



MIRTHE Investment Focus Group: Creating Infrastructure to Transition Early Stage Technologies to Commercial Use

*MIRTHE Executive Director
PRISM Director for Industrial Enterprise
Joseph X. Montemarano
Princeton University*



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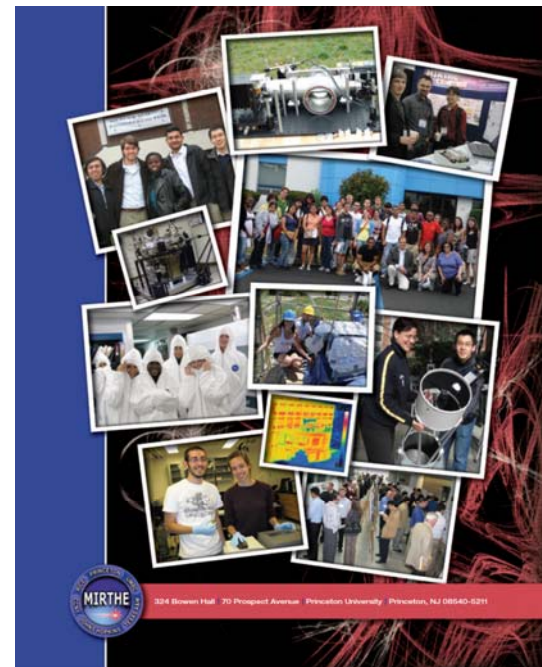
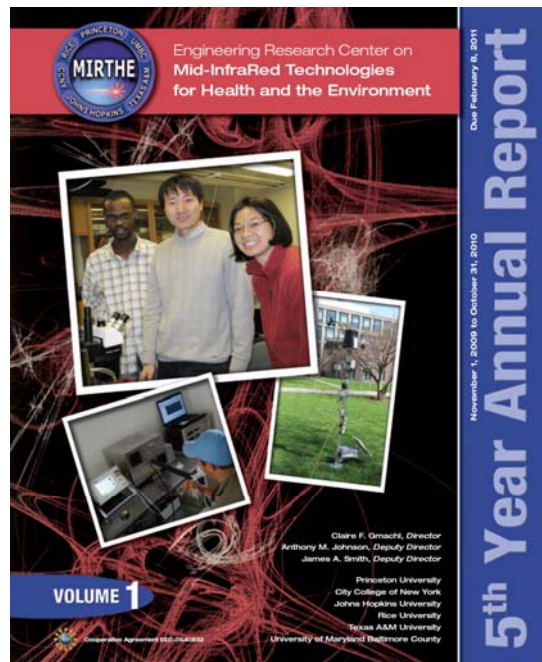
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Outline

- Technology transfer/commercialization perspective at Princeton
 - An example when things work well
 - An example when universities need to be innovative
- NSF ERC as driver in the launch of an Investment Focus Group to provide needed commercialization infrastructure
- Video perspectives from the IFG kick-off conference
- Conclusions





