Ice crystals on thistle shot early one morning at Saw Hill Ponds. (Photo by Carlye Calvin.)

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For the people of NCAR, UCAR, and UOP Vol.42 #2 • February 2007

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Just One Look

UCAR photographer Carlye Calvin shot this photo of Punxsutawney Phil's distant cousins—prairie dogs—casting shadows near Foothills Lab. This year the City of Boulder declared February 2, traditionally known as Groundhog Day, as "Prairie Dog Day," pledging to honor the importance of this furry, burrowing rodent to the Western prairie ecosystem. The groundhog's closest relative in Colorado is actually the yellow-bellied marmot, but the marmot is in hibernation in February.

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New data center to be based in Cheyenne

The news that so many were waiting for arrived in January, when NCAR announced that its supercomputers will have a brand new home in Cheyenne in 2010.

And not just any home. The center will have up to 20,000 square feet of raised-floor computing space.

NCAR is building the center in partnership with the University of Wyoming, the State of Wyoming, the Cheyenne–Laramie County Corporation for Economic Development, the Wyoming Business Council, and CU-Boulder.

“We are excited to work on this extraordinary and pathfinding project with our colleagues at the University of Wyoming and the University of Colorado to form new bridges of scientific inquiry,” says Tim Killeen, NCAR director. “The data center project is a major step for NCAR that will advance research in the geosciences and enable us to greatly improve our understanding of the world around us.”

NCAR managers and dignitaries from the State of Wyoming gathered at a press conference at the Wyoming State Capitol in Cheyenne on January 25 to announce the data center partnership.

The computers, which will be upgraded regularly, will initially achieve speeds of hundreds of teraflops. A teraflop is a measure of a computer’s speed that can be expressed as a trillion floating-point operations per second. By the time the new center

opens, it may be be possible to acquire computers with speeds measured in petaflops, or a thousand trillion floating-point operations per second. Such a computer is a million times faster than an already-fast personal computer.

The road to Wyoming

NCAR considered partnerships for the data center with a number of organizations along the Front Range, giving CU-Boulder and the University of Wyoming particularly close scrutiny. NCAR also looked into leasing space and retrofitting an existing data center.

With support from NSF and the UCAR Board of Trustees, NCAR chose to locate the center in Wyoming after a rigorous evaluation, concluding that this partnership would facilitate getting the greatest computing capability for the regional and national scientific community at the earliest possible time.

“The Wyoming offer provides more computing power, sooner, and at lower cost,” Tim explained during an all-staff town hall meeting on January 31. “We’ve secured the future of NCAR’s role in leadership computing.”

The Wyoming offer consists of a 24-acre “shovel-ready” site for construction in the North Range Business Park in Cheyenne near the intersection of I-80 and I-25, along with physical infra- structure for fiber optics and guaranteed power transmission of 24 megawatts. The University of Wyoming will provide $20 million in endowment funds for construction, as well as $1 million annually for operations. NCAR will utilize the State of Wyoming’s bond program to fund construction, with the state treasurer purchasing bonds that will be paid off by NCAR.

Although CU-Boulder’s offer would have given the new center greater proximity to other NCAR facilities, it would have left NCAR with a mortgage of $50 million rather than $40 million and less long-term financial savings. The Cheyenne site offers cheaper construction costs and lends itself to future expansion. It also brings a transformative partnership to a state that has traditionally lacked opportunities in technology and research.

Environmental impacts

The new center will be the first NCAR facility to earn LEED (Leadership in Energy and Environmental Design) certification for its design, construction, and operation. Measuring 108,000 square feet in total with 15,000-20,000 square feet of raised floor, it will be built for 8 megawatts of power, with 4-5 megawatts for computing and 3-4 for cooling. The power will be generated primarily from “clean” coal (coal that has been chemically scrubbed to reduce emissions of harmful pollutants) via Cheyenne Light Fuel and Power. NCAR is also aggressively working to secure the provision of alternative energy (wind and solar) for the facility, hoping to attain an initial level of 10%.

“We’re going to push for environmentally friendly solutions,” Tim says.

Building bridges

CU-Boulder will serve as one of the center’s founding partners with NCAR and Wyoming. According to Tim, NCAR expects these partnerships, stimulated by the data center, to lead to new and fruitful scientific collaborations. The center is expected to generate collaborations with other institutions as well as part of an effort to develop a cyber-collaboratory.

