Some exhausted members of the Tulane University Uptown recovery team on Sept. 15, 2005—two weeks after Hurricane Katrina. Left to right: Greg Potter (chemistry, Washington Univ.), James Peel (Bruker Instruments), Russell Schmehl (chemistry), David Mullin (cell and molecular biology), Scott Grayson (chemistry), Qi Zhao (chemistry), Gary McPherson (chemistry), W Godbey (CBE), Brian Mitchell (CBE), Vijay John (CBE), and Bob Garry (microbiology).

From Survival to Renewal

Katrina and its Aftermath at Tulane's Chemical and Biomolecular Engineering Department

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The Chemical and Biomolecular Engineering Department at Tulane University has a rich tradition dating back to 1894, as the first established program in chemical engineering in the South and the third program in the country.[1] Tulane University faced a struggle for survival in the fall of 2005 when the city of New Orleans was devastated in the wake of the flooding from Hurricane Katrina. This article chronicles the experiences of the department and its efforts not just to maintain viability but also to look to the future with a renewed sense of purpose. In keeping with the university's approach to describing the events of the period between Aug. 29, 2005, and the present, the article is divided into three sections: survival, recovery, and renewal.

As background, we give the reader an idea of the department. At the time of Katrina, there were nine full-time faculty (**Professors O'Connor, Papadopoulos, Law, Mitchell, Ashbaugh, Godbey, Lu, De Kee,** and **John**), two staff members (**Dr. Prindle** who serves as a senior instructor and laboratory supervisor, and **Ms. Lacoste**, the departmental administrative secretary), and **Professor Emeritus Gonzalez**, who

participates in teaching graduate courses and in collaborative research. The department had about 30 graduate students studying toward their Ph.D., and about five part-time M.S. students. Undergraduate enrollment was about 80 with graduating classes between 15 and 20 students. Undergraduate interest in the program, and enrollment numbers along with it, saw a steady increase as a result of the recent emphasis and inclusion of biomolecular engineering into the curriculum in 2003.

SURVIVAL

Residents in the New Orleans area are accustomed to threats from hurricanes, but there had been none to hit the city since Betsy in 1965. The horrendous traffic jams and inconveniences of evacuation that were experienced when Hurricanes Georges and Ivan came close but missed the city convinced many that evacuation was unnecessary. A sense of complacency had set in. But Katrina was no mere threat. By Aug. 25, it was clear the storm was zeroing in on the New Orleans area. Some 300 miles off shore, the hurricane strengthened to a Category 5 status, giving sufficient reason for the university to initiate evacuation plans for students. Ironically enough, the weekend of Aug. 27 was supposed to be the faculty's annual welcoming of the latest batch of freshmen, but hasty departures were being urged instead. **President Scott Cowen** called a meeting of all students and requested that they all return home or evacuate to Jackson on buses the university had arranged. Temporary housing had also been arranged for evacuating students at Jackson State University. Our faculty made individual plans for the storm while making sure their graduate students had concrete evacuation plans. Two of our faculty decided not to evacuate prior to Katrina, but the consequent flooding and the infrastructure and security issues in the city mandated they leave a few days after the hurricane. Most faculty and students first evacuated toward the Baton Rouge, Houston, and Jackson areas.

It was particularly heartwarming to see the graduate students back and helping us clean the laboratories to resume research activities. Even though some had damaged apartments, they teamed up and those with livable apartments opened their doors and hearts to those without.

The events of Hurricane Katrina have been well documented. We all watched the disaster in real time with acute sadness, for we could clearly identify with all the locations in the images. The stress was heightened by the fact that phones were not working and we were unable to get in touch with our colleagues and students. Tulane's information technology services were disrupted and university e-mail addresses were useless. Communication was slowly established through text-messaging and the use of temporary e-mail addresses. It was at this time that Hank Ashbaugh got through to colleagues in the chemical engineering community with his request for help in placing our students (see box on page 82 for his personal recollections). Vijay John followed up with a separate e-mail. The department will forever be grateful for the outpouring of help for our students and faculty. The major ChE departments geographically closest to Tulane—in Houston and in Baton Rouge (Rice, the University of Houston, and LSU) took in many of our students and offered our faculty laboratory and office space—we are so tremendously thankful.

