
Library disasters: A learning experience

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Water damage can strike twice—or even eight times—despite every precaution.

Kresge Physical Sciences Library serves the Dartmouth College community in the following subject areas: chemistry, earth sciences, astronomy, physics, mathematics and the computer sciences. The collection is composed of approximately 80,000 volumes with more than 1,500 serial titles. Physically, the library is divided into two large rooms; one area houses the staff and public service operations, the general reference and current periodical collections; the second area includes the general collection (monographs, serials and bound journals) and three discrete reference collections (chemistry, physics and earth sciences). The ceiling of the second area is totally exposed, with no additional floors above. For some time the exposed roof over the general collection had been in a state of disrepair; its restoration was to take place after the construction of a room on a small portion of the roof. Since the room was intended to house heavy equipment, the design involved disturbing the already inadequate integrity of the roof. Steel supports were laid on the roof, slightly elevated from the surface of the roof itself and holes were drilled into the roof to anchor the new structure.

The flooding which occurred during the evening of July 21, 1983, was the first in a series of water disasters which plagued Kresge Library through September 1983. In all, eight separate flooding incidents occurred and the resulting damage to both

the collection and the environment was significant (see diagram on page 253).

Before the roof was completely repaired, a total of 1217 volumes were water damaged; one title was unsalvagable following the disaster (see Table 1). In addition, the entire collection was covered in plastic for more than one month (cover photo) and ultimately the library had to be closed for one week to allow the staff to clean up and reorganize the collections. After the most severe episodes, the library was able to operate only on a limited basis.

Access to the general collection was restricted to Library personnel only; titles requested by patrons were retrieved by the library staff. Library services were restricted at certain times to reserve transactions alone, not only due to the severity and frequency of the incidents, but also because the damaged volumes required the immediate and total involvement of the library staff present.

The most critical element in coping with a disaster is the immediate availability of people-power, regardless of the timing of the disaster. In that respect, the Dartmouth College Library system has demonstrated considerable foresight in disaster response preparation. In 1981, the library established a formal Disaster Team; members were selected from all levels of the library hierarchy, from top level administration to staff personnel. The members of the initial team developed a disaster

manual to lend guidance and to detail procedures for any type of library disaster. Training sessions provided an opportunity for the members to familiarize themselves with disaster occurrences and appropriate responses. The existence of such a well-prepared group cannot be recommended strongly

Preparation is inexpensive insurance.

enough; because members represent all aspects of library operations, their background and experience are invaluable. Their assistance is valuable not only in terms of quantity (i.e., numbers), but most importantly, in terms of quality. They are genuinely concerned with preserving the collection and provided the expertise needed to avert a greater disaster at Kresge Library. In addition to the Disaster Team, a second pool of people-power may be necessary to move large numbers of volumes in immediate jeopardy.

The quick access to and availability of materials for coping with a water disaster is a further necessity. Again, the Dartmouth College Library system demonstrated foresight: along with the implementation of a Disaster Team, emergency supplies were housed in an accessible location in each Library on campus. These supplies included: flashlights, scissors, first-aid equipment, plastic sheeting, paper towels and newsprint. In coping with a water disaster, additional equipment stored centrally proved to be as vital: dehumidifier, wet vacuum, fans, large plastic trash cans, and the availability of a vacuum drying unit. The dehumidifier was used to keep the moisture content in the affected area below 67%; at higher humidities, considerable mold and/or mildew damage could occur. The wet vacuum was able to absorb large amounts of water resulting from the numerous and often severe rain and wind storms. The fans were utilized to keep air circulating, to prevent stagnation of any standing water and to retard the growth of mold and mildew. Fans were also used to air-dry volumes not totally saturated. The vacuum drying unit (in our case, a Vacudyne) was used to dry the most severely damaged volumes; in the final analysis, only one title printed on coated paper was rendered completely useless.