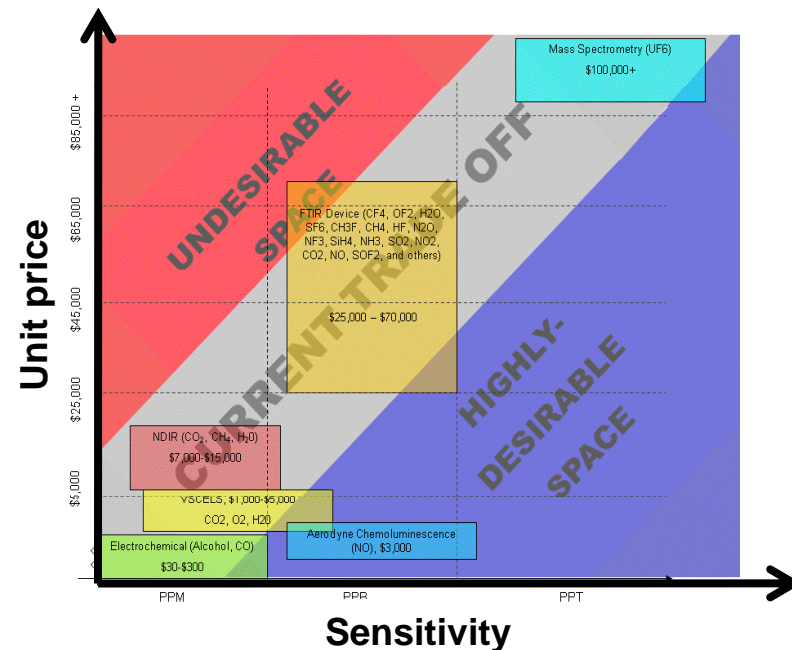
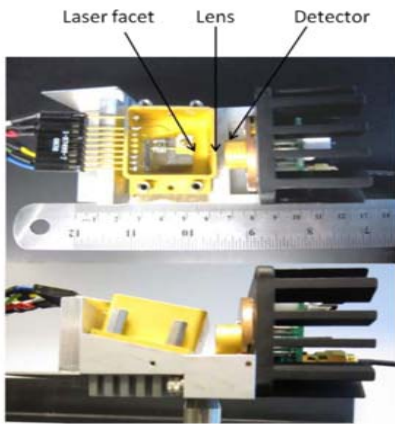
What we already know how to do, and what just can't be predicted

- **Big transactions with big companies**
 - Universities are scoured for “home-runs” with companies posed to act
 - Alitma license to Eli Lilly resulted in successful anti-cancer commercialization
- **Less defined opportunities are not on large corporate radar and small company/entrepreneurial deals are more complex**
 - Longer gestation periods and intensive capital requirements targeting niche markets demand **relationships** be built in order to even get to the **transaction**
 - Multi-wavelength IR detector program with Sensors Unlimited initially focused on roadway “black ice” and on aircraft wings became an enduring model for on-campus industry collaborations and facilities access as well as unparalleled success
 - And sometimes with good timing, luck and ability to recognize that “**killer app**” (as all-optical networks proliferated so did a technology in waiting solution ready to monitor all-optical networks)
- **Sensors Unlimited was acquired by Finisar Corp in 2000 for \$700 million, bought back in 2003 for \$6 million, and sold to Goodrich Corp in 2005 for \$60 million**
- **For MIRTHE to generate next great technology/business opportunities it needs to develop key pieces of missing tech commercialization infrastructure**