One challenge the new center poses is that it will require staff relocation to Cheyenne, as about 40-50 positions are associated with the new center. CISL director Al Kellie stressed during the town hall meeting that the organization has three years to consider various staffing arrangements and determine how to best manage staff in two locations.

Pending approval by the Wyoming legislature and NSF and completion of a facility design and review process, construction should begin within about one and a half years. Krista Laursen, who served as project director for the acquisition of the NSF/NCAR Gulfstream-V aircraft (HIAPER), will direct the Data Center Project Office.

"All of us working on this project are very excited to get started with the facility design process in the next few months," she says. • Nicole Gordon

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Guest Column

Climate Change and Islands: Are Scientists Serving Society?

One of the biggest dangers of global warming is sea level rise. As glaciers and ice sheets melt, they add to theamount of water in the ocean. In addition, as the ocean absorbs heat from rising global temperatures, it swells as a result of thermal expansion, the tendency of matter to increase in volume when heated.

Between 1870 and 2004, sea levels rose by about 20 centimeters (8 inches), with accelerated rates during the final 50 years of that period. The Intergovernmental Panel on Climate Change assessment released earlier this month predicts seas to rise 18-58 cm (7-23 in) by 2100; other recent research suggests a greater rise, up to 88 cm (35 in).

In late December 2006, rising seas did something unprecedented when they entirely washed away an inhabited island. The island, Lohachara, was situated in India's Sundarbans, a mangrove delta where the Ganges River empties into the Bay of Bengal. It was home to 10,000 people who evacuated before the sea swallowed up their home.

And on the other sides of the world, in Alaska and the South Pacific, islanders have already moved farther inland or are preparing to abandon their islands altogether in the face of rising seas and erosion.

Ilan Kelman.

Ilan Kelman, an ASP postdoc in SERE's Center for Capacity Building, researches vulnerability, risk, and disasters, with a special emphasis on islands and coastal areas. As a guest columnist for this issue of Staff Notes Monthly, he shares his thoughts about the role of atmospheric scientists within the context of islands and climate change.

More on Ilan's work.

Islands are romantic, mysterious, dazzling, tranquil, and exquisite. Or so the myths tell us. For me, reality often matches myth. The isolation and marginalization of islands betrays a beauty and allure which has led me to focus much of my research on island sustainability, particularly related to reducing vulnerability to atmospheric extremes.

Despite the inherent vulnerabilities of small and isolated populations, islands also inspire through the solutions that they provide to the rest of the world. Islands yield tight kinship networks and a strong sense of community, which help their inhabitants tackle challenges rapidly and cohesively. Rather than traditional economies of scale, diseconomies of scale—that is, economic disadvantages to increasing the scale of production—and economies of smaller scales are advantageous for island livelihoods. Traditional island knowledge, which is vanishing amidst global cultural homogeneity, still provides adept skills for adjusting to sudden events and long-term trends.

UCAR photographer Carlye Calvin shot this photo of a small island off the coast of Antigua during a 2005 field project.

Climate change, though, could pose difficulties beyond islanders' abilities to cope. Economic and population centers of many islands and island groups are being impacted through extreme weather events plus longer-term creeping environmental changes. Sea-level rise is not the only scenario that could cause island destruction. Other possibilities include devastating cyclones (comparable to Cyclone Bebe, which inundated Tuvalu in 1972, and Cyclone Heta, which flattened Niue's infrastructure in 2004), changes in ocean currents, depleted fisheries, and ocean acidification. The potential for island abandonment is being forced onto the international scientific, development, and sustainability agendas.

The movements have already started. In July 2004, the international media reported the world's first climate change refugees from the island village of Shishmaref, Alaska, who moved inland due to sea-level rise and thawing permafrost. Then, in December 2005, the international media again reported the world's first climate change refugees, but this time from the Lateu settlement in Vanuatu, an island chain in the South Pacific. These islanders also moved inland due to sea-level rise plus more frequent flooding. The proliferation of "firsts" suggests that we must give more scientific input into these discussions, policies, and actions.

