



FREDERICK NATIONAL LABORATORY FOR CANCER RESEARCH

SEPTEMBER 2012

The Wait Is Over

By Nancy Parrish, Staff Writer

At a March 2010 gathering at the construction site of the Advanced Technology Research Facility (ATRF), Craig Reynolds, Ph.D., associate director of the National Cancer Institute (NCI), noted that the facility would be a place where public-private partnerships will produce the next generation of diagnostics and treatments for cancer and AIDS. The completion of the facility, he said, “is anticipated by the 1.5 million Americans who get cancer every year....They anxiously await this construction” (*News & Views*, April 2010, page 3).

Now, the wait is over. Just three years after ground was broken, the ATRF opened its doors in June to sophisticated research laboratories that support the Frederick National Laboratory for Cancer Research (FNL).

The new facility represents “a consolidated source of state-of-the-art technologies and associated expertise made available to researchers both inside and outside of the NCI,” Reynolds said in a recent e-mail. “Access to these technologies will help to

reduce the cost and shorten the time to develop new agents for the prevention, diagnosis, and treatment of cancer and AIDS.”

Move Consolidates Labs in 30+ Buildings

The move to the ATRF consolidates staff and operations previously scattered among more than 30 buildings at FNL’s main campus within the perimeter of Fort Detrick. As part of the FNL, which is the only Federally Funded Research and Development Center dedicated exclusively to biomedical research, the ATRF is home to laboratories housing advanced technologies and scientific expertise in genomics, proteomics, and imaging and nanotechnology. In addition, nearly two wings of the facility are devoted to biopharmaceutical development, from feasibility assessment through Phase I/II cGMP manufacturing, as well as regulatory documentation.

The ATRF data center (see pages 18–19) will accommodate the sophisticated data-handling requirements of the advanced research activities housed in the facility. With the ability to manage

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From the Editor

We're pleased to bring you this special issue of the *Poster*. To mark the opening of the Advanced Technology Research Facility in June 2012, we are devoting this entire issue to the new facility—its laboratories, the technologies it houses, and, more importantly, the promise it holds for advancing research to accelerate the development of new diagnostics and treatments for people living with cancer and AIDS.

Employees receiving this issue will also find a special insert covering some of the significant activities that occurred at the Frederick National Laboratory since the last issue of the *Poster* was published in June, including the announcement of the Spring Research Festival Poster winners, and photos from Take Your Child to Work Day, the Student Science Jeopardy Tournament, and Student Poster Day.

We hope you enjoy this special issue about the Advanced Technology Research Facility. Our regular features of the *Poster*, including Platinum Publications, Science Today, the Poster Puzzler, and news from the Frederick National Laboratory community, will return with the December issue.

Melissa Porter, Executive Editor



New Partnership Agreement to Streamline Research

By Frank Blanchard, Staff Writer

A new partnership mechanism will enable the Frederick National Laboratory to streamline research and development collaborations, respond more rapidly to opportunities, and manage intellectual property for technology transfer.

The U.S. Department of Health and Human Services has given final approval for the Frederick National Laboratory for Cancer Research (FNL) to begin using the contractor Cooperative Research and Development Agreement, or c-CRADA.

Previously, FNL research and development partnerships with academic, industry, and nonprofit research organizations have required government participation. This meant that SAIC-Frederick, the Operations and Technical Support Contractor for the FNL, could enter into direct collaborative agreements with outside organizations only with the

participation of National Cancer Institute (NCI) personnel.

With the c-CRADA, the FNL will, for the first time, be able to receive funds directly from partners to offset the costs associated with outside research collaborations.

In addition, the new mechanism gives extramural and commercial researchers greater access to the science, technology, and expertise of the FNL.

“This provides a new vehicle to offer our distinctive technical capabilities to the external biomedical research community,” said SAIC-Frederick Chief Executive Officer Dave Heimbrook, Ph.D.

Under the c-CRADA, SAIC-Frederick will have ownership rights to intellectual property that might emerge from the agreement. While the government will retain its statutory rights to intellectual property developed at FNL, external

partners will be able to obtain exclusive or non-exclusive license rights to the technology developed as a result of the partnership, thereby expediting technology commercialization. This could make it easier, for example, for the FNL to move potential technologies through the development pipeline, from the FNL bench to the patients' bedside, in collaboration with the commercial partner.

“This new instrument will also enable the contractor to respond more rapidly to collaboration opportunities that support the NCI mission,” Heimbrook said.

This mechanism will help eliminate potential stumbling blocks and bottlenecks that existed previously in establishing partnerships to pursue specific areas of research or technology development. Use of the c-CRADA is expected to accelerate the delivery of safe and effective cancer treatment to patients, while maintaining alignment with NCI objectives. ■

Building Design Fosters Partnerships

By Nancy Parrish, Staff Writer

The physical space of the Advanced Technology Research Facility (ATRF) is designed to encourage collaborations, both internal and external. Of the 330,000 square feet of space at the new facility, nearly 40,000 have been set aside for collaborations between the Frederick National Laboratory for Cancer Research (FNL) and outside partners in an arrangement that brings together scientists and specialists from government, industry, academia, and the nonprofit sectors in support of the research of National Cancer Institute (NCI).

With dedicated laboratory and “think tank” space for collaborative work with partners across a continuum of technologies and platforms, the new facility is designed to foster partnerships that will help NCI accelerate the development of new concepts and research aimed at translating findings into diagnostics and therapies.

Partners will be able to co-locate at the ATRF and interact directly with FNL scientists, as well as gain access to the advanced technologies, the cGMP manufacturing capabilities, and the intellectual property and regulatory affairs specialists of the FNL, to achieve outcomes that



Standing in front of the visitors' entrance at the Advanced Technology Research Facility are Craig Reynolds, NCI associate director (left), and Dave Heimbrook, SAIC-Frederick chief executive officer. Public-private partnerships will “advance science, technology, and drug development, which should directly benefit the patients living with cancer and AIDS,” Heimbrook said.

are favorable to both the NCI mission and the partners' needs. Such public-private partnerships represent the cornerstone of NCI's mission to accelerate the delivery of new diagnostics and treatments to people living with cancer and AIDS.

Partnership Support Offices on Site

The ATRF also houses offices that support the development of partnerships with outside organizations and that manage the contractual agreements related to partnerships. The Partnership Development Office facilitates the creation of partnerships with outside organizations. In addition, the NCI Technology Transfer Center and the SAIC-Frederick Intellectual Property Office (see page 17) work together to manage a variety of contractual agreements between collaborators regarding the exchange of materials and intellectual property, as well as technology transfer agreements, invention reporting, and patent applications.

“These partnerships will facilitate a closer working relationship between the best and brightest extramural scientists, NCI's intramural researchers, and contract staff at the FNL, all working at a single location on a common mission,” said Craig Reynolds, Ph.D., associate director of NCI. ■

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the massive amounts of data generated by high-throughput genomics, proteomics, imaging, and associated computational requirements, the data center is designed to support current research needs as well as expand to nearly double its capacity to meet future needs.

“By coalescing many of our top technologies into a single state-of-the-art facility, we create a technically sophisticated and highly collaborative environment that is immediately

appealing to anyone coming through the building, whether they are scientists or not,” said Dave Heimbrook, Ph.D., chief executive officer of SAIC-Frederick, the Operations and Technical Support contractor for FNL.

January Completion Anticipated

The laboratories of the Advanced Technology Program and the Biopharmaceutical Development Program relocated to the new facility

over the summer, and they will be followed by the Sequencing Facility in the fall. The move is scheduled to be completed in January 2013, when the Center for Cancer Research Molecular Targets Laboratory relocates.

About 250 of FNL's 2,800 employees will move into the new facility. FNL will continue to maintain the majority of its laboratories, both government and contractor, at the Fort Detrick location. ■

New Space Opens Opportunities for NCL

By Nancy Parrish, Staff Writer

For the first time, the Nanotechnology Characterization Laboratory (NCL) is under one roof, as a result of their move to the Advanced Technology Research Facility (ATRF). The move is expected to streamline their work

as well as provide greater opportunities for collaboration with other researchers, both internal and external.

“Before the ATRF, NCL’s labs were in two different locations, with half our biologists at an offsite facility at the Frederick Innovative Technology Center.

This created all sorts of logistical battles to get

samples and reagents from one place to another in time and without damage or degradation,” said Scott McNeil, Ph.D.,

NCL’s director. “Now,

not only will we have all NCL scientists in one location, we’ll be co-located with other groups we collaborate with routinely, such as those in the Advanced Technology Program and Technology Transfer.”

NCL Instrumental in New Cancer Therapies

Established in 2004 to assist cancer researchers in developing nanomaterials for use in cancer diagnostics and therapies, NCL is the result of a formal collaboration among the National Cancer Institute, the National Institute of Standards and Technology (NIST), and the U.S. Food and Drug Administration (FDA). NCL scientists assess the physical and chemical characteristics of nanomaterials being developed as

candidates for cancer therapies. Before use in human testing, nanomaterials must undergo stringent regulatory review by the FDA through the Investigational New Drug (IND) application process. Because of the relationships with NIST and the FDA, NCL scientists are well versed in the requirements of a successful IND submission.



