

**TechConnect Summit**

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# Open For Business: Air Products & Chemicals Technology

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**Air Products and Chemicals**



# Outline

- **Air Products Snapshot and Background**
- **Open Innovation Practices**
- **Technology Needs**
- **Case Studies**
- **Partner Recognition Programs**
- **What's Next?**



# Air Products Snapshot and Background

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# Fast Facts – Air Products

- **Global gases, materials, equipment and services provider**
- **\$10 billion in Revenue & \$1 billion in Net Income (FY 07)**
- **Chemical industry safety leader**
- **Operations in more than 40 countries**
- **>20,000 employees worldwide**
- **Known for our innovative culture and operational excellence**



# Open Innovation Practices

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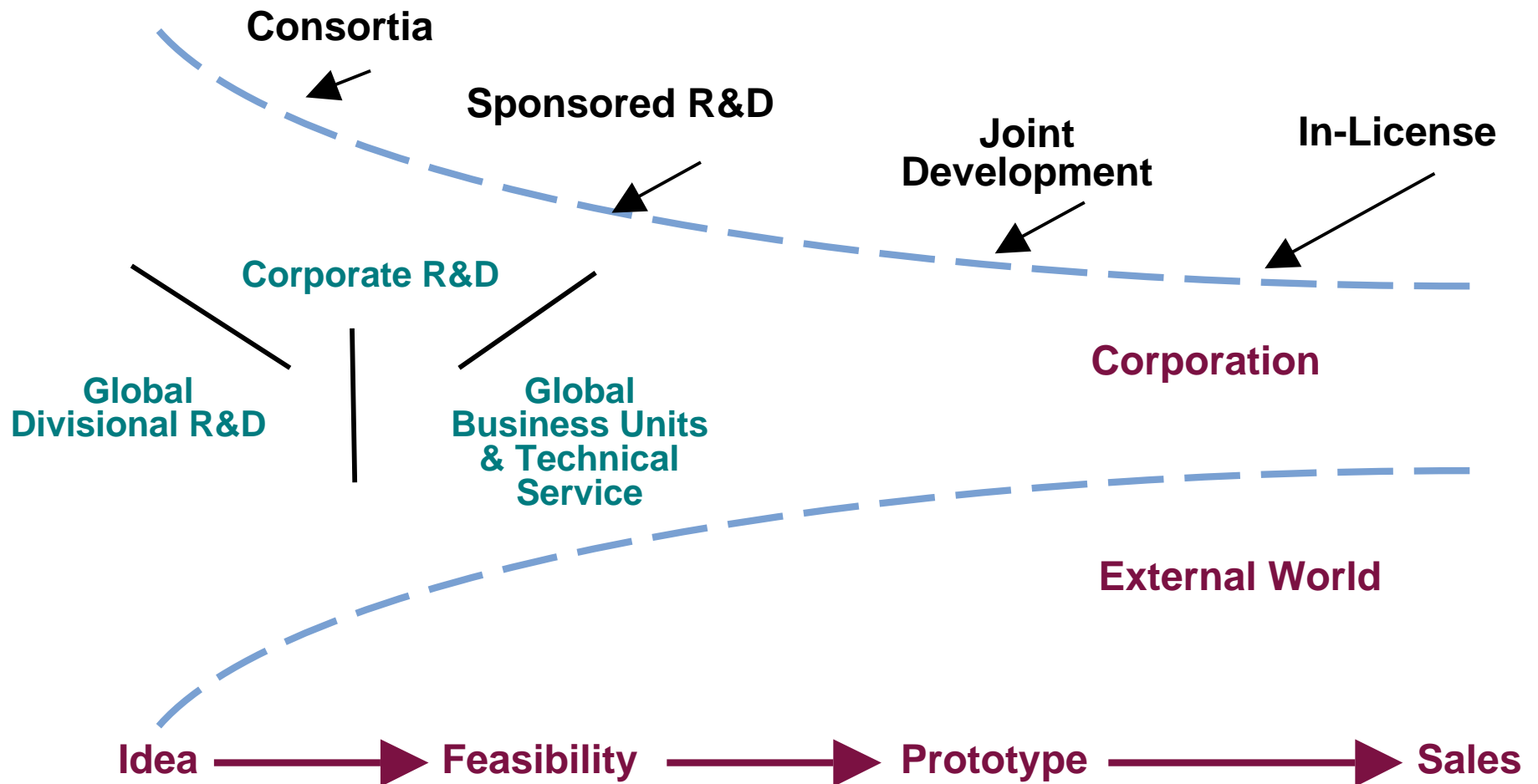
# Why Embrace Open Innovation?

