CHAPTER 9

HEALTH SCIENCES
A Newcomer and a Pioneer

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Hall of Life, 1987–2005

The Museum’s 1987 annual report called it “a milestone year.” Among the Museum’s remarkable accomplishments was the inauguration of a new core competency: health sciences. This would be a unique addition to the Museum in many ways, not least of which was the way it came about. The older, more traditional Museum core competencies, zoology or anthropology, for example, began with collections. But health sciences began with a merger.

The Merger

The Hall of Life was originally a Denver nonprofit health education center founded in 1975 by Dr. Leo Nolan and other community leaders who were concerned about the lack of professional health education. Colorado was one of the few states that did not mandate or fund health education in the schools (it still does not). The Hall of Life helped to fill the void. Its mission was “to provide to people of all ages innovative exhibits and dynamic educational programs that teach how the body functions, that motivate positive health choices, and that emphasize the role of personal responsibility in matters of health and physical fitness.”

The Hall of Life was so popular that it soon outgrew its location in the basement of the Blue Cross-Blue Shield building in downtown Denver. Encouraged by the Gates Family Foundation to extend its reach by joining forces with a larger institution, the Hall of Life approached the Children’s Museum of Denver. When that did not seem to be the right fit, the Hall of Life proposed a merger with the Denver Museum of Natural History. As it happened, the Museum had just completed a new building addition and was planning content to fill it. One suggestion was an exhibition on human senses, therefore an exhibition focused on human health did not seem too great a stretch. In 1985, with the new health gallery in mind, the Museum approved the merger with the Hall of Life. Community support came by way of the Gates Family Foundation, which contributed $200,000 for planning and $3.2 million in an endowment challenge grant.
The Museum brought on James “Jim” Goddard as project director to execute the merger, raise funds, and plan and build the exhibits and health classrooms. Goddard and his team, including community advisors and the design firms of Lester Associates of West Nyack, New York, and Design/Joe Sonderman of Charlotte, North Carolina, completed the exhibition master plan in November 1987. At a cost of $8 million, phase I of the new permanent health exhibition opened to the public in fall 1989, with phase II opening a year later. At 17,000 square feet, the Hall of Life became one of the largest health education centers in North America, and most probably the only one of its kind located in a museum.

The Hall of Life Exhibition

The Hall of Life was very different from any other gallery in the Museum’s history. It was not collections based, at least in the traditional way of a natural history museum. Its subject matter did not resemble conventional natural history. Its purpose and formats were different, too. Perhaps because of the exhibition’s nontraditional nature, the Museum chose exhibit designers from outside rather than using the in-house team, a controversial decision that caused some skepticism and perhaps a little resentment among Museum staff. Goddard and his planning team visited health education centers across the country and realized they wanted to avoid what was then typical: huge body parts and replica humans to walk through. They wanted to be true to the original mission of the Hall of Life, with its emphasis on personal responsibility for making healthy choices and preventing disease.

The “specimens” in the Hall of Life would be the visitors themselves, not objects from the Museum’s collections. Because the focus was on the visitor, the exhibits had to be participatory. Planning documents described the experience as a process “which is inherently fun and includes a sense of exploration, discovery, and decision making” and characterized the entire exhibition as “an event.” The intended audience was families with school-age children. Exhibition components dealt with wellness and disease, including human development, the senses, fitness, nutrition, stress, and substance abuse. Many components were interactive, involving computers or engagement with volunteers who might be performing dissections or other procedures. The LifeCard, on which visitors could enter personal information and which individualized the experience, was very popular and was applauded nationally by other health science organizations (Fig. 9.1).

In many respects the exhibition was controversial and daring in its formats and use of technology. However, its innovations were consistent with a spirit of renovation and renewal present throughout the Museum, whose staff and visitors considered it a dynamic and educational institution. The Hall of Life embodied that spirit. Its emphasis on the visitor and on the visitor’s interaction influenced all future Museum exhibitions.
The Hall of Life Programs

The Hall of Life was both an exhibition and an educational program. When the Hall of Life came to the Museum in 1987, it was a separate division, directed by Goddard. In 1989 Director John Welles created an Education Division, also directed by Goddard. It consisted of two departments: the Hall of Life, managed by Sue Palmer and later by Dianne Pavelka, and Public Programs (natural history programs and travel), managed by Diana Lee Crew. Educators in both departments shared ideas and learned from one another, but the Hall of Life remained somewhat separate—a health education center in a museum.