Recent precedents exist for island evacuations, mainly from volcanic eruptions, and the cases have been extensively studied. In most examples, long-term relocation was unsuccessful because the islanders chose to return, even when the volcano continued menacing. That could be considered a positive long-term result because the island society remained intact and responded to the challenge even though the islanders were living in a possible danger zone. After all, everywhere on Earth could be considered a possible danger zone, with the potential for flash floods in Boulder, earthquakes in Boston, and hurricanes in New York or Washington, D.C. If people wish to remain in the face of such threats, fully understanding the consequences, should they be forced to leave their homes and identities?

How should atmospheric scientists contribute to a situation in which islanders wish to stay on their climate change–affected island until they must run or die? Should we actively promote debate on possible impacts, given our and their knowledge of weather and climate? Or should we stay with physical science and let others—social scientists, development agencies, politicians, and more—lead the way? What would the social impact be, on islanders and on scientists, from formally investigating, publicizing, and being operationally involved in island abandonment decisions?

Physical scientists potentially have an immense amount to contribute to these ethical and policy debates, from ensuring that correct scientific information is available and used to explaining what is not known and why that is not known. They can also provide a scientifically rational perspective alongside other equally important views, and translate technical terms into easily understood

language.

Naturally, care is essential when we become involved. For example, terming the issue "abandonment" or "permanent evacuation" has more emotive connotations than "relocation" and "permanent departure." Language is powerful, with our choice of words translated from and translated to as important as the medium and manner of communication—especially considering that some languages are inherently more emotive than others and that some languages might not be able to express the full range of connotations from the various phrases.

As scientists, we must always consider the interpretation and application of our work. We should also consider our responsibility to society in order to ensure that our science is applied properly. •Ilan Kelman

On the Web

More on Ilan's work.

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Snow closures: A look behind the scenes

Staffers got a special holiday treat in December that wasn't candy, neckties, or potpourri baskets. Rather, it was the gift of time, in the form of two and a half snow days.

UCAR/NCAR's facilities in Boulder closed on the afternoon of December 20, and for full days on both December 21 and 29, due to major snowstorms that closed roads, schools, and businesses. For many staffers, their day's work began and ended with a quick morning phone call or Web check to ascertain that it was indeed a snow day, after which they went about their business sleeping in, shoveling the walk, or perhaps working from home. But who makes the call to close due to weather? What criteria do they use?

The route from Foothills to Center Green in late December. (Photo by Ilan Kelman.)

The official answer can be found in Section 5-1-2 of the UCAR Policy Manual, which states that closure decisions are made on a site-by-site basis by the vice president for finance and administration (Katy Schmoll), with the recommendation of the director of Physical Plant Services (John Pereira) and in consultation with the director of Safety and Site Services (Steve Sadler). Rick Anthes, UCAR president, also weighs in.

According to Steve, the group relies on a number of criteria to determine whether or not to close, among them severe weather warnings from the National Weather Service (NWS) and internal forecasts from meteorologists in ESSL/MMM and COMET. The status of other organizations in Boulder is also taken into account.

"If all the schools are closing and we know our employees have child care concerns, that factors in," Steve says. "We use information from a number of different sources, and no one of them rules."

Forecasting snow days

Morris Weisman in ESSL/MMM provides informal forecasts to Steve when severe winter storms approach Boulder. "I try to get snow days every day, and every once in a while Steve agrees to it," he jokes.

A forecaster at heart, Morris says he's always watching the weather. When a severe event is looming, he examines standard NWS operational models and reviews radar and satellite data, as well as output from NCAR's Weather Research and Forecasting model (WRF) when possible. He also practices a much simpler method: looking out the window.

"You really have to pay attention to what you see outside and what the observations are showing you," he says. "For the December 20 blizzard, there was disagreement in the models but the potential for a big storm. It wasn't until that morning that we could see the huge area of precipitation having developed over the Plains and moving westward toward the Front Range."

Katy, John, and Steve try to make the call to close for the day by 5:30 a.m. so that they complete the notification process by 6 a.m. Christy Fletcher and Liz Kriete (both in SaSS) send e-mail and voice mail notification to all employees at Boulder facilities and update the SaSS hotline (ext. 1100). A notice is posted to the main UCAR

Web site as well as the F&A and SaSS sites. John notifies local media to have UCAR/NCAR included on public closure announcements.

Security and snow removal

Not everyone gets the day off, though. Because NCAR has an around-the-clock security presence, officers stick it out during storms, even if that means shifts that last 24 hours or more.