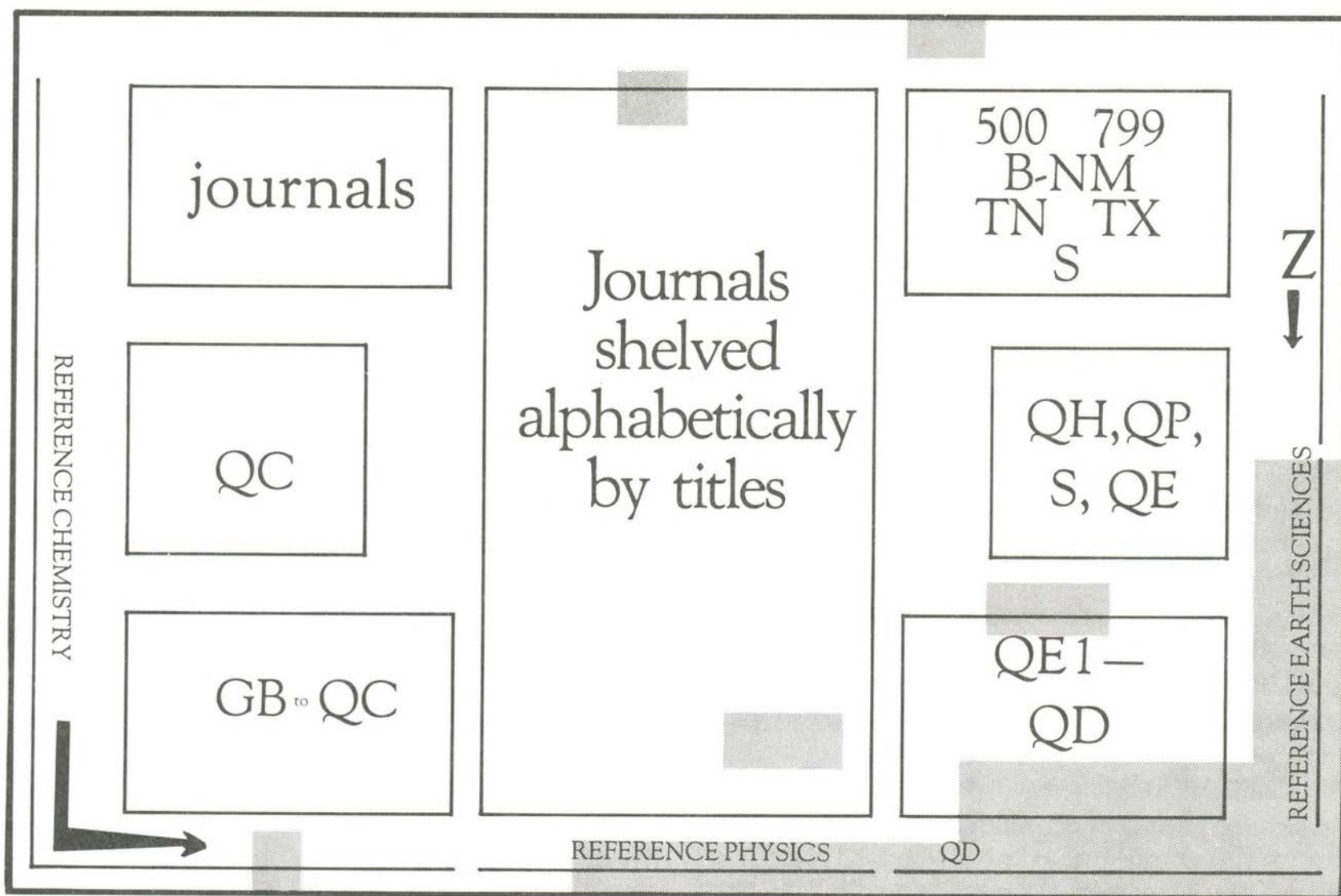
The most serious physical handicap in dealing with this water disaster proved to be the lack of adequately sized plastic sheeting to cover and protect the collection. At present, commercially produced plastic is available in a variety of width \times length sizes, but plastic sufficiently large to cover a normal library stack range is not readily available. The only immediate alternative is to cover the

stacks by overlapping the plastic sheets. The problem with this technique, however, is that the overlap seam is not sealed and is a prime target for additional leakage. Ideally, adequate plastic, sized specifically for the length and width of each stack range, would be housed with other emergency supplies in the library. A parallel problem is that plastic, once hung over the stacks, sags and collapses under the weight of water dripping from the ceiling. Thus, the plastic must be solidly attached to the end of the stack ranges or the walls (using very strong tape) and drainage holes must be punched in the plastic in the middle of each aisle so the water cannot accumulate and cause further damage. Despite the strategic placement of waste cans under each hole, the face of each stack must also be covered to prevent splashing onto the titles from water draining through the holes punched in the plastic draped above the stacks.