Katrina wrought significant damage to Tulane. Two-thirds of our picturesque campus in the historic Uptown neighborhood of New Orleans had flooded. Winds from Katrina damaged the roofs of several buildings. The computer systems were down, with the university backup tapes located safely yet inaccessibly in high-rise buildings downtown near the Superdome, the site of so much trauma and sadness. The upper administration was operating from Tulane's Executive Business School campus in Houston—the saga of how they brought back function to operations and coordinated the recovery is an interesting story in itself (see <www.tulane.edu>). The breakdown in payroll systems was the first major crisis, since the university had no idea how to issue paychecks or even a way to identify those on its payroll. We were dealing with emergency financial personnel who had to be educated that a graduate stipend simply meant salary. With the help of the deans, department chairs, and faculty members, all employees and graduate students were identified and paychecks issued through direct deposit. Professor Dan De Kee, who also serves as the associate dean for graduate studies, was invaluable as he kept the pressure on payroll administration from his evacuation location of Gaithersburg, Md. In many instances, the university simply took the word of the deans that individuals belonged on the payroll and issued paychecks. It is to the credit of the university that all employees and graduate students were paid during the entirety of the period between Sept. 1 and Dec. 31, 2005, while the university remained closed.

Within a couple of weeks following Katrina, faculty members Brian Mitchell and Vijay John—who live to the north and to the west of the city—had returned to their homes, grateful to find minimal damage. John Prindle, who lives near Baton Rouge and had not evacuated, served as a communications conduit (see his personal account in box on page 83). Hank Ashbaugh slowly traveled from Jacksonville, Fla., up the eastern seaboard to Troy, N.Y. (Rensselaer) where he even-

Professor Hank Ashbaugh's recollections of connecting with his research group and the chemical engineering community

After Hurricane Katrina hit on Aug. 29, 2005, a sense of helplessness grew in me as I watched the perpetual coverage of the flooding of New Orleans from my father's house in Jacksonville, Fla. The storm had knocked out the phone network for anyone with a New Orleans area code, so communications with the faculty in my department were spotty at best. Foremost on my mind was where my research group had scattered in the wake of Katrina. I quickly located one postdoc who still had a New York area code on his cell phone, and learned that he'd safely evacuated with Professor Yunfeng Lu's group to Shreveport, La. More worrisome were the two graduate students from India who had just arrived in the United States to join my group the week before the storm. How do you locate two newcomers to this country who had scattered in a panic? Then I remembered that I had recruited these two students from UICT with the help of ***Professor V.G. Pangarkar****. I e-mailed him at 11 p.m. and by 2 a.m. my two students had contacted me to say they were safely on their way to Texas.*

My success in locating my far-flung group gave me the idea that we should try to reconstitute the department over the Internet. The first step was to locate the individual faculty members. The Internet servers for Tulane had been shut down before the storm, so using campus e-mail addresses was out. Instead, on Sept. 1, I wrote an open e-mail to the chemical engineering community—copying every department chair—to tell our story and request the whereabouts of any Tulane faculty. The response was phenomenal. Over the course of the next three days I responded to over 400 e-mails wishing us well, volunteering support, and, more importantly, giving me clues as to where our faculty had evacuated. Within a week and a half I managed to locate all our faculty, get alternate contact information for each, and begin to reassemble the department. Two weeks after the storm I sent a second e-mail to the ChE community providing news of our faculty's whereabouts. As faculty members were being located, we started to compile lists of graduate and undergraduate students to expand our "virtual" department. Using the contacts we had developed outside the department, we were able to connect students with departments and universities that had volunteered to host them during our semester in exile. To facilitate interdepartmental communications, we created a blog (<spaces.msn.com/members/TulaneCBE/>) to disseminate information on support for students, student registration, communications from our chair, and miscellaneous tidbits. Moreover, the blog provided a window for our friends outside the department to keep updated on our status. ❐

tually spent the rest of the semester. During his travels, he stopped in at universities along the way (North Carolina, Delaware, Princeton) where he had studied. Kyriakos Papadopoulos also evacuated to New York (Columbia) after a two-week stay in Lafayette, La. W Godbey ended up in Houston (Rice) by way of Huntington, W.Va., Dallas, Texas, Grapevine, Texas, and Fort Smith, Ark. Kim O'Connor went to Houston (Baylor Medical School); Yunfeng Lu to Albuquerque (University of New Mexico) by way of Houston; Richard Gonzalez to Jackson, Miss.; and Ms. Lacoste to relatives who live north of the city. Victor Law went to Angleton, Texas, and had to evacuate a *second* time due to Hurricane Rita. Our students were scattered all over the country and were welcomed in at all universities. We had survived the hurricane. The next step was to plan our recovery.