Jamie Rodriguez, research associate, NCL, uses an inverted phase contrast microscope to visualize a specific type of cell in culture. To the right of the microscope is an automated cell counter, which captures the number of cells she is viewing. Lydia Perkins, NCL summer intern, works at a laminar flow hood in the background.

Now considered a leader in biomedical nanotechnology, NCL is currently engaged in more than 75 partnerships with the extramural community—academia, industry, and other government laboratories—in which NCL scientists are testing more than 250 different nanomaterials intended for clinical applications related to cancer therapies.

NCL-tested cancer therapies now in clinical trials include targeted, nanoparticle-carried chemotherapies, such as a prostate cancer therapy from BIND Biosciences. Other NCL-tested products are based on very different principles than chemotherapy, according to Jennifer Hall Grossman, Ph.D., an NCL scientist. For example, AuroShell, a product from Nanospectra Biosciences, Inc., uses heat to destroy a tumor without

significant damage to surrounding healthy tissue (see sidebar).

NCL also supports the work of other government agencies. Researchers at NCL are currently participating in a two-year collaboration with the National Institute of Environmental Health Sciences (NIEHS), in which NIEHS has funded infrastructure and characterization support in a study of the environmental health and safety impacts of nanomaterials. NCL has similar collaborations with the FDA, including support to projects to assess the safety of nanoparticles in sunscreens and cosmetics.

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NCL-Tested Therapies in Clinical Trials

NCL recently tested the cancer therapy AuroShell, a product of Nanospectra Biosciences, Inc. AuroShell is a gold nanoshell that is injected intravenously and accumulates in tumors due to its nanosize. Once the particles are in the tumor, they are irradiated with near-infrared laser light, which heats the particles and thermally destroys the tumor and the surrounding blood vessels without significant damage to healthy tissue. AuroShell is currently being given to patients in a Phase I clinical trial for head and neck cancers.

Other successful partnerships have been formed with pharmaceutical companies to reformulate previously “failed” cancer drugs. According to the October 2011 issue of *NCL News* (pages 1–2), tumor necrosis factor (TNF), a powerful chemotherapeutic tested in clinical trials in the 1990s, had to be discontinued due to severe adverse side effects. Working with NCL, CytImmune Sciences was able to develop AurImmune[®], which is a nano-sized gold particle that is bound to TNF. In a recent Phase I clinical trial of AurImmune, three times what had previously been a lethal dose of TNF was given to patients with few negative side effects—illustrating how reformulating drugs using nanotechnology can greatly reduce the toxicity of chemotherapeutics.

Electron Microscopy

Move Affords Many Advantages to EML

By Nancy Parrish, Staff Writer

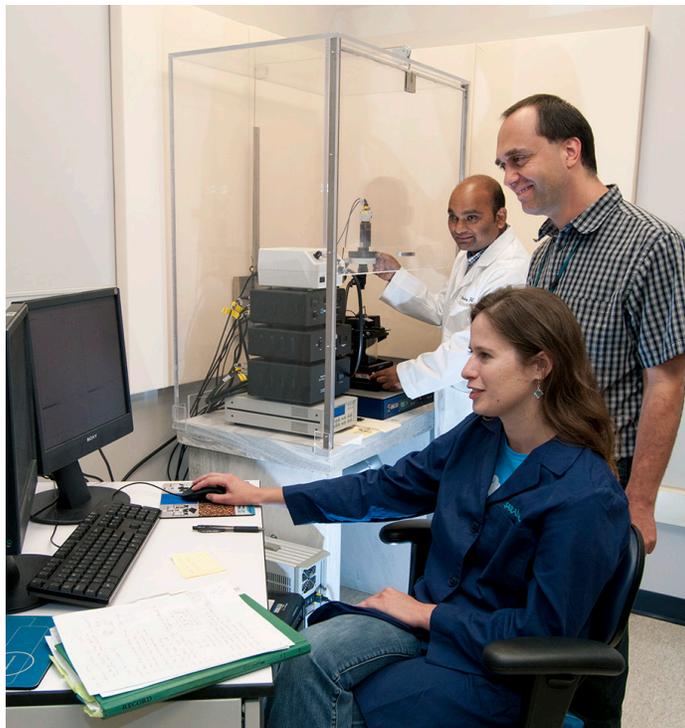
Ulrich Baxa, Ph.D., director of the Electron Microscopy Laboratory (EML), enjoys finally having his staff all in one place.

“Our lab is now all in one location, as compared to our previous situation, with two different locations,” he said. “This will make daily work much easier, in particular for me since I am able to have an office next to the other EML staff.”

A single location is not the only advantage to EML’s relocation to the Advanced Technology Research Facility (ATRF). According to Baxa, the new, larger space offers potential for expansion of staff and technology, which could lead to new partnerships with industry, academia, or other government agencies.

More space has also enabled a better arrangement of the instrumentation. For example, the ultramicrotomes are now located by themselves, in a separate room. These highly sensitive instruments are used almost daily in EML to prepare study samples, some of which may be as thin as 40 nanometers. In the old lab, Baxa said, the ultramicrotomes were in an area where a lot of people walked by, causing vibrations and air movement. These seemingly harmless disturbances can cause slight variations in the section thickness. Having them in their own room reduces the possibility of such interferences and ensures the highest quality and consistency of samples, he said.

Baxa’s laboratory works closely with the Nanotechnology Characterization Laboratory (see previous page), which is now across the hall in the ATRF rather than in two other buildings, as it was before the move. Together, these laboratories house powerful microscopes that are used to visualize cellular and subcellular activity, bacteria and viruses, and even a single strand of DNA.



Sarah Anderson, EML research technician (seated) and Ulrich Baxa, EML director, check scanning results from the atomic force microscope (shown in the background). Girija Chaubey, scientist, Nanotechnology Characterization Laboratory, is operating the microscope.

Supporting a Broad Range of Research

Electron microscopy (EM) is frequently used to confirm conclusions derived from other methods, such as a fluorescence (light) microscope, or to make measurements that cannot be done by other, simpler methods (such as, for example, liposome characterization or nanoparticle location in cells), Baxa said.

His laboratory provides significant support to the research of the NCI HIV Drug Resistance Program. “While it is possible to fluorescence-label virus particles in cells, it is not completely straightforward. Electron microscopy of HIV-infected cells, for example, is still the easiest way to study HIV mutations,” Baxa said. Similarly, he noted, “nanoparticles often require EM for characterization and identification in tissue or cell samples.”

EM is also used to check samples for autophagy, the process by which a cell

degrades its own components. While autophagy has long been considered a normal cell function, Baxa said, “its importance in cancer-related processes has been recognized recently as it can be a sign of drug toxicity or even a target in developing new cancer treatments.” Autophagy is relatively difficult to study based only on visible light microscopy or fluorescence microscopy, but with EM, it is easily identified in cells, Baxa said.

“About 80 percent of our current work is related to retroviruses, nanoparticles, or autophagy,” Baxa said. The work of his lab has recently supported studies on thyroid regeneration after thyroidectomy and development of novel vaccines against disease, and numerous studies on HIV. “A lot of the projects we support are quite basic research projects that often have broader implications for understanding cancer processes,” he said. ■

Sources of information in this article: http://www.jic.ac.uk/microscopy/intro_em.html; http://www.nanooze.org/english/articles/article5_powerfulmicroscope.html

New Space continued from page 4

Expansion Foreseen

Such interagency and extramural collaborations are projected to increase now that NCL is in its new location. “Before the ATRF, the fundamental limitation to NCL’s expansion to support additional partnership opportunities was insufficient space for equipment and staff,” Grossman said. “Being co-located with EML [Electron Microscopy Laboratory] and partners will also facilitate NCL operations.” ■

ATRF Houses All of the Latest DNA Sequencing Technologies

By Ashley DeVine, Staff Writer

By the end of October, the Advanced Technology Research Facility (ATRF) will be one of the few facilities in the world to house all of the latest DNA sequencing technologies.

“Sequencing costs have decreased more than 10,000-fold, which now enables broader surveys of cancer genomes,” said Dan Soppet, Ph.D., director of the Laboratory of Molecular Technology (LMT), Advanced Technology Program. “With the ability to study thousands of cancer genomes at increasing resolution, we can now identify all of the commonly seen mutations in cancer genes and many of the rare genetic changes that may contribute in combination to the establishment and progression of cancer.”

Next-generation sequencing has reduced DNA sequencing time from months to days, or even hours.

Five Next-Generation Sequencers in One Location

Next-generation sequencers available in LMT include the Roche 454, Life Technologies SOLiD 5500 XL, and Life Technologies Ion Torrent Personal Genome Machine.

The Sequencing Facility (SF), which will move to the ATRF in October, offers sequencing on the Illumina HiSeq2000 and GAIIX and the Pacific Biosciences PacBio RS.