"Our biggest concerns during heavy snowfall are at the Mesa Lab on the hill road, where we get people sledding, skiing, and snowboarding. We survey the roads and our parking lots constantly," says Ron Wicker from AlliedBarton Security Services, UCAR's contract security service. The hill road is private NSF property.

Severe weather doesn't mean that NCAR is closed to the public. Visitors to the Mesa Lab on a snow day are allowed into the building for self-guided tours provided the building isn't experiencing power or maintenance problems.

Maintenance staffers are another group who don't all get the day off during building closures. Dave Maddy, manager of maintenance and construction in PPS, oversees snow removal efforts at the organization's Boulder facilities. "Big snow events work the same as any time it snows more than an inch," he says. "In the event of an extreme storm when we think we might lose access, we station our people here in advance."

Those people are a crew of staffers led by Rich Johnson (PPS) who mobilize whenever snow falls. NCAR, not the City of Boulder, is responsible for clearing the hill road to the Mesa Lab.

During major snowstorms, driving to and through Boulder to the Mesa Lab road to clear it can be a challenge. "It's one thing to have great equipment and a great crew, but when the highway patrol says you can't drive on a road, that does it," Dave says. "But the folks on our snow removal crew tend to be fairly hardy stock who own vehicles that get them around."

An independent contractor, overseen and supported by PPS, clears snow from the sidewalks and parking lots at the Foothills, Center Green, and Jeffco campuses. The City of Boulder is responsible for clearing the adjacent roads.

Keeping the computers humming

The Mesa Lab computer room requires at least one operator around the clock to monitor the room's infrastructure and ensure that the supercomputers and network remain up and running. The lab has a back-up generator in case of a power outage.

"We're considered essential staff regardless of plant closures," explains Linda LaBrie, computer production group head. "It's a role built right into the job description."

One person can single-handedly oversee the room during snowstorms, but the problem is usually getting that person to and from the building. Often this means staffers putting in extra-long shifts, sometimes up to 36 hours. It also requires computer room and infrastructure support staff who own four-wheel drive vehicles to volunteer to shuttle colleagues to and from the Mesa Lab.

"The December storms demonstrated outstanding teamwork and effort because a lot of staff were on vacation," Linda says.

What about the bill?

Finally, there is the burning question that everyone would prefer to not think about while enjoying a snow day: what are the financial consequences? According to Katy, the average snow closure day costs UCAR about $300,000-340,000. Since the December closures took place during the holidays when more staffers than usual were taking PTO (paid time off), the total cost for two and a half days came to $518,000.

During a closure, salaries for employees scheduled to work (those not on PTO, travel, or based outside Boulder) cannot be charged to NSF or other direct funders; instead, the salaries are charged to the benefits pool. Increases in the benefits pool impact the funding available for science and programs. Because of the way the federal government handles budgeting, the snow closures have the effect of raising UCAR's benefits rates two years after they occur.

"It potentially makes the cost of employing someone higher," Katy explains. "We are all sensitive to increases in the indirect rates, which necessitates caution in closing our facilities."
Because the organization serves as a host for conferences and events that are attended by visitors from literally all over the world, site-wide closures can have a dramatic, detrimental effect on important meetings, Katy adds.

She points out that UCAR has a very liberal work and family policy that allows employees and supervisors to establish flexible work alternatives, which can be applied during circumstances such as snow storms when staffers might find it risky to drive to work.

"Supervisors are generally very sympathetic, and will allow employees to come to work late or leave early in order to mitigate against the conditions, making up the work at later times," she says. • Nicole Gordon

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Random Profile: Justin Watt

Every other month, Staff Notes Monthly spotlights a staff member selected from the phone directory with the help of a random number generator. This month we profile Justin Watt, who provides food service support for Event Services.

Justin Watt.

Justin has been working for Event Services in the Mesa Lab cafeteria since April 2006. His main duty is dishwashing, though he also prepares and serves food during the lunch hour.

His favorite part of the job is his co-workers. “We always have a good time and joke around a lot,” he says.

His least favorite part of the job is waking up early enough to commute from his home in Nederland, since he’s not a morning person and doesn’t own a car. “I have to wake up at 5 a.m. to catch the bus down to Boulder, then catch the Skip, then take the shuttle up to the Mesa Lab, so it takes me a while to get to work,” he explains.