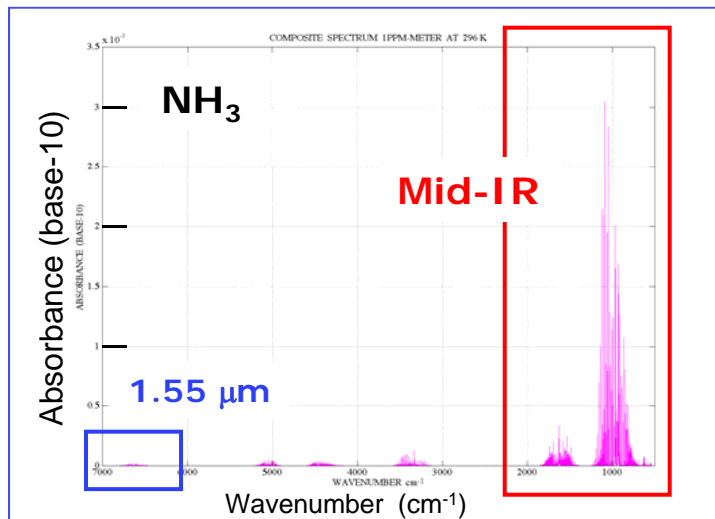
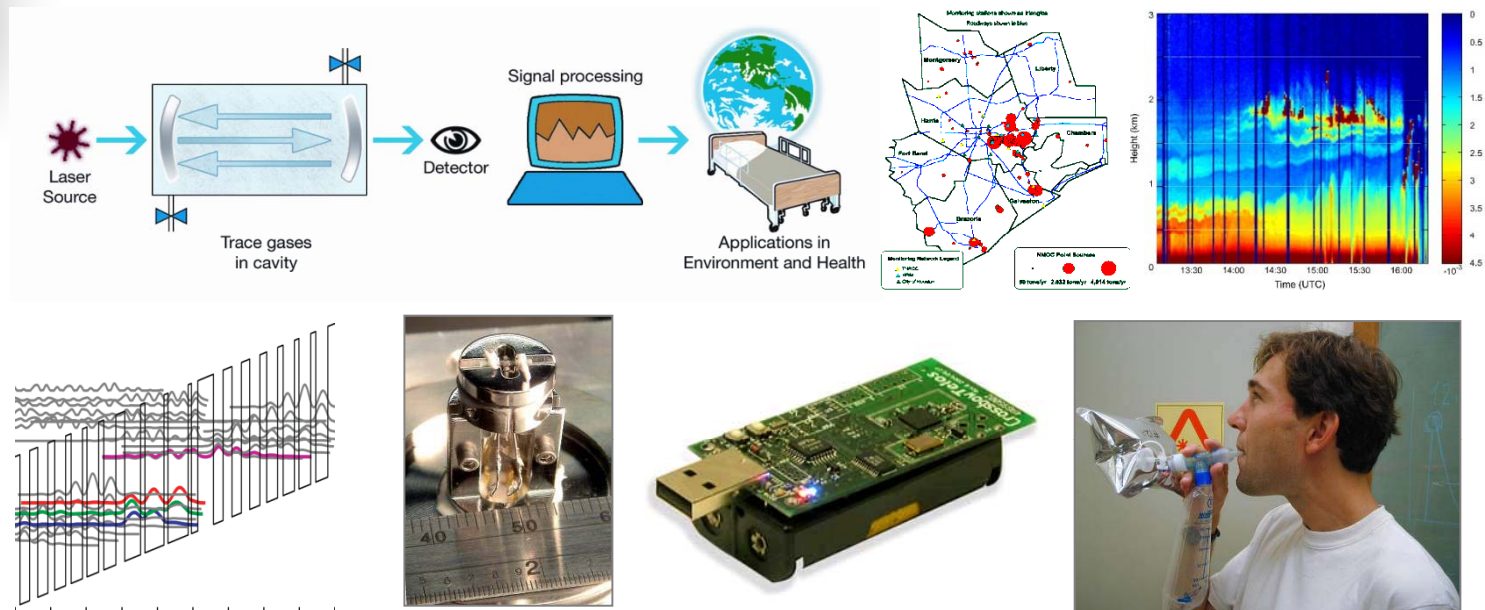
Technology vision

- Development of a new platform of mid-IR trace gas sensor systems
 - Unprecedented high-performance and cost-effective
 - Compactness, autonomy, networking capability, fast response
 - Individual, urban sensor network, global scale
- MIRTHE addresses the important societal challenges
 - Securing a clean, safe, sustainable, and healthy environment
 - Accessible healthcare
 - National and global scale





Scientific underpinning of MIRTHE research



- Molecules uniquely identified
- Sub-ppb sensitivity
- Non-destructive, non-invasive, fast dynamic response.
- Telecom infrastructure / Moore-curve development
- Mid-IR (3-30 microns) offers 1000-fold increase in absorption relative to 1.5 microns

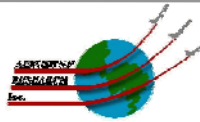


MIRTHE industry members & practitioners are a key component of the Mid-IR ecosystem

Partners:



General Members:



Affiliates:



Media Affiliates:



Non-profit/Gov:





But the ecosystem is not complete without the professional investors

- While the money is important, VCs expertise and business smarts is even more important
 - But why would they be involved in a university research center?
 - How could they be attracted to provide the services our small company collaborators need?
- By giving them the confidence that they will not miss the next big investment opportunity to come out of Mid-IR
 - And providing insights into technologies so they do not repeat the mis-steps that led to the telecom bubble



