

UNIVERSITY OF COLORADO BOULDER

ACADEMIC REVIEW AND PLANNING ADVISORY COMMITTEE

FINAL REPORT FOR THE CU MUSEUM OF NATURAL HISTORY

Presented to Provost Russell Moore

February 4, 2015

Accepted:



Provost & Executive Vice Chancellor for Academic Affairs

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: Date

REVIEW PROCESS

The review of the CU Museum of Natural History (“Museum”) was conducted in accordance with the 2014 review guidelines. Self-study responses were prepared by the unit and reviewed by an internal review committee (IRC), which found that the report was complete and certified that the unit had adequately responded to the mandatory questions on diversity, assessment, and mentoring and had supplied a copy of the unit’s bylaws. An external review committee (ERC) visited the unit during April 2014, reviewed the relevant documents, and then met with faculty, staff, students, and university administrators. The reviewers’ comments and recommendations are cited at appropriate points. This public document reflects the assessment of, and recommendations for, the Museum of Natural History as approved by the members of the Academic Review and Planning Advisory Committee (ARPAC).

II. OVERVIEW OF THE UNIT: INSTRUCTIONAL PROGRAMS AND RESEARCH/SCHOLARSHIP/CREATIVE WORK

The campus’s standardized description of the unit may be found on the website of the Office of Planning, Budget and Analysis (PBA) (<http://www.colorado.edu/pba/depts/arp/index.html>). PBA updates the profile annually in the fall semester.

Established in 1902 by the Board of Regents, the Museum has the distinction of being the first CU-Boulder institute. The Museum is the steward of over 4.5 million unique cultural objects, artifacts, and plant and animal specimens that document the climate, environment, and evolutionary life cycles of the Rocky Mountain high plains and southwest region of the United States. Stewardship of these collections entails collecting, housing, preserving, providing access to, and instructing the campus and the general public in natural history through the use of its irreplaceable cultural, biological and environmental assets.

The Museum has a three-fold mission: 1) to be a top natural history museum, 2) deliver a quality master’s program in museum and field studies, and 3) further the educational mission of the university through public programming. Administratively it is divided into four divisions: 1) collections and research, 2) public programming, 3) the Museum and Field Studies graduate program, and 4) administration.

Faculty and Staff

The Museum director reports to the dean of the Graduate School. Faculty rostered in the Museum are “faculty curators,” “curation” being defined as possessing the academic expertise to develop a collection and conduct research with specimens, artifacts, or objects. Faculty curators receive tenure and promotion review in the cognate department in which they teach, and merit evaluations are conducted in both the

primary unit and cognate department. The 2013-2014 PBA unit profile reported nine rostered tenure-track and tenured (TTT) faculty curators, in addition to one director/instructor. The 2013 self-study listed ten Museum faculty: one full professor and one assistant professor with tenure homes in Anthropology; two full professors, two associate professors, and one assistant professor in Ecology and Evolutionary Biology (EBIO); and two associate professors and one assistant professor in Geology. These faculty members conduct research in five disciplines: anthropology, botany, paleontology, entomology and zoology. One EBIO associate professor will depart in December 2014 and a search is underway to hire a replacement. The self-study reported that three members of the faculty are male, two of the seven female faculty are members of underrepresented groups, and some identify as members of the LGBTQ community.

Twenty-six professional staff are university staff (collections managers, public section staff, and administrative staff); seven are non-TTT or research faculty members; and twelve are GA/GRAs. Including ten faculty, there are a total of 55 museum employees (40 female and 15 male) who are full and/or part-time personnel. Diversity statistics for regular museum staff are as follows: 46 white employees, two Hispanic, four Asian, one African American, and two who chose not to disclose their background. Excluding the latter two individuals, seven (15.2%) of the 55 Museum staff are members of underrepresented groups. Of the 37 student assistants, most are undergraduates; 28 are white, two Native Americans /Alaska Native, four Hispanic, one Pacific Islander, and two Asian Americans.

Additional Museum personnel categorized as “Without Compensation” (WOC) appointments total 51 in number. The self-study describes these colleagues as “affiliated researchers from other institutions, retired curators, curators adjoint, and volunteers” who contribute to the research and/or growth of the collections. WOC diversity statistics are as follows: 34 are white, 2 are Hispanic, 14 chose not to disclose a status, and 1 is Asian. Twenty-one WOCs are female and thirty male. In total, Museum personnel include 143 faculty members, professional and administrative staff, WOCs, and student assistants, with 83 females (or 58%) and 60 males (42%). The majority of personnel are white (108, 75.5%); eight are Hispanic (5.6%), seven Asian (4.9%), one African American (0.7%), two Native American /Alaskan Native (1.4%), one Pacific Islander (0.7%); 16 (11.2%) preferred not to disclose their race or ethnic identity.