RECOVERY

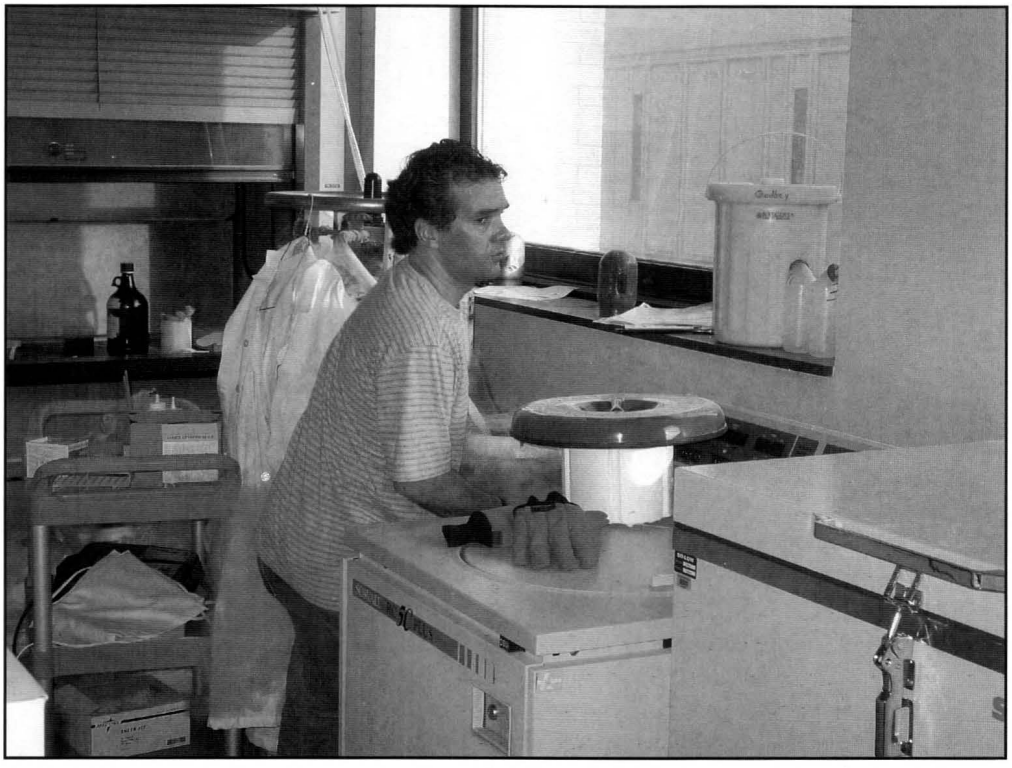
The early days following the hurricane, when the campus and surrounding Uptown neighborhood were without electrical power, are detailed in Brian Mitchell's account of the recovery efforts (see box on page 85). The university hired Belfor, an international disaster-recovery corporation, and the campus was teeming with Belfor employees. Huge power generators and trailers were scattered across campus as Belfor set about draining water from building basements (note: basements in New Orleans = bad idea!), gutting damaged floors, and reinstalling utilities. By early to mid-October, electrical power had been restored to the neighborhood and most of the campus had power, with the notable exception of the science building where electrical transformers and other utilities placed in the basement had been destroyed. The university's senior administration had returned to the city and had started operations in the main administration building (Gibson Hall). From there they monitored the recovery and began the strategy for renewal.