No library anticipates a disaster of any nature, but the lessons learned from an actual experience provide valuable insights for disaster planning and preparation.

The ramifications of any disaster are far reaching and should be considered in disaster planning. The following list highlights those of greatest importance:

- sufficient space must be available away from the damaged area in which volumes can be diagnosed and treated;
- the immediate availability of many book trucks is required to rapidly remove volumes in peril;
- the availability of large trash cans for collecting water, preferably 20–30 gallon plastic which will not rust;
- to have adequate emergency supplies available at all times; in anticipation of recurring incidents, the supplies need to be re-stocked frequently, in order that shortages will not affect one's ability to cope with additional occurrences;
- an immediate check of all electrical outlets including ceiling lights for water accumulation in order to prevent short circuits and the possibility of a fire;
- an inspection of the ceiling periodically during the disaster, particularly if removable fibreboard tiles are in place, to deflect water saturated pieces from falling on the collection or people below. In addition, false ceilings can conceal real and potential damage that may otherwise go unnoticed;
- lowering the temperature of the affected area to prevent further damage from standing water;
- an adequate and complete record-keeping form to document titles damaged and their treatment is essential;
- the availability of an in-house or local preservation expert for consultation on salvage and restoration;
- the availability of a book press in order to treat waffled or mildly dry volumes;
- the availability of a certified rare book dealer



Physical locations of water leaks in Kresge Library

or expert, to assess the amount of damage to titles not currently in print or difficult to acquire;

- a procedure to determine the deterioration of titles, damaged but replaced in the collection, is vital for insurance purposes;
- the availability of a competent commercial cleaning organization for the final restoration of the physical condition of the area.

Valuable lessons learned include:

- make sure that any contemplated renovations or new designs which might affect your library are thoroughly discussed with you (to anticipate and hopefully prevent any disaster);
- do not assume that you have enough material and personnel available; often what you believe is adequate will not suffice—plans should exist to allow for back-up resources;
- keep an even temperament; anger will not accomplish anything positive.

Obviously, it is impossible for every library to be totally prepared to deal with any disaster which might strike; however, preparation is inexpensive insurance and should be compulsory. Our experiences in 1983 confirm this and we continue to make every effort to be better prepared in the future. We share our experiences with the hope that others may also plan more effectively.

Two and one half years passed uneventfully with no mold growth on the previously wetted books. The disaster supply closet was carefully restocked with the hope that such diligence would ensure against further water disasters. Library staff members went back to their usual activities until....

Another disaster strikes

The assistant librarian received a call from the library director on Monday, December 23, 1985, at 6:15 a.m., asking that she come in immediately because a pipe had apparently burst and the library was flooded. With the Christmas holidays imminent, many library staff were on vacation including the physical sciences librarian. Arriving at the library 30 minutes later and prepared for yet another water leak, the quantity of water (2-3" covering the floor of the entire general collection area) and more continuing to rain from the ceiling, proved almost unbelievable. The library director briefed her quickly, noting that the water had been shut off, despite apparent evidence to the contrary.

The Buildings and Grounds crews were dispatched immediately to the library, since other staff would not be in for another hour. Efforts to contact the chair of the Dartmouth College Library Disaster Team failed and with the exception of the presence of the assistant librarian and one colleague who arrived later because he lived relatively far away, all other members of the team were unavailable. Messages were left in all library units indicating that any personnel who could be spared should be sent to Kresge Library upon their arrival.

Buildings and Grounds crews arrived shortly and began putting up plastic sheeting which had been stored in the disaster supply closet. The importance of removing the fibreboard acoustic ceiling tiles cannot be underestimated because the tiles

become saturated and disintegrate in areas of inhomogeneity and structural weakness. Failure to remove these tiles promptly compounds disaster recovery efforts because the tiles fall into the plastic sheeting, pulling it down and thereby causing additional damage to the collection.