Instructional Programs

The Museum delivers a master’s of science degree in Museum and Field Studies (MFS) and a professional certificate. This unit does not manage an undergraduate degree but does participate in undergraduate teaching through its cognate departments and supervises students in Undergraduate Research Opportunities Program (UROP) and graduate-level research. The Unit Profile reports that the TTT faculty ranks first out of 51 units in undergraduate SCH which translates into greater service teaching. This statistic

is slightly misleading because it involves teaching undergraduate courses in the cognate departments. The Museum faculty evaluation model is 40% research, 20% curation, 20% teaching, and 20% service. The curation responsibilities of Museum faculty members contribute to their success in teaching, collection development, and disciplinary research. For example, exhibit curation requires disciplinary knowledge to interpret scientific concepts that educate the K-12, campus, and public audiences.

Budget

The Museum operates on four sources of funding: 1) general fund and Departmental Administration Indirect Cost Recovery (DA-ICR), 2) auxiliary funds, 3) contracts and grants, and 4) gift funds. The self-study reported a 2013 budget of \$4,045,252 to support on-going operations and museum administration. The five research areas (Anthropology, Botany, Entomology, Paleontology, and Zoology), and Public sections are funded from the general fund for university staff and graduate student salaries, student hourly pay, operating, and travel expenses. Forty faculty and staff positions were funded from the General Fund “while some 110 staff lines were funded from a variety of other funding sources.”

Fund	Allocation	Percentage
General Fund	\$2,408,214	60%
Contracts and Grants	\$1,450,519	36%
Auxiliary Funds	\$ 73,414	2%
Gifts and Endowments	\$ 113,105	2%
TOTAL	\$4,045,252	100%

The Museum experienced a marked increase in contract and grant awards during the review period. A total of 35 collections-based research grants were awarded since the previous program review cycle. The combined seven-year total dollar amount of faculty grants awards (\$7,580,398), including awards through other units (\$4,107,887), through FY2013, was \$11,688,401 for 116 awards. It is significant to note that NSF Thematic Collections Network (TCN) grants are highly competitive, multi-institution digitization grants, and the Museum collaborates on four of these projects. This figure is remarkable in light of the fact that only eleven such awards are made across the country. The 2003 AAM Accreditation Report noted the increase in grant awards at the time of the accreditation process and cited the need for additional administrative support to manage award finances.

Auxiliary funds consist of the following sources: gift store sales, education workshops, events, image rights, book royalties, and sales of collection management services. Monies from these unrestricted funds help support graduate students; purchase course materials, lab supplies, and equipment upgrades; and public education programs. The self-study reported a FY2013 end-of-year principal amount of \$2,637,577, stating that this was a 22% increase since FY2007. Gift funds are used according to specific directives

and support collection management, student research, scholarship, and other activities at the director's discretion.

Space

Museum offices, laboratories, exhibit, and collections spaces are housed in four different locations for a total net assignable square footage of 66,081: Henderson houses the anthropology collection and faculty, administrative, and public education staff; Curtis houses the paleontology, entomology, and zoology collections and personnel; Clare Small houses botany; the Museum's East Campus space consists of two meat lockers that house low-use collections, equipment, and library collections.

III. HISTORY OF PROGRAM REVIEW

The Museum first underwent program review in 1985, with subsequent reviews in 1992, 1999, and 2006. One issue has been consistently documented over the thirty-year review period: a lack of adequate physical infrastructure for collections. The dire physical condition of the facilities and collections is reported in each cycle, as is the lack of collection storage and office, lab, and exhibition space. Renovations have occurred, most recently the remodeling of the Bruce Curtis (MCOL) building in 2001 prior to the Hunter building demolition in 2002; while helpful, these efforts have not ultimately resolved the problems facing the collections. Space, specifically the condition of Henderson and Clare Small, remains front and center in the current self-study, as well as in the IRC and ERC reports.

The 2014 ERC expressed concern about the facilities and their impact on not only the collections but also the staff and students. They note that physical space, or lack thereof, and current configurations of existing space, make it difficult for curators to interact and develop synergy across the Museum. The IRC recommended that the ERC address the possible loss of accreditation due to their storage conditions. The ERC agreed that the physical infrastructure is "abominable" and wrote that the Museum "would be hard pressed to accredit the mammal collection" but did not specifically state that accreditation might be lost as a consequence of not addressing building and collection space issues. The ERC summed up the Museum's situation as critically in need of a new physical infrastructure. They concurred with the IRC that a shared facility (e.g., shared freezers) would help create efficiencies and foster intellectual exchanges across the Museum.

That faculty are rostered in the Museum but earn tenure in cognate departments was debated throughout past reviews. The 2014 IRC also observed the "awkward integration of curation activities in the University model of split appointments." It recommends "a peer-evaluation system for curation activities." The ERC noted that the Museum's merit review is a complicated dual-review process and that, while not an obvious systemic

problem, there is a need to clarify the process for junior faculty early in the tenure-track process. They observed that improved communication between the cognate departments and the Museum might help the situation. Junior faculty members expressed concern about the comprehensive and tenure reviews, stating that there is a lack of communication about expectations. ARPAC notes that CU-Boulder has a number of faculty members who are reviewed in both a department and an institute.