“Different sequencers have different strengths and weaknesses and are appropriate for answering different types of cancer questions,” said Jennifer Troyer, Ph.D., senior scientist, Technology Development, LMT. “Often one sample or set of samples will be run on more than one sequencing platform.”



Claudia Stewart places a 314 sequencing chip on the Ion Torrent Personal Genome Machine. This chip produces 10–100 Mbp of sequencing data depending on the type of sequencing run.



Robin Stewart loads a sample on the SOLiD 5500. The sequencing machine is often used to detect the relative quantities of different RNAs expressed in a tissue or an individual.

The 454’s moderate throughput but relatively long reads of 400–1,000 base pairs (bp) work well for whole-genome sequencing of small or medium genomes. For example, a bacterial genome is considered relatively small because it may have a few million base pairs of DNA compared to the three billion in the human genome.*

One of the advantages of the PacBio RS (3,400-bp read) is that, although it produces less data, it can sequence difficult regions of a genome that have not been sequenced well by other machines. The PacBio RS also does not require fragment DNA to be amplified or cloned, which can result in biases.

On the other hand, systems like the SOLiD or Illumina HiSeq, which have shorter reads, are better suited for sequencing large genomes because they have a much higher sequencing capacity. They also perform well for DNA–protein interaction studies and transcriptome profiling.

The Illumina and PacBio platforms “can be used together quite effectively, particularly for de novo assembly of whole genomes,” said Bao Tran, Ph.D., director of SF.

The Ion Torrent, which LMT acquired last year through an early access program, offers price and speed advantages over other sequencers. A sequence run can cost as little as \$500 to \$750 (at around \$20 per megabase pair [Mbp]), compared to typical prices of \$1,500–\$7,500 (at less than \$1 per Mbp) for the Illumina, Roche, or SOLiD sequencers. An Mbp measures how much sequence data is produced in a single run.

LMT is working towards Clinical Laboratory Improvement Amendment (CLIA) certification on the Ion Torrent so it can be used to sequence patient samples.

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Sequencing Technologies



Teri Plona places a protective shield on the Roche 454. Arati Raziuddin and Viktoriya Grinberg prepare samples in the background.



Inside the Roche 454, sippers, which look like straws, are lowered into clear plastic tubes. These tubes hold all the reagents (buffers, nucleotides, wash solutions, etc.) that the machine needs for a sequencing run.

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Sanger Sequencers Are Important for Clinical Studies

LMT also has two ABI 3730XL conventional Sanger sequencing instruments that are CLIA-certified, making them important for use in clinical studies. “These are crucial to the validation of next-generation sequencing experiments, while maintaining an important core sequencing service and CLIA-validated mutation detection to NCI investigators,” said Kristen Pike, group leader, CLIA Molecular Diagnostics Sanger Sequencing Group and Roche 454 Next-Generation Sequencing Group. ■

*<http://www.wellcome.ac.uk/News/2009/Features/WTX056032.htm>

Scientific Support

Scientific Library at the ATRF

By Ken Michaels, Staff Writer

The Scientific Library satellite at the Advanced Technology Research Facility (ATRF) is set up to accommodate scanning and e-mailing of resources and to provide one-on-one consultations with a librarian.

The satellite is electronic only, with no physical collections, and is operated by existing staff, who rotate between the main facility on the Fort Detrick campus and the ATRF. Library users who require materials in print form may use the shuttle service to the Fort Detrick campus.

For the first time, librarians in the satellite will be housed in the same

facility as their clientele. Library services are available to Frederick National Laboratory for Cancer Research (FNL) personnel at the ATRF, as well as any partners occupying space there.

The Scientific Library is in E Wing, on the second floor, and operates weekdays, 8:30 a.m. to 5:00 p.m. ■

DMS: Same Services, Different Location

By Nancy Parrish, Staff Writer

Data Management Services, Inc. (DMS) has supported multiple sites of the FNL for more than 25 years, according to Jim Racheff, DMS president. The new facility is larger than some of the other off-site locations, but the basic services remain

the same, he said.

A small staff from DMS is located at the ATRF to coordinate desktop computer support, system administration, and programming services.

“The entire catalog of computer and statistical services will continue to be available to ATRF employees, whether or not particular staff members or skill sets are co-located at the ATRF,” Racheff said. “It might be two campuses, but it’s still one FNL.”

The DMS office at the ATRF is in the administration wing, on the second floor. Staff members are available weekdays, 8:00 a.m. to 5:00 p.m., and the computer helpdesk may be reached during those same hours at 301-846-5115. ■

Conference Capabilities

Conference Space More Than Doubles at ATRF

By Ken Michaels, Staff Writer

The opening of the Advanced Technology Research Facility (ATRF) conference center more than doubles the amount of meeting space now available at the Frederick National Laboratory for Cancer Research.

The first floor conference center includes a 200+-seat auditorium. At more than 3,000 square feet, it is more than twice the size of the Building 549 auditorium. Also on the first floor are six other conference rooms, each seating 16–30 people, and a 24-station computer training room. All rooms have audiovisual capabilities and some are equipped for audio and video teleconferencing.

The conference spaces are designed for maximum flexibility and optimal use of space. The auditorium, for example, is flat, not stepped, allowing the room to be configured and used in a variety of ways. It can accommodate meetings with more than 200 participants, which may have been held offsite in the past.

The ATRF's large open atrium provides another place for meetings and collaboration. The atrium features wall-mounted digital signage, which is maintained by the conference center staff. Large screens are mounted at each entrance and just outside the auditorium doors to display messages, weather alerts, and daily conference center schedules.

The conference center also provides room for caterers to set up and prepare food for meetings, and a breakout area that can be used for setting up tables and chairs.

The “think tank” is a suite of rooms on the third floor designed especially for collaboration and work on special projects or problems. It includes individual work spaces, small breakout areas, and a large room equipped for audiovisual displays and video



Tammy Miller, conference center technician, in the control room of the ATRF conference center.

teleconferencing. The “think tank” and one large public meeting space on the third floor are also supported by the conference center staff.

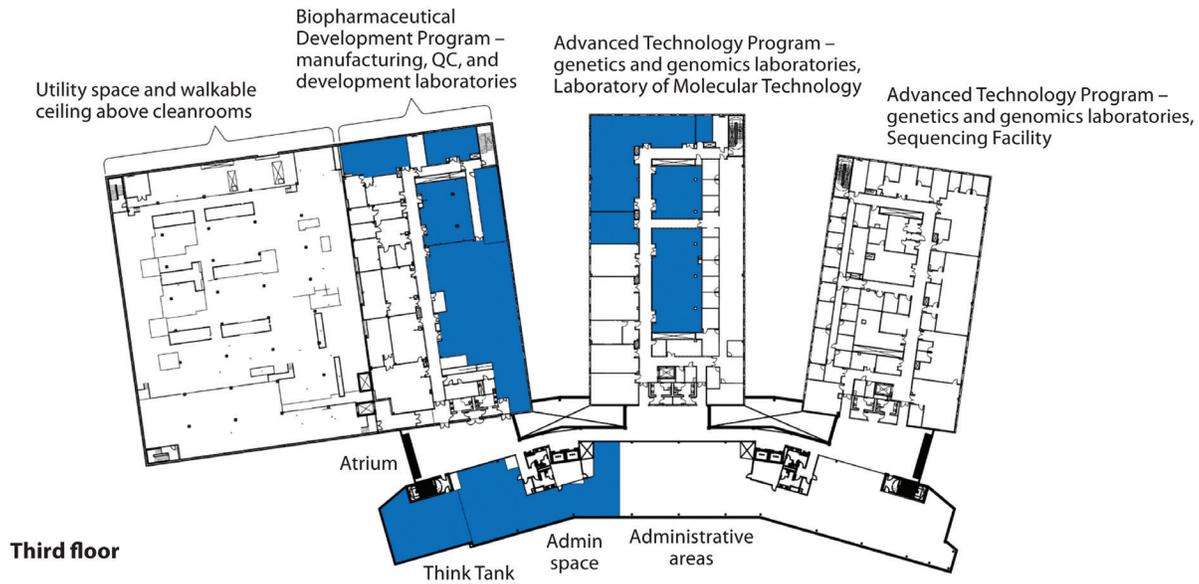
One conference center technician and two event planners are located adjacent to the conference center in room E1111. An illustrator from Scientific Publications, Graphics & Media is available to ATRF scientists daily. ■



