Discovery Park

Purdue's Bindley Bioscience Center and Birck Nanotechnology Center

Stimulating university research… agents for economic development

PURDUE UNIVERSITY

Discovery Park *Integrated* Centers

An ideal center will excel in six dimensions

- ✓ Quality
- ✓ Economic development
- ✓ Interdisciplinary
- ✓ Leverage
- ✓ Leadership
- ✓ Synergistic

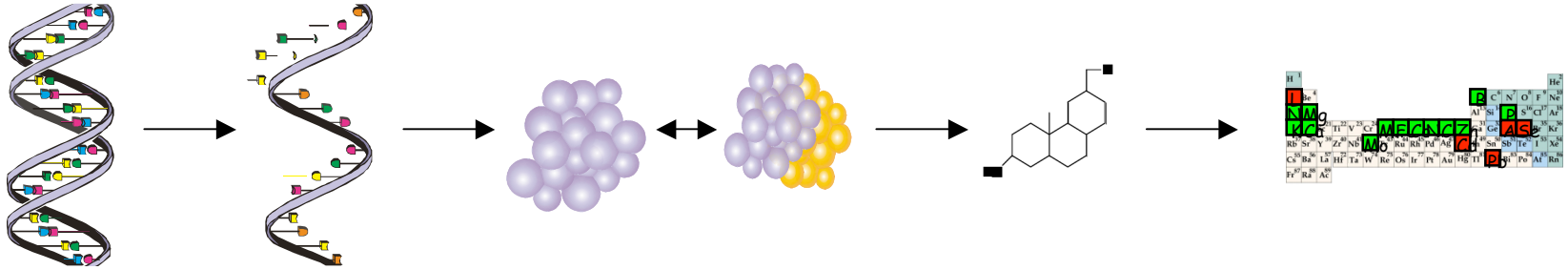
Building on Strengths at Purdue Univ.

- Leading university programs in:
  - Pharmaceuticals, pharmacy
  - Engineering
  - Analytical Chemistry
  - Veterinary Medicine
  - Structural Biology
  - Agriculture
- Award winning research park
  - Outlet for Purdue technology

Discovery Park aims to utilize these strengths for new, multidisciplinary research approaches with an eye to commercialization opportunities

Systems biology approach

Genomics **Transcriptomics** **Proteomics** **Metabolomics** **Ionomics**



Rather than a biological process, entire biological systems are evaluated with multiple technologies. Success will require innovative development of technologies, combination of analytical methods, processing of data for uniformity and intensive computational modeling to generate new knowledge from experimental results