Past program reviews also commented on the faculty's research productivity and teaching, stating that faculty members should increase their publication rates and secure outside grant funding. Other issues brought to light include assessment of the MFS master's program and the growing importance and necessity of information technology (IT) as it relates to the cataloging, management, access, digitization, and archiving of the Museum's unique collections.

In 2006 the Program Review Panel (PRP) summarized the situation in this way: "Overall, it seems to us that the museum is poised to be a great institution, held back most critically by physical facilities and funding." This statement was followed by the recommendation to hire a director "with an external and fund-raising experience." The Museum accomplished this goal when a director with significant fund-raising experience was hired in 2008. He subsequently led development of an ambitious FY2010-2019 strategic plan.

The unit was also encouraged to increase the number of visitors and specifically target school groups. The current self-study documented visitors and inquiries and noted that "from 2006 through 2013, the museum welcomed more than 1,356,000 visitors both on, and off, site." These data include attendance tracked at traveling exhibit venues. Additionally, the unit experienced a significant increase in campus and public visitors to Henderson Building exhibits and events.

In addition to the recommendation to hire a new director and increase attendance, the 2006 PRP committee recommended the following: that the Museum "re-align its advisory board into a fund-raising and development board; expand teaching MOUs to include service recognition; review the certificate program and re-evaluate the relationship between the two tracks in [the] MFS program with an eye to improving the Administrative track, or further regularizing its teaching by faculty as opposed to adjuncts; and consider seeking designation as a 'state museum.'" Some progress in these areas has been made and is addressed in the analysis section.

The 2006 Program Review Panel made the following recommendations to university administration: 1) permanently fund the informatics coordinator, 2) add a faculty line with expertise in museum informatics, 3) continue to hire per the faculty's strategic plan, 4) make the museum's physical plant needs a priority, 5) make the Museum a prominent element in the next capital campaign and attach a development officer to the project, and lastly, 6) work with the Museum to seek designation as a "state

museum.” No additional hires were made, and some renovations to Henderson were conducted since the last program review. The Museum was not featured as a prominent capital campaign element, nor did it receive the attention of a development officer for such a purpose. As a result of continued physical plant issues, the unit did not further investigate a “state museum” designation.

During the exit interview with ARPAC, the ERC highlighted three items of importance. First, they stressed that CU-Boulder holds world-class collections ranging from the individual collections (e.g., the Navajo Rug and Southwest Pottery collections) to its collections as a whole. The biological collections are significant to track climate and evolutionary change. The ERC stressed that the Museum is in a period of growth in all aspects and the public education component is in an upward trajectory. They noted that the Denver Museum of Nature and Science (DMNS) does not have the size and scope of CU-Boulder’s collections, but it benefits from being a direct line-item in the state budget.

The ERC complimented CU-Boulder’s hire of the Museum Director, Patrick Kociolek, and observed that the curators and staff are happy despite being located in three buildings and challenged with pests and flood issues. Museum personnel are complimentary of their director as are the chairs of two cognate departments.

IV. THE MUSEUM IN A CAMPUS CONTEXT

Museum faculty members contribute to the educational mission by teaching in cognate departments, offering MFS graduate education, and delivering public educational programming. The MFS, as described in the Museum’s strategic plan, aims to train the next generation of museum professionals. The Museum also perceives itself as one of the University’s many public faces, in part by instructing the campus and the general public about the natural world through exhibits, online projects, and educational programming. The Plan notes that the “Museum’s approximately 30 docents provide hands-on support to school groups and other visitors as they experience the Museum’s exhibits.”

The self-study notes that the Museum helps to “communicate science —the science that is done at CU—and helps the university reach out to the people of Colorado,” and that it is “a convening and gathering place for a wide range of communities in science and many other disciplines.” The strategic plan envisions and asks administration to support a “cultural crescent on campus,” which will “span the area from the Museum of Natural History to Macky Auditorium, and will include the new Visual [Arts] Center, Fiske Planetarium, and other cultural assets on campus. Building a cohesive brand for these cultural assets will enhance visibility and expand the economic impact of these cultural institutions.”

With grant funding, the Museum's Outreach Program took on many innovative projects, some examples of which are the development of travel kits for classroom use across the state and a kit for distribution to senior centers as well. Outreach staff manage three Citizen Science projects, with two that engage online audiences: the transcription project, *Notes from Nature*, (<http://www.notesfromnature.org>), hosted by Zooniverse, a portal for "web-based citizen science projects," *Condor Connections*, (www.condor-connection.org); and *The Bees Needs* (<http://beesneeds.colorado.edu/>), a field-based project that relies on citizen reporting of careful observations about bees and wasps in the Boulder area. Thus, the Museum's role on campus includes not only the preservation of its collections and their use for research but also forging a network of partnerships and engaging in significant public outreach.