From the department's perspective, this was a time to take stock of our losses. Brian Mitchell, Vijay John, and John Prindle were among a handful of faculty and staff cleared for regular entry into the engineering building. All other employees had to get clearance to enter the building (usually by calling Brian or **Nick Altiero**, the dean) and were escorted into the engineering building by Brian to recover computer hard drives, etc. There were significant safety issues, as the building ventilation systems had not yet been decontaminated. During the months of October and November, the computer and communication systems at Tulane returned to normal operation and we slowly transitioned back to our university e-mail addresses. It was an interesting time, as Brian, John, and Vijay came in almost every day to man the phones, keeping in touch with our colleagues and our students. We had to balance these duties with our personal lives, in which Katrina had impacted school openings for our children, job conditions for our spouses, and much more. There was very little

time for intellectual work. It was a time in which we all realized the frailty of the human condition and learned to act with newfound compassion. Three of our colleagues had suffered such damage to their homes that they needed temporary housing. Overall at Tulane, 25-40 percent of the employees had homes significantly damaged by flooding. There was, and continues to be, a resounding spirit of helping one another.

We learned several lessons from our experiences in survival and recovery that are useful to pass on. When planning for disasters, science and engineering departments should always take into account the consequences of electrical power and communication failures for extended periods. It is wise to maintain extra supplies of liquid nitrogen to preserve biological samples. Personnel and graduate students should have alternative e-mails that can be accessed anywhere through the Internet. Inventories of chemicals, instruments, and general property must be maintained by the department. Access to buildings under repair should be tightly controlled even to employees—a faculty member paying a nostalgic visit to the medical school building before the power had been restored is said to have caused significant water damage by using the plumbing while the system was under repair. Even if thawed biologicals (*e.g.*, tissue samples) have been removed, decontamination of the entire building must be performed under professional supervision.

By early December, most buildings were functional and the campus was being spruced up for the return of the students. Faculty members throughout the university were excited about returning to work. President Cowen and the upper administration had done a wonderful job in maintaining student morale by presenting Tulane as a unique institution where rigorous education would be combined with exceptional opportunities to participate in public service to rebuild a great city. Early registration rates were high and the faculty was looking forward to the future. We knew that the univer-



W Godbey contemplates the whoosh of liquid nitrogen vapors that indicated his dewar full of biological samples was still cold—evidence that years of research were still safe.

Dr. John Prindle's recollections of maintaining connections with the undergraduates

Students are any chemical engineering department's lifeblood. They challenge the faculty to continually improve teaching skills. Their tuition pays for a portion of the department's expenses. And with each freshmen class comes a distinctive view of the world and how to improve it. In many ways, students are a department's primary legacy. So, it is not surprising that a strong personal connection forms between faculty members and each student they instruct.

In the aftermath of Hurricane Katrina, this personal connection was severely tested. For more than a month after the event, the university's network servers were down, rendering the familiar student e-mail addresses useless. Shortly after Tulane announced it was canceling the fall semester, students began calling faculty at home to discuss their options. Student concerns ranged from whether they should attend another university for the semester to whether they should register for chemical engineering coursework at that university. During these discussions, the faculty realized most students simply wanted to be reassured that we would assist them any way we could. With each call, students were

See ***Maintaining Connections with Undergraduates,*** *continued on page 98*

Members of the faculty and instructional staff in less stressful times. From left, standing: W T. Godbey, Daniel De Kee, Vijay John, Yunfeng Lu, Kim O'Connor, Kyriakos Papadopoulos, Brian Mitchell, and John Prindle. Seated: Richard Gonzalez, Hank Ashbaugh, Victor Law.

sity, as with all employers in the New Orleans region, would be in a difficult financial situation. But there was a contagious spirit to get the students back, work hard, build up research, and try to recover. It was particularly heartwarming to see the graduate students back and helping us clean the laboratories to resume research activities. Even though some had damaged apartments, they teamed up and those with livable apartments opened their doors and hearts to those without. Yunfeng Lu, who lives a block from campus, feverishly worked to repair his damaged home so his sizable group of graduate students could have a place to stay if they were unable to find appropriate accommodations.