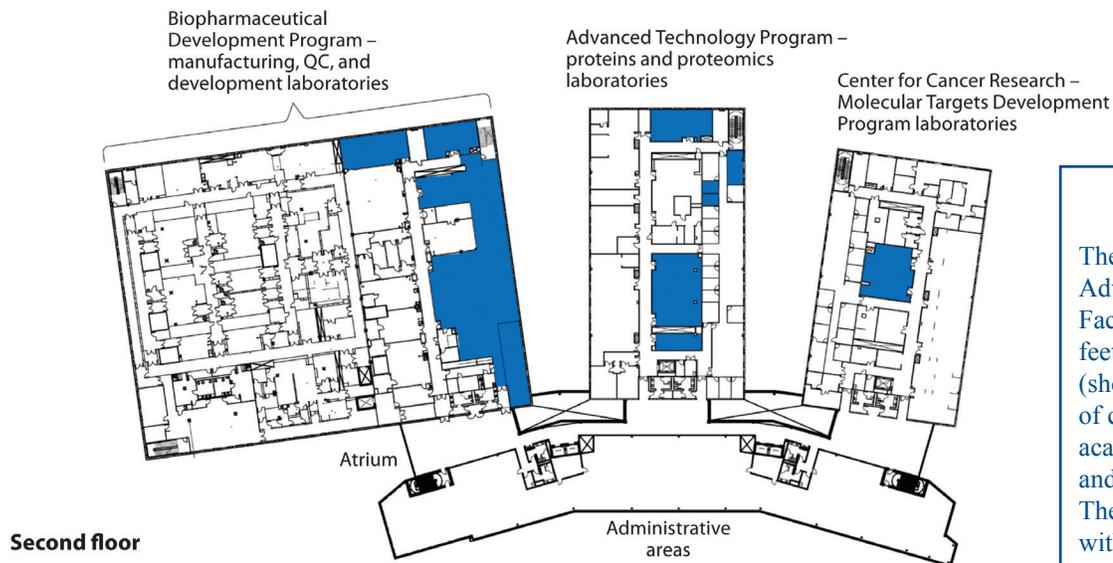
The 200-plus-seat auditorium is twice the size of the Building 549 auditorium.

Partnership Space

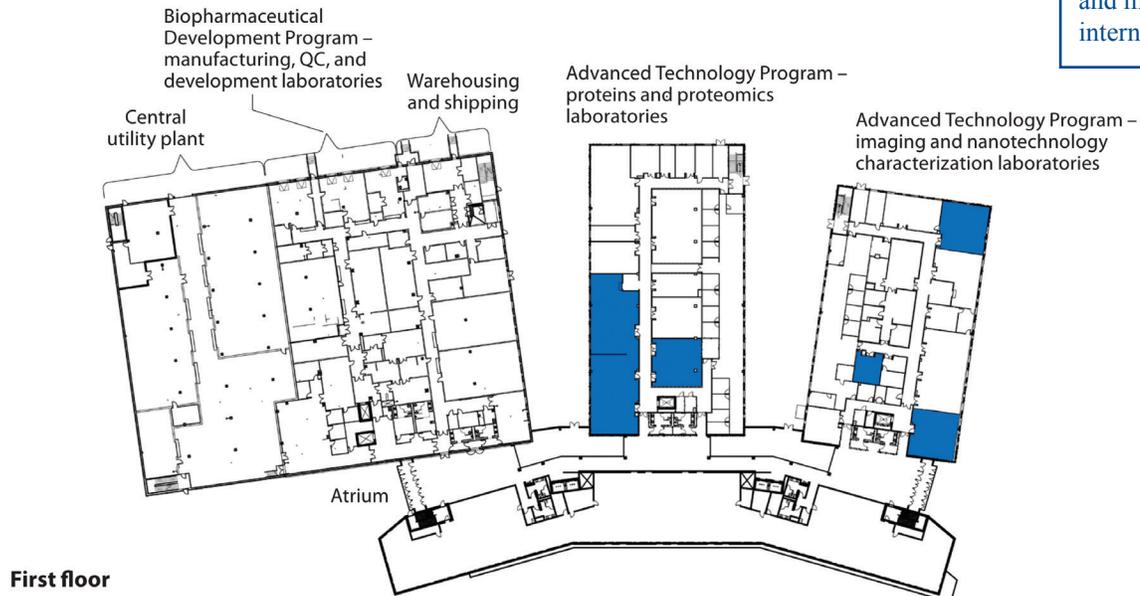
■ Partnership space (39,610 NSF)



Third floor



Second floor



First floor

Dedicated Space

The three-story, 330,000-square-foot Advanced Technology Research Facility has nearly 40,000 square feet designated as partnership space (shown in blue) for co-location of collaborators from industry, academia, nonprofit organizations, and other government agencies. The partnership space, combined with multiple conference rooms and meeting areas, encourages both internal and external collaborations.

Advancing Research through Partnerships

Proteins and Proteomics

The Protein Expression, Protein Chemistry, and Antibody Characterization Laboratories, and the Laboratory of Proteomics and Analytical Technologies provide a central location for research involving protein expression, characterization, and production; virus production; DNA construction and cloning; monoclonal antibody production and characterization; and cell line characterization. Data generated in these labs support the discovery and validation of biomarkers, development of cancer diagnostics, and methods for monitoring therapeutics. Fifteen mass spectrometers in a single location support research to advance the understanding of cellular functions at the proteomic and metabolomic levels.

Imaging and Nanotechnology

Two specialized laboratories support research related to HIV and other retroviruses; cellular functions that may be involved in cancer-related processes; and the development of nanomaterials to be used in cancer diagnostics and treatments. The scientists of the Electron Microscopy Laboratory are experts in preparing cultures for imaging by powerful microscopes that can visualize subcellular activity, bacteria and viruses, and even a single strand of DNA. The Nanotechnology Characterization Laboratory serves as a national resource and knowledge base for cancer researchers, and facilitates the development and translation of nanoscale particles and devices for clinical applications.

DNA Sequencing/ Molecular Technology

The ATRF is one of the few facilities in the world to house all of the most current DNA sequencing technologies. The Laboratory of Molecular Technology and the Sequencing Facility house five next-generation sequencers, using technology that has reduced DNA sequencing time from months to days, or even hours. These sequencers, as well as traditional Sanger sequencing technologies, are available for evaluating cancer samples to identify pathways, genes, or gene products that are involved in disease development.

The specialized laboratories at the Advanced Technology Research Facility (ATRF) provide a wide range of scientific expertise and advanced technologies that support the National Cancer Institute's mission to accelerate the translation of research discoveries into new diagnostics and treatments for people living with cancer and AIDS. The facility is designed to accommodate laboratory and office space for partners from the government, industry, academia, and the nonprofit sector.

Biopharmaceutical Development

The Biopharmaceutical Development Program provides leading-edge development of monoclonal antibodies, recombinant proteins, peptide and DNA vaccines, gene therapy products, and other biological and immunomodulating agents. The program develops and manufactures biopharmaceuticals for toxicology studies and Phase I and II clinical trials in accordance with Current Good Manufacturing Practices. With the ability to easily segregate processes and perform product change-over activities, this program also has the capacity to produce non-clinical or Phase 0 clinical materials.

Data Center

The data center provides networking, storage, and computational support for the laboratories and staff of the ATRF, as well as for potential partners working on site. With the capacity to house as many as 20,000 cores and 20 petabytes of data, the data center supports sequence analysis, computational chemistry, and molecular modeling, and will provide multi-tiered resources to accommodate both higher-performance and increased capacities that can be scaled out as the research dictates.

Research and Partnership Support

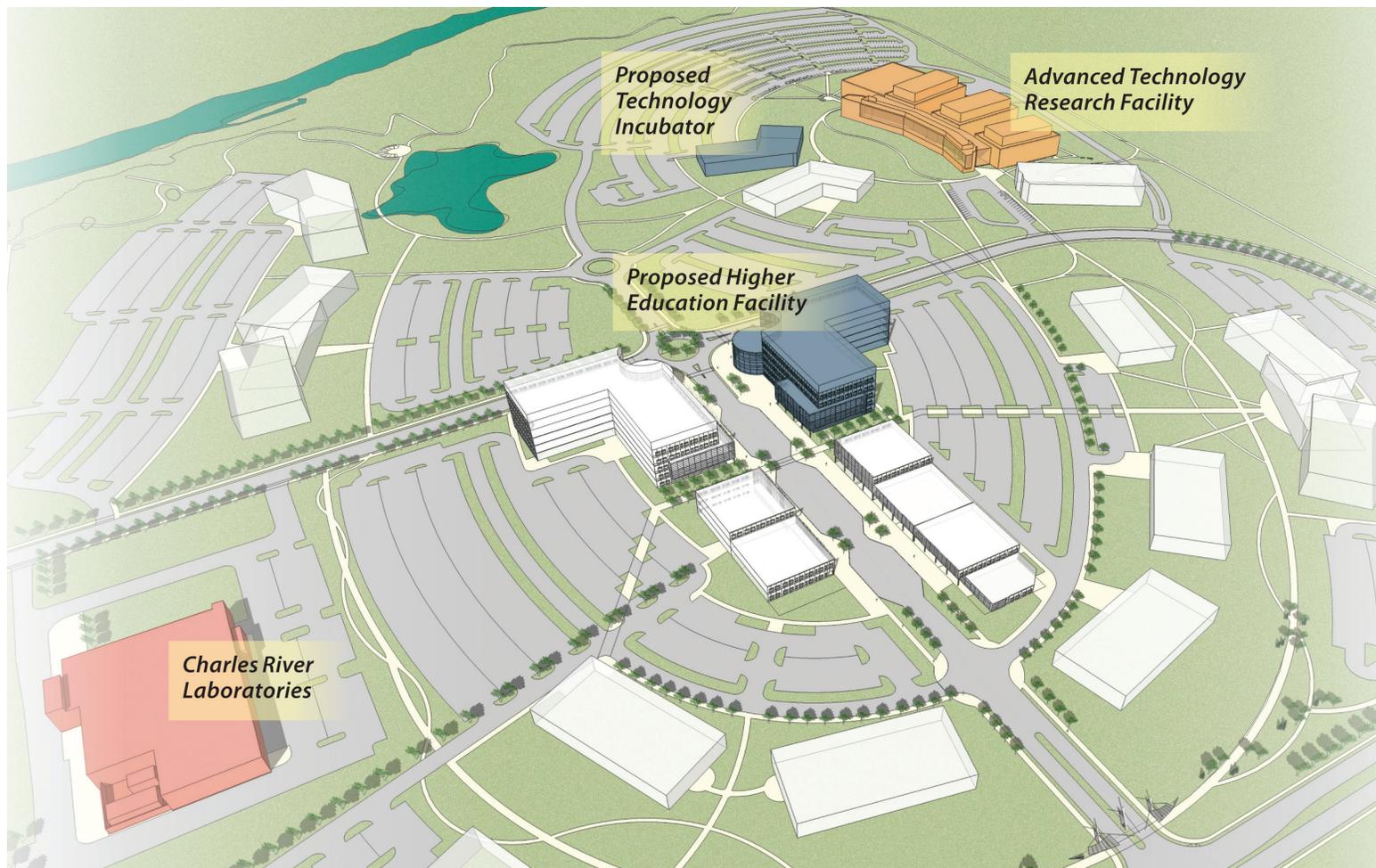
On site are the NCI Technology Transfer Center and the SAIC-Frederick Intellectual Property office, which work together on matters related to collaboration agreements, materials and technology transfer, and invention reporting and patents.