The self-study notes that from FY 2006 through 2013, the museum "received \$269,997 in awards and grants specifically for program and exhibition creation and delivery; \$94,028 in event and programming revenue; and \$65,505 in revenues from hall rentals and traveling exhibits." A successful STEM program, Girls at the Museum Exploring Science (GAMES), begun in 2002, was recognized by the Mountain-Plains Museum Association in 2005 with an Award for Excellence in Programming. Half of the participants in this outreach program have been young Latinas. The Young Explorers Grant Workshop connected undergraduates with scientists and photographers and exceeded expectations. These are just two of the numerous programming successes documented in the self-study. Increased programming has helped make programs like BioLounge a success, but these accomplishments have been achieved without increased staffing. Museum staff expressed concern with their workload when they met with the ERC.

V. THE MUSEUM IN A DISCIPLINARY CONTEXT

No association ranks museums and/or museum graduate programs. In general, two types of museums exist, those that are free standing and those with research and collections at the forefront. Of the latter, and particularly those that are university-based natural history museums, the difference lies in size of faculty, collection size and scope, grant awards, and physical plant conditions. The Museum suggests that the following natural history museums are peers: University of California, Berkeley; Harvard University; University of Florida; University of Kansas; University of Michigan; University of Oklahoma; University of Utah; University of Washington; and Yale University. Even these peers can differ markedly, however. The University of Utah, for example, has greater attendance, but their faculty members secure smaller grant awards. The University of Oklahoma has a bigger staff and is focused on attendance.

CU-Boulder's Museum is in part a teaching museum. The 32-credit-hour Museum and Field Studies Program (MFS) results in an MS degree, with a 12-credit-hour MFS Professional Certificate also offered. The latter is sought either by degree candidates in other graduate programs on campus or by mid-career museum professionals seeking

continuing education. MFS students must complete cognate coursework, the most popular being in the natural science departments of Anthropology, EBIO, and Geological Sciences. While many Certificate students' home departments are also in these disciplines, the Museum has in recent years developed relationships with the departments of History and Art & Art History in both the MS and Certificate programs and has actively sought similar relationships in order to expand the reach of their programs. There are two tracks (collections/field and public/administrative) in these programs, and students are required to pass comprehensive examinations and complete either a thesis or culminating project together with a 150-hour internship outside of CU (75-hour for certificate students). The program is noted for its experiential learning, its cadre of campus relationships, and its partnerships with museums across the region.

One issue of crucial importance for museums for the last two decades has been the Native American Graves Protection and Repatriation Act (NAGPRA), which requires institutions that receive federal funding to return Native American cultural items to tribes and descendants. Anthropology faculty and staff are nearing completion of the process, begun in 2003, and CU-Boulder is seen as a model in managing the process in a compassionate and inclusive manner. NAGPRA responsibilities were undertaken without additional staffing. The self-study reported that the "last of the humans remains is to be repatriated before the end of 2013" and what remained to be done were consultations "on objects of cultural patrimony and sacred objects." While this responsibility appears administrative in nature to comply with federal law, this process is informed by the curatorial nature of the faculty and collection managers' positions. The self-study explained that "as of this writing [Fall 2013], 645 individuals have been repatriated to tribes, along with all 737 funerary objects and 12 sacred and cultural patrimony objects."

VI. ANALYSIS

ARPAC joins the 2014 ERC in praising the Museum's record of accomplishments since its last review. It has made significant strides developing research collections and a publication record. The strategic plan observed that Museum faculty received grant awards at a higher percentage than "was observed in the cognate department. Nearly all of the Museum's faculty received a grant award in FY09, (seven of nine) compared to only 52 percent in Anthropology, 36% of those in EBIO, and 19% of those in Geological Sciences." The Museum has more than doubled extramural funding. The rate of research productivity for the Museum faculty has also significantly increased since the last program review. According to the self-study, "since 2006 Museum faculty have published 243 papers and book chapters (published or in press), five edited volumes, and two books. This represents more than a doubling of publications by museum faculty since the last PRP." ARPAC observed that publications may be the result of curation and that perhaps citing this fact would assist with the explanation of how curation contributes to teaching, research, and service.

The Museum has also successfully placed its MFS graduates, some of whom have published, and increased its public programming and outreach activities as recommended in previous PRP reviews. These accomplishments were made without an increase in personnel or radical improvement in physical infrastructure. The ERC praises Museum leadership for this progress, noting at the same time that the campus has been slow to provide support.

Physical infrastructure

The dire conditions of the Museum collections are such that irreplaceable resources are in danger of deterioration and destruction. The self-study details, through narratives and images, the collections storage spaces that the 2014 IRC and ERC described as “deplorable.” Both stated that collections are in danger of deterioration due to extreme environmental conditions and man-made plumbing and natural water disasters.