RENEWAL

On Dec. 8, the Board of Administrators at Tulane University announced a renewal plan as a consequence of the financial exigency. The plan has turned out to be the largest restructuring of an American institution of higher education on record. Under the plan, some 230 faculty members were terminated, including 35 members of the School of Engineering. The Departments of Civil and Environmental Engineering, Mechanical Engineering, Electrical Engineering, and Computer Science have been slated for elimination by the fall of 2007. The university has been reorganized with the formation of a School of Liberal Arts and a School of Science and Engineering, in addition to the professional schools, to fully constitute a comprehensive university. Chemical and Biomolecular Engineering is one of only two surviving engineering departments; Biomedical Engineering is the other. Both were merged into the School of Science and Engineering, which has been further divided into academic divisions. Biomedical Engineering is now part of the Division of Biological Sciences and Engineering. Chemical and Biomolecular Engineering and the Department of Chemistry form the Division of Chemical Science and Engineering. The entire renewal plan makes for fascinating reading for those interested in academic organization, strategy, and administration. It can be found at <http://renewal.tulane.edu/>. Long-term goals of the plan as stated by the Board of Administrators are: (1) diligence in retaining our institutional quality and working to heighten that quality; (2) dedication to providing an unparalleled, holistic undergraduate experience for our students; (3) continued strengthening of core research areas and graduate programs that build on our strengths and can achieve world-class excellence; and (4) an absolute commitment to using the lessons learned from Katrina to help rebuild the city of New Orleans and to then extend those lessons to other communities.

We mourn the breakup of the School of Engineering, an institution that existed for over a century. We also mourn the departure of our colleagues who have worked tirelessly to improve the school. It is sufficient to say that we will continue to work hard toward enhancing the reputation of the department. The current dean of the engineering school, Nick

Altiero, has been appointed the new dean of the School of Science and Engineering. We believe his appointment indicates the university's recognition that engineering is still a significant and continuing component of Tulane, and we look forward to working with him to renew, reconstitute, and expand engineering as opportunities present themselves. He has been clearly told that the Board of Administrators will be receptive to new ideas for engineering at Tulane upon return to financial stability.

What is the future of the department? The university is expected to return to financial stability within a couple of years, with the bond market expressing confidence in the strong management team at Tulane.[2] Our student body has returned and we are back to high intensity in both research and education. Our informal merger with chemistry is a seamless fit. Over the years, the two departments have formed strong bonds, with research collaborations and an environment of mutual support. The atmosphere of cooperation has led to the establishment of superb instrumentation facilities in advanced spectroscopy, electron microscopy, and organic and inorganic analysis. We are especially proud of our high-resolution electron microscopy and confocal microscopy facilities wherein we are instituting a full range of cryoimaging techniques for biological imaging. Collaborations with the Medical School have been set up and we are considered a vital player in Tulane's objective to become world-class in health sciences research. Such collaborations are in stem-cell culture, gene delivery to cancer cells, and vaccine development and delivery technologies. The department has significant strengths in the areas of computational chemistry, self-assembly, nanostructured materials, colloid science, and polymer and ceramics processing. The university has clearly stated its intent to bring every Ph.D.-granting department up to national prominence, and we expect significant investments to our department as the university returns to financial viability.

The next couple of years will be difficult. In addition to their intellectual lives, faculty and students will worry about rebuilding their personal lives, which must come first. Kindness and compassion will be the order of the day in the department in dealing with such issues. It will also be terribly exciting to witness and participate in the rebuilding of the city. It is incredibly heartening to see students mobilizing on all kinds of public service projects, from involvement in public school education, to gutting destroyed houses so that residents can return to rebuild and establish communities, to providing meals to the thousands of laborers who are working to rebuild the city.

We are determined to persevere. Please wish us well . . . and come visit.

ACKNOWLEDGMENTS

W T. Godbey made very helpful suggestions to the article. The faculty, staff, and students of the Department of Chemical and Biomolecular Engineering express our deepest gratitude to our colleagues in the chemical engineering community for their many gestures of kindness in the wake of Hurricane Katrina, and for their numerous forms of support in helping us to re-attain our prestorm level of excellence.

Department chair's note: I am privileged to work with my faculty and staff colleagues who showed so much courage and dedication to restoring the department to viability. The three coauthors of this article (Prindle, Ashbaugh, and Mitchell) were especially helpful with their efforts to contact every undergraduate and graduate student and their efforts to restore the research infrastructure. They were always available to help, and Professor Mitchell coordinated the entire recovery aspects of the engineering school. To rebuild the department with such colleagues is the best job I could hope for.

