Bindley Bioscience Center

This tour begins at the entrance of Bindley Bioscience Center doors that face Mann Hall. Take them into the atrium area and gather around for a quick overview of building facts below. The Bindley building tour should take approximately 20-25 minutes, depending upon the audience.

(Level 1)

STOP: Atrium

Talking Points

- Bindley Bioscience Center is one of the original centers of Discovery Park and was completed in October 2005.

- Building features:
  - Abundant natural light and flexible lab space
  - Open concept to encourage communication
  - Labs with glass walls become an outreach tool, showcasing learning process to visitors.
  - 55,000 square feet.
  - 6 large laboratories (20,000 square feet).
  - Skywalk to Birck center is on 2nd floor

- Research facility dedicated to interdisciplinary life sciences and engineering teamwork.

- Like all of Discovery Park, Bindley is linked outside the campus as well: pre-college students, current students, alumni, corporate partners and state economic developers.

- Mission is to offer new capabilities in the life sciences. We do that with:
  - technical and scientific staff
  - facilities/instrumentation

- Connects Purdue expertise from all of Purdue's life sciences-related colleges, school, and departments—Biology; Pharmacy; Veterinary Medicine; Agricultural & Biological Engineering; Chemistry; Chemical Engineering; Food Sciences; Horticulture as examples.

- Focus is applications to today's grand challenges, such as:
  - Diagnosis of medical conditions
  - Treatment of diseases
  - Safety of our food supply
  - Increased nutritional value of our food
  - Safer and improved therapeutic drugs
  - Biological-based solutions to energy
  - Identifying and improving environmental health effects

Poster 1A: Bionanotechnology

"We conduct biology experiments using the "nano-scale," which is one-billionth of a meter. Here a nano-sized biology instrument gives us new information about communications between and among nerve cells, including exact measurements of chemicals or impulses released by the cells, the timing and direction of these releases, and how quickly or slowly these chemicals or impulses are traveling."

Ask if there are any questions at this point – write them down if you do not know the answer.

Swipe your I.D. card to gain access to the inner corridor door and continue around the left corner and halfway down the hall where the cubicles and labs are located.

EXTRA MATERIAL FOR ATRIUM

Use this information ONLY if you have more time and the audience has some science background.

STOP 1: Atrium

Core Research Areas (refer to standing banner)

- Biomolecular Technologies: the development of new instruments to study sub-cellular molecules or parts of cells, such as proteins, metabolites, genes, ions.

- Computational Life Sciences & Informatics: applies advancements in computer technology to biological problems. Improves our ability to analyze biological data, to store massive amounts of data, to compare results from one instrument to another, and to manipulate molecules at the nano-scale. Also enables "systems biology" to see how changes in one part of a living system (or a cell, gene, or other sub-part) affect rest of the system.

- Bionanotechology: uses capabilities of Birck Nanotechnology Center to work with biological problems at the nano-scale (one-billionth of a meter) for discovery and technology development not possible before.

- Cytomics & Imaging: Cytomics=study of cells. Faculty study cells through placing their image in natural systems to examine what is happening in "real time."

STOP 2: Office Carrels

Talking Points

The facility is organized with 3 large labs on each floor. On this 1st floor, we have:

- Shared Collaboration Offices
  - 3 on this floor; 3 on 2nd floor.
  - Used by researchers working on projects.

- Office Carrels
  - 94 graduate students; 6 undergraduate students.
  - 10 BBC research scientists; 18 postdoctoral researchers.
  - 16 technical staff (lab support).
  - Also visiting scientists; PU faculty members (90) share offices in this building.

- Cytomics & Imaging Laboratories
  - Imaging Laboratory is on immediate right side.
  - Research here focuses on picturing and measuring cells and sub components of cells.

Poster 2: Cytomics and Imaging
Endoscopes are used in medical procedures to identify abnormal growths inside the body. In collaboration with Kodak Company, a study is underway to create a better endoscope – one that uses a more powerful camera than is currently used in hospitals. The camera would enable doctors to see problems at the microscopic level, thus allowing better identification of the type of problem ("is it cancer?"), cutting health-care costs by reducing the number of procedures, and improving treatment techniques.

STOP 3: Flow Cytometry Laboratory

Talking Points: ***Here we have the cytomics laboratory.***

- Flow cytometry separates cells to enable study of different cell types.
- Banner at door shows original flow cytometer used to separate cells.

Poster 3: Solving Grand Challenges
To diagnose AIDS, doctors must know the count of a certain type of white blood cell (the T lymphocyte) of a person who is infected with HIV (human immuno-deficiency virus). The Cytometry for Life Project is working to develop a simplified, less expensive version of a very complicated scientific instrument that separates and counts white blood cells. This new instrument would allow more people to receive testing, especially in areas of the world where access to medical care is limited and where the incidence of AIDS is rising.

STOP 4: Biomolecular Technologies Laboratory

Talking Points:

The labs in the Bindley have safety features that protect the faculty & students working here. For example, this dial **(point to wall dial)** should always read less than .01. This means that there is a negative pressure on the inside of the lab, so that particles tend to stay inside the lab rather than flowing outward to other parts of the building.

- Work in this lab focuses on analysis of small molecules, such as proteins, metabolites, and genes.
- Flexible bench assignments prevent "silos."
- Gases stored in hallway closets; flow through ceiling pipes to utility columns to allow more flexibility.

Poster 4: Translating Research into Practice
Our researchers are miniaturizing a mass spectrometer (a large scientific instrument used to measure and analyze molecules) in order to obtain instant results by measuring molecules directly at the source, rather than "lifting" a sample and sending it to a lab for analysis. Potential applications include scanning for explosive residues at airport security check points or finding fingerprints at crime scenes (rather than the "powder and lift" method).