Hall of Life health education was successful when it first came to the Museum, but once there, with the resources and support of a large institution, it became even more so. Although Colorado did not require or fund health education in schools, many teachers, administrators, and parents wanted it taught. Schoolteachers did not feel comfortable teaching sensitive topics or those that required a medical background; they looked to the Hall of Life to do this for them. In addition, health was fundable. Many health-related organizations or foundations wanted a greater public presence and could support educational efforts on topics of interest. Grants and an endowment funded salaries, curriculum development, materials, and other program costs and included scholarships to cover program fees. As a result, the Hall of Life programs and education staff greatly outnumbered their counterparts in cultural and natural history education at the Museum.

Hall of Life educators were specialists. Most had medical backgrounds as nurses or certified health instructors. Though based on anatomy and physiology, classes emphasized prevention to show how daily behaviors affect health. Frequently topics were sensitive or controversial: teenage sexuality, pregnancy prevention, substance abuse, helmet safety, organ transplants, and AIDS awareness, for example (Fig. 9.2). Teaching techniques were innovative, even avant-garde. They were hands-on and participatory. The Healthy Heart class for grades two through five is representative, as this catalog description shows: “Observing the dissection of an animal heart highlights this presentation. Your class will listen to their own resting and exercising heart rates with individual stethoscopes, and...”
compare other animal hearts to the human heart. The Hall of Life instructor points out how diet, smoking, and fitness influence the body’s hardest working muscle."

In the size of its program, subjects taught, and teaching techniques, the Hall of Life was a national model, which was recognized in 2002 when the National Association of Health Education Centers awarded its first Outstanding Health Educator of the Year Award to Hall of Life educator Sharon Caskey. The Tar Wars poster contest, cofounded by Hall of Life educator Glenna Pember and Dr. Jeffrey Cain, won a World Health Organization award for tobacco prevention. Further evidence of the Hall of Life’s widespread reputation came in 2000 when two small Alaskan villages, Mentasta and Chistochina, invited Hall of Life educators to work with their health aides, teachers, and students to create interactive health activities and displays, which the children would present to the residents of their villages. This partnership, involving reciprocal visits, lasted for several years (Fig. 9.3).

The Hall of Life was a model for the Museum in other ways as well. Its large and very professional volunteer program included many from the medical profession. Trained by Hall of Life educators and managed by Elizabeth Arend, these volunteers provided interactive opportunities in the exhibition, offering the Museum a lasting lesson on how to extend an exhibition’s reach. Because the Museum had not yet established a health sciences research department to support the exhibition and its programming, no health curators were on staff. Thus the health educators looked outside the Museum for advice. An ongoing relationship with the University of Colorado School of Medicine and Health Science Center ensured the scientific accuracy of exhibition content and curricula and provided evaluation. Educators established partnerships with individuals in the medical community and with organizations such as Donor Alliance and the 9Health Fair. These community ties often provided funding as well as expertise. A notable program and partnership was SHARE (Student Health: Awareness and Responsibility through Education), funded by the Helen K. and Arthur E. Johnson Foundation. SHARE was a sequential health education program for third, fourth, and fifth graders in school districts serving low-income populations. Classes were offered in English, Spanish, or a bilingual format. Begun in 1996, SHARE continued for five years. A child who remained in the
same school could receive 12 different SHARE programs. A decision-making component added to the self-responsibility message of these health programs.

The Hall of Life was notable for the strength and extent of its outreach. All health programs were available outside as well as inside the Museum, taking place at health fairs, parent organizations, senior centers, corporations, community centers, as well as in schools. In fact, in 1993 Hall of Life programs reached as many individuals through outreach as through classroom programs in the Museum. With the Hall of Life as a model, natural history and cultural programs were taken off-site as well.

The Hall of Life influenced the culture of the Museum—in other words, its internal audience. Goddard established the Health and Safety Committee; its first and biggest accomplishment was a no-smoking policy for the Museum. A Wellness Committee provided staff development on topics such as breast cancer, heart health, and nutrition and arranged yoga and chair massages for staff. Health staff added interpretive aspects to the traveling exhibitions *Speed* and *Designer Genes*, and even influenced the decision to decline the traveling *Bill of Rights* exhibition because it was sponsored by the Philip Morris Company.7

**Health Sciences Audit**

In 1997 the Museum established the DMNH Core Competency Audit Committee to identify the strengths and weaknesses of each core competency and to make recommendations for improvement. The Health Sciences Report was submitted on July 14, 1998. It included a self-assessment by Hall of Life staff, the analyses of two outside evaluators (John Zaremba, executive director of the Robert Crown Center for Health Education, and Patricia Horvath, associate executive director of the Health Museum of Cleveland), as well as the committee’s own findings.