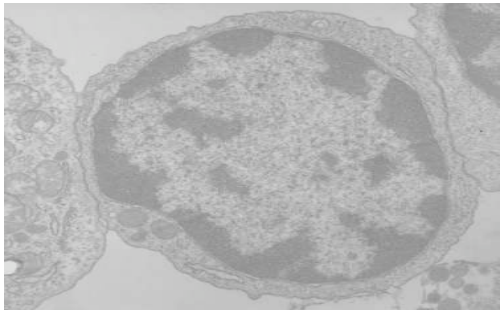


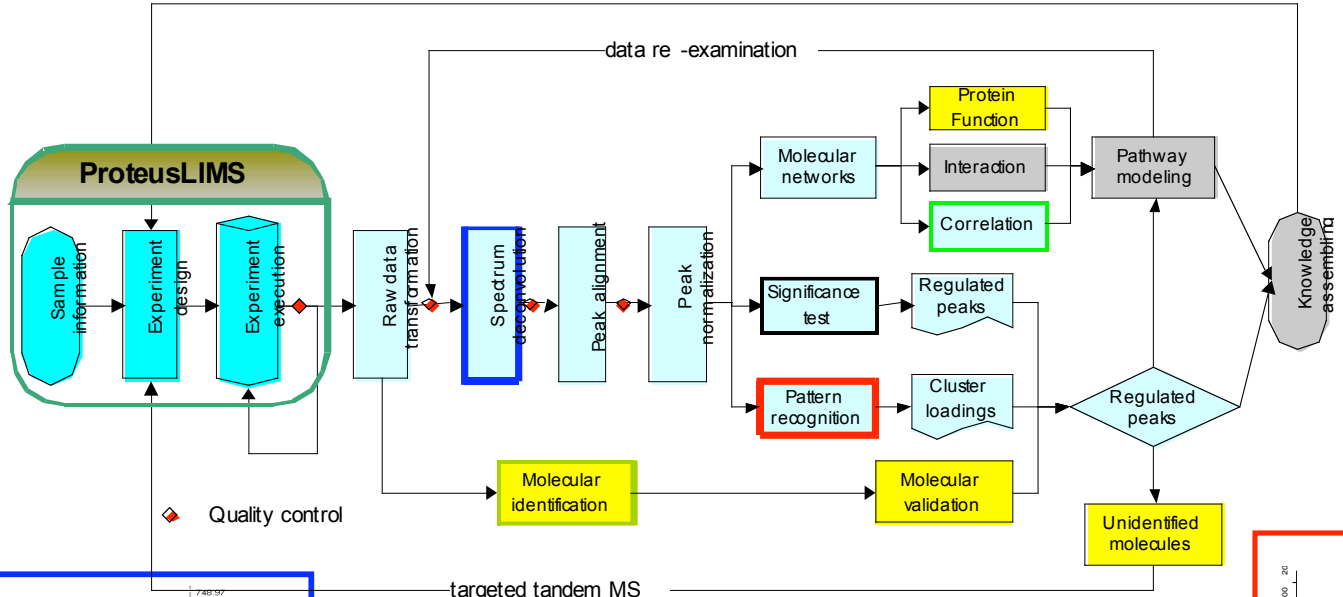
Photo from J.Adamec.

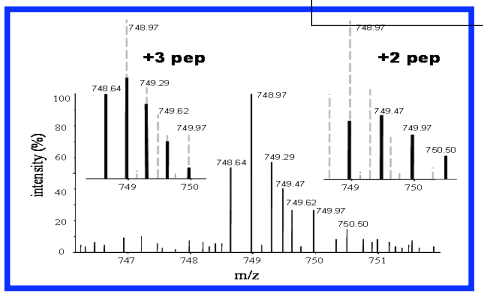
Mature stand of *Miscanthus* x *giganteus*, approximately 3.5 m (11.5 ft) high.
Photo by Dr. I. Lewandowski

Systems biology

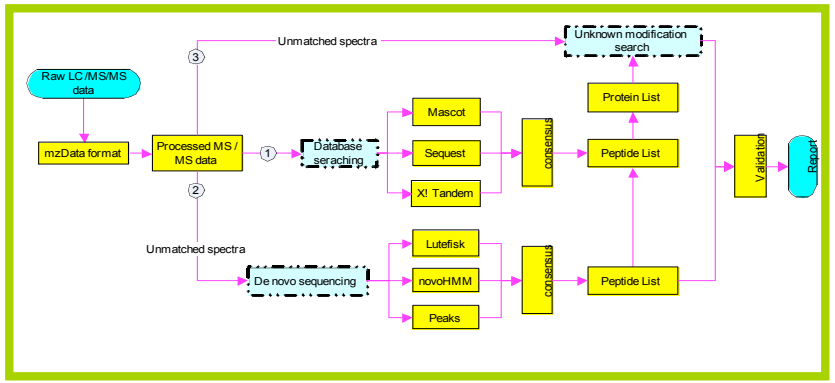
- Ethanologenic yeast
- Biofuels-relevant crops
- Clinical proteomics centers (NIH)
- Cancer care engineering
- Computation and bioinformatics