- **Increased pressure for faster, better and lower cost new product development**
- **No single company has > 1% of global R&D capacity<sup>(1)</sup>**
- **Reduced inflow of scientific talent to the US<sup>(2)</sup>**
- **Meet Growth Targets**
  - **P&G CEO sets goal to have 50 % of innovations acquired from outside the company<sup>(3)</sup>**

- **External Technology is more accessible**

1. Carroll, D. 2003 "Beyond the Boundaries of Innovation: Global R&D," AICHE Worldgenetic Conference
2. Brez, C. Castro, C. 2005 Putting the "Global" in Global R&D, IRI External technology Directors Network Meeting, February 16.
3. Huston, L, Sakkab, N, 2006, "Inside Proctor and Gamble's New Model for Innovation" HBR, March

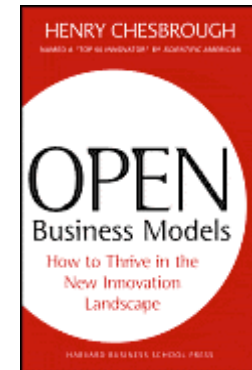
# Classic Open Innovation Pipeline



# Open Innovation Redefined

## “Open for Business”

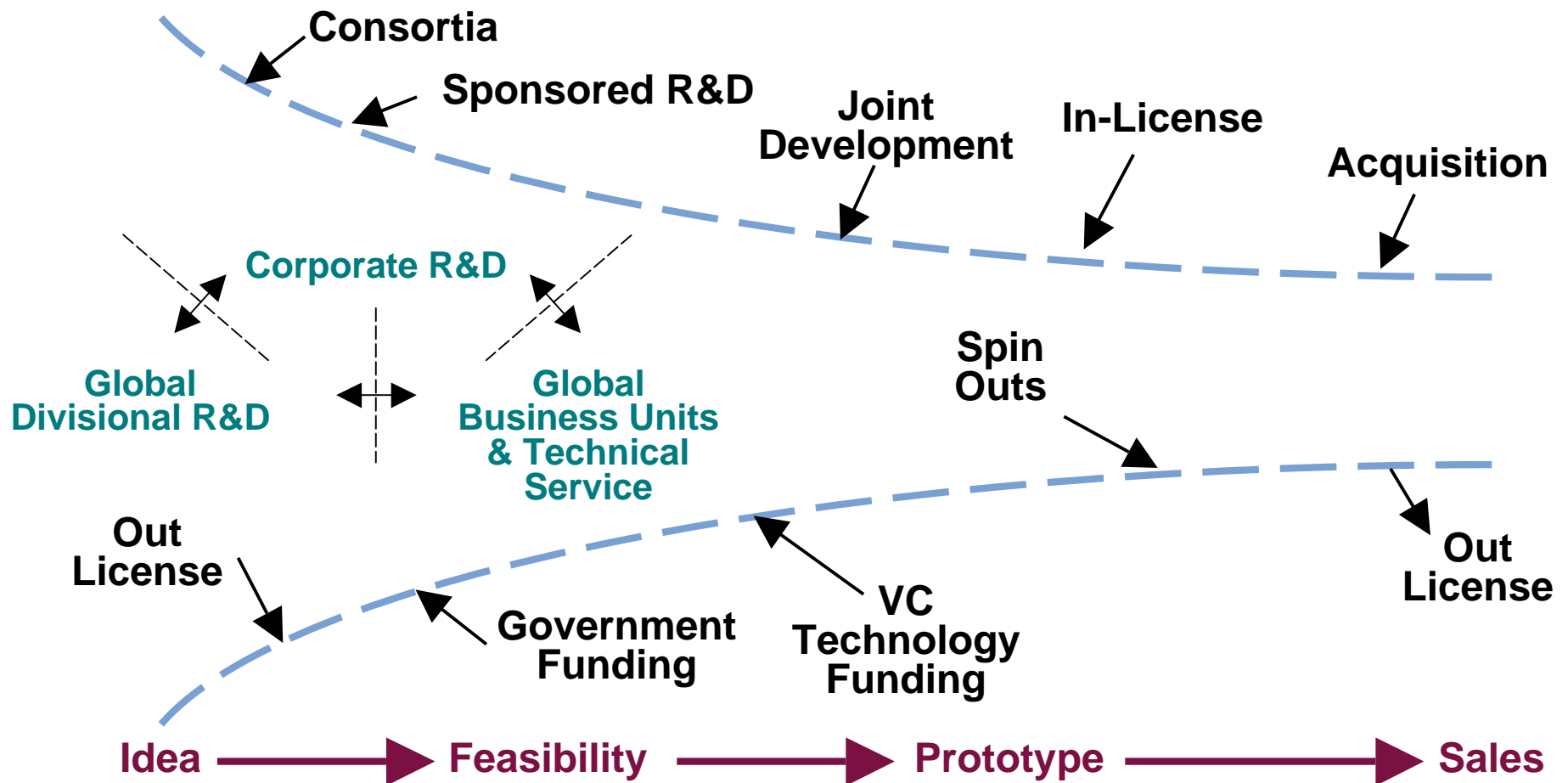
- **Eliminating Barriers to OI**
  - with external world
  - Internal
- **Broaden Technology Transfer**
  - Into the company (classical)
  - From the company
  - Within the company
- **Strategy**
  - Maximize value creation and extraction