Before coming to NCAR, Justin was manager of Neapolitan’s Italian Restaurant in Nederland, where he started as a dishwasher and worked his way up before the restaurant closed. He aspires to some day open his own restaurant with a hookah bar (a café for smoking flavored tobacco called shisha). “I love to cook and am really good at making Mexican and Italian food,” he says.

He doesn’t have a favorite menu item in the cafeteria, but if he could make any addition, it would be something his family calls “hospitality casserole,” a dish passed down from his grandmother that consists of noodles, spinach, black olives, cheese, and beef. “It’s something my mom makes, and it’s really good,” he says.

Justin lives in Nederland, the same town in which he grew up. He used to play bass in a band, and more recently he’s taught himself guitar and drums. He uses his computer to record the music he creates, playing it through eight speakers in his house. His musical influences include everything from hip-hop to metal to Irish rock, particularly

the Pogues and Flogging Molly. “I wish I could play fiddle or accordion,” he says.

If he could design his own dream concert, picking the band of his choice to see at any venue, he would see One Minute Silence, a London band he describes as political rap/metal, at Tulagi’s in Boulder.

On the weekends, Justin likes to play pool at his house with friends. He recently built a ping-pong table from scratch. “One corner isn’t flat, so someone gets an advantage or disadvantage, depending how you look at it,” he says. “But it works.”

Justin gets together with friends to golf, bowl, and play pick-up football, basketball, and baseball. He also snow skates in the homemade skate park in his parents’ front yard. He likes movies as well, particularly dark comedies, horror flicks, and independent films. The best movie he’s seen recently is Little Miss Sunshine.

One thing he doesn’t like is interpersonal drama.

“I avoid it at all costs,” he says.

Working at UCAR/NCAR seems to run in Justin’s family: his mother, Carlye Calvin, works in Communications as a photographer and Web designer, while his father, Andy Watt, builds instruments for ground and airborne research in EOL.

“So far, no one has any clue that she’s my mom,” Justin says about Carlye.

Justin’s brother, Mike, lives in Boulder where he attends CU, and the two hang out frequently.
•Nicole Gordon

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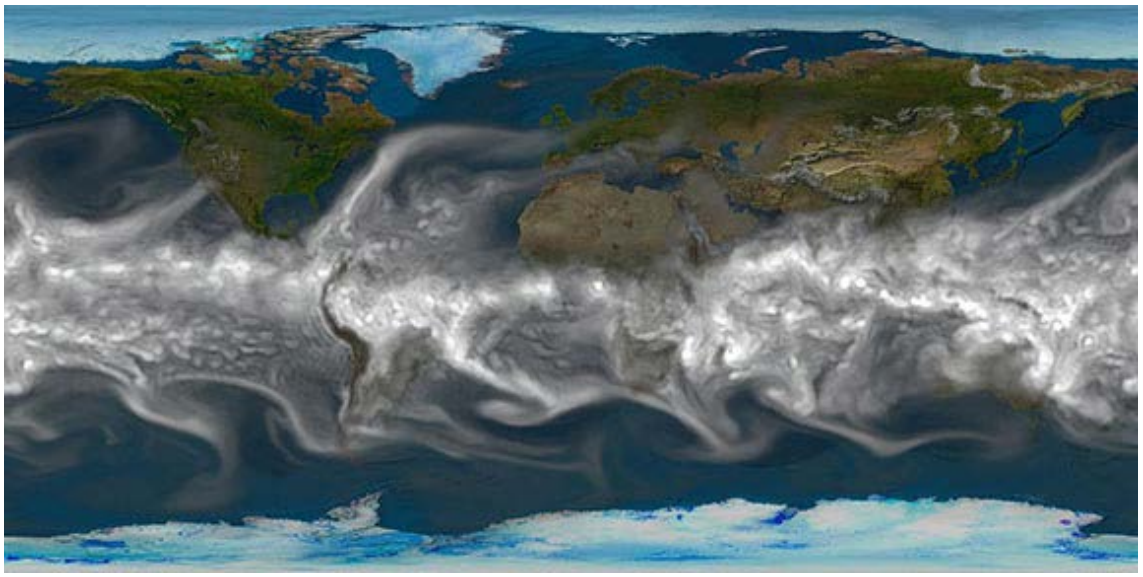
Images by NCAR scientists on display



This image, created by Don Middleton (CISL) from a high-resolution global climate model, is on display at the Denver Museum of Nature and Science, along with two other images by NCAR researchers.

