Geo.Alp, Sonderband 1, S. 23–31, 2007

ERSCHLIESSUNG DER BERGBAUBILDARCHIVE DURCH EIN DIGITALISIERUNGSPROJEKT AN DER ARTHUR-LAKES-BIBLIOTHEK DER BERGBAUSCHULE COLORADO (GOLDEN, USA)

CREATING ACCESS TO IMAGES OF THE MINING INDUSTRY: DIGITIZATION PROJECTS AT THE ARTHUR LAKES LIBRARY, COLORADO SCHOOL OF MINES

Lisa G. Dunn & Joanne V. Lerud-Heck

Mit 11 Abbildungen / with 11 figures

Colorado School of Mines, Arthur Lakes Library, 1400 Illinois Street, Golden, Colorado, 80401 USA,
e-mail: ldunn@mines.edu, jlerud@mines.edu

Schlüsselwörter: Arthur Lakes Bibliothek, Bergbau (Geschichte), Fotosammlung, Digitalisierung, Quellen (Archiv), Bergbauschule Colorado (CSM)
Keywords: Arthur Lakes Library, mining history, collection of photographs, digitization, source material (archives), Colorado School of Mines (CSM)

Zusammenfassung

Digitale Fotosammlungen werden aus verschiedenen Gründen wie Erhaltung der Originale, breiter Zugang für Benützer, als Lehrbehelfe oder zur Förderung ausgewählter Themen oder Sponsoren erstellt.

Die digitale Fotosammlung der Arthur-Lakes-Bibliothek an der Colorado School of Mines (Golden, Colorado, USA) wurde erstellt, um den Zugang zu Fotos zu erleichtern und den Bekanntheitsgrad dieser Sammlung zu vergrößern, ohne den Erhaltungszustand des Originalmaterials zu gefährden. Gemeinsam mit der National Minig Hall of Fame und dem Museum in Leadville, Colorado, wurde ein erstes Digitalisierungsprojekt begonnen. Im Zuge weiterer Projekte wurde diese Foto-Datenbasis durch weitere Fotos und eine erweiterte Metadatei ergänzt. Die Datenbasis ermöglicht einen schnellen Zugang und die Bergbaufotos können wesentlich besser genutzt werden als dies durch andere Informationsquellen möglich ist. Viele dieser Fotos zeigen lokale und regionale Bergbauaktivitäten und bieten dem Benutzer einen guten Einblick in die Bergbaugeschichte. Aus den Erfahrungen von Organisationen im Digitalisieren und durch Kooperationen könne auch kleine Institutionen mit beschränkten Ressourcen lernen und selbst erfolgreich digitale Fotosammlungen aufbauen und betreiben. Je mehr Bilder vom Bergbau und der Bergbauindustrie, speziell aus deren Archiven, Bibliotheken und Sammlungen, online zugänglich gemacht werden, umso mehr Bedeutung bekommt das Web und bildet damit eine wertvolle Quelle an Informationen über den Bergbau und die Bergbaugeschichte.

Abstract

Digital image collections are created for a variety of reasons, including preservation of originals, wider access for users, educational support, and promotion of the subjects depicted or the sponsoring organization. The Colorado School of Mines Arthur Lakes Library's digital image collection was created to improve access to images including those on mining activities and to extend awareness of the collections without jeopardizing preservation of the original materials. The Library's first digitization project was implemented in partnership with the National Mining Hall of Fame and Museum in Leadville, Colorado. Additional projects have added images and enhanced metadata to this Image Database. The Database provides ready access to users and its mining images can communicate with users in ways other sources of information do not. Many

of these images are part of local or regional mineral operations that no longer exist – the images give users a view into the history of mining. Small institutions with limited resources can successfully create and manage digital image collections by learning from organizations experienced in digitization and partnering with other institutions with shared goals. As more images of the mining industry, particularly from archival collections in libraries and museums, become available, the Web will be a rich primary source of information on mining and mining history throughout the world.