PDP: a complete system for complex data management and mining

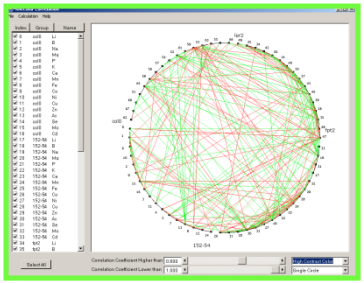




Spectrum deconvolution



Integrated protein identification



molecular correlation networks

pattern recognition

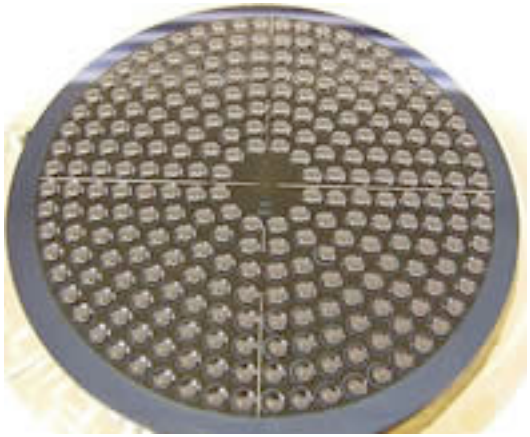
PURDUE UNIVERSITY

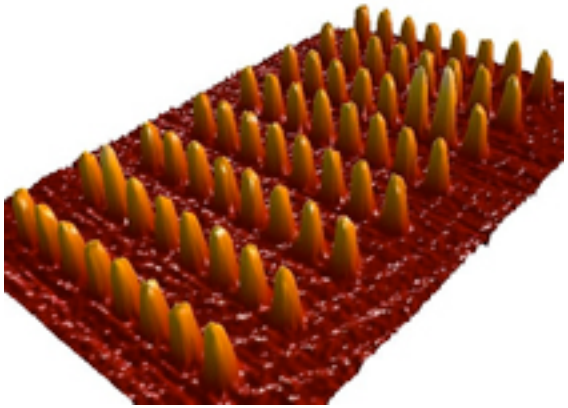
Opportunity: personalized medicine

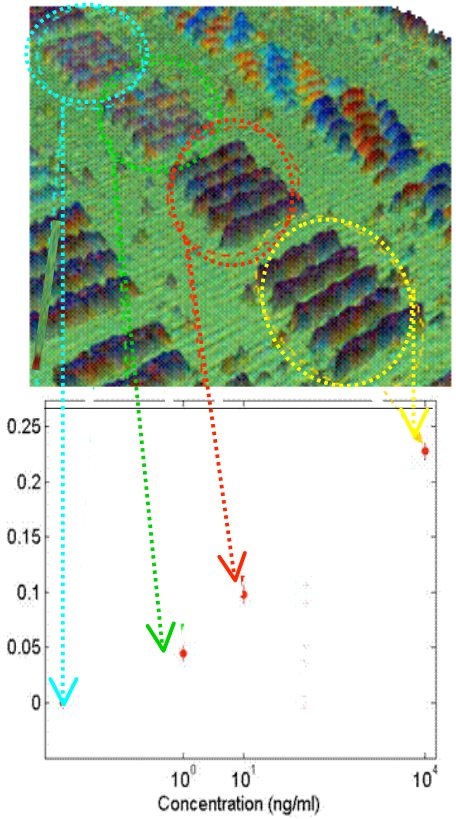
- 'Omics technology holds promise
- From hundreds of candidate biomarkers, just a few are FDA approved
  - Biomarkers give signatures of individuals and disease states
  - Critical need for reproducibility, and for data handling and mining
  - develop and exploit excellent animal models

Discovery Park

Immunological array system







An interferometric map of the surface of a bioCD array along with the corresponding dose-response curve for analyte binding. The height of the protein spotted in the rectangular sample well is proportional to the amount.

Powerful validation platform

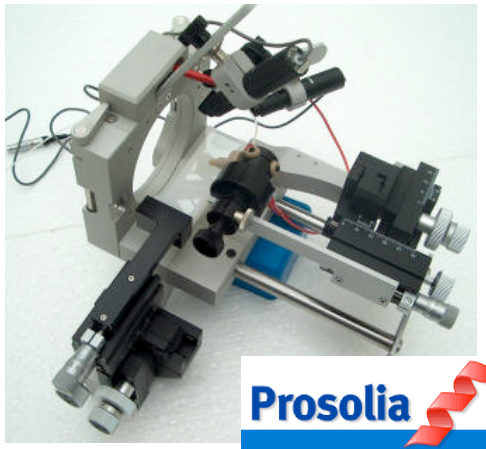
- Label free detection of candidate biomarkers
- Research tool ➡ diagnostic
- 4 current grants in the Bindley with Quadraspec

QuadraSpec™

PURDUE UNIVERSITY

DESI development

Discovery of desorptive electrospray ionization (DESI) enables direct sample interrogation with mass spectrometry



Prosolia Inc.