Engagement of investment community

MIRTHE Investment Focus Group (IFG)

is

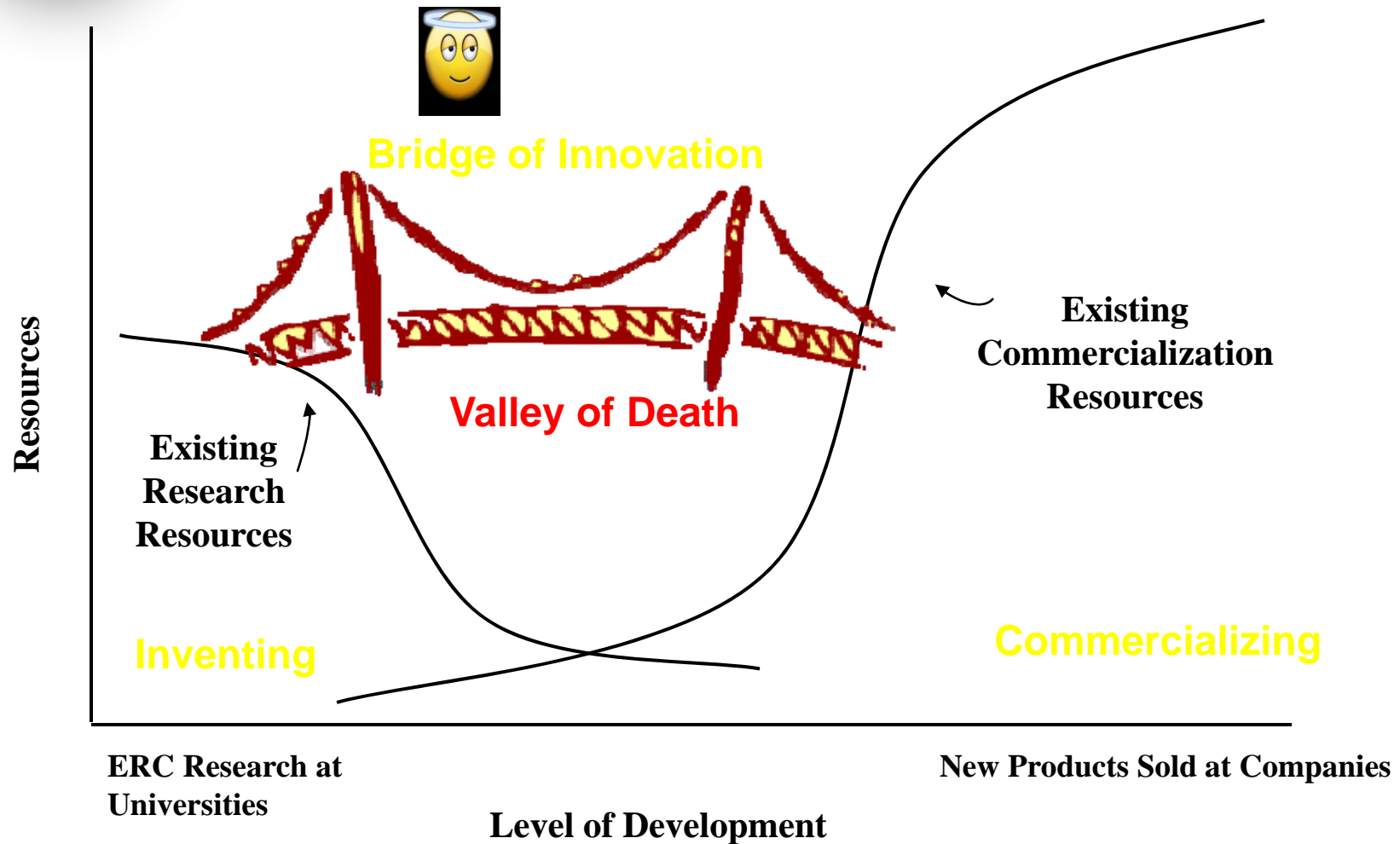
a network of professional and angel investors seeking opportunities emerging from MIRTHE mid-infrared technologies and related applications