Introduction

Many digital image collections are now available on the World Wide Web. These collections represent a wide variety of subjects and serve multiple purposes for both the sponsoring organization and the users. Digital image collections can serve as a means of preserving the original graphic materials, minimizing handling and exposure that would eventually lead to degradation of the item. Images available on the Web are potentially accessible to a wider audience than a physical collection could ever reach. Images support educational activities on many levels, both formal and informal. Organizations can use images to connect to their target populations, reach new users, promote their programs, and solicit financial and other kinds of support for the collection and for the organization as a whole.

The Web offers a tantalizing promise of access to libraries. This is particularly true when trying to reach new user populations, or addressing the goal of improving access to special collections. Staff at the Arthur Lakes Library, Colorado School of Mines, were interested in experimenting with digitization of selected Library collections and exploring some of the benefits of a Web-based digital image collection.

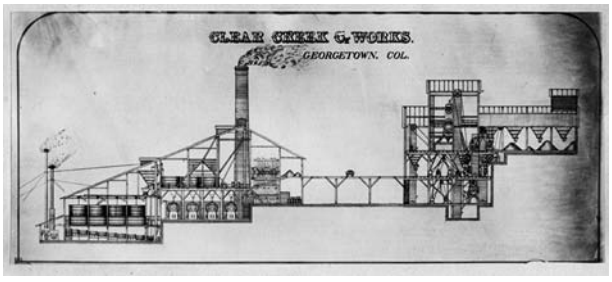

Fig. 1: Diagram of the Clear Creek Company Works mill, Georgetown, Colorado, circa 1880. Courtesy, Colorado School of Mines Library's Mining History Archive.

Abb. 1: Diagramm der Clear Creek Company Works mill, George - town, Colorado, um 1880; mit freundlicher Genehmigung: Bibliothek der Bergbauschule Colorado, Bergbaugeschichte-Archiv.

Colorado School of Mines and Library Archive Collections

The Colorado School of Mines is a small (3500-4000 students) PhD-granting state university in Colorado, USA. It offers mostly engineering degrees, and specializes in earth resources, energy and the environment. The School of Mines (CSM) was founded in 1874 as an institution to train mining and metallurgical engineers in the Western US during a time of rich discoveries of gold and silver deposits in the Rocky Mountain Front Range of the Colorado Territory. CSM has changed with the times but has maintained its mineral resource ties and its focus on applied engineering education and research.

The Arthur Lakes Library reflects CSM's mission; it is a very applications-oriented library with strong collections in the physical sciences and engineering. Because of the university's historical connection with the mining industries in the USA and internationally, the Library has acquired over time a collection on

Fig. 2: A stereopair depicting hydraulic mining of gold placer deposits in Russell Gulch, Colorado, late 1800s. Collier's Rocky Mountain Scenery company produced stereopairs of Colorado scenery for sale. Courtesy: Colorado School of Mines Library's Mining History Archive.

Abb. 2: Ein Stereopaar zeigt einen Goldbergbau mittels Wasserkraft in Russell Gulch, Colorado, Ende des 19. Jahrhunderts. Die Collier's Rocky Mountain Scenery company stellte Stereopaare der Landschaft Colorados zum Verkauf her. Mit freundlicher Genehmigung: Bibliothek der Bergbauschule Colorado, Bergbaugeschichte-Archiv.

mining and mining history as well as materials on the history of CSM itself. The Russell and Lyn Wood Mining History Archive was created to house and preserve these materials, some unique to the Library. Although library users can gain on-site access to the Mining History Archive's collections, which include documents, reports, manufacturers' catalogs, industry journals, photographs and artifacts, these items are not readily accessible to off-site users (Figure 1).

The CSM Library staff were aware of other organizations' digitization activities and saw some of the Library's archival collections as good candidates for digitization and access on the Web. The staff focused on the Archive's many graphic materials such as photographs, stereopairs, postcards and illustrations (Figures 2, 3). However, the staff had no experience with either the technical (hardware and software) or the practical (policies, workflow, specialized metadata, cost) aspects of implementing a digitization project.

Digization at the Arthur Lakes Library

Several digitization initiatives were being planned in the state of Colorado by 2000 and the region was host to the newly-formed Colorado Digitization Program (CDP), a private granting agency whose mission was to support digitization projects related to Colorado's heritage. The Arthur Lakes Library collaborated with the National Mining Hall of Fame and Museum in Leadville, Colorado, which had a large uncataloged collection of graphical materials on mining covering a range of dates, and the partnership received a small grant from the CDP to create a joint collection. This grant provided starting funds for the two institutions to digitize approximately 1,000 images on mining subjects with an emphasis on the mineral heritage of Colorado but including minerals-related images from other regions.