The Henderson building houses rare southwestern pottery, baskets, and textiles that require a stable environment. Henderson does not have a coordinated HVAC system and instead operates with a patchwork of evaporative cooling and/or stand-alone air conditioning units to manage temperature and humidity in storage areas. Extreme temperature swings wreak havoc on the collections. Clare Small houses plant and lichen specimens, some unique to Colorado but others from remote areas such as the Galapagos Islands. The building’s foundation continues to migrate, evidenced by spreading wall cracks that are actively monitored by Facilities Management. Additionally, although the Bruce Curtis Building’s (MCOL) situation is somewhat improved, the Museum has outgrown its space, which makes the growth of current collections, or adding new collections, a continued challenge. Environmental conditions continue to test the curators’ and collection managers’ patience, most recently when several MCOL fossil specimens disintegrated due to extreme spikes in temperature and humidity.

All locations vary in physical condition, but the Curtis building/MCOL is described as the best, with Clare Small and Henderson tied for substandard conditions. ARPAC constructed a timeline of the Museum’s physical plant history to provide context for this longstanding challenge:

- 1985: The Herbarium’s impending move into the Clare Small basement is reported. “All reports agree that the current space allocations are, as the external team put it, “completely inadequate and must be improved...”
- 1992: The PRP reported that “in all areas, space problems of quality and quantity exist. . . . [T]he facilities often are not adequate to protect the specimens from ambient environmental conditions.”
- 1995: The University of Colorado Board of Regents approved the program plan to renovate the old Geology Building as the Museum Collections Building

- (formerly known as the Bruce Curtis Building), and \$1.4 million of private funding and \$3.8 million of state funding was raised for the project.
- 1999: The PRP reported that the Bruce Curtis/MCOL “building was approved and funding allocated by the State, obviating the need to turn exhibition areas over to collections. An elevator and other facilities for the handicapped were installed in the Henderson Building.”
 - PRP recommended “essential HVAC upgrades to all existing collections facilities (Henderson, Botany in Clare Small Gym), and additional upgrades for exhibits in Henderson.”
 - 2001: The move into the Bruce Curtis/MCOL building was completed in the fall.
 - 2002: The Hunter building is demolished. It formerly housed collections in botany, entomology, paleontology, and zoology.
 - 2003: The Museum received American Alliance of Museums (AAM) accreditation.
 - 2005: A safety inspection and audit were undertaken after a flood and an act of vandalism.
 - The program review reported that the Museum had used “its plant funds and obtained additional funding from the provost’s office in order to partner effectively with Facilities Management. The museum met the safety standards for AAM accreditation.”
 - Repairs were made to the Herbarium’s air handling system (Clare Small Building) to decrease chlorine fumes from the rec center pool.
 - The Museum funded a Facilities Maintenance (FacMan) investigation of climate control options for selected sections of the Henderson Building. Affordable options were not possible to implement although evaporative coolers were installed in some collection storage areas since the last program review.
 - In the summer of 2005 an architectural plan was commissioned by the Museum to prioritize specific sections in Henderson. “The museum hopes to use this study as a basis for a fundraising campaign.”
 - The PRP noted that “the lack of a fire suppression system in Henderson is reprehensible.”
 - 2006: The PRP reported that “the need to upgrade the Henderson building” was one of two top unmet needs (the other being a permanent IT staff line). A fire suppression system was installed since the last PRP.
 - 2013: Boulder’s historic flood penetrates Clare Small. Collections are spared due to the staff’s quick action in dealing with a clogged drain located outside the building.
 - FacMan actively monitors Clare Small’s structural cracks that continue to expand and “show measurable changes.”
 - The self-study reports that the Bruce Curtis/MCOL building storage “has experienced thirteen water-related emergencies of flood-level in ten

years, resulting in over \$32,000 in insurance claims and loss of unique specimens for which there is no replacement.”

- 2014: In response to 2013 flood damage, \$40,000 of Research Infrastructure Improvement funding is allocated to the Clare Small Flood Door project. The proposal included a \$6,670 departmental match.

The Museum’s collections, unlike, for example, the collections managed by the University Libraries, are not candidates for offsite storage because of the nature and format of the objects (e.g., pottery), or specimens (housed in alcohol, or in trays, or cabinets). These unique collections cannot be safeguarded in enclosures for frequent transport. Additionally, collections are loaned to researchers and scientist across the country and abroad. The self-study reported that “1,156 requests for loans of objects and specimens to support research during the reporting period resulted in 54,475 specimens/artifacts loaned.” The Museum’s collections are truly one-of-a-kind in documenting Colorado’s natural history. ARPAC observed that a new facility could generate revenue if the Museum was deemed a state-mandated repository, but in its current condition it will not qualify.