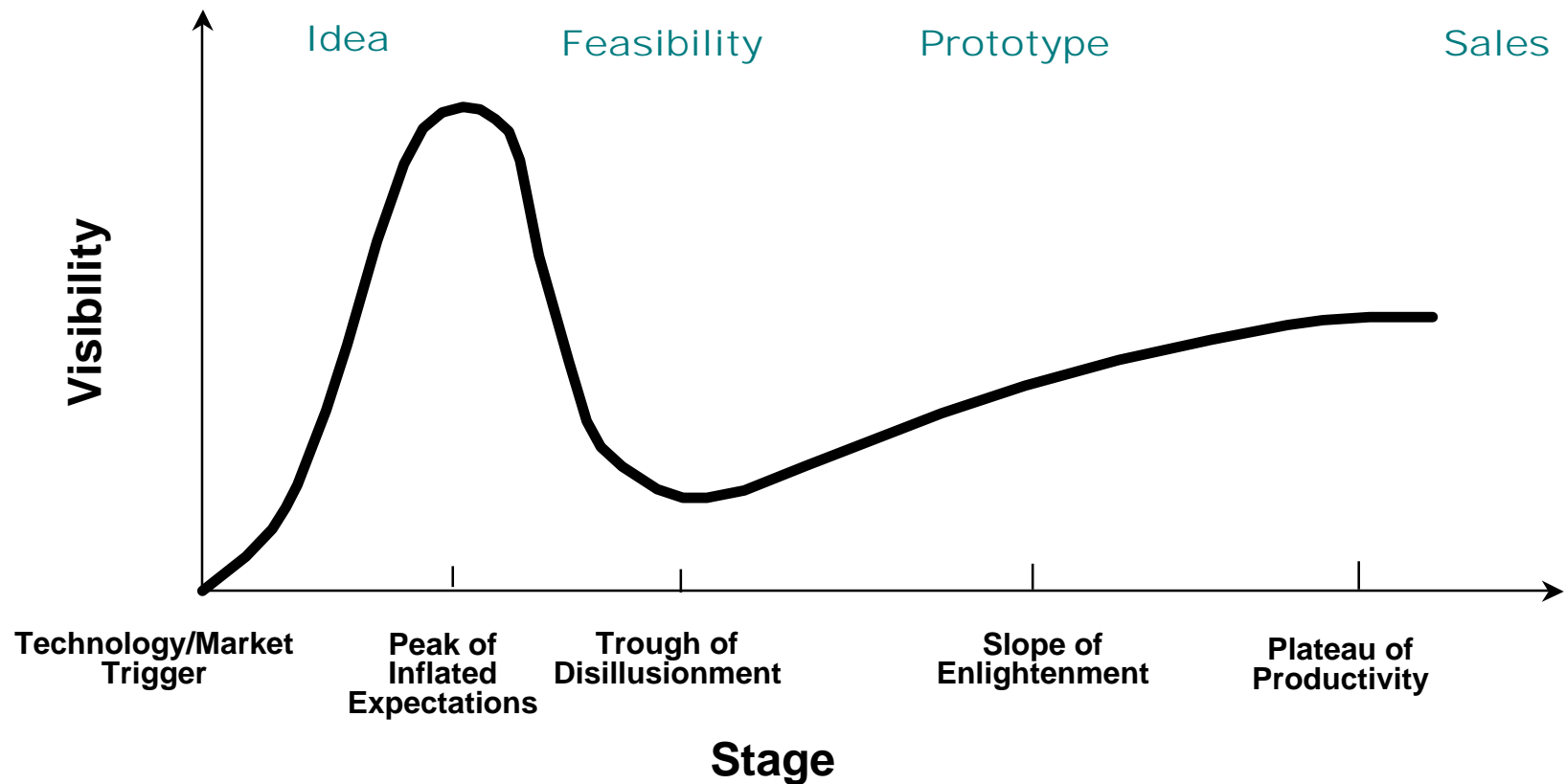
# Organizational Internal Barriers

- **NIH “Not Invented Here” Syndrome**
  - **Between internal groups**
  - **With the outside world**
- **Role of the technology organization**
  - **Inventors vs solution providers**
- **Technology outsourcing**
  - **vs insourcing solutions**

# “Open for Business” Open Innovation Redefined



# Stages of Technology Development "The Hype Cycle"



Source: Gartner, Hype Cycle for Emerging Technologies 2005



# Technology Needs

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# Focused on Four Growth Platforms

- **Electronic Materials**
- **Performance Materials**
- **Energy**
- **Healthcare**



(See brochure handouts )

# Needs: Electronic Materials

- **Precursor materials for semiconductor film fabrication (e.g., for  $\text{SiO}_2$ , Cu,  $\text{Si}_3\text{N}_4$ )**
- **Materials for photovoltaic manufacture**
- **Printable electronic materials**
- **Low- and high-dielectric constant materials**
- **Thin-film deposition technology**
- **Advanced cleaning technology for wafer processing**
- **Solid precursor delivery systems for film deposition**

# Needs: Performance Materials

- **Surfactants, defoamers and pigment dispersing agents**
- **Epoxy additives and resins**
- **Conducting polymers and materials for organic electronics**
- **Polyurethane and Polyurea additives, curatives and prepolymers**
- **Lithium ion battery materials**
- **Personal care cosmetic ingredients**
- **Industrial & Institutional cleaning additives**

# Needs: Energy

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- **Novel hydrogen generation**
- **Natural gas reforming technology**
- **Syngas purification**
- **Applications of industrial gases for energy generation**
- **Membrane technologies for gas separation**
- **Alternative energy technologies**
- **Advanced CO<sub>2</sub> capture technologies**

# Needs: Gas Applications Technologies

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- **Water treatment**
- **Food processing**
- **Metal processing**
- **Combustion**

# Case Studies

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# Sponsored R&D

- **Partner: Pennsylvania State University**
- **Partnership**
  - **Strategic R&D Alliance at University level**