The report commended the Hall of Life exhibition for its interactive, individually relevant aspects, particularly the LifeCard system. Hall of Life programs were recognized for their strong outreach, wide variety of formats, and the loyalty and dedication of the core staff. The history of strong partnerships and collaborative relationships was also applauded. All evaluators observed the same weaknesses: “Hall of Life exhibits are static, outdated, and, in some cases, broken. They are not designed to include current knowledge and changing information on a regular basis.”8 Facilities were inadequate, including classrooms, offices, storage, equipment, and computers.

Evaluators saw health education programs and staff as exceptional but poorly integrated into the Museum. Horvath expressed surprise that when the independent Hall of Life came to the Museum, the result was not so much a merger as an add-on.9 Zaremba sensed that “the Hall of Life staff feels isolated from the Museum.”10 Both external auditors thought the operations of the Hall of Life were located too far down the Museum’s
organizational chart and that the Museum needed a PhD or otherwise qualified health sciences expert at the senior level.

**Restructuring Health Sciences**

The process of integrating health sciences as a core competency would take more than ten years, but the first step occurred when the Education Division was reorganized in 1997. The Hall of Life became a component of the Youth and Teacher Programs Department, and was no longer its own department. Integration went much further in 2002, when health staff and programs were combined with their natural and cultural history counterparts. All youth and teacher programs would be managed together, all adult programs, and all children’s workshops, no matter the subject matter. Budgets, grant writing, marketing—all would be combined. The result of this reorganization was that the Hall of Life no longer existed as a separate educational program. The name Hall of Life now applied only to the exhibition.

As expected, this merger was difficult and unpopular with the Hall of Life staff. Even bigger changes were to come. In 2004 the Museum was in a difficult financial position. All departments experienced substantial budget cuts, including staff reductions. Within this context, the administration looked hard at the Museum’s educational program, including its classroom programs, which were expensive to run, especially those in health. Attendance was declining, some supportive grants had ended, and program costs exceeded revenues. And there were pedagogical concerns. Richard Stucky, vice president for programs at the time, remembers that administrators questioned the Museum teaching such topics as sex education or helmet safety: shouldn’t these topics be taken care of in the schools? And was the Museum responding not to internal priorities but to the wishes and funding of outsiders? Furthermore, Ron Rohovit, then director of education, and others felt that children coming to the Museum should not spend time in classrooms at all; they should be active in the galleries and exhibitions. He preferred to apply funds to increasing programs and staff presentations on the floor. Because of these concerns, in 2004 the Museum discontinued all on-site classroom programs (outreach programs and tours were retained). Twenty-eight education staff, both full and part time, lost their jobs; 23 of them were health educators. In 2006 the Museum reversed itself: the guided tour programs were eliminated and classroom programs brought back. Health classes were the first to return.
Health Sciences Today, 2005–Present

In 2005, under the leadership of President and CEO George Sparks, the Museum completed a strategic plan, Museum 20/20. That plan’s very first priority was health sciences. Action items were to (1) establish a health sciences research department that included hiring a PhD-level curator, (2) renovate the Hall of Life exhibition, and (3) review all health sciences programming. All were actions intended to strengthen the health sciences core competency.

Health Sciences Initiative

The Museum hired its first curator of human health, Bridget Coughlin, in June 2005 and tasked her with establishing a research and collections plan for the new department and renovating the aging Hall of Life exhibition. A biochemist by trade, Coughlin had most recently been managing editor of the Proceedings of the National Academy of Sciences; she was thus both a scientist and a communicator—a good fit to lead the health sciences initiative. Coughlin and her team worked on a health science initiative feasibility study, submitting it to the Museum’s board of trustees in September 2006.

The feasibility study is an important document for understanding the mission, goals, and objectives of today’s health sciences core competency. It begins by recognizing the importance of health sciences to the Museum and the region. Health was then and still is today one of the Museum’s most popular topics, as evidenced historically by high attendance in the Hall of Life, in the two health-related temporary exhibitions, BODY WORLDS 2 and Grossology, and in health-related programs that preceded the study. The report notes the “enormous—and growing—disconnect between what science is discovering about health and how people live and take care of themselves.” Americans have difficulty understanding and using important health information because they are generally uncomfortable with science: only 17 percent of American adults are familiar with basic scientific principles; only 20 percent of Denver eighth graders meet state science standards. The study reported that other institutions around the country were opening or planning health galleries. Without a new health sciences program, including a permanent exhibition, the Museum was jeopardizing its leadership in informal health education.

Perhaps the study’s conclusion was no surprise: in order to have an integrated health sciences program and a strong core competency, the Museum needed to design and develop an entirely new health exhibition. The study proposed a new mission for health sciences: “to broaden visitors’ knowledge of human biology and inspire the application of these discoveries to their lives.” A new, renamed health sciences exhibition and a newly established health sciences research department would help carry
out this mission and address the issues in health sciences noted by the report. More ambitiously, the exhibition would be “one of the nation’s first great health sciences exhibits for the 21st century” and together with a strong research program would “advance the Museum’s goal of becoming the best regional science museum in the United States.” The Museum board of trustees accepted the study’s bold recommendations.