REFERENCES

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Professor Brian Mitchell's narrative on the recovery of our physical facilities

Two weeks after Hurricane Katrina, the department's personnel situation was still critical, but much more stable. All faculty and staff had been located and were in communication, most undergraduates had been advised which courses to take at their host institutions, and graduate students were in contact with their advisors. While many continued to struggle with personal issues related to assessment of their home damage, FEMA, the Red Cross, insurance, accommodations, and informing friends and family of their whereabouts, it became clear that it was time to give some attention to the status of departmental facilities, especially those related to research. The concern for research facilities was uniform throughout Tulane's research community, but the urgency in engineering was associated primarily with biological samples that had now been in unreplenished liquid nitrogen (LN_2)-cooled dewars for two weeks in the sweltering New Orleans summer heat.

***Laura Levy**, senior vice president for research, authorized a convoy for Sept. 15 to the Tulane campuses to assess damage. The convoy, led by **John Clements**, professor and chair of microbiology and immunology, departed early that Thursday morning from the Tulane University Regional Primate Center in Covington, which is located on the Northshore*

See ***Recovery of Physical Facilities***
continued on page 86

Recovery of Physical Facilities

Continued from page 85

of Lake Pontchartrain and had not received any significant damage from the storm. The eight-vehicle convoy consisted of researchers from both Uptown (Engineering and Science) and Downtown (Medical School) campuses, and traversed the 24-mile Lake Pontchartrain Causeway bridge in record-setting time with the assistance of a police escort. Its entrance into the city marked for many of the recovery-team members their first views of Metairie and New Orleans since the hurricane. The sights, sounds, and smells did not bode well for finding facilities intact.

Upon arriving at the Uptown campus, the Downtown team continued on to the more heavily damaged Medical School campus, while the representatives from Science and Engineering set to work. The team from the Chemical and Biomolecular Engineering Department consisted of Professor and Chair Vijay T. John, Assistant Professor W T. Godbey, and Professor Brian S. Mitchell. Flashlights in hand, the team entered the Lindy Claiborne Boggs Center for Energy and Biotechnology around 9 a.m., and trudged up the back stairs to the third and fourth floors that comprise the bulk of the department's research facilities.

As doors were opened and each lab inspected, hope grew that the department had evaded major damage. Lab benches looked as if students had simply left for lunch.

An initial scan of the department showed it to be in relatively good condition: no blown-out windows, no water damage, and no indications of unauthorized entry, save for one broken interior window in the department's Electronic Classroom. A keypad on the door and no missing equipment in the classroom soon led to the conclusion that security personnel had broken the glass simply to gain entry and evaluate damage. As doors were opened and each lab inspected, hope grew that the department had evaded major damage. Lab benches looked as if students had simply left for lunch. Only one lab had minor damage, the result of a window being left partially open and the hurricane-force winds toppling some glassware.

The team then concentrated its efforts on two general areas: securing biological samples and recovering research data. W Godbey was elated to find that his LN_2 dewar full of biological samples—including rare cells and tissue specimens that were collected over years of research—was still cold. (One can equate his joy at seeing the cold, white cloud rise from his liquid nitrogen storage freezer with the emotions exhibited by JPL engineers when a probe successfully lands on Mars.) He quickly replenished the dewar with LN_2 from a pre-Katrina storage tank in his lab, and did the same with Professor Kim O'Connor's samples in an adjacent laboratory. The team then collected biological samples from dewars in the Biomedical Engineering Department, consolidated the samples into one 25 l dewar with wheels, and placed the dewar by a service elevator to facilitate future refilling operations. Some thought was given to carrying the portable dewar down the stairs and placing it on the first floor since there was no power in the building, but there were indications that power to the elevators could be restored on a temporary basis, if necessary. Unfortunately, biological samples that had been frozen in a refrigerator freezer were no longer cold and had begun to decompose. DNA samples that had been placed in a freezer to slow decomposition could withstand room temperatures for moderate time periods, so they were still salvageable and were therefore retrieved.