With the crews instructed and mobilized, organization of the recovery effort began. It was still too early to make arrangements for frozen storage or transportation. Thousands of books needed to be moved out of the danger area and sorted into locations designated for wet and dry material, the wet volumes to be processed for shipment to frozen storage. What would be needed in the way of space and supplies? A list was made: book trucks and people-power for moving books, freezer paper for separating books so they would not freeze into a solid block, milk crates or boxes for moving books, a mechanism to inventory the books for insurance purposes if necessary, information on insurance coverage and the availability of funds to cover immediate costs, a truck for transportation, local freezer facilities to buy time, information on facilities to dry the books, equipment to measure the humidity in the environment, and rotating fans and dehumidifiers to restore the environment. The list seemed endless and it all needed to be handled immediately on the eve of Christmas Eve.

A plan for work flow was prepared in the hour before library staff arrived: furniture was moved and hastily written signs posted—wet books here, dry books here. The decision was made to keep an inventory of the books using call number and short title (spine title) on tape recorders, an idea that developed as a result of the last disaster. Keeping a written record would have been too time-consuming and unwieldy: time was of the essence. At 8:00 a.m., library staff in support areas were notified of the need to send all available booktrucks to Kresge via Buildings and Grounds crews. As staff members arrived, they were asked to sign in so that a complete record could be kept of those who as-

sisted with the disaster. Then the work began. Some staff were sent to procure materials: more plastic and freezer wrap from Central Stores, tape recorders from the library's main office (3) with additional ones (8) from the media support service on campus, and cassette tapes from a local store. Others began checking stack ranges and moving load after load of books to the designated wet or dry areas. Others cut freezer paper into 9 × 12 sheets. Still others inserted freezer wrap between the books as they recorded the call numbers and spine titles on cassettes preparing them for shipping to the frozen storage facilities.

In the meantime, an effort was made to contact local frozen storage facilities as identified in the Dartmouth College Library Disaster Manual. First on the list was the College's dining hall which was closed for the Christmas break. Next the U.S. Army Corps of Engineers Cold Regions Research and Engineering Laboratory (CRREL) located 1 mile from campus was contacted. Eventually storage space for our wet materials was secured in a garage-size cold room at CRREL. We were initially led to believe that a rental truck could be driven into the CRREL facility thereby eliminating the need to pack and unpack the books, but the high weight/volume ratio of the books prevented this owing to concerns about the structural integrity of the floor. With frozen storage space for the holiday week in the process of being secured, preliminary information was gathered about methods for drying our collection. To this end, the Northeast Document Conservation Center (NEDCC), the library conservation center for our region, was contacted. They advised us about a variety of drying options and thoroughly assessed the facts of the situation (approximately 5,000 wet books, 30% fully saturated, 30% one-third saturated, the remaining 40% wetted only at the edges) before recommending the vacuum freeze drying of the materials. It is worth noting that, although some of the books were wetted directly from the top, the vast

TABLE 1. Volumes damaged during water disaster episodes

	Number	Percent
Total damaged	1217	100
Monographs	411	33.8
Journal Volumes	321	26.4
Serial Volumes	485	39.8

majority soaked up standing water from the shelves on which they rested. LUM bindings, being particularly absorbent, facilitated the greatest amount of damage as they soaked the water up around the entire text block. As a result of this problem, a thorough check of each volume, by pulling it off the shelf, became absolutely essential as water damage was seldom obvious from the spine alone. Frequently the books absorbed all trace of water standing on a given shelf.

Available options included air-drying the material ourselves, sending the materials out to be air-dried, or vacuum-drying the materials in our own vacuum chamber. Air drying the materials ourselves was a physical improbability owing to the shortage of labor, space, the magnitude of the disaster, and the high risk of mold growth due to the time involved in drying thoroughly wetted volumes. Vacuum drying the books in our own chamber would be extremely slow owing to the number of books in need of attention and would require prolonged use of the frozen storage facility. Sending the materials out to be air-dried, or at least some of them, proved to be an option worth exploring.