**Health Sciences Department**

Coughlin’s first step was to create a departmental research and collection plan that would establish policies appropriate for the greater Museum audience. Collections in other Museum core competencies generally derived from curatorial research. In contrast, items in the existing health collection—fetuses, hearts, and lungs among them—had been acquired to support the exhibits and programs of the Hall of Life. Coughlin has continued this practice, growing the collection based on the biology and physiology that the new health gallery, *Expedition Health*, explores. The current collection is small, but its 55 specimens are rare, unique, or of medical importance. They include plastinated (permanently preserved) cross sections of a human torso and a foot (Fig. 9.4), and a plastinated brain. The department is actively adding to this collection in the areas of anatomy, pathology, and histology.

The collection is important scientifically, but it is not the basis for curatorial research. Instead, Coughlin proposed a radical way to conduct health sciences research at the Museum: a community-based and audience-focused participatory lab. This would allow Museum audiences to be directly connected to research, not merely as observers but as actual participants in an authentic study run by volunteer citizen-scientists. In September 2008 the project, called the Genetics of Taste: A Flavor for Health, won a three-year Science Education Partnership Award in the amount of $654,641 from the National Institutes of Health. In addition, Coughlin successfully applied to the Western Institutional Review Board for approval to host human subject research at the Museum, an activity crucial to the success of the project.

![Figure 9.4. A plastinated slice of a human foot, one of 23 authentic anatomical specimens displayed in *Expedition Health*.](image-url)
Taste: A Flavor for Health

The Genetics of Taste is the inaugural research study of the Health Sciences Department. Undertaken in Lab Central of Expedition Health, this study is novel and authentic, with aspects that make it truly innovative; it is an excellent example of community-based participatory research. Citizen-scientists—volunteers extensively trained in the protocols of research on humans—help conduct the study. The subjects are Museum visitors who choose to enhance their Museum experience by participating in the study. And, the research questions were selected by the public.

The research focuses on the sequence of the gene tas2r38, cleverly pronounced “taster 38,” which was revealed by the Human Genome Project. This gene determines the ability to taste a specific group of molecules that are profoundly bitter to some and completely tasteless to others. Visitors record their taste perception to the harmless compound propylthiouracil; in addition, they can record nontraceable ethnographic information about themselves. “We hypothesize that where your ancestors came from thousands of years ago may have influenced how your tas2r38 gene evolved,” says Curator of Human Health Nicole Garneau. “If your ancestors came from a part of the world that had toxic, bitter-tasting plants, theoretically you should have the ability to taste the bitterness, and that ability to distinguish between edible and poisonous plants would have meant survival.” The study also examines any relationship between the density of papillae (the bumps on the tongue) and overall body fat, a measure related in part to the amount and kind of food we consume. Participants’ tongues are temporarily stained with a bright blue dye, allowing the papillae that contain taste buds to be easily counted (Fig. 9.5).

These simple experiments promote more learning than it might at first appear. Museum curators will publish results in both popular and peer-reviewed journals, thus contributing to the body of knowledge in health science. The citizen-scientists who administer the tests learn the research process and how to explain it and its purpose to the public. But from a Museum perspective, the visitor-subjects may be the most important learners of all. Community-based participatory research allows the Museum to connect audiences not only to expertise, but also to broader scientific knowledge and process as visitor-subjects become active participants. They personally experience a specific result of the Human Genome Project. They learn the relationship between genetics and anatomy as they pertain to food preferences, and the possible effects of food preferences on their own health. They learn the workings of evolution in their own bodies. This project is an engaging learning experience that makes abstract and complex scientific concepts personally relevant and readily understood.

Figure 9.5. This visitor’s tongue has been dyed blue and a portion isolated within a circle one centimeter in diameter. A volunteer citizen-scientist will count the number of papillae (the red bumps that resist the dye) and include the data in the Genetics of Taste research program.
In the midst of this research-focused activity, Coughlin was also the scientific advisor on the core planning team for *Expedition Health*, which opened in April 2009 on time and under budget. And as if that weren’t enough activity, in 2006 Coughlin added deputy chief curator of the Research and Collections Division to her responsibilities. In 2010 she was promoted again, to be the Museum’s vice president for strategic partnerships and programs, a position she currently holds while still maintaining her position as a curator in the Health Sciences Department.

In October 2009 Nicole Garneau, a molecular geneticist, became the Museum’s second curator of human health. With Coughlin’s promotion to vice president, Garneau took over both the position of chair of the Health Sciences Department and the lead of the Genetics of Taste research study.