Similar operations related to the collection and consolidation of biological samples were conducted in the chemistry and biochemistry departments, as well as at the Downtown campus. For example, a recent Public Broadcasting NOVA segment documents the heroic efforts of Tulane researcher ***Tyler Curiel*** *to save irreplaceable sinonasal undifferentiated carcinoma (SNUC) samples from his laboratory (<http://www.pbs.org/wgbh/nova/sciencenow/3302/08.html>). LN_2 is also critical to the operation of some advanced analytical tools, such as Nuclear Magnetic Resonance Spectrometers (NMRs).* ***Gary McPherson*** *and* ***Russell Schmehl****, our colleagues from chemistry, diligently worked to ensure that the NMR magnets in both the Department of Chemistry and Tulane's Coordinated Instrumentation Facility (CIF) did not quench. Eventually, these units also required that their liquid helium reservoirs be recharged, a task which involved several other dedicated individuals from both chemistry and CIF.*

The recovery of research data consisted primarily of retrieving laboratory notebooks and computers from investigators' offices and labs. It was unknown at that point how long the university would remain closed, and some investigators had not decided whether to relocate to other universities for the semester. Many opted to leave their computers for the time being. As it turned out, Tulane would be closed for the entire semester, and many faculty members did indeed relocate to continue their research, if only out of their homes. As a result, many computers and hard drives were retrieved during subsequent recovery trips. The retrieval and shipping of computers for faculty, staff, and graduate students proved to be problematic. Some requested only hard drives, which required opening computers, and some requested not only computers, but monitors and other peripherals as well. Shipment of large pieces of equipment required travel to neigh-

TABLE 1
Some Lessons Learned

Biological Materials	For brief power interruptions, a chest freezer is preferable to an upright freezer for storage of biologicals at -80 ° because it will remain cold for longer periods of time.
	If space and funds permit, store biological samples in LN_2 rather than a freezer, because • a full LN_2 dewar will stay cold for months, even in 100 °F heat, if unopened; however . . . • the storage of tissue samples with bacterial samples creates a potential contamination issue, so . . . • transform bacteria and lyophilize the modified culture broths with bacteria in them, for storage at room temperature for indefinite periods of time.
	Keep an adequate supply of LN_2 on hand.
	Consolidate LN_2 samples into one container whenever amenable, even if that means sharing one between laboratories, subject to the constraints described above.
Research Data	Back up your electronic data on a regular basis to an easily retrievable location.
	Consider replacing your desktop computer with a laptop and docking station so data is easily portable in an emergency.
	Have students store research notes, laboratory notebooks, and samples in a predefined location so critical nonelectronic data can be easily located in their absence.
	Store flammable research notebooks in a fireproof and waterproof container.
Electrical Equipment	Place all electrical devices on appropriately sized battery backups with surge protection to guard against short-term power interruptions.
	For longer power interruptions, if time permits, shut down all electrical devices and turn off electrical breakers to prevent damage due to power surges upon being re-energized.

boring communities where postal facilities were open (and packed with people trying to get their mail). In some cases, computers and supplies were driven to their final destinations by faculty or staff members. Much of this effort could have been avoided with proper data storage practices. Though there are certainly security and accessibility issues with off-site data storage, in a case like this, in which faculty is forced to scatter to various locations without sufficient warning to retrieve or back up data, the ability to retrieve important information from a neutral site would be invaluable. One such resource currently under development is the Louisiana Optical Network Initiative (LONI)—<http://mycenit.latech.edu/LONI2005/)>—which will provide a high-speed optical network for researchers at a number of Louisiana universities, including Tulane. But until such networks are in place and easily accessible to the research community, individual investigators must accept the responsibility for ensuring that their research data are secure and readily retrievable. A list of other "Lessons Learned" is shown in Table 1. An area for further research is listed in Table 2.

By Sept. 26, residents were being allowed back into Orleans Parish on a limited basis, so police escorts and convoys were no longer necessary. Recovery trips to the campus continued, and it was during the ensuing six- to eight-week period that the majority of computers and research equipment were removed to allow investigators to continue their research at external sites. In most instances, the investigators, or their representatives, were escorted onto the Uptown campus by either the dean of engineering or his designee. All visitors to campus had to be cleared with the Office of Public Safety prior to their visits, and random identification checks from armed security officers were the norm. A system was established for recording institutional identification numbers for all equipment removed from the campus. Investigators were allowed to remove equipment for research purposes, but were informed that doing so could have insurance implications; i.e., if there was hurricane-related damage, they may not be able to prove it since insurance adjustors had not yet arrived on campus. A few investigators moved their labs—equipment, graduate students, and all—to host universities for the semester. Some chose to remain at Tulane and carry out their research with graduate students who had either remained behind or returned. By mid-November, escorted visits had virtually ceased, cleanup operations were well under way, and the Department of Chemical and Biomolecular Engineering was gearing up for the spring term. Tulane University officially opened to faculty and staff on Dec. 19, 2005, and the spring 2006 term began Jan. 16, 2006, right on schedule. ❐