The CDP provided initial access to scanning equipment as well as grant money. It played an equally critical role as a network of advice and *"best practices"* by disseminating recommended practices for scanning and metadata and acting as a coordinator to bring together other digitization project leaders from regional universities, libraries, museums and historical societies. The availability of others' expertise and a forum for discussing priorities, trade-offs, accessibility issues and problems allowed the participants of the Arthur Lakes Library to better define their own project.

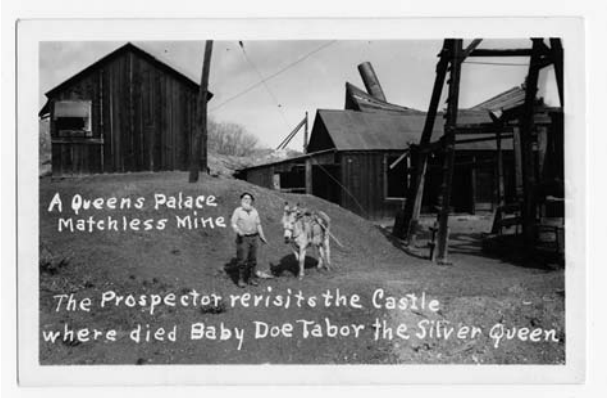

Fig. 3: Postcard depicting the Matchless Mine, Leadville Colorado. Altered photographs such as this one from the late 1940s were commonly made for the tourist trade and distributed locally. Courtesy, Colorado School of Mines Library's Mining History Archive.

Abb. 3: Die Postkarte zeigt den Matchless Bergbau in Leadville, Colorado. Ähnliche Fotos wie dieses aus den späten 40er Jahren des 20. Jahrhunderts wurden häufig für das Touristengeschäft aufgelegt und lokal vertrieben; mit freundlicher Genehmigung: Bibliothek der Bergbauschule Colorado, Bergbaugeschichte-Archiv.

The Library completed its first digitization project, *"Mining and Mineral Industries in the US: Photographic Perspectives,"* of about 1,100 images in 2002. The images were attached to minimal metadata records in MARC cataloging format (although not full MARC records). The images themselves display as both thumbnails (small reference images) and full-size graphic interchange format ***(*.gif)*** display files from links to a server supported by CSM. The image records were entered into the Image Database, a searchable database on an Endeavor Voyager™ software platform, at http://csmphotos.coalliance.org. In addition, as part of the original CDP grant project, metadata and image links were exported to the Heritage Colorado Collections catalog at http://www.cdpheritage.org/heritage/index.html. The Heritage catalog is a union catalog of digital images on Colorado's heritage and supported by the CDP.

Mining images in the image database

Since the completion of the first project in 2002 the Library has continued to add mineral industry images to the Image Database (Figure 4) and has expanded into other subject areas. Today the Library's digital collections include over 4,000 images on a variety of subjects relevant to CSM's engineering mis-

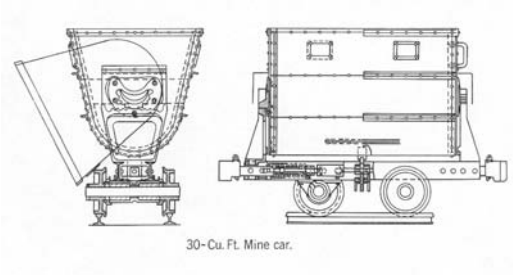

Fig. 4: Diagram of a mine car, United Verde Extension Mining Company, Arizona. Courtesy, Colorado School of Mines Library's Mining History Archive.

Abb. 4: Zeichnung eines Bergbau-Hunts, United Verde Extension Mining Company, Arizona; mit freundlicher Genehmigung: Bibliothek der Bergbauschule Colorado, Bergbaugeschichte-Archiv.

Fig. 5: Pay Rock Mill, Silver Plume Colorado, 1800s. Courtesy, Colorado School of Mines Library's Mining History Archive.