The community-based lab is not restricted to volunteer citizen-scientists, but also supports departmental outreach. A highly competitive application and interview process, which takes place yearly, leads to the selection of two to four Teen Science Scholars who work on health sciences research as paid interns in the summer—a very direct and personal way of teaching science and encouraging scientific careers (Fig. 9.6). Often working in partnership with universities, the Health Sciences Department has also offered summer internships to undergraduates. Additionally, Garneau
cochairs the Education Committee of the Colorado BioScience Association. In this role she helped the association launch its undergraduate internship program and hosted one of the first “externs” as part of a program for local high school science teachers to gain updated experience in the field of biotechnology.

Today’s Health Sciences Department is active in pursuing both good science and science communication. Curators reach public audiences through research, delivery of engaging talks and presentations, and by providing science expertise for all health-related exhibits and educational programming. Garneau reached more than 5,000 people through direct outreach in 2010 and an additional 15,000 online through blogging and video streaming. For this achievement, the American Association for the Advancement of Science honored Garneau as a finalist for its 2010 Early Career Award for Public Engagement with Science.

New to the Museum in 2010 was the launch of a Science section on the Museum’s website. This next step in communication allows curators like Garneau to take science beyond the Museum’s walls. The star of the Health Sciences section of the Museum website is Garneau’s alter ego, Yo Pearl the Science Girl. She blogs and tweets and answers questions about genetics or reacts to issues of the day. The website has become a resource not only for engaging a greater audience but also for connecting visitors to real scientists and real research in the Health Sciences Department.

**Expedition Health**

The Museum opened *Expedition Health* in April 2009. Like the Hall of Life, it makes the Museum experience personal and relevant. It uses the Peak Pass, a version of the Hall of Life’s LifeCard, and incorporates interactive exhibit components and staff facilitation. The exhibition targets families with school-age children and gives consideration to the region’s changing demographics and its growing underserved audiences.

In many ways *Expedition Health* goes beyond the Hall of Life. The exhibition’s primary focus is not on specific diseases and their prevention; rather, its aim is to teach visitors about the body’s biological and physiological processes. *Expedition Health* is also more embedded in the Museum; it is more like other exhibitions in its extensive use of authentic artifacts and anatomical specimens. More than half of the exhibition components contain specimens, 23 in all. Many more are used in the exhibition’s demonstrations, shows, or carts, and they are also used in educational classes and labs. Most notable are the two full-body plastinized hikers, the first on permanent display in any museum.
The Hikers

Of the many inspiring and exciting exhibits within *Expedition Health*, the most iconic is *The Hikers* (Fig. 9.7). Although installed two years after the exhibition opened, *The Hikers* was not an afterthought. In fact, the exhibition’s design team knew from the beginning that they wanted to include authentic anatomical human specimens to complement the interactive exhibits. They included 23 such specimens and planned for a spectacular addition: two human figures permanently “plastinated,” that is, preserved through a patented process in which body fluids are replaced with liquid plastic. Unlike individual organ and tissue specimens, which are often readily available, the full-body specimens would take time to secure, dissect, position, cure, and finally mount for display. At times the dream of two full-body plastinates seemed to be just that. The first obstacle was quite simply that no museum had ever done this.

Gunther von Hagens, the eccentric genius behind the plastination process and the hugely popular *BODY WORLDS* traveling exhibitions, had previously ignored all requests from museums across the world for donated bodies. Would he treat this museum any differently? In 2005 Coughlin traveled to von Hagens’s Institute for Plastination in Guben, Germany, to find out. She described to von Hagens the extraordinary success of the *BODY WORLDS* 2 exhibition when the Museum hosted it in 2005: huge attendance numbers, greater than those experienced by museums in cities such as Los Angeles or Chicago with much larger populations, a testament to Colorado’s interest in health and wellness. She described the vision for *Expedition Health*, with its emphasis on the human body, its commitment to authenticity, and its conviction that the plastinates could best teach anatomical lessons. She told of the partnership with the State Anatomical Board of Colorado, which would provide third-party oversight of the donation process, and of the support of an ethical advisory group that had carefully considered spiritual and moral issues. She did all she could to demonstrate the Museum’s scientific credibility. Meeting in their lab, von Hagens and his staff pulled out *Gray’s Anatomy*, *BODY WORLDS* catalogs, and other volumes and discussed how plastinates might be used in the exhibition. But von Hagens was noncommittal and difficult to read.