Mission:

- Introduction of venture capital, angel and other investment professionals related to mid-infrared technologies and applications opportunities
 - Exposure to MIRTHE small and large company members
 - Opportunities to nurture MIRTHE related start-ups
 - Joint assessment of technology readiness and approaches to commercialization
- *Co-chaired by Dr. Mort Collins and Dr. Ralph Taylor-Smith of Battelle Venture*
 - *>20 board members have been recruited so far*
 - *Kick-off conference held (Oct 5 meeting – video archive on website)*
 - *Meeting frequency: twice a year, plus one or two meetings in association with other MIRTHE events, including specific industry sector highlights;*
 - *Fall 2011 meeting planned with Cleveland Clinic to focus on medical apps*



Invention to Commercialization Gap





Conclusions

- Large companies excel as solutions integrators for large markets
- Early-stage IP presents challenges to commercialization and requires special infrastructure
 - Early technologies do not hit hurdle rates of large R&D companies
 - Long-term return profile exceeds corporate earnings timeframe
 - R&D screeners sometimes display “NIH” (not invented here) sentiments to externally generated technologies, especially from universities
- While small companies are better acclimated for early development work they often lack the capacity
 - They really ‘get’ university faculty and early-stage IP
 - But often lack adequate capital and market access
- The Mid-IR Focus Group adds needed expertise and resources to identify and speed commercialization of promising technology business opportunities
- Investors interested in the IFG should contact MIRTHE’s Industrial Liaison, Bernadeta Wysocka, at bwysocka@princeton.edu



MIRTHE IFG Board Members

Mort Collins (Battelle Ventures); Co-Chair

Ralph Taylor-Smith (Battelle Ventures); Co-Chair

Maxine Ballen (New Jersey Technology Council)

Kathleen Coviello (NJEDA)

John Dexheimer (LightWave Advisors Inc.)

Karla Ewalt (Office of the Dean for Research, Princeton University)

Debbie Hart (BioNJ)

Randy Harmon (NJSBDC)

Cornelia Huellstrunk (Keller Center, Princeton University)

Eric Kutner (Princeton Entrepreneurs Network)

Michael Lucca (The Incubation Factory)

Mark V. Laurenzi (RedScript Ventures LLC)

Steven Lorenzet (Kean University)

Tom Melzer (RiverVest Venture Partners)

Joseph Michels (One Equity Partners)

Lawrence Newman (Rider University).

Gregory H. Olsen (GHO Ventures)

Katherine O'Neill (Jumpstart NJ Angel Network)

Cole Van Nice (Chart Venture Partners)

John Weaver (Princeton Entrepreneurs' Network)

Richard White (Silicon Valley Bank)

Mid-Infrared Technologies for Health and the Environment



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MIRTHE IFG Kick-off Conference

MIRTHE Investment Focus Group

Conference

October 5th, 2010

8:00 am – 5:00 pm

Princeton University
Friend Center
Convocation Room
35 Olden Street
Princeton, NJ 08540
[map](#)

hosted & sponsored by:



www.mirthecenter.org

- Meet **Investment Focus Group (IFG)**, a network of professional and angel investors seeking opportunities emerging from MIRTHE mid-infrared technologies and related applications. **Co-chaired by Morton Collins and Ralph Taylor Smith of Battelle Ventures**, Investment Focus Group provides introductions to promising start-ups, established technology businesses, and large end-users.