Moisture Control Services, a division of Cargocare Engineering Corporation, located in Woburn, Massachusetts, specializes in maintaining and restoring physical environments and has in the last year moved into the business of drying library materials. Originally recommended by NEDCC to restore the library environment, we contacted them and learned of their services in drying books either by installing high capacity dehumidification equipment in space available on site or at their corporate location. The cost ranging from \$18-\$25/ft³ is substantially less than freeze-drying costs. Use of an air drying process in this disaster was ruled out largely due to the amount of time required to complete the process for heavily saturated books and the correspondingly increased risk of mold growth to a permanent research collection. Appropriate uses of this technology might include the drying of office records, circulating library collections without permanent research value, or other situations where cost is an overriding factor. The decision to vacuum freeze-dry the collection was then made.

The closest vacuum freeze-dry facility for northern New England is American Freeze Dry Incorporated, in Audubon, New Jersey. Telephone calls to them provided a cost estimate and necessary requirements for shipping the books. Information from MacDonnell Douglas in St. Louis, Missouri, gave a cost comparison. Boxing or crating the books for shipping became the next most important concern. Locating an estimated 500 milkcrates in rural New Hampshire proved impossible, but a local moving company already prepared for another major job came to the rescue; they provided strapping tape and a tape gun as well.

By 3:00 p.m. after a hard day at work and a picnic lunch from a local restaurant, the bulk of the

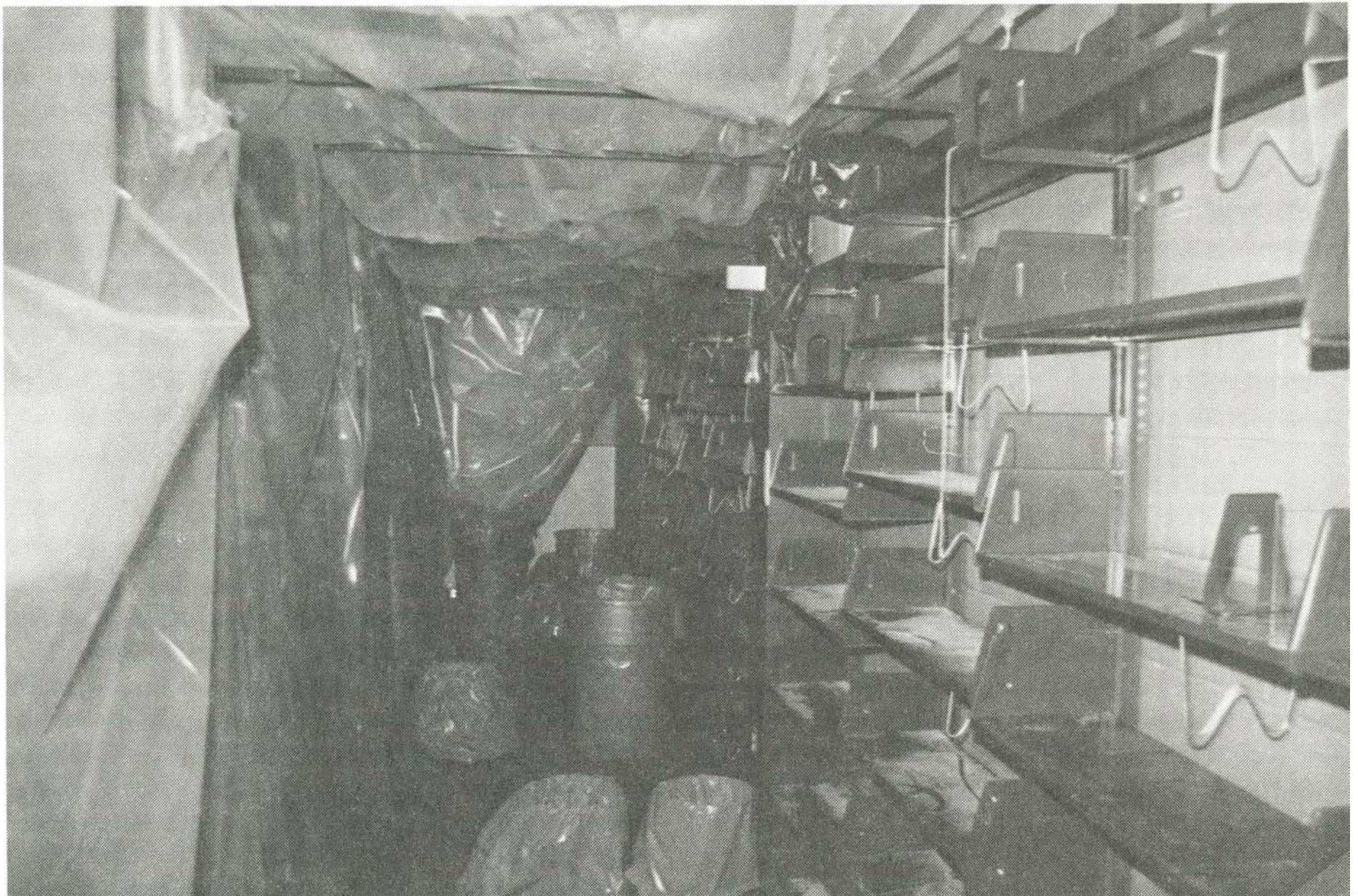
job was done. With the help of 36 staff and volunteers the books were inventoried, prepared for shipping and loaded into a rental truck to be transported to the local frozen storage facility. Because this facility was still being brought down to temperature (-10°F), the books were left in the truck overnight outside at approximately 0° to -10°F. The following morning a dedicated crew of library