At teatime he packed up the books, disappeared into his office without a word of encouragement, and began playing his violin. Left alone in the lab, Coughlin figured she was listening to the proposal’s swan song and prepared to leave Germany without the promise of the plastinates. Suddenly, as she describes it, von Hagens burst from his office. “He slams his hands down on the table and says, ‘I have got it! I know the position. This will be fantastic. Stand on that chair, reach out like that … I can see it now. OK, this is good.’”

Figure 9.7. *The Hikers*, two plastinated human bodies immortalized in a single moment of their climb. The journey to bring *The Hikers* to the Denver Museum of Nature & Science was made possible by Kathy and Stephen McConahey. Inspired by the *BODY WORLDS* traveling exhibition, they were determined that the Museum should permanently display plastinated figures, and it did, thanks to their generosity and long-standing commitment.
Von Hagens was convinced and felt his team was prepared for the selection, dissection, positioning, and final preservation of donated bodies in a way that was custom-made for Expedition Health. The process would take six years, and it would become a genuine partnership between von Hagens, his team, and the Museum. The Museum prepared a 64-page manual illustrating just how the bodies should be dissected, how brain, nerves, muscles, and internal organs should be shown to best illustrate the body’s intricate and beautiful anatomical coordination. Another manual illustrated the positioning of the bodies, with the skeletal system on top, helping the muscular body climb a rock face. A medical illustrator also helped interpret the nuances of the design team’s vision. Six times during the preparation of The Hikers Coughlin flew to Germany to approve the chosen cadavers and to oversee various stages of the process. She dedicated one trip entirely to the ethical and legal review of the body donation process. This is the process that permits individuals to make a declaration of will during their lifetime so that upon their death their body may be preserved and used for public education in a museum setting.

Project manager Bryce Snellgrove also visited Germany to see The Hikers and take their measurements, since he was responsible for coordinating the design, fabrication, and installation of the exhibit. The Museum commissioned rock fabricators and glass manufacturers and held them to the same high standards of production required for the figures themselves.

Finally, on June 3, 2011, the Museum unveiled The Hikers, becoming the only museum to permanently own and exhibit two full-body plastinates.

The “big idea” of Expedition Health is that “the human body changes in ways that we can see, measure, and optimize.” To realize this big idea, the exhibition centers on a narrative: the authentic attempt by a very diverse group of Colorado residents to climb a local mountain, Mount Evans. The story line places the exhibition in Colorado and in the natural world, appropriate for the Museum’s natural history content and its regional focus. And it creates a coherent exhibition experience that feels like an adventure. As the exhibition’s concept phase report explains, “Personalization is key.” Visitors first sign in electronically via a Peak Pass on which they will record data about their own bodies generated during the visit (Fig. 9.8). Then they choose a “buddy” from the real expedition team to act as a guide and interpreter. A mix of experiences throughout the exhibition interweaves health science content and the expedition story. Sometimes the visitor’s journey is physical, sometimes emotional, sometimes intellectual. It can be private or can become social during interactions with staff, volunteers, or other visitors—or with the virtual buddy, an innovation derived from the tested success of peer learning. Different environments within the exhibition are geared to visitors of different ages, interests, and learning styles.

Figure 9.8. At the end of their visit to Expedition Health, this family reviews the information about their bodies recorded as they participated in the exhibition’s various activities.
Expedition Buddies

In August 2008, 12 Coloradans (Fig. 9.9) set out to climb 14,258-foot Mount Evans, an iconic peak in Colorado’s Front Range that is visible from the Museum. The climbers were good representatives of Colorado: a mixture of ages, backgrounds, and ethnicities, covering a range of health and fitness. They persevered through blisters, aching muscles, and altitude sickness, but fog and cold turned them back just short of the summit (Fig. 9.10). Even though they did not stand on top, the climbers felt they had accomplished their goal.

The climb was not their only achievement, however. Nor were they alone. A seven-person professional video and photography team went along and recorded the event, creating material that would be used later in *Expedition Health*. These 12 climbers were to become *Expedition Buddies*—partners on a Museum visitor’s journey through this new exhibition.

At the entrance to *Expedition Health*, visitors see pictures and read descriptions of the buddies and choose one to accompany them. At various places in the exhibition, when the visitors’ computerized Peak Pass is activated the buddies speak in their own voices and in their own words to the visitor, describing their training and experience and explaining human biology and health as they know it.

Although the Museum advertised only minimally for these volunteer positions, more than 500 people applied. The selection process included auditions before a casting firm, an essay, and an on-camera interview. The Museum did not want actors, however, but real people who spoke authentically. The buddies are a form of peer learning, an educational technique that has proved successful in more traditional educational settings but is an innovation in a museum. It seems to be working: visitors apparently enjoy the company of a buddy, and many say they repeat their visit just to experience it with a different partner.