The self-study further explained that faculty do discuss the feasibility of adding new collections before considering gifts/acquisitions. Some sections have gift funds to purchase collections, but in past instances, after careful deliberation, Museum faculty turned down gift collections due to the lack of space and inadequate environmental controls. ARPAC recognizes that the Museum is in the process of clearing a former storage space to expand the exhibits area. This effort is evidence that continued collection growth and development continue to be impacted by the lack of space and the poor quality of existing space. In the past, ARPAC has recommended focusing on building a better outward-facing museum, but it is now mostly concerned about the issue of housing irreplaceable collections in the face of imminent demise. ARPAC finds the conditions deplorable and urges a concerted effort on the campus to work towards an immediate resolution of this crisis.

Digital Infrastructure

The growing necessity of the Museum’s Information Technology (IT) resources was recognized during the 1999 program review. At that time, the Museum identified the need to digitize its collection records and requested staffing for a division of collections and bioinformatics. Since then, Museum faculty have secured federal digitization grants to fund the creation of digital images stored in databases that can be accessed via the web. The result is a cadre of solutions whose accessibility and sustainability differs by project, with no single interface or digital preservation plan in place for the collections. The Museum has creatively dealt with its IT needs but has now identified its need for a digital assets manager who can work across the disciplines to curate and manage their digital infrastructure in a comprehensive manner. Their web site is a portal that

illuminates collections and connects to citizen science projects for access by researchers and the general public, but is in need of a discovery layer for cross-platform searching.

ARPAC concurs with the Museum's self-study observation and sees the opportunity to partner with the Libraries to address digitization needs. Currently the Libraries' digital initiatives team is a partner with the Museum's senior educator to launch a grant-funded [3D](#) natural history collection, consisting of fossils and artifacts. This is a local example of the convergence of Galleries, Libraries, Archives and Museums ([GLAM](#)). Faced with reduced resources, these types of cultural heritage institutions began partnerships early in the 21st century. ARPAC encourages a similar approach with the campus cultural heritage collections.

In 2009, the strategic plan noted that 11% of the general operating fund covered office supplies, printing and mailing, and IT needs. IT-related costs increased 162% between 2007 and 2013 (\$8,025 to \$21,062). By 2014, IT resource needs are defined as managing the cost of digital storage in light of the growth and development of the Museum's digital research collections.

The self-study also discusses becoming the future repository of faculty research collections for [DNA](#) and RNA specimens. As campus faculty members who possess research collections stored in department freezers (e.g., anthropology, biology, MCDB, chemistry, biotechnology, etc.) prepare to retire, their specimens are at risk of being lost to future researchers. Analogous to centralizing server storage, consolidating freezer usage may realize significant savings of campus energy costs. This approach adds another layer of complexity to the necessary infrastructure that must be addressed in order to remain relevant in teaching and research. The ERC noted that with NSF grants comes the expectation that the home institution will match the award in some way, and the ERC emphasized that "this is the future." More dialog with faculty, and perhaps an assessment of campus needs in this respect, could prove useful.

Both the IRC and ERC support the Museum's request to fund a digital assets manager, but neither remark on the need for a digital infrastructure to create, manage, and archive digital collections. A member of the Museum faculty recognized this need and is a co-PI in a NSF-subsidized PetaLibrary grant project undertaken in 2011 in collaboration with Research Computing (RC) and the University Libraries. This project is a fee-based service with recurring annual costs that is managed by RC. The service was established for archiving research data; consequently, contractual restrictions and system design limit the types of digital content that can be stored there. Because the project is grant-funded, there is no guarantee that the service will exist beyond the life of the grant, which concludes in 2017. Currently a department has to decide whether to pay for active service (the ability to access digital assets on a regular basis) in addition to archiving (and a backup copy with/without occasional access), and [RC](#) can charge between \$100 to \$200/TB/year depending on the need for regular access or archiving the digital assets. The Museum will have to bear this additional cost.

The Museum's dilemma is that both physical and digital storage are necessary to continue the development of collections that track Colorado's environmental history. Once digitized, these resources are accessible to a wide audience, but virtual access does not diminish the need for new and improved space or improved collection storage and access. Both the IRC and ERC mention the natural tie to a future School or College of Environment and Sustainability, but ARPAC notes an additional research tie to the College of Communication, Media, and Information (CMCI). Doctoral students in the Department of Information would have opportunities to engage in bioinformatics projects with Museum faculty if staffing and a digital infrastructure existed. The 2006 PRP mentioned this possibility in regard to collaboration with computer science faculty. The approval of CMCI sets the stage for collaboration to explore research in digital curation, the use of new media, and informatics. In addition, the Libraries' hire of a digital archivist creates opportunities with the MFS program. ARPAC believes the campus must begin planning for a more comprehensive approach to digital asset management.

