National Air and Space Museum)

Challenges and needs
Respondents cited a range of concerns and needs in order to move forward. Some of these have been noted earlier in these materials, or are addressed in a positive way in the preceding section. But several topics deserve attention here:
- Low attendance. A number of museums reported difficulty in attracting or retaining seniors to programs, and told of efforts that had been discontinued
as a result of low attendance. One museum reported that marketing strategies that work for other audiences were not effective for seniors. Competition with other institutions (such as art museums) for seniors as volunteers was cited by at least two museums, compounded by the already described perception of science museums as places for children.

- Funding. Volunteer programs are the most common way of involving seniors, and are generally supported by museums' operating budgets. That is a positive indication of institutional support and priority—where funding and staffing are adequate. But a number of museums cited limited funds and staff, which in turn affected both the quality and quantity of involvement and service they could offer to seniors. Grant opportunities have been relatively limited with a few notable exceptions. The NSF Informal Science division has been a steady funder of community-based programs, including those directed at older adults and intergenerational programs. Most recently, the MetLife Foundation special initiative to ASTC members funded programs for youth and programs and exhibits for seniors and may signal a change in the funding community’s perspective. Still, financial support for involving seniors is a significant issue and must be addressed fully and pragmatically in order to move this agenda forward.

People are coming to the conference seeking a deeper understanding of the demographic shift and its implications for their institutions. They want practical advice and information about who is doing what and how they are doing it. They want ideas for programming, models and best practices, and ways to secure funding and to make the case. They want to see what materials and technical assistance are available, and build peer groups and networks. They want to know about adult learning and cognition, and hear from thinkers in the field.

We have our work cut out for us. Let us begin by mining and pooling our collective knowledge to make the most of the longevity revolution.
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