Collection integrity must be the first priority.

staff and volunteers unpacked the truck and loaded the books quickly into the cardboard boxes.

Once the wet books had been removed from the building, a thorough check was made of several thousand supposedly dry books. All appeared to be completely dry. The area was straightened out and a notice, indicating restricted access to the collection and the reason for the disarray, was posted.

Attention turned to restoring the physical environment. The Buildings and Grounds crews had successfully wet-vacuumed the carpet and removed most of the disintegrated ceiling tiles. The ceiling dripped only occasionally. Rotating fans were placed strategically throughout the library to ensure air circulation. The central heating facility had been instructed to cool the building down to help prevent the growth of mold and a decision was made to back ventilate through the building's air exchange system, thereby pumping cold, dry outside air into the building and lowering the humidity drastically. Dehumidifiers proved to be inoperable owing to the fact that the coils froze completely even at 65°F. The next morning the building was inspected by the assistant librarian who was pleasantly surprised at how much drying had occurred just overnight. The temperature was about 55°F. and the relative humidity was 38%. A representative from Moisture Control Services used a probe to check the humidity in the carpets, discovering that it too was relatively low and that there was no appreciable damming effect where the stacks met the carpet (damming occurs when water is trapped in a confined area, usually where pressure prevents its escape). By Thursday, three days after the disaster the relative humidity was 33% and the building temperature was 49°F. With the holiday over and the physical environment stabilized, the decision was made to bring the building back up to normal temperature, resulting in a further drop in the relative humidity to 24% at 65°F. Rotating fans to maintain air circulation continued to be used throughout the cleanup operation and for nearly a week afterward, as an added precaution. The collection was thoroughly rechecked



Efforts to protect the collection involved moving many books. Note the funnel of plastic sheeting used to divert water away from the collection. Plastic bag-lined trash cans are strategically placed to catch water released through holes in the sagging plastic.

for any additional wet books and the only one found was successfully air-dried in house.

After the Christmas holiday final arrangements were made for transporting the books to be freeze-dried at an estimated cost of \$50–\$60/ft³; the pallets and shrink wrap necessary for shipping the boxed books were obtained. Ultimately the books were counted (4,479) and repacked properly (spine side down to promote air circulation) into the boxes. The boxes (313), inventoried, numbered and labeled, were then loaded on pallets (13) and shrink wrapped to keep them in place on the pallets as required for shipping. Eventually they were shipped in a refrigerated semi-tractor trailer to be freeze-dried. Attention to such details as the accessibility of loading docks, the availability of fork lifts and pallet pushers, the preparation of a bill of lading, and loading techniques for pallets should not be overlooked. It is important to specify that the contents of a frozen load remain frozen during loading and transport.

In the days following the disaster, arrangements were made for an inspection by an insurance adjuster who needed to see, not only the damage caused to the building itself, but also a representative sample of the type of damage sustained by the books and the overall quantity of materials damaged. A local cleaning service was contracted to come into the library to steam clean the carpets, and to clean, deodorize and sanitize (with a mold

and mildew resistant disinfectant) the affected walls and shelving.