- Attend Presentations and Poster Session

Keynote Speakers:

**Dr. Morton Collins and
Dr. Ralph E. Taylor-Smith**
General Partners, BATTLE VENTURES

Agenda Oct 5th 2010

8:00am-8:30am

Registration and Breakfast

8:30am-9:00am

Welcome

IFG mission and the current investment climate
Morton Collins and Ralph Taylor-Smith,
General Partners, Battelle Ventures

9:00am-9:20am

Overview of MIRTHE Technology

Claire Gmachl, *MIRTHE Center Director*

9:20am-9:40am

Research to Reality: The NSF Perspective

Deborah Jackson, *National Science Foundation*

9:40am-10:00am

MIRTHE Roadmap, Peter Schram

10:00am-10:20am

Coffee Break

10:20am-12:00pm

Start-ups and Early Opportunities at Princeton

Portable Wireless mid-IR Sensor Systems, Stephen So
Non-Invasive CO₂ and Glucose Diagnostics, Anna Michel
Environmental sensor networks: applications in air quality and building energy studies, Elie Bou-Zeid
New standoff detection methods for trace gas, Dick Miles
TAG lens adaptive optics for imaging and materials processing, Craig Arnold

12:00pm-1:00pm

Lunch

1:00pm-3:00pm

MIRTHE small companies' presentations

The death of one technology and the birth of another, Erik Crosson, Picarro
Mass optical data storage in a compact crystal device, Glenn Gladney, Access Optical Networks
The Breathmeter – Enabling Early Disease Detection and Therapy Monitoring, Dejan Nedin, Ekipis Technologies Inc.
Leveraging Mid-IR Security & Safety Investment, John Romanowich, SightLogix
From Sensors Unlimited to United Silicon Carbide: lessons learned outside the ivy walls, Chris Dries, United Silicon Carbide

3:00-5:00pm

Poster Session & Networking

Space is limited. **Please register by September 30, 2010.** Registration fee \$150. No charge for MIRTHE and IFG members, faculty and students. To register or make a payment please contact Denise Ritzmann at dritzman@princeton.edu or 609.258.4912. Please remember to bring confirmation of your reservation at check in.

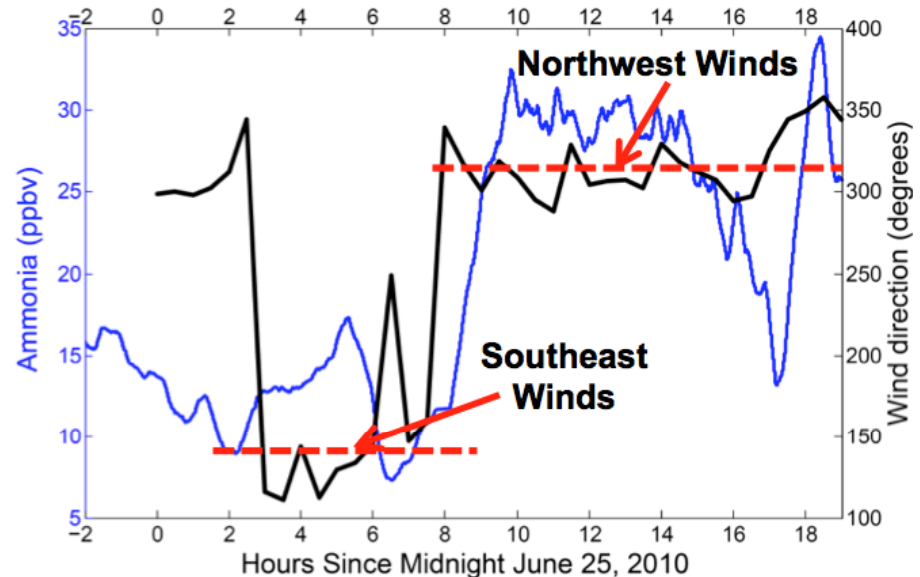




Open-path Ammonia Sensor Development



- * Successful deployment of sensor in 2010 CALNEX experiment.
- * Good performance in harsh field environment.
- * Detected large temporal variations in NH_3 associated with contrasting source regions.
- * Sensor enhancements.





Palm-size QC laser-based CO₂ sensor

- QC laser operating at 4.3 μm
- SNR ~ 300 for 5 ms averaging time
- Short term accuracy - detector noise limited
- Only 8mm optical path vs. 3.5m required @ 2 μm