The Scientific Library's satellite office provides access to electronic resources and offers one-on-one consultations with a librarian.

Data Management Services has a small staff on site to coordinate desktop computer support, system administration, and programming services. Its full catalog of computer and statistical services is available to laboratory and office staff at the ATRF.



Riverside Research Park



ATRF Anchors Riverside Research Park

Frederick National Laboratory's Advanced Technology Research Facility (ATRF) is the anchor facility for Riverside Research Park. Offering the opportunity for public and private partnerships in a world-class research campus environment, Riverside Research Park features 177 acres in a setting designed to attract biomedical research and development organizations. Co-location of companies and organizations with complementary and synergistic technologies, products, services, and capabilities will help to advance the creation of the next generation of diagnostics and treatments for people living with cancer and AIDS. ■

PEL Staff Together for the First Time

By Ashley DeVine, Staff Writer

John-Paul Denson and Troy Taylor of the Protein Expression Laboratory (PEL) used to pack liters of *Escherichia coli* lysates on ice, put them in the back of a microvan, and drive across campus to deliver the samples for protein purification.

Now that all PEL staff members are working under the same roof at the Advanced Technology Research Facility (ATRF), transferring samples is just a walk down the hall. Staff members were previously spread out in five buildings across the Fort Detrick campus.

Improved Fermentation Space for Protein Production

PEL's fermentation laboratory is where all bacterial and yeast protein production work begins.

At the Fort Detrick location, the fermentation laboratory was packed with equipment, and hundreds of feet of wiring snaked along the floor to deliver utilities like water, steam,



John-Paul Denson hooks up a data connection cable to one of the fermentation laboratory's Bioflo 110 Modular Benchtop Bioreactors. These bioreactors are primarily used as growth vessels to express recombinant protein in a variety of host organisms (mainly *Escherichia coli*).

and pharmaceutical air to fermenters. If a fermentation needed oxygen, "we had to roll in a canister of oxygen on a cart, strap it down, and hook it up manually," said Denson, a research associate in PEL's Protein Purification Group.

At the ATRF, the hook-ups for utilities drop down from the ceiling into large manifolds, which connect to the fermenters. Adjustments are quick and nothing clutters the floor.

These quick adjustments are important because proteins produced from bacteria are sensitive to changes in temperature or oxygen levels. If temperatures are too high, protein yields could decrease. Likewise, a small change in dissolved oxygen could affect a project's success. Reproducible protein production is vital because PEL often starts with smaller-scale production and then scales up to full production.

Although the fermentation laboratory's space at the ATRF is similar in size to its previous space, the ceilings are higher (12 feet instead of seven) and the lab is set up to accommodate work flow.

Desk space is separate from the lab, giving researchers more space to monitor the bacteria and yeast fermentations that lead to protein production.

The Latest in Viral Suite Technology

PEL's Viral Technology Group produces viruses from clones generated by the Cloning Group.

Before the move, PEL's viral suites were in two different buildings, and some of the space was shared with other groups. DNA samples had to be hand-carried across campus from the molecular biology laboratories to the viral suites, where viruses were made.

With viral suites now in one location, PEL researchers are working in space that is customized for lentiviruses and adenoviruses. Adenoviruses require specialized containment because they are



Troy Taylor adjusts the steam pressure on the manifold that provides pharmaceutical air, chilled water, steam, oxygen, and other gases to the bioreactors in PEL's fermentation laboratory.

highly concentrated and can contaminate other viruses. Therefore, the viral suites are isolated, with separate access to a central autoclave.

"Lentiviruses and adenoviruses are innovative tools for understanding cancer pathways in cell lines or living animals," said Dominic Esposito, Ph.D., director of PEL. A lentivirus stably transfers its DNA into the genome of a cell line to express proteins or introduce DNA to report on cellular activities. An adenovirus does not integrate its DNA, but instead delivers it to the cells to produce proteins transiently. ■

Improved Collaboration among PEL Staff

What began as an informal hallway discussion among group leaders led to a major improvement in PEL's protein production process—the development of the Purify First technology for microscale protein purification. This technology allows PEL to monitor, at a smaller scale, the conditions (such as expression hosts or fusion tags) for protein purification that will allow a project to succeed when it is scaled up. Checking the conditions at a smaller scale provides a cost savings to customers.

Now all PEL staff members (and other ATP scientists) can come together for these types of discussions, likely paving the way for new advances.

Protein Laboratories in Single Location

By Andrew Stephen, Timothy Veenstra, and Gordon Whiteley, Guest Writers, and Ken Michaels, Staff Writer

The Laboratory of Proteomics and Analytical Technologies (LPAT), Antibody Characterization Laboratory (ACL), and Protein Chemistry Laboratory (PCL), previously located on different floors or in different buildings, are now together on the first floor of C wing in the ATRF.

Considering that the primary focus of all three laboratories is on protein characterization, their incorporation into a single, large space makes perfect sense. This integration affords scientists in these laboratories the opportunity to interact and share knowledge more readily than when they were in separate locations. As most scientists will attest, the ability to readily exchange ideas leads to more efficient methods for solving existing problems while seeding fertile ground for the development of novel studies. In the area of technology innovation, several LPAT and PCL staff members are currently working together on projects, and this collective effort is expected to increase as lab members become more familiar with each other's areas of expertise.

NIH's Highest Concentration of MS Expertise

The primary analytical technology within this collective laboratory is mass spectrometry (MS). The mass spectrometers are in a single, large room that represents the highest concentration of MS expertise and equipment within the NIH intramural community.

The room currently houses 15 mass spectrometers and has enough space for additional instruments in the future. Housing all of the mass spectrometers in a single room simplifies the building engineering requirements; more importantly, however, is that having them all in the same room encourages people with expertise in MS to interact and share their knowledge.

There are several types of mass spectrometers. The new facility's collection includes ion-trap, Orbitrap, Fourier transform ion cyclotron resonance (FTICR), triple quadrupole, and time-of-flight (TOF) mass spectrometers.

While all of these instruments can determine molecular mass, each type of mass spectrometer has a unique capability. Some (i.e., ion-traps, Orbitraps, FTICR) are designed for high-

proteins isolated from complex mixtures. In addition, one of the TOF instruments in the lab is used for MS imaging, which involves the interrogation of an entire tissue section to determine the location of various ions within the sample.

Recent Findings Using MS

Xia Xu, Ph.D. (LPAT), recently measured the absolute quantity of 15 estrogen metabolites in the NCI-60 cell panel using triple quadrupole MS.¹



LPAT researchers Ming Zhou (left) and Athar Masood set up equipment in the new mass spectrometry laboratory at the ATRF.

throughput protein sequencing. These instruments are used for global analysis to determine differences in protein abundances between different biological samples. They are also optimized for identifying post-translational modifications across entire proteomes or within a single purified protein.

The triple quadrupole mass spectrometers are designed for molecular quantitation and are used primarily for quantifying the absolute abundance of metabolites (and proteins) in human serum, urine, or tissue.

The TOF mass spectrometers are used for intact protein molecular weight determination or characterization of

He found that many of the cancer cell lines not commonly associated with steroid hormones (e.g., melanoma and leukemia) contained significant amounts of endogenous estrogens and estrogen metabolites. These results suggest that human tumors outside of those associated with the female reproductive system may be beneficially treated using therapy aimed at estrogen biosynthesis and estrogen-related signaling pathways.