Abb. 5: Pay Rock Mill, Silber-Blei Colorado, 19. Jh.; mit freundlicher Genehmigung: Bibliothek der Bergbauschule Colorado, Bergbaugeschichte-Archiv.

Fig. 6: Postcard of miners operating a drill underground at the Climax Mine, Colorado, circa 1937. Courtesy, National Mining Hall of Fame and Museum.

Abb. 6: Postkarte mit Arbeitern beim Bohren unter Tag in der Climax Mine, Colorado, um 1937; mit freundlicher Genehmigung: National Mining Hall of Fame and Museum.

Fig. 7: Bishop George M. Randall, a founder of the Colorado School of Mines, circa 1870. Courtesy, Colorado School of Mines Library's Mining History Archive.

Abb. 7: Bischof George M. Randall, ein Gründer der Bergbauschule Colorado, um 1870; mit freundlicher Genehmigung: Bibliothek der Bergbauschule Colorado, Bergbaugeschichte-Archiv.

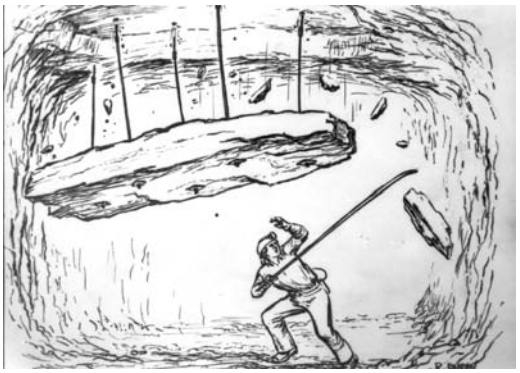

Fig. 8: Accident illustration from the US Bureau of Mines, 1970s. Courtesy, Colorado School of Mines Library's Mining History Archive.

Abb. 8: Darstellung eines Bergbauunfalls durch die US Bergbaubehörde, 70er Jahre des 20. Jh.; mit freundlicher Genehmigung: Bibliothek der Bergbauschule Colorado, Bergbaugeschichte-Archiv.

sion and activities. Images range in date from the 1870s to the present, in:

Mining and mineral industries
Ropeway engineering and industry
Towns, buildings and railroads of Colorado
Colorado geology and scenery

Within the mining and mineral industries collection, the Database includes a number of sub-collections such as:

Colorado mines and mills of the 1800s
Climax molybdenum mine, Leadville, Colorado
Colorado School of Mines history
Mineral specimens from Colorado mines
Mines of the Copper and Iron belts of the northern USA
Mine safety illustrations
Western USA uranium/vanadium mines.

Figures 5–9 show some of the images available in the Image Database. Digital image files represent photographs, lantern slides, stereopairs, postcards, diagrams, technical drawings, illustrations, and depictions of physical artifacts.

The purpose of the digital collection has evolved as well. Initial discussion about the goals of the collection included the possibility of the collection serving as an archive to accurately preserve the original graphic materials in archival digital format. After exploring the technological implications of this and the Library's priorities, it was decided that the digital collection's main purpose would be to provide access; it would be the *"working collection"* for these graphical materials. Images could then be altered during digitization to improve usability (changing contrast, cropping, etc.); the *"original"* archival version remains in physical format.

Similarly, the Library's treatment of ownership and use has evolved. The collection originally represented physical objects held on site by either the Arthur Lakes Library or the National Mining Hall of Fame and Museum. With the proliferation of digital cameras the collection now includes digitally-created files donated as such to the Library, with no print equivalents. The collection is meant to be used – permission for personal, scholarly and educational use is a requirement for inclusion of any image in the collection. Some copyrights are owned by CSM, while others belong to the original photographer. Still other images are in the public domain. A digital rights statement linked to each image's record in the Image Database indicates the terms of use and contact information for users. The project staff discussed the application of security devices such as digital watermarks to discourage reproduction but finally decided in favor of a simple border brand that would identify the image's origins but still allow the types of usage consistent with the collection's purpose.

Fig. 9: Miners with a trolley locomotive in the Morris Lloyd iron mine, Marquette Range, Michigan, 1930s. Courtesy, Colorado School of Mines Library's Mining History Archive.