TABLE 2
More Information Needed

There is an issue with vapor phase vs. liquid phase storage of biologicals: There is a high probability that fungal spores will be floating in LN_2, and if the storage tubes are submerged in the liquid then there is a chance of sample contamination. On the other hand, a full dewar, if left unopened, can keep samples cold for months. Some kind of study would help clarify whether liquid phase storage is indeed safe for biologicals.

Maintaining Connections with Undergraduates

Continued from page 83

requested to provide contact information for classmates (e-mail addresses, cell phone numbers, etc.). If they were uncomfortable doing this, they were asked to contact classmates themselves and encourage them to contact one of the faculty. This approach, along with posting a request on the department's blog (see Professor Ashbaugh's account), still only allowed direct contact information to be gathered for about 50 percent of our students. The junior and senior classes, however, had set up their own Yahoo groups prior to the storm, which meant departmental e-mails ultimately reached more students. In one instance, a student posted faculty messages to a Web site the student had built specifically for sharing department information with classmates. In retrospect, gathering alternate contact information prior to Katrina as a regular part of getting acquainted with students would have allowed department outreach efforts to be more effective after the hurricane.

Student feedback from phone conversations led to the realization that our core course curriculum was aligned with only a fraction of other chemical engineering programs. Our unique Practice School program during the senior year[3] requires that most core courses be offered a semester earlier than other programs. As a result, students found it challenging to find the chemical engineering courses they needed. Of particular concern were the seniors and their need to complete a capstone design course before graduation. Within a day of recognizing this issue, the consensus from the faculty was that our process design course would be offered during the spring semester. This information was quickly communicated to the seniors. The speed with which decisions of this type were made and communicated ultimately affected the options our students had during fall registration. Since Katrina made landfall the weekend before the semester started, however, even the best efforts meant students began attending classes at other universities two to three weeks late.

Many students evacuated New Orleans without their textbooks or notes. Because of the broad scope of most capstone design courses, the most affected group was those seniors who managed to enroll in this course. As a result, the faculty member who would have taught this course within our department during the fall semester offered to provide supporting information from books that the students owned but left in New Orleans.

Those students who attended other universities in the fall were requested to send us the name of the university and the courses for which they were registered. This provided a means of double checking what the student thought was an equivalent core course. If the course was not adequately equivalent, the student was quickly notified. Under the difficult circumstances, many students pragmatically chose to take their remaining non-ChE courses during the fall.

Near the end of September, the faculty began discussing the course schedule for the spring and Lagniappe semesters. From the fall registration information provided by our students, it became evident that offering all core courses during these two semesters would be a requirement in order to keep the students on track. By mid-October, a course schedule for both semesters had been established which met this objective.

Registration for the spring semester at Tulane began in early November. Two weeks prior to registration, all students were sent an e-mail requesting they update their fall course-enrollment information. In this e-mail, students were also informed that they would be able to contact three departmental advisors (Drs. Mitchell, John, and Prindle) by phone for advising assistance over the five-day period just prior to the beginning of registration. This call center setup provided the students with assistance in addressing their registration questions. Since the university Internet and e-mail servers were restored in mid-October, there was no problem contacting all of our students using their university e-mail addresses. The response to this request was substantially higher.

Several challenges had to be overcome in manning the call center. Since the campus was closed and security was tight, department offices could not be entered without special permission. In addition, service to department phones was not activated until the second day. Despite obstacles, the call center was ultimately successful in providing students with assistance in addressing their concerns prior to registration.

All of these efforts in establishing and maintaining the faculty-student connection were difficult under the challenging conditions. We believe, however, that they have forged even stronger ties between both groups. As a result of these experiences, some students feel more comfortable discussing problems with faculty. Faculty interest in our students and their well-being has increased as well. While both groups looked forward to the start of the spring semester and a return to a sense of normalcy, that normal state will be distinctly different. And, in many ways, better. ❐