In an example using an ion-trap mass spectrometer, Ming Zhou, Ph.D. (LPAT), collaborated with Yossef Raviv, Ph.D. Center for Cancer Research, utilizing a photoaffinity-labeling approach to identify new proteins that facilitate

HIV-1 transfer.² They identified ectopic mitochondrial ATP synthase as a factor that mediates HIV-1 transfer between antigen presenting cells (APCs) and CD4+ target cells. This result was validated as antibodies directed against ATP synthase inhibited the APC-mediated transfer of multiple strains of HIV-1 to CD4+ target cells. This identification of ATP synthase's role in HIV-1 transfer provides new targets for inhibiting HIV-1 proliferation in vivo.

ACL Works Closely with Protein Groups

The mission of the ACL is to develop and/or characterize antibodies or other affinity binding reagents and provide all data and reagents to the public. The first antibodies were raised against recombinant full-length proteins produced in a collaboration with Argonne National Laboratory. Two outside companies were contracted to produce the antibodies, and the ACL selected antibodies from submitted candidate clones. The aim was to have three antibodies for each target.

Since its establishment in 2005, the ACL has raised antibodies against proteins produced by the Protein Expression Laboratory (PEL) for intramural investigators, proteins produced by the Structural Genomics Consortium in Toronto and the University of Copenhagen, and both proteins and peptides requested by extramural investigators. All of the antibodies and cell lines are available at cost from the University of Iowa Developmental Studies Hybridoma Bank.

With the move to the ATRF, the ACL may now interact more easily with both the PCL and PEL groups, and continue collaborations to broaden its capabilities.

Raising Antibodies

The ACL is expanding in terms of the ability to raise both antibodies to peptides and peptides with modifications, such as phosphorylation, which are known to be important in cancer.

A collaboration with PEL has demonstrated the ability to raise an antibody to insoluble proteins through immunization with inclusion bodies. This has provided three antibodies to the PSPHL protein, representing the only antibodies that have ever been raised against this protein. The ACL has also begun raising antibodies to other proteins from PEL that were raised for the Nanotechnology Characterization Laboratory (NCL) and one of its collaborations. The capabilities of the ACL allow for the selection of antibodies that can be used for a highly specific end purpose defined by the NCL collaboration.

“To date, we have approximately 230 antibodies available that have been screened from over 2,500 candidate antibodies. These antibodies have been used extensively, according to our provider in Iowa. Furthermore, many are being incorporated in diagnostic tests by various commercial vendors,” Gordon Whiteley, Ph.D., director of ACL, said.

Protein Chemistry

The PCL uses MALDI-MS in combination with traditional protein chemistry methods to identify proteins and their modifications. In a study recently published with Ira Pastan, M.D., CCR,³ Oleg Chertov, Ph.D., identified a specific modification on a protein that confers resistance in pediatric patients with acute lymphoblastic leukemia from treatment with immunotoxins. The PCL also has a variety of technologies that support investigators in characterizing how proteins interact with their binding partners including new drug candidates.

Andrew Stephen, Ph.D., acting director of the PCL commented, “I think the most exciting thing about moving to the new building is having all this different expertise [in the Advanced Technology Program] now in one location. Being co-located, I expect we'll have more chance to discuss science and share our expertise, leading us to a more integrated approach to solving problems.” In addition, he said, the co-location

will enable more creative technology development because staff from different labs will be involved in the same project.

Attracting Partners

Having a program with experts in a multitude of technologies, having collaborations with NCI principal investigators, and having new partnership space all in one place are likely to attract companies interested in developing new technologies and partnering with NCI scientists.

Having beta space adjacent to these laboratories will be invaluable in partnering with companies who wish to develop technologies or beta test early versions of new technologies.

Timothy Veenstra, Ph.D., director of LPAT, noted that, as the laboratory interactions strengthen, “we anticipate expanding in new areas to provide NCI scientists access to cutting-edge technologies. There are already plans to develop a metabolomics discovery capability to find cancer-related metabolites in studies utilizing either human samples or mouse models. To be successful in this new area is going to require the collective expertise available within the ATRF and the sharing of knowledge between individual scientists. Fortunately, the ATRF has provided the necessary geometry, and now it is simply up to individuals to take advantage of the personal knowledge within their surroundings.” ■

References

1. Xu X and Veenstra TD. (2012). *Genome Med.* 4:31-35.
2. Yavlovich A et al. (2012). Ectopic ATP synthase facilitates transfer of HIV-1 from antigen presenting cells to CD4+ target cells. *Blood.* In press.
3. Wei H et al. (2012). *Proc Natl Acad Sci U S A.* 109(18):6898-903.

Andrew Stephen, Ph.D., is acting director of the Protein Chemistry Laboratory; Timothy Veenstra, Ph.D., is director of the Laboratory of Proteomics and Analytical Technologies; and Gordon Whiteley, Ph.D., is director of the Antibody Characterization Laboratory.

Eliminating Redundancies

By Ken Michaels, Staff Writer

The Biopharmaceutical Development Program (BDP) is, for the first time ever, in a single building at the Advanced Technology Research Facility (ATRF).

At the Fort Detrick location, BDP operations were spread out in about a dozen buildings, resulting in redundancies in maintaining various utilities (air handlers, clean steam, water for injection, etc.) for multiple buildings rather than one.

BDP's space at the ATRF is purpose-built for developing and manufacturing

biopharmaceuticals for toxicology studies and Phase I and II clinical trials. These areas are primarily clean room spaces operated in accordance with Current Good Manufacturing Practices (cGMPs) and the utilities and support areas required for cGMP compliance.

Another important aspect of bringing the program together is that all of BDP's production trains are in the same location.

A production train includes the equipment and facilities needed to manufacture a single product from start to finish. BDP has three distinct GMP production trains: one bacterial with a maximum capacity of 500 liters, one cell culture with a maximum capacity

of 1,000 liters, and one viral with a maximum capacity of approximately 20 liters.

BDP also has three more production trains in the smaller-scale areas: one bacterial with a capacity of 100 liters, one cell culture with a capacity of 75 liters, and one viral with the capacity of about 5 liters. Materials manufactured in these areas are for non-clinical and potentially very early clinical use.

"The BDP facilities are a unique resource for NCI, providing in-house manufacturing

capabilities that would otherwise require outsourcing," said John Roach, Late Process Science director, BDP. Outsourcing could cause potential delays in getting promising therapies to the clinic to be evaluated quickly and efficiently, Roach said.

The partnership space at the ATRF provides BDP with the opportunity for potential partnerships with organizations that could take over the manufacture of promising therapies as products move through Phase II clinical trials and beyond. Other opportunities might include collaborations with entities that are developing new manufacturing technologies. "BDP might utilize these new technologies to facilitate manufacture of a particular product while a partner would have the opportunity to apply its new technologies in a larger-scale setting," Roach said.

BDP's space at the ATRF gives the group the additional capacity to produce non-clinical or Phase 0 clinical materials. BDP can also more easily segregate processes and product change-over.

BDP already collaborates with Advanced Technology Program (ATP) laboratories, and the closer proximity of the two programs at the ATRF "will foster an environment for an even greater degree of collaboration," Roach said.

Although BDP moved into the ATRF in early August, the majority of its GMP production component will remain at Fort Detrick through the end of 2012. During that time, the ATRF will be undergoing a variety of validation activities. BDP expects to have non-GMP production up and running before the end of 2012, and GMP production by the first quarter of 2013. ■

Mark Slatcoff attaches a sample valve to the 1,000-liter bioreactor, which is used for large-scale cell culture production. After production, the material is filtered or centrifuged, and then further processed before the final bulk product is produced. The final bulk product is filtered again, and then vialled for use in preclinical or clinical trials.



New Location Improves Efficiency of Partnership Activities

By Ashley DeVine and Nancy Parrish, Staff Writers

The physical proximity of the SAIC-Frederick Intellectual Property (IP) Office to the NCI Technology Transfer Center (NCI-TTC) is one of the many benefits of being at the Advanced Technology Research Facility (ATRF), according to Courtney Silverthorn, Ph.D.

Being in one location “has increased the effectiveness of both informal communication and formal meetings. We have already brainstormed ideas about solutions for several issues in the hallway during an informal chat,” said Silverthorn, an IP specialist.

The SAIC-Frederick IP Office works closely with NCI-TTC on matters related to collaboration agreements, materials and technology transfer, and invention reporting and patents. With the offices now just a few steps away from each other instead of in different buildings, “We can easily walk IP-related documents, such as invention reports or an original copy of a Material Transfer Agreement, down the hall instead of sending them through interoffice mail,” Silverthorn said. This aspect alone can save up to four business days, she said.