ped to
cial mass

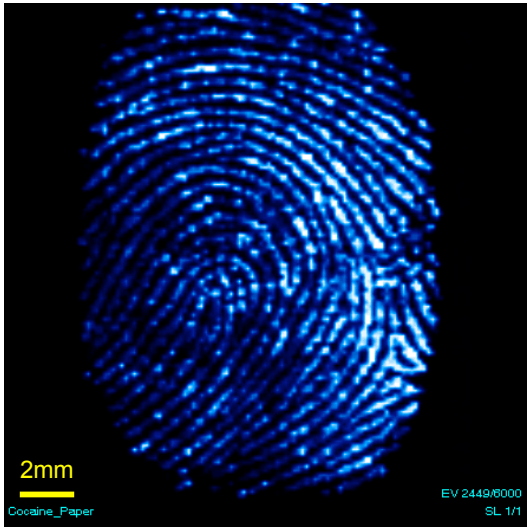
Further developed to field-ready miniaturized mass spectrometer for sensitive molecular detection

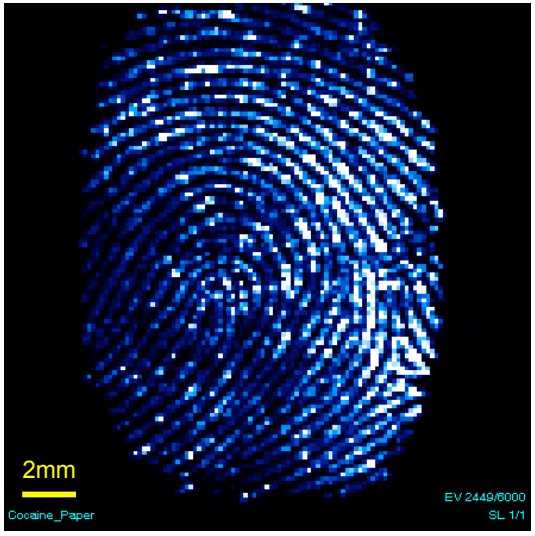
Purdue Aston Lab miniaturized DESI mass spectrometer

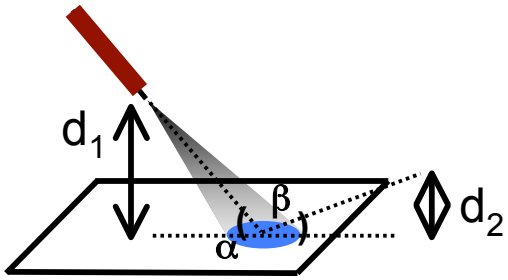
griffin analytical

Discovery Park

Map of Cocaine on Latent Fingerprint







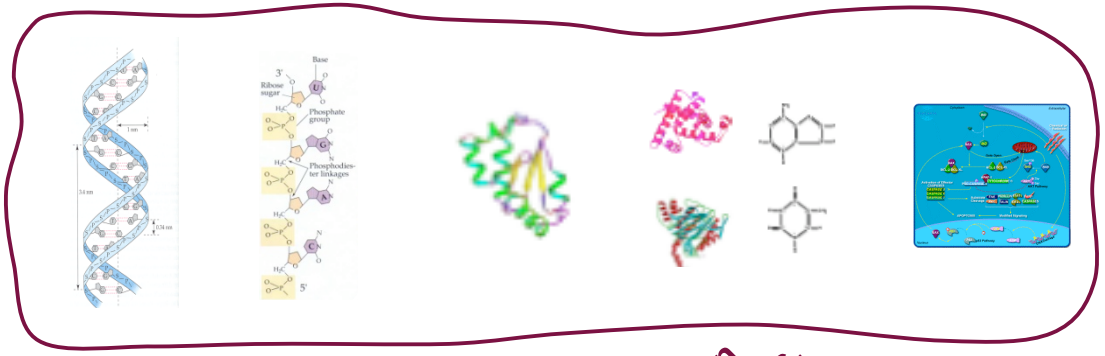
d_1= 1mm **d_2= 1mm**
α = 50° **β ~ 10°**
HV= 5kV **N_2= 100 psi**

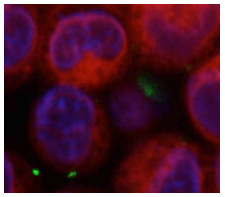
Solvent= MeOH:H_2O (9:1 v/v)
Flow= 1.5µL/min

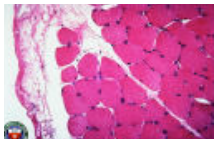
UNIVERSITY

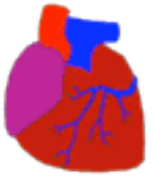
BioMEMS and Bionanotechnology Tools

Genomics
Transcriptomics
Proteomics
Metabolomics
Cytomics









DNA
mRNA
Proteins
Protein Interactions, Metabolites
Pathways
Cell-Cell Interactions
Tissue
Organs