Abb. 9: Bergleute mit einem Elektro-Antriebswagen / einer Elektro Lore im Morris Lloyd Eisenbergbau, Marquette Range, Michigan, 30er Jahre des 20 Jh.; mit freundlicher Genehmigung: Bibliothek der Bergbauschule Colorado, Bergbaugeschichte-Archiv.

Image metadata and searchability

The Library's Image Database is publicly accessible via the Web (http://csmphotos.coalliance.org). It is searchable by multiple parameters, including keyword, proper names (company, mine, geographic, etc.) and subject heading. Because most of the record fields are searchable, users can do keyword searches for personal names, formats, and publishers and photographers, all data that commonly accompanies the physical items, as well as any data included in controlled subject headings and narratives added by the metadata creator.

As many who have used image collections on the Web are aware, it is not enough to simply place image files in a database. Metadata describe both the content and characteristics of the image and must accompany images to make them readily accessible to users. When determining how to construct image metadata, important decisions need to be made based on a number of factors, including user populations targeted, resources available to create the desired level of metadata, compatibility with existing metadata records, future data migration needs, and whether the metadata will represent the digital image, the physical item, or a combination of both.

The Image Database is accessible to a wide variety of users, but the project staff targeted several specific user populations when considering their metadata. These include technical users (engineers, specialists),

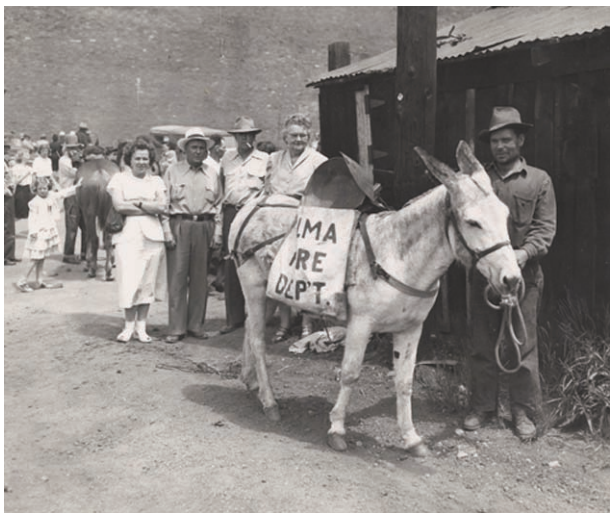

Fig. 10: Colorado's mining history includes a pack-burro race at Fairplay's Gold Days Celebration, Colorado, 1952. Burros carried a pack and mining equipment; handlers accompanied their burros on foot. Courtesy, National Mining Hall of Fame and Museum.

Abb. 10: Colorado's Bergbaugeschichte schließt auch eine Reihe von Tragtier-Rennen zu den Fairplay's Gold Days Feiern ein (hier Bild aus dem Jahr 1952). Packesel trugen ein Bündel sowie Bergbauausrüstung; die Abrichter/Betreuer begleiteten ihre Packesel zu Fuß; mit freundlicher Genehmigung: National Mining Hall of Fame and Museum.

teachers and students in K-12 education, and those with a general interest in mining history (Figure 10). Providing access to these user populations falls within the Library's mission and goals.

Project staff determined, with limited staff and financial resources to devote to metadata creation, one record would represent both the physical and digital items. Compatibility and ability to migrate record data to other software platforms were important, especially since the original project required supplying records to the CDP's union catalog. Records were originally created in a text format and manipulated into MARC. Future metadata records will be created using the Library system's MARC cataloging software.

Images are accompanied by at least a minimal amount of metadata, including dates, origins, geographic location depicted, and any annotations accompanying the physical items. Because of variations in the skills and practices of the several metadata creators, the quality of the initial metadata accompanying the images varied considerably. Enhancing this metadata was considered a priority since the quality of the metadata significantly affects access. This is an ongoing project and promises to be the most time-consuming part of this and future digitization projects.