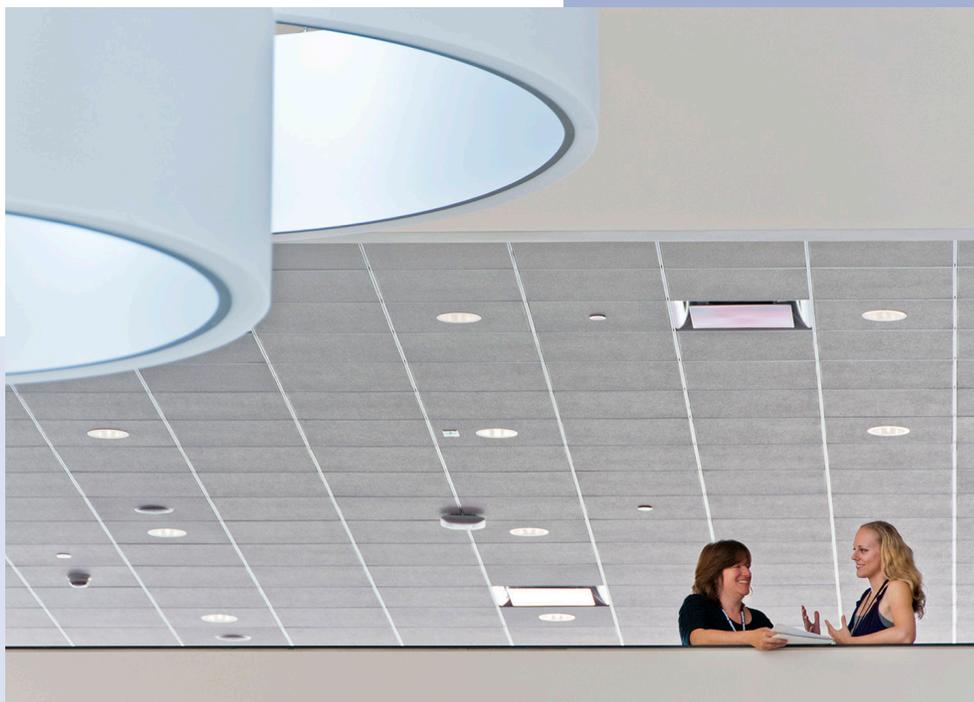
The SAIC-Frederick IP Office reports all inventions made by SAIC-Frederick scientists to NCI-TTC, Silverthorn said.

NCI-TTC facilitates the process of patenting NCI/Frederick National Laboratory technologies and marketing them to the scientific community, and also negotiates a variety of collaborative agreements with external partners, according to Tom Stackhouse, associate director, NCI-TTC.

Both offices often co-negotiate agreements when an interaction involves scientists from both NCI and SAIC-Frederick, or when a collaboration with the external research community is in development.

Working with the Partnership Development Office

The SAIC-Frederick IP Office and NCI-TTC work closely with the Frederick



Jennifer Troyer (left), a senior scientist in the Laboratory of Molecular Technology, consults with Courtney Silverthorn, an IP specialist, in the atrium of the ATRF. The SAIC-Frederick IP Office often works with scientists from the Advanced Technology Program.

National Laboratory Partnership Development Office (PDO), which is also located at the ATRF. The PDO often makes initial contact with potential partners, Silverthorn said.

Prior to the approval of the contractor Cooperative Research and Development Agreement (c-CRADA; see story on page 2), NCI-TTC directly led the development of the CRADA activities, while working with the PDO.

The c-CRADA expands partnering mechanisms and allows the SAIC-Frederick IP Office, in collaboration with the PDO, to negotiate these agreements when there is no participation by government staff in the research.

Partnership Space

The partnership space at the ATRF allows NCI-TTC to be more active in establishing and managing collaborative agreements that will bring partners to the facility. “Being able to have partners co-located will provide opportunities to

bring together, in the same physical space, unique sets of expertise to generate and develop new and innovative technologies,” Stackhouse said.

The SAIC-Frederick IP Office interacts regularly with scientists from the Advanced Technology Program because of the frequency for which the labs are sought out for collaborations, Silverthorn said. “Many of them are now located in the ATRF, which means they can stop by if they have a question about entering into a collaborative agreement, exchanging materials or information with another party, or reporting an invention. We can assist them more effectively in person rather than exchanging a series of e-mails.” ■

Water-Cooled Data Center Packs More Power Per Rack

By Frank Blanchard and Ken Michaels,
Staff Writers

Behind each tall, black computer rack in the data center at the Advanced Technology Research Facility (ATRF) is something both strangely familiar and oddly out of place: It looks like a radiator.

The back door of each cabinet is gridded with the coils of the Liebert cooling system, which circulates chilled water to remove heat generated by the high-speed, high-capacity, fault-tolerant equipment.

This passive cooling system eliminates the need for the usual raised floor found in many computing centers, lowers energy costs, and makes it possible for a 30 percent increase in power per rack. The cold air system in Building 430 on the Fort Detrick campus can handle 12 to 15 kilowatts per rack. The water-cooled Liebert system at the ATRF supports 20 kilowatts per rack.

This cooling system is one of the first of its kind to be installed in the mid-Atlantic region. The water source is a 400-ton chiller and pumps located on the roof of the building, above the auditorium. Water and electrical conduit enter the data center through the ceiling and run to each individual computer rack.

“Super” Center

The ATRF data center has one-and-a-half times the computing power and twice the data storage of the data center in Building 430.

The data center’s first priority is to provide networking, storage, and computational support for all of the laboratories and staff located at the ATRF. The resources will be shared within the various groups and, if warranted, made available to other groups and potentially to new partners who wish to collaborate with ATRF researchers.

The computational services include virtualization that will offer dynamic resources on an as-needed basis,



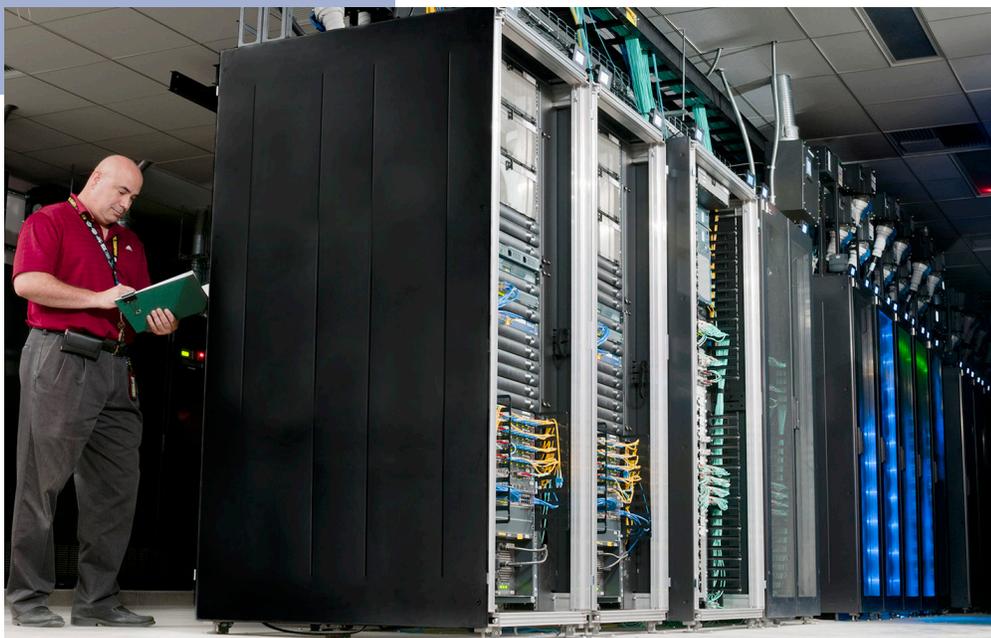
The water cooling heat exchanger (radiator), shown here on the rear door panel, is an integral part of the computer rack. As hot exhaust air blows through the chilled water coils and fins, cold air is exhausted into the data center row.

along with a batch facility for job-based processing. These jobs have historically been for sequence analysis, computational chemistry, and molecular modeling. The storage facilities will provide multi-tiered resources to accommodate both higher performance and increased capacities, with the ability to scale out as the research dictates.

Continuous Operations Ensured

Adjacent to the data center is the motor control room, which houses the Uninterruptible Power System. The system’s size and redundancy allow it to support the 800-kilowatt Phase I facility. The motor control room, in turn, is supported by two GenRac generator sets for continuous data center operations in the event of a loss of commercial power. The administration and laboratory wings have separate backup systems for all major cooling and power systems, so that if one cooling or power module fails, there is enough reserve capacity to still meet full demand.

A high level of fault tolerance in the network, storage, and servers is



The network racks in the foreground house all of the Local Area Network (LAN) and Wide Area Network hardware. The fiber cables from the 17 ATRF LAN closets, the storage systems, and the servers are fed through the overhead cable trays into the network racks and connected. The racks in the background contain 2 petabytes of tier-two and -three disk storage.

Data Center

incorporated into the design of the data center. All components have dual paths for power, network, and storage area network connectivity.

All of the equipment in the data center and the motor control room has monitoring capability that has never been available in the past. The status can be monitored and alarms can be generated by the Building Automation System, which has only recently been able to support the operations in Building 430.