In February 1986 another water leak occurred; in this instance, the amount was small, but the fact that water continued to enter through the ceiling brought a renewed sense of frustration to the staff. Approximately one-third of the collection was covered with plastic and so far prevention of further water damage to the collection has been successful. On this occasion, the water entered as a result of a rupture in the outside seal around the base of the room above the library, the same room the construction of which caused the original series of water damage incidents in 1983. Upon investigation, it was determined that the accumulated snow and ice had risen above the level of the outside seal and with a rapid fluctuation in the outside temperature, a freeze-thaw effect allowed water to seep slowly between the seal and the outside wall of the room onto the unrepaired portion of the roof under the room. Since many fibreboard ceiling tiles had been removed due to the severe water damage in December, none were in place to absorb or retard the incoming water. Fortunately, the leak was small in quantity and it occurred during the normal work day. The staff immediately, and very effectively, dealt with the incident. Since that time, no additional leaks have occurred, but the potential for further damage still exists. The outside seal was repaired, but there is no guarantee of its integ-

rity and with the onset of the normal spring thaw the library may be faced with additional water leakage incidents. As a result of these occurrences, various solutions have been suggested to prevent future incidents; these include the installation of metal canopies over the stacks, the installation of water-sensitive tape along the outside perimeter of the room above the library, the design and installation of a large sloped drip-pan to fit under the outside dimensions of the room and above the ceiling of the library, and the installation of sealing material for the unrepaired portion of the roof under the room. None of the suggestions by itself could prevent a major water disaster, but for the continuing "small incidents" some solution must be found. The integrity of the collection must always be the first priority; achievement of a satisfactory solution may be complex, costly and time-consuming, but it must be pursued.

A false sense of security cannot substitute for continued vigilance. That the roof was repaired in 1983 did not rule out the possibility of water leakages occurring for other reasons; in short, although we cannot predict events beyond our control, we can be as well prepared as possible.

Postscript

The freeze-dried books have been returned and the unpacking and sorting process has begun. Some of the books can be returned directly to the collection, but many need additional repairs (separating pages, pressing, rebinding) and some must be replaced. This processing is being carried out by a student assistant hired solely for this task; she works two hours, four days a week and is sorting approximately 100 volumes each day. She works using guidelines developed by the assistant librarian and

is supervised by the physical sciences librarian. Statistics are being kept during the sorting phase to determine the real damage costs to the collection itself.

In addition, six metal canopies, purchased from the Wilson Company, have been installed on an experimental basis to determine their role as part of the solution. No final decision has been made as yet.

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Doctoral Dissertation Fellowship awarded

Gemma De Vinney, State University of New York at Buffalo, has been granted a Doctoral Dissertation Fellowship by the Association of College and Research Libraries and the Institute for Scientific Information (ISI). Her proposed research is entitled: "The 1965-1975 Faculty Status Movement as a Professionalization Effort with Social Movement Characteristics: A Case Study of The State University of New York." The award consists of a citation and \$1,000 contributed by ISI, and will be presented to her at the ACRL Program Meeting, 2:00-5:30 p.m., Monday, June 30, New York University, at ALA Annual Conference in New York.

This is the fourth ACRL Doctoral Dissertation Fellowship to be granted. Last year, Joanne Euster, a doctoral student at the University of California, Berkeley, and Vicki Gregory, a doctoral student at Rutgers University, were co-winners of the

fellowship. The purpose of the fellowship is to foster research in academic librarianship by encouraging and assisting doctoral students in the field with their dissertation research.

Recipients of the fellowship must be active doctoral students in the academic librarianship area in a degree-granting institution who have completed all their coursework and had their proposal accepted by the institution. The criteria for judging include the potential significance of the research, methodological validity, originality, clarity, and a convincing timetable.

Applications for next year's fellowship may be made to: Mary Ellen K. Davis, Program Officer, ACRL/ALA, 50 E. Huron St., Chicago, IL 60611-2795. Seven copies of the application should be submitted. Applications must be received by December 1, 1986, to be eligible. ■■

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