  - **Over 80 projects in last ten years**
- **Strategic Value**
  - **Prenegotiated IP terms**
  - **Speed to market**
  - **Lower cost**

# In Licensing

- **Partner: University of Connecticut**
- **Partnership**
  - **License to conductive polymer technology targeted to organic displays**
- **Strategic Value**
  - **A new product offering**
  - **Emerging market**

# Small Company Partnering

- **Common forms of Partnerships**
  - **Service Agreements**
  - **Contract R&D**
  - **Licensing**
  - **Joint Development Agreements**
  - **Minority Equity Positions**
- **Need to clearly outline rights & obligations of parties**
  - **IP rights is a key provision**

# Government Sponsored Research

- **Partners: DOE and corporate partners**
- **Partnership**
  - **Development of new high temperature gas separation technology**
- **Strategic Value**
  - **Supplements internal R&D**

# Recognizing External Partners

- **At Corporate Level – Global**
- **External Innovation Collaboration Award**
  - Acknowledges partner bringing high value
  - Initiated in 2002



Russian Institute Award Presentation

# What's Next ?

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- **Imperative to “be open” externally AND internally**
- **Open Innovation budgets of Fortune 1000 companies are established and continue to increase**
- **NIH → “Proudly Found Elsewhere”**
- **Increase out – licensing efforts**
- **Strategic Partnering with the Government**
- **Reach out globally to build relationships**



# Thank you!

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# Back-Up Slides

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# Partnering Examples

- **Acquisition**
  - **American Homecare Supply (respiratory services)**
- **Joint Venture**
  - **DA Nanomaterials (wafer planarization)**
- **Minority Equity Investments**
  - **Solicore (battery)**
- **Joint Development Agreement**
  - **Nanotechnologies Inc (nanoparticles)**
- **Licensing-out**
  - **Gas applications, chemicals**
- **Licensing- in:**
  - **APT ( water treatment technology)**
- **Contract Research**
  - **University of Florida**
- **SBIR Support Letters**

# Needs: Healthcare

- **Medical applications of gases**
- **Home-care technologies**