Enhancements of the metadata center primarily around creating descriptive subject headings and providing brief narratives about the image for context (Figure 11). Subject headings are controlled vocabulary assigned to each image, allowing the user to retrieve sets of images with similar themes. Initially, subject headings compatible with Library of Congress (LC) Subject Headings were selected. However, some LC subject headings contain terminology no longer commonly used in the minerals industry; others were too generic or too specific in the context of the Database. Therefore, in some cases non-LC subject headings were selected as more appropriate for both the collection and our targeted user populations. Because of the place-based nature of much of the minerals industry, geographic subject headings were emphasized. Mining methodology (for example, *"Underground mining"*, *"Placer mining"*), type of mineral (*"Silver mines and mining"*), and categories of mining activity (*"Blasting"*, *"Mine safety"*) were also selected to help users group categories of images in their searches.

The narrative is probably the most time-consuming part of the metadata enhancement. Narratives can include a brief history of the site or activity depicted, a summary of the image's significance, and details about the image. These details are chosen to enhance keyword searching retrieval and can include the names of persons, type of equipment, company information, geographic details, etc. Narratives are written to complement the subject headings; they provide additional searchable data without diluting the purpose of subject headings as controlled vocabulary. Care must be taken when creating narratives to avoid terms that could provide too many false *"hits"* when searching. For example, the histories of many mines in the Western US were significantly influenced by the development of railroads. However, the term *"railroad"* is avoided unless there is actually a railroad depicted in the image.

Enhanced metadata allow users to retrieve images depicting: oil shale operations in Colorado; mine timbering in Michigan iron mines; explosives magazines; gold placer operations; mining properties of the Calumet and Hecla Consolidated Copper Company; miners working underground; environmental effects of mining.

[Anvil-Palms Mine, mine rescue crew]	
Call Number:	U842b
Title:	[Anvil-Palms Mine, mine rescue crew].
Main Author:	Petersen, Max S.
Other Author(s):	United States Bureau of Mines. Arthur Lakes Library. Russell L. and Lyn Wood Mining History Archive.
Date:	July 1946.
Linked Resources:	Full size image.
	
	Digital Rights Statement
Description:	GIF (Image file) Photograph : b&w ; 4 x 6 in.
Narrative:	The Anvil-Palms Mine (Anvil-Palms-Keweenaw Mine?) in Gogebic County, Michigan was opened in 1886. The Mine was operated by Pickands, Mather and Company before its closure in 1957. Pickands, Mather and Company was established in 1883 as an iron mining and shipping firm with interests in the Lake Superior region. It was one of the large mining companies that consolidated smaller properties in the Michigan iron ranges in the early 1900s. The Company became one of the largest iron ore companies in the US.
Subject(s):	Pickands, Mather and Company. Iron mines and mining Michigan. Underground mining Michigan. Miners Michigan. Mine rescue work. Scenes, underground Michigan. Gogebic County (Mich.)

Fig. 11: Sample of metadata for an image in the Image Database. Note the narrative and controlled subject headings.

Abb. 11: Beispiel eines Metadaten-Blattes zu einem Bild in der Bilddatenbank. Zu beachten sind die beschreibenden sowie die kontrollierten Überschriftsfelder/Kategorien.

Partnerships

In the beginning, the CDP encouraged collaboration or partnerships to secure the original funding grant. The **Arthur Lakes Library** partnered with the **National Mining Hall of Fame and Museum** because of the rich collection of historical mining photographs at each insitution, a shared focus on mining history, and a strong relationship of trust between a member of the Board of the Museum and the staff of the Library. Each entity had a common mission, that of advocate for the scholarship of researchers even though the entities were different in primary purpose: library vs. museum. A mission helps the organizations to focus on the ways each organization can best deliver development, support, and other services to their respective constituents, including each other, as well as serve as viable partners together. Joint projects build understanding among key staff of the expertise to be found in each partner and the unique role each organization fills.

While the Library was certainly encouraged by the success of this joint project, not all partnerships will work as well as the one mentioned above. If the partnership is viewed as competition for funds, expertise, equipment, or status, the partnership may be doomed. Communication and coordination must occur regularly and often. Decisions must be made with an eye toward compromise but not at the cost of functionality for either entity.