Cantilevers, Nano-pores, NWs, NTs, Quantum Dots, Nano-particles

Micro-fluidics, Soft-Lithography

Polymers and hydrogels, Ink-jet Printing, 3-D Stereo-lithography,

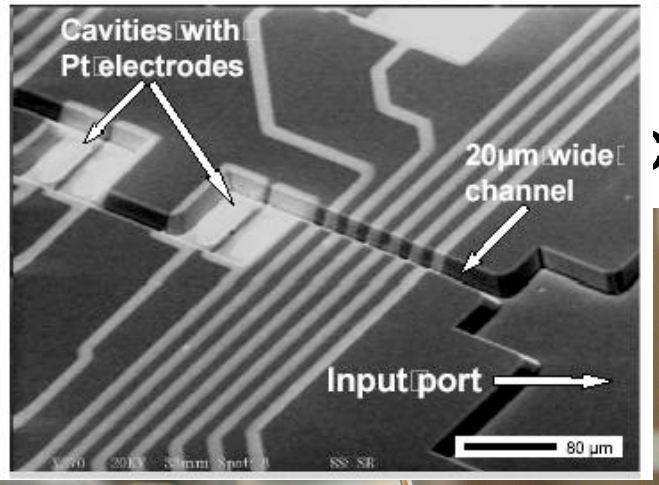
PURDUE UNIVERSITY

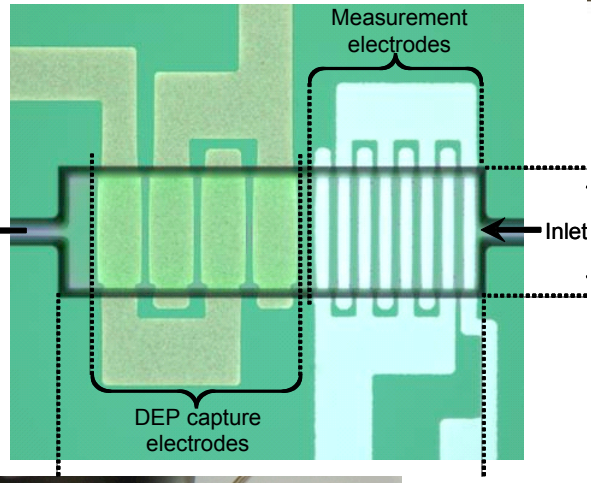
Example projects in Bionanotechnology

- Continuous drug delivery with nanomachined titanium pins (M. Rao)
- Nanoparticle mediated targeting in cells (J. Leary)
- Nanocrystalline drug compound formulations (S. Byrn, K. Park)
- Polymers, particles, vesicles for drug delivery (Y. Yeo, K. Park, J.P.Robinson, D. Thompson)
- Nucleic acid based assembly and functional nanomachines (D. Bergstrom)
- Nanostructured surfaces for tissue engineering (J. Rickus, A. Pannitch)
- Biochips and nanointegrated systems for single molecule detection and analysis (J. Irudayaraj, M. Rao, R. Bashir)
- Nanomechanical sensors for detection of biological targets (D. Akin, J. Irudayaraj, M. Rao)
- Biological nanomotors for drug and gene delivery (D. Thompson, C. Savran, C. Mao, D. Akin)
- Imaging and flow characterization (J. Leary, J.P. Robinson)