Museum and Field Studies Graduate Program

The self-study indicates that average annual applications for the MFS program in the current review cycle (67 applications) have increased 49% since the previous cycle (45 applications). There has also been an improvement in quantitative measures of applicants (average undergraduate GPAs and GRE scores), and the ERC wrote that a "high national regard for this program is evident from its success at recruiting excellent students (a number of whom indicated that they had declined offers from top programs to attend CU)." And yet enrollment has actually declined slightly, averaging 10 students per year over the course of the review cycle. The Museum may consider conducting surveys with applicants who decline admissions to determine more conclusively why this is so, but all indications are that decreases in funding for the program are at the heart of the matter. Fellowship funds, which were ~\$20K for AY12-13 (reduced by 33% since AY06-07), appear to be the most problematic.

The MFS MS is typically a terminal degree, and according to alumni surveys conducted by the Museum and as reported in the self-study, just over half of respondents who received their degrees between December 2005 and May 2013 have found employment in a museum. Many of the other half of the respondents have found employment in related fields (e.g. botany consultant, etymologist), and the ERC considered these indicators of "success." The self-study also shows that greater than half of alumni respondents continue to reside in Colorado, surmising that perhaps this fact explains "why so many of our graduates have found employment outside a traditional museum." The Museum may wish to explore whether this is in fact the case in future alumni surveys to inform current and future curricular decisions. In any case, it does appear

that the MFS program is highly successful in educating students for relevant employment.

ARPAC concurs with both the ERC and IRC that with additional resources the MFS program could be expanded. Such expansion would include additional relationships with other campus units and enhanced course offerings, especially in digital collections management. The Museum has the right mix of excellent leadership, interdisciplinary and innovative partnerships, and experiential learning programs to meet needs of current students and their future employers.

With respect to the potential to increase enrollment, ARPAC supports the requests for a digital asset manager position and a Ph.D.-level position in informal learning, both of which potentially could be dually-rostered in other departments and provide instruction in the MFS program. A faculty line in informal learning would help forge a link to the School of Education and develop a formal science education component that may additionally strengthen ties to several different areas (CMCI and the Libraries come to mind). In addition to bolstering the MFS curriculum, a faculty line specializing in informal learning would help qualify the unit for federal grants in science education.

However, it may be difficult for the campus to restore instructional and GA funding to levels available during the previous review cycle. In addition, the MFS program appears to be the very essence of a professional master's degree, and a tuition-sharing model may better allow the unit to pursue its teaching needs. Reshaping the program in this manner may be worth considering. Additional professional masters' degrees, offered in collaboration with the Art & Art History or History departments, could also be considered and may benefit from this model.

The 2013 self-study reported one African American and one Latina out of 16 MFS students and confirmed that the Museum's Clark Scholarship Fund is available to support Native American student recruitment. The Museum acknowledged that it could improve recruitment of underrepresented groups and had a new diversity plan, "along with provision of funds for recruiting and supporting Native Americans and Hispanic Students." No Native American student appears to be enrolled in the MFS program at this time. Other 2012 fall census student demographics show that 81% were Colorado residents and 81% women. To be equitable, the Museum could consider the recruitment of more men from underrepresented groups to the MFS program. Half of currently enrolled Latino students are male.

Faculty & Staff

Being rostered in the Museum (Graduate School) but earning tenure in a cognate department was a concern cited by some tenure-track faculty in the 2006 program review. The 2014 ERC identified mentoring and communication about the tenure

process as an issue. During the exit interview, the ERC commented that some cognate departments “don’t [appear to] care” about curation, and that attitude makes Museum faculty look different during the review process. They recommend that the Museum director and cognate chairs meet with tenure-track faculty on a regular basis to explain the process and field questions. ARPAC notes that the Museum’s bylaws define “curation” (7 III. G. Appendix I) and that the Museum recently decided to form a committee whose members will further define curation and develop metrics to assist in future comprehensive and tenure reviews.

The IRC also suggests a peer-evaluation system, and ARPAC believes additional multiple measures for tenure review may help put curation in context. Perhaps the Museum can identify top-tier natural history museums, regardless of affiliation with public or private universities, to request a critique of a faculty member’s curation performance. The director could then provide a supplemental explanation for inclusion in the tenure dossier. ARPAC suggests that the Museum explore options with the Office of Faculty Affairs.

In meeting with collections managers, the ERC noted their interest in teaching. ARPAC supports this idea and recommends that the logistics be explored. A provision in the bylaws states that collection managers can teach with approval from the director and curator. The bylaws also state that instructors have voting rights but are restricted from voting in the merit review process and promotion and tenure cases.

Fundraising

In 2006 one of the “low cost or no cost” recommendations made by the PRP was to “make fund-raising the primary charge of the Advisory Board.” Yet, the FY2010-2019 strategic plan noted that “the Advisory Board currently has had no formal role in fund-raising, and current members are not interested in fund-raising. They do see a role for themselves as ambassadors—friend raisers—for the Museum and have begun to engage in those efforts on a limited basis.” ARPAC observes that the lack of support from the Center for Advancement (formerly known as the University of Colorado Foundation) has been non-existent.