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Figure 9.9. All 12 buddies at the beginning of their journey up Mount Evans.

Figure 9.10. Buddies during a fog-shrouded portion of their trek.
Research has shown that individual museum visitors (and presumably also those in organized groups) expect entertainment, education, and social time from their visit. They want to have fun while learning. They don’t want to be lectured or made to feel guilty about their bodies or behaviors. Knowing this, exhibit planners resisted pressure from advisory groups to focus on issues like obesity or diseases that have little meaning to children. Instead, they planned an active exhibition where visitors experience how their own bodies react to the typical stimuli of an expedition. The various exhibits allow visitors to record their heart rates as they exercise, measure their stride lengths, watch their pupils dilate, or feel the effects of windchill (Fig. 9.11), among other engaging activities.

In addition, educators and performers give shows and demonstrations daily on the Summit Science Stage. In Pirates of the Human Being: Meet Your Microbial Mates, for example, students meet the “microbial mates” that live in and on their bodies. Volunteers with carts provide hands-on activities to help visitors learn about the anatomy of the brain or how bones are composed of cells and are alive, just like our moving muscles. Sitting in the Body Trek Theater, the region’s first “object theater,” visitors vicariously experience the climb up Mount Evans with Teal, a Colorado teacher selected to represent the Museum on film, and then they experience special effects in the theater (Fig. 9.12). Of Expedition Health’s many innovations, the most ambitious and far reaching may be the laboratories included in the exhibition. In addition to Lab Central’s Genetics of Taste research project, the laboratory space known as Biology Base Camp is intended for families and school groups and allows visitors to become scientists. They don gloves, goggles, and lab coats and perform various experiments or explorations in nutrition or cell biology, testing their hypotheses. The many exhibits within the larger Expedition Health, though varied in content and format, all develop the same theme in different ways. As they leave Expedition Health, visitors should walk away thinking, “My body is amazing and changing all the time.”

Figure 9.11. In this interactive exhibit on the effects of windchill, the young girl places her hand in a wind stream and monitors its temperature as capillaries contract, bringing less blood to the area.

Figure 9.12. Bridget Coughlin in 2008, rewriting the script on location for the BodyTrek Theater show in Expedition Health.
Biology Base Camp is a 1,200-square-foot wet lab within Expedition Health. Visible from the exhibition floor and open to the public, it accommodates up to 30 visitors and volunteers. Designed for group participation, Biology Base Camp appeals to family and school group audiences. Visitors don gloves, goggles, and lab coats and select one of five lab benches where they can perform experiments testing their own hypotheses. A “computer tutor” gives step-by-step instructions onscreen, and volunteer facilitators are present to answer questions and offer assistance.

In some experiments, these new scientists are able to see their own cells—a powerful experience, especially for children. In Battle Bacteria, visitors apply different agents, such as bleach or hand gel, to a bacterial culture and then use fluorescent dyes to compare the agents’ ability to kill the bacteria. In Food Chemistry, participants develop a hypothesis about the percentage of sugar in some popular breakfast cereals and then test their hypothesis by extracting the sugar and measuring it using a refractometer (Fig. 9.13). These experiments present visitors with relevant questions to answer, opportunities to look at the results, and the ability to easily repeat the experiment. Thus they learn the scientific process, not in the abstract but by doing. They are also encouraged to consider the health implications of what they learn at the bench.

Biology Base Camp is modeled after similar successful labs at the Science Museum of Minnesota and the Maryland Science Center. Upon opening, it became only the third such lab in the country. 

*Expedition Health* has been recognized nationally for innovation and effectiveness. The Association of Science-Technology Centers gave it the prestigious Roy L. Shafer Leading Edge Award for Visitor Experience. And the Hungry Hiker: Build a Meal computer game (Fig. 9.14) won the Apps for Healthy Kids competition, which is organized by the USDA as part of First Lady Michelle Obama’s Let’s Move! campaign. Visitation has been the best proof of success. During its first 18 months 730,000 people experienced the exhibition, with 30 percent as repeat visitors—a remarkably large percentage in such a short time (Garneau & Hostetler 2010). Moreover, evaluators discovered that visitors spent more time in this exhibition and used it much more intensively than in other exhibitions of comparable size and theme.
Health Sciences Programming

As in the days of the Hall of Life, the Museum offers avenues for health education to complement Expedition Health. Not only does every exhibit correspond to one or more of the Colorado Science Standards and the National Health Education Standards, but the Museum’s website offers an online teachers’ guide to the exhibition and includes background health information and classroom activities.