Discovery Park

Micro-fabric ct

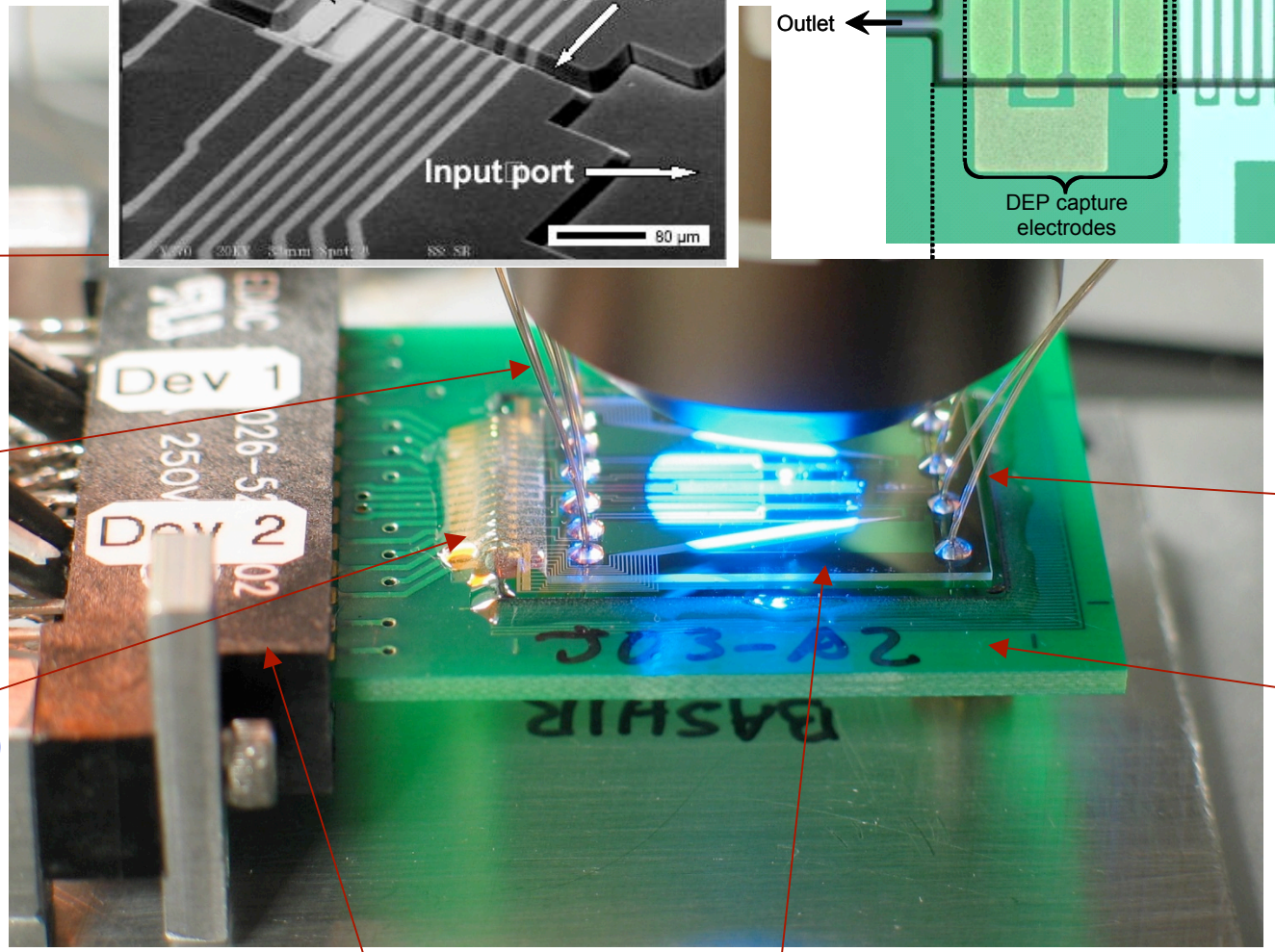




Microscope Objective

Micro-fluidic Tubes

Wire-bond (with epoxy)



Micro-fluidic Tubes

PC board w. heater

Edge Connector

BioChip

PURDUE UNIVERSITY

Discovery Park

Seeding and Nurturing Start-up Companies

1. Griffin Analytical Technologies
2. 2K Corporation
3. Biovitesse Inc.
4. Tienta Sciences
5. Indigo BioSystems
6. Prosolia
7. PriProTex*
8. Quadraspec, Inc.
9. Data Tracking Solutions
10. Theme Work Analytics**
11. Advanced Radiotherapeutic Solutions*
12. VEM Smart Systems, LLC
13. M4 Corporation
14. MagSense Life Sciences
15. MatrixBio, LLC
16. Prima Specialty Vectors
17. Stormfront Productions**
18. Identity Alliance**
19. Cytometry for Life**
20. AlGalCo**

- Details of licensing are being worked out

** Non Purdue Technology

PURDUE UNIVERSITY

Discovery Park

Thank you!

Charles Buck
Director of Operations
Bindley Bioscience Center
cbuck@purdue.edu

PURDUE UNIVERSITY