The current Museum director joined the faculty and staff in 2008 with significant fundraising experience, including playing a vital role in raising over \$400m for the California Academy of Sciences. Restructuring the membership of the advisory board to strengthen their capacity to raise funds should be considered. Additionally, the Museum may consider developing an executive board, or steering committee, to strengthen its fundraising capacity by identifying community members who can assist with their time and talents. In any event, better support for fund-raising is essential.

As for past recommendations that the Museum investigate a “state history museum” designation, ARPAC considers them moot in light of the critical plant issues that may disqualify the Museum from such designation.

Summary

ARPAC concurs with the ERC’s observation that the Museum continues its upward trajectory, having made significant improvements and meeting research and grant award goals since the 2006 program review. The director, who has an impressive track record of fund-raising prior to joining CU-Boulder, has yet to receive the necessary assistance needed to raise significant funds. With increased support from the Center for Advancement, the Museum would do well to collaborate with other campus heritage centers to raise funds for a new facility. In the summer of 2013, the deans of the Graduate School, College of Arts and Sciences, the University Libraries, and the Vice Chancellor of Research all signed a letter addressed to the provost stating their unified support of the Museum director’s request to make a new Museum a priority in the campus plan. ARPAC wonders how this letter was received.

In some respects, the Museum possesses potential the campus has yet to realize. Dedicated advancement support seems likely to yield significant fund-raising opportunities. Building a storage facility, renovating Henderson, otherwise improving and branding the “cultural crescent,” and building a comprehensive infrastructure for digital assets—all promise to enhance the campus’s reputation in “communicating science” and STEM learning, both regionally and nationally. And while the Museum has established a network of partnerships on campus and beyond, the continuing convergence of the work of museums, libraries, and archives allows, if adequately supported, for utterly new contributions to scholarship and learning. The contributions would undoubtedly enhance the campus’s reputation.

VII. RECOMMENDATIONS

To the unit:

1. The condition of the Museum’s facilities is in crisis and should be a campus priority. Work with the University Libraries to build a collections storage facility (see recommendation #1 to chancellor, below)
2. Make the case to use Capital Asset Management Program (CAMP) funds to renovate Henderson.
3. Host regular explanatory reappointment, tenure, and promotion process meetings with tenure-track faculty and chairs of cognate departments.

4. To expand multiple measures of curation as it contributes to teaching, research, and service for tenure and promotion, identify museum-peer external reviewers for the evaluation of a candidate's curation performance.
5. Examine the value of reshaping the MFS program as a professional master's degree so as to be eligible for revenue sharing. Alternatively, consider developing new programs in collaboration with Art & Art History, History, CMCI, and the Libraries that would utilize this model. In programs not using this model, consider supporting MS students with grant funding.
6. Explore with University Libraries a joint appointment of a digital assets manager.
7. Explore with the School of Education a joint appointment for the informal learning position.
8. Explore engaging campus stakeholders, such as the University Libraries, the Heritage Center and the Art Museum, to spearhead a Cultural Heritage Collections Task Force. Work with the Research Data Executive Committee and develop a white paper that identifies the digital asset and storage needs of campus heritage collections and how these needs do or do not differ from research data storage.
9. Consider a dual-board structure to strengthen the Museum's capacity to raise funds. The advisory board could be complemented by an Executive Board with a fund-raising focus.
10. Continue to enhance efforts to diversify faculty, staff, students, and programming and outreach efforts.

To the dean of the Graduate School:

11. Facilitate a partnership between the Museum and Libraries for a digital assets manager.
12. Support the Museum's request for a faculty position in informal learning, which could be dually-rostered in the School of Education.
13. Facilitate discussions related to new professional masters programs.

To the provost:

14. Support a new collections facility and renovations for the Henderson building and communicate the campus's level of support to the museum director.
15. Communicate to the campus the Museum's important contributions to the academic mission.
16. Confirm whether additional space in MCOL is available to the Museum on a temporary basis.
17. Work with OIT, the Vice Chancellor for Research, and the Research Data Executive Committee to understand and prioritize needs for a digital asset management infrastructure on campus.

To the chancellor:

18. The condition of the Museum's facilities is in crisis and should be a campus priority. A new building should be placed on the legislative agenda. Alternatively, support a new collections facility and renovations to Henderson.
19. Recognizing the academic role filled by the Museum, direct the VC for Administration to incorporate the unit's space needs into campus priorities.
20. Support the Museum's desire for fund-raising by assisting with making its needs a priority for the Center for Advancement.

The director of the CU Museum of Natural History shall report annually on the first of April for a period of three years following the year of the receipt of this report (i.e., April 1st of 2016, 2017, and 2018) to the dean of the Graduate School on the implementation of these recommendations. Likewise, the dean shall report annually on the first of May to the provost on the implementation of recommendations addressed to the college. The provost, as part of the review reforms, has agreed to respond annually to all outstanding matters under her/his purview arising from this review year. All official responses will be posted online and made available for university community comment.