Health sciences programming is now well integrated into the Museum, both in galleries by the Museum Programs Department and in classes and workshops by the Youth and Teacher Programs Department. Classroom programs on health for school groups continue to be the most numerous and well attended of any Museum programs for youth. (The 2010–2011 school programs brochure listed 34 programs on different health science topics offered either at the Museum or in the schools.) Some titles are familiar: You’ve Got Guts and New Me: Puberty began with the Hall of Life. Labs still include dissections of animal hearts, lungs, and eyes. But now biology is emphasized, particularly anatomy and physiology. Courses on drug, alcohol, and tobacco use and other prevention-focused programs have been discontinued. Today there are virtual classes: through videoconferencing, students in their classrooms interact with an educator in the Museum and observe a dissection of a heart or lung to learn about circulation or respiration. Another distance-learning program, Scientists in Action, also uses videoconferencing equipment so that students in school auditoriums, assembled in the Museum, or even in children’s hospitals around the country can accompany scientists in the field or in their labs. In 2010 and 2011 Garneau was the scientist in action during Healthy, Unique You, a virtual examination of her work in genetics and its bearing on one’s health (Fig. 9.15). This free program expressly targets students in schools with lower-income populations. Another recent program, Passport to Health, extends the experience of the Museum’s Expedition Health exhibition to fifth graders at 30 low-income schools in the Denver metro area. It provides field trips, family days, and resource materials. Funded by the Colorado Health Foundation, it is free to the schools and is intended to increase students’ understanding of health science, raise their science literacy, and inspire them toward healthy lifestyles.

Teachers recognize the importance of health science but are often uncomfortable incorporating it into their science curriculum. To help, the Museum offers professional development classes. The Genetics of Taste workshop is a three-day summer institute that takes place in the lab in Expedition Health. Using its research on taste, the workshop shows how the health triad (genetics, choices, and the environment) affects body systems. Several spaces in this workshop are designated for teachers in school districts with large populations of low-income families or low-science-performing
students. In 2012 Body of Knowledge, a course for practicing fifth-grade teachers, offered online instruction as well as face-to-face meetings to help teachers understand key concepts in health science and learn how to make it relevant to their students’ lives through cutting-edge teaching technologies. Both workshops offer college credit.

As the first health exhibit educator/coordinator, Nancy Walsh was part of the core planning team for Expedition Health, contributing her expertise in informal learning and visitor experience. Now as director of Museum Programs, she continues to guide programming in this core competency both for families through Visitor Programs and for adults through the Adult Programs Department. Walsh’s successor as coordinator for health sciences, Brian Hostetler, develops the live programs in Expedition Health, including shows and touch carts, and he trains the staff and the 200 volunteers who conduct them. He is also a member of the core team responsible for the exhibition.

Evening programs for adults frequently focus on health science topics. These programs can be serious or fun, and usually they are both. During Medical Shows: Fact and Fiction, attendees watched clips from favorite TV melodramas such as House, Scrubs, CSI, and Grey’s Anatomy, then laughed and learned as curators Coughlin and Garneau discussed what was real, what was invented, and what could have been malpractice. Both curators have contributed to episodes of Science Lounge, the Museum’s offbeat, lively program for adults ages 25 to 45: Wine and Chocolate (the science behind antioxidants), The Science of Beer (the chemistry of ale) (Fig. 9.16), and Science with Altitude (the body’s response to high elevation). More traditional formats also make health sciences relevant, accessible, and interesting. Such was author Rebecca Skloot’s lecture on The Immortal Life of Henrietta Lacks, a story that raises disturbing bioethical questions about human experimentation.
Finally, health sciences programming is supplemented by a long history of community partnerships. For many years, the Museum has hosted the annual Tar Wars poster contest sponsored by the Colorado Academy of Family Physicians Foundation. On special days each year, Delta Dental, Kaiser Permanente, OR Nurses, and others set up displays and conduct activities in the Museum. For several years while their new facility was under construction, the University of Colorado School of Medicine conducted their Mini Med School at the Museum, and Bridget Coughlin taught several of the classes. Partners like 9Health Fair and the Mabel Y. Hughes Charitable Trust have provided scholarships or funding to support programming.

The Future

Barely 25, health sciences is a newcomer in the Museum’s long history. Yet its contributions have been significant. This core competency has generated some of the largest numbers in the Museum in terms of visitors, students, partners, volunteers, and grant and donated dollars, and has changed the way the Museum thinks and operates, particularly when it comes to planning permanent exhibitions. The Hall of Life’s personal and participatory format led directly to Space Odyssey and ultimately to Expedition Health. The Genetics of Taste lab is not only unique in a museum context, but it is the first community-based and audience-focused lab in the country that conducts real molecular genetics research. Paradoxically, then, health sciences at the Denver Museum of Nature & Science is both a late arrival and a pioneer.
Literature Cited


Endnotes

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