STOP 5: Bio Safety Lab

No Poster for Stop 5

Talking Points:

- Space for specialized infectious diseases projects: for projects involving pathogens (harmful germs) requiring extra levels of safety.
- Self contained area: own ventilation system separate from rest of building.
- Pass through autoclave: sterilize objects coming out of or going in to lab.

STOP 6-A: Physiological Sensing Facility

- Agricultural & Biological Engineers opened this facility to build bio-sensors that can impact a variety of areas.
- Point to wall poster: several medical applications are listed, such as sensing nitric oxide transport in heart muscle; how nerve cells regenerate.

STOP 6-B: Physiological Sensing Facility

Down this hallway on the wall you can see examples of agricultural applications.

Poster 6: Food Safety
A sensing device is being built that can measure the breakdown of muscle fiber in animals that we use in the food-processing industry. With this hand-held device, plant operators would be able to determine whether food is spoiled before products are packaged and sent to grocery stores.

Point out the elevator to the 2nd floor for those who need to use the elevator, and guide the group up the stairs to 2nd floor walkway to Birck Nanotechnology Center.

When you reach the top of the stairs, continue straight to the walkway to take you to the Birck Nanotechnology Center.

***Bindley Bioscience Center tour ends, unless you have time to continue to the 2nd floor.**

****If you have enough time, continue through the 2nd floor inner corridor on the right hand side by the elevator. You will again need your I.D. to gain access to thiscorridor.***

(Level 2)

STOP 7: Molecular Cytometry Laboratory

Talking Points

The 2nd floor is organized like the 1st floor, with shared collaboration offices at the end; administrative staff offices at the end on the right; and office carrels in the center of the corridor.

- Molecular Cytometry Laboratory provides additional cell separation capabilities *(point to wall poster).*
- Uses high speed cell sorting and a laser as the separation technique.
- Home of the world's faster cell sorter (the premier prototype to commercial high-speed cell sorters now on the market).
- The goal of the "LEAP" instrument *(point to wall poster)* is to use a laser to find rare cells circulating in blood (e.g., cancer cells in remission patient), separate those cells away from the rest of a person's "good cells," destroy those cells, and then return the "good cells" back to the patient (similar idea to kidney dialysis). This is a project in collaboration with a company called *Cyntellect*.

Poster 7: Biology and Space Travel

During space travel, the cells of astronauts are subject to damage by exposure to radiation. In a NASA-funded Mission to Mars project, Purdue researchers are developing a method to gain real-time, cellular-level physiological measurements that would then enable the monitoring and repair of DNA in the radiation-damaged cells. This nano-medical system uses biological sensors that would first detect alterations in a cell's activity and then automatically signal a "DNA- repair gene" to move into those specific cells to repair the damage.

STOP 8: Left Side Laboratories

Talking Points

The laboratories on the left side of the 2nd floor have several scientific names (!), but generally they relate to experimenting in different ways with molecules.

- In the labs on the left, polymer coatings can be made to wrap around molecules to (for example) monitor what a drug molecule does and where it goes when it enters a cell.
- At the far end on the left, we have robotic instrumentation that can screen large numbers of molecules at one time.
- Bindley Bioscience Center is uniquely equipped and designed to conduct bionanotechnology research that links biology and nanotechnology (point out poster on left side of hall).

Poster 8: Nanotechnology
Researchers are developing very small tools with huge impact on the treatment of illness and disease.

-Nanotools to coat drugs with layers of molecules that will allow a release of the drug only at certain times.
In collaboration with Medimmune Company

-Nanomotors to direct drug molecules to work on certain parts of a cell, like a cell protein or an invading virus.

-Reprogramming cells to stop certain cell activities, such as deterioration and virus reproduction.

EXTRA MATERIAL FOR 2ND FLOOR

The BBC is a "distributed center," meaning that not all of its operations are housed in this building. BBC facilities elsewhere on campus include:

- Metabolite Profiling Facility (located in Horticulture building)
  - Defines all components of metabolites (thus develops profiles) of biological systems.
  - Both quantitative and qualitative results.
  - Uses mass spectrometry coupled with multi-dimensional gas and liquid chromatography (GC and LC-MS) to provide researchers with new technologies, as well as expert training and consultation on research instrumentation to run their own experiments.
  - Allows assessment of the hierarchical flow of information from the genome to the transcriptome, proteome, and metabolome ultimately defines cellular phenotypes.

- Purdue Proteomics Facility (located in Hansen)
  - A shared facility of Bindley Bioscience Center (BBC) and the Purdue Cancer Center that provides unique approaches to analyzing both intact and fragmented proteins.
  - Enables never-before-possible analysis of protein modifications: Example--the genes in DNA tell the RNA to make proteins, sometimes these modifications become damaged, thus potentially causing medical problems; new knowledge in this area could lead to diagnostics identifying problems specific to an individual ("personalized medicine").
  - A National Cancer Institute proteomics collaboration (several participating universities, clinical labs, biotech businesses) working together to develop standardized methods of testing for protein biomarkers Group is also working to find specific protein biomarkers that could be used for preventive monitoring and early detection of breast and prostate cancers.
  - Many projects in Bindley Bioscience Center employ these technologies for biomarker discovery in health and disease – a signature research area at the BBC.

WALK: Over the Sky Bridge and enter the Birck Nanotechnology Building

Talking Points

This bionano work is dependent upon the interconnection of the Bindley and the Birck Centers.

- Point out the groundbreaking site of the 5th addition to Discovery Park: the Discovery Learning Center projected to be completed in 2009.

- Skywalk to Birck Nanotechnology Center provides convenience of collaboration; connection of buildings of Discovery Park.

Bindley Bioscience Center Tour Ends.

Thank you for touring the Bindley Bioscience Center