Solar plumes, nematode worms, kidney stones, nano-crystals, pulmonary arteries, chicken organs: images that scientists produce of the things they study may be visually striking and demonstrate creativity, but they are not a form of art.

Or are they?

That's one of the questions posed by an exhibit currently on display at the Denver Museum of Nature and Science. Art in Science | Science in Art is a juried exhibition of images made by University of Colorado–affiliated scientists and artists, including six NCAR researchers.

The exhibit organizers asked scientists to submit images that they made as part of their everyday work. Artists whose images illustrate scientific principles were also asked to participate. The organizers hope to provoke participants and exhibit-goers to think about the gulf between science and art. How wide is it? Can there be any communication across it? If a scientist makes an image that looks like art, is that a happy accident or do some scientists intentionally make their work more artistic than strictly necessary?

Out of hundreds of submissions, the jury selected 66 to be placed in an online gallery. Of these, 30 were printed in large format, framed, and hung in a traveling show that opened on January 18 in Denver.

Among the works on display are an image by Don Middleton (above) from a high-resolution global climate model; a depiction of a turbulent solar plume, created by Joey Mendoza (CISL) and Mark Rast (ESSL/HAO); and the flow of the Kuroshio current as illustrated by Dave Brown (CISL), Frank Bryan (ESSL/CGD), and Tim Scheitlin (CISL).

Joey, a systems administrator who also works on visualizations, was inspired to enter the solar plume visual he and Mark created because it was such a unique image. “At the time [May 2003] it was one of the biggest simulations performed here, and everyone said it was amazing,” he says, adding that to him the image represents both art and science.

Dave, a software engineer, collaborated with Tim and Frank on the Kuroshio current image, using special techniques to regrid the data for visualization. “There is definitely art in deciding how to illustrate science properly,” he says. “There are so many choices to make—what boundaries to show, what perspective to use, where to put the center of the picture.”

The exhibit will remain in the Denver Museum of Nature and Science’s West Atrium until mid-May. On June 1, it opens at the University of Colorado’s Given Institute in Aspen. • Nicole Gordon

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Delphi

Marc Genty
Delphi Coordinator

Questions and suggestions from the staff to management may be submitted in confidence to the Delphi Coordinator. They should be submitted in written form, preferably via interoffice mail in a sealed envelope marked confidential. They must be signed. Detailed procedures for submitting questions are given in the UCAR Policies and Procedures Manual, *section 4-1-2, and on the Delphi Web site.* Staff Notes Monthly *publishes questions and answers of general interest to staff, and the Delphi Web site has a log of all questions submitted since 1995.*

Delphi Question: Cafeterias trans-fat–free?

Delphi Question #569 (received January 2): Recently New York City voted to ban the use of artificial "trans fats" in that city's dining establishments. Many food manufacturers are also eliminating this type of fat, given its well-documented health risks.

Does the UCAR cafeteria currently use artificial trans fats in its fried or baked products? If so, is there a plan to eliminate these fats, and if so, when is the target date? I realize the cafeteria cannot cater to every health concern, but this one seems especially important. I enjoy the cafeteria's food, and I'd like to be able to sample a doughnut or a serving of French fries without worrying that this unnecessary and dangerous type of fat might be present.

Response (received January 9): The UCAR/NCAR/UOP cafeterias have been aware of the movement to ban artificial trans fats and have already replaced many items that contain these fats for several years now. All the cafeterias use liquid canola fryer oil and cook with an olive oil blend and butter. We sell Orowheat brand breads, which contain no trans fats. We also sell scones, danishes, croissants, ciabatta, focaccia, and rustic and French breads from Bluepoint Bakery that contain no trans fats. For breading, we use panko, a Japanese-style breadcrumb that contains no trans fats. We are currently working with our primary vendors (Sysco, Shamrock, and U.S. Foods) to purchase all trans-fat–free products, which would include griddle oil, crackers, tortillas, chips, etc. The doughnuts we sell, however, are made with vegetable shortening (partially hydrogenated soybean oil).

While we are working to eliminate trans fats completely, we want our clientele to know that we already have many food products that are trans-fat–free. Please continue to read food labels and ask cafeteria personnel if you have any more concerns.

—Nancy Post van der Burg
Event Services

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