The Unified Communications will provide all phones, conference calls, and Webex activities to take advantage of the completely digital TCP/IP-based network.

The ATRF could house as many as 20,000 cores and 20 petabytes of data (which is equivalent to the amount of data processed by Google in one day*). A core is the current term for what was once called a central processing unit, or CPU, which came one to a computer. The initial installation involved 684 cores.

The ATRF and Building 430 data centers are connected using Dense Wavelength Division Multiplexing (DWDM), which can provide as much as 32 times the normal capacity of a fiber optic line.

Double Current Capacity Possible

If future funding becomes available, the number of generators, uninterruptible power supplies, and power distribution units will be doubled. Expansion has been



The Dense Wavelength Division Multiplexor (open door) provides high-speed fiber channel connectivity. Fiber cables provide fault-tolerant paths between the ATRF and Buildings 430 and 350 at the Fort Detrick campus.

provided for with pre-poured generator slabs, extra conduit, a support rack for an additional 400-ton chiller, additional floor space, and specialized air handlers. ■

*<http://mozy.com/blog/misc/how-much-is-a-petabyte/>

Upcoming Events and Dates to Note

Farmers' Market, every Tuesday through October, 11 a.m.–1:30 p.m., in front of Building 549
Columbus Day: Frederick National Laboratory closed October 8
Veterans' Day: Frederick National Laboratory closed November 12
Thanksgiving Day: Frederick National Laboratory closed. November 22

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Area Map



Frederick, the northern anchor of the I-270 technology corridor, now has two locations for the Frederick National Laboratory for Cancer Research. Its facilities are on the Fort Detrick campus and at the new Riverside Research Park, located alongside the Monocacy River.



<http://ncifrederick.cancer.gov/ThePoster>



Poster

FREDERICK NATIONAL LABORATORY FOR CANCER RESEARCH

SEPTEMBER 2012



Take Your Child to Work Day July 18

Holding a human brain, playing with alpacas, extracting DNA from bananas, exploring water density, using a confocal microscope, and handling live insects were just a few of the activities that children had a chance to experience during Take Your Child to Work Day 2012. ■



Spring Research Festival

Congratulations to the 2012 Spring Research Festival Poster Winners

On May 9 and 10, nearly 150 scientists, postdoctoral fellows, research technicians, and students shared their current research findings at the 16th annual Spring Research Festival. Of these presenters, 44 received awards in 14 categories. ■



Werner H. Kirsten Student Internship Program (High School Student)

Cancer Biology

Alexis Hott, Joseph A. Donkor, Optical Microscopy and Analysis Laboratory (OMAL), Frederick National Laboratory

Jimmy Liu, Nanotechnology Characterization Laboratory (NCL), Frederick National Laboratory

Developmental and Cell Biology

Rebecca Moriarty, Cancer and Developmental Biology Laboratory (CDBL), Frederick National Laboratory

Detection and Diagnostics

Devar Ferhadi, Laboratory of Proteomics and Analytical Technologies (LPAT), Frederick National Laboratory

Immunology

Sarah E. Turner, Laboratory of Experimental Immunology (LEI), Frederick National Laboratory

Haley Hochstein, Laboratory of Molecular Immunoregulation (LMI), Frederick National Laboratory

Infectious Pathogens

Shane Falcinelli, Friedlander's Group, USAMRIID

New Technology

Jake Kirkwood, OMAL, Frederick National Laboratory

Structural Biology and Chemistry

Selene Sparks, NCL, Frederick National Laboratory

Luke Verdi, Structural Glycobiology Section, Frederick National Laboratory

Virology

Benjamin Holdridge, AIDS and Cancer Virus Program (ACVP), Viral Oncology Section, Frederick National Laboratory

Darren D'Souza, Retroviral Replication Laboratory, Frederick National Laboratory

Post Baccalaureate (Student)

Detection and Diagnostics

Sudipa Chowdhury, Chemical Biology Laboratory, Frederick National Laboratory

Genetics and Epidemiology

Christina Ruiz-Rodriguez, LEI, Frederick National Laboratory

Molecular Biology

Ashley Denney, Gene Regulation and Chromosome Biology Laboratory, Frederick National Laboratory

Therapeutics and Drug Delivery

Jessica Sine, Nanobiology Program, Frederick National Laboratory

Graduate (Student)

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Developmental and Cell Biology

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Postdoctoral Fellow

Biochemistry

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Biodefense

William A. Harrell, Jr., Medicinal Chemistry, USAMRIID

Cancer Biology

Yurong Song, Mouse Cancer Genetics Program, Frederick National Laboratory

Developmental and Cell Biology

Kangsun Yun, CDBL, Frederick National Laboratory

Spring Research Festival

Genetics and Epidemiology

Karobi Moitra, LEI, Frederick National Laboratory

Immunology

Fanching Lin, LEI, Frederick National Laboratory

Kuppusamy Balamurugan, Laboratory of Cell and Developmental Signaling, Frederick National Laboratory

Noriho Iida, LEI, Frederick National Laboratory

Stephanie K. Watkins, LMI, Frederick National Laboratory

Structural Biology and Chemistry

Jason R. Stagno, Macromolecular Crystallography Laboratory (MCL), Frederick National Laboratory

Yu-He Liang, MCL, Frederick National Laboratory

Scientist (Lab Technician/Technical Support)

Applied and Environmental Biology

Craig Cavin, Foreign Disease Weed Science Research Unit, USDA

Cancer Biology

Jim Stauffer, Cancer and Inflammation Program, Frederick National Laboratory

Detection and Diagnostics

Jennifer Goodrich, National Bioforensic Analysis Center, DHS-National Biodefense Analysis and Counter Measures Center

Immunology

Anthony Scarzello, LEI, Frederick National Laboratory

Structural Biology and Chemistry

George T. Lountos, MCL, Frederick National Laboratory

Wojciech K. Kasprzak, Nanobiology Program, Frederick National Laboratory

Research Technician (Lab Technician/Technical Support)

Developmental and Cell Biology

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Immunology

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Infectious Pathogens

Stephanie Lehman, Bacteriology, NBACC

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New Technology

Lyuba Khavrutskii, Synthetic Biologics and Drug Discovery Facility, Frederick National Laboratory

Structural Biology and Chemistry

Ferri Soheilian, Electron Microscopy Laboratory, Frederick National Laboratory

Other

Molecular Biology

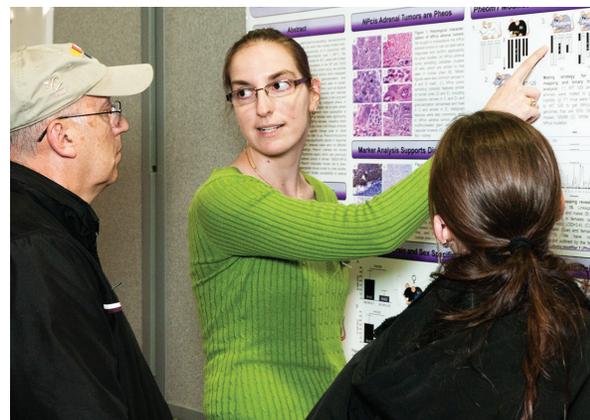
Hyunbum Jang, Nanobiology Program, Frederick National Laboratory

New Technology

DaRue A. Prieto, LPAT, Frederick National Laboratory

Therapeutics and Drug Delivery

Kirill A. Afonin, Nanobiology Program, Frederick National Laboratory



Summer Student Activities

Student Jeopardy Tournament, July 25

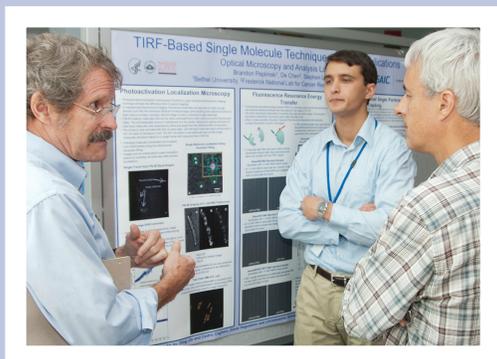
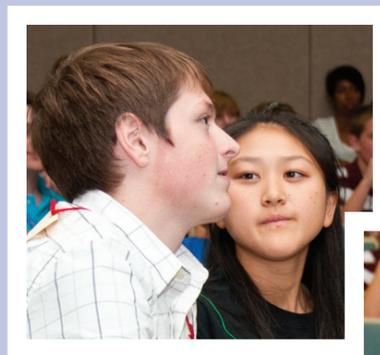
Eighteen students participated in the sixth annual Student Science Jeopardy Tournament.

Congratulations to the winning teams:

First place: Nikhil Gowda and Madelyne Xaio

Second place: Emmy Yang and Michael Ketcha

Third place: Dahlia Kronfli and Bonnie Douglas



Student Poster Day August 1

Summer Student Poster Day brought 55 Werner H. Kirsten student interns and college interns together to present their research to the Frederick National Laboratory and Fort Detrick communities. ■