The experiences and involvement with this collaboration showed that complementary roles need not grow into conflict or competition as some had predicted. Selecting the right partner is critical for suc-

cess. As expertise grows, the potential for selecting partners grows; perhaps a partner might be selected for the kinds of digital images already available or a collection that complements a collection already held. Communication must include the identification of emerging needs and technologies, and each organization must be committed to making the digitization project a success. Each entity must also be nimble enough to devote more staff, time, effort, or funds to ensure the positive outcome of the collaboration. Even though the Arthur Lakes Library is considered a small library, the first projects selected were those resources researchers would find valuable.

Recognizing partnership opportunities may require creative thinking. Additionally, leveraging funding, expertise, and equipment may bring about interesting collaborations. Historical museums and societies may partner nicely with libraries and/or archives. Local communities or historical districts may desire to partner with entities that have greater access to the infrastructure and expertise that can support digitization projects such as universities. Newspapers may desire to increase their exposure and/or assist preservation of early issues by digitizing; this desire could integrate well with regional archives directives. Institutions holding scientific, cultural, and historical resources may desire to digitize the items of these collections and partner with archives or libraries with similar interests.

Future projects

The Arthur Lakes Library believes it is a priority to promote access to the special collections housed and managed by the Library. Where once special collections could only be accessed by visitors to the physical library, the Web now expands access. The Library owns a number of collections relevant to the history of mining that would enhance the Image Database and are possibilities for future digitization projects. For example, there are maps and diagrams in the Library's Map Collection of Colorado's early mines and mining claims. Artifacts from the Archive include mining lamps, equipment, and memorabilia of the School of Mines; digital images of these artifacts would be a valuable addition to the Database. The Library has a collection of mine reports – reports by Inspectors of Mines containing assay data, descriptions of workings, and even mentions of cultural heritage interests – that are publications of very limited dispersal. As most of these reports are approaching the century mark, digitization of the documents and accompanying maps would decrease wear and tear on the original in the short term and allow world-wide access to this very important collection.

The Library is also interested in further exploring partnerships with others holding graphic materials on mining. Alumni of CSM are a relatively untapped source of graphic materials on both the School and on mining engineering around the world. Local historical societies and museums in Colorado have a wealth of graphic materials on regional mining history, often unique to their sites. These small organizations may have digitization capabilities but often lack the technological resources to make their collections accessible to wide audiences via the Web. These partnerships represent additional challenges in developing shared collections and managing intellectual property, but the resulting additions of materials would improve the breadth and depth of the Image Database's coverage of mining.

The focused disciplines of the Colorado School of Mines and the Arthur Lakes Library go beyond mining and are international in scope. Other technical collections in the Library that would benefit from a wider audience are ongoing or potential digitization projects. For example, the Library's Ropeways Collection, a specialized collection concerning the theory, design, operation, and history of ropeway systems – one of only three in the world that are publicly accessible – has considerable interest from all over the world. The Library is currently digitizing the photographs of Charles F. *"Chuck"* Dwyer, P. E., a designer, builder, regulator, and user of ropeways. Preliminary contact has been made with an international expert in ropeways, Dr. Professor Gabor Oplatka, to place his images of ropeways in the Library's digital collection; these images would complement those already available. The ropeways industry heavily emphasizes communication and access to information because of safety and legal factors, primarily in recreational ropeways such as ski lifts. A digital collection of ropeway materials will aid communication to industry users internationally.

Because digitization is not a university priority at this time, the Library must seek external funding for such projects. Fundraising adds time and effort to any project, but when done in collaboration with other organizations it can be an effective means of supporting some digitization projects. Educational efforts on digitization that are directed at the insti-

tution as a whole can occur simultaneously with a project, emphasizing relevance to the organization's mission and benefits accrued.

To date, digitizing graphic materials has not been used as a digital preservation method per se at the Arthur Lakes Library. However, as hardware and software technology for this purpose improves, the potential of digitization for preservation purposes will be re-evaluated. Preservation-level digitization has the potential to be a safety net for physical archives that by their nature are in danger from theft, fire, flood, and other catastrophic events.

Conclusion

The staff of the Arthur Lakes Library plans to continue to expand the digital image collections in the Image Database as resources become available. Working with a digital collection provides the Library with new opportunities to partner with other organizations and offers new options for potential donors.

Manuskript eingelangt: 7. Oktober 2006 / manuscript submitted October 7, 2006
Manuskript angenommen 1. März 2007 / manuscript accepted March 1, 2007