



# ORD Innovation

SAB and BOSC Discussion

July 10<sup>th</sup>, 2012

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Chief Innovation Officer  
EPA Office of Research and Development

# What Does Innovation Look Like?

Turning an invention into a product that is widely used...



Ford Model T

Tapping into what users want and understand...



Preparing for the Zombie Apocalypse (HHS, CDC)

Changing the way you do business ...



Brownfields Program, Omaha (EPA)

Combining science and technology from disparate fields to create something new...



Aerovironment Nano Hummingbird UAV (DARPA)

# What Does Innovation Look Like?



Aerovironment **Nano Hummingbird** UAV (DARPA)



# Innovation Skunkworks

*To help catalyze change in ORD and EPA, and find a systematic way to bring new ideas into our research, ORD established the Innovation Team in September 2010.*

We have developed a **strategy** based on:

- Fostering a dynamic environment that rewards and recognizes creative problem solving
- Piloting, evaluating, and institutionalizing new research approaches
- Demonstrating the merits of integrated transdisciplinary research
- Addressing major environmental challenges by promoting new technologies and approaches beyond those possible with traditional ORD capabilities

***This may be a good start, but we want to do better.***



## We are asking you...

- How can ORD's initial innovation activities be improved to ensure continued and long-term benefits for EPA?
- Are there useful experiences and lessons from other research organizations about managing innovation?
- What guidance can the SAB and BOSC provide for ORD in developing metrics that would be most effective in assessing the success of our innovation efforts?



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# ORD Innovation Strategy

Shifting from individual projects to a systematic approach

## What?

## How?

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### Support innovation at the bench in ORD laboratories

*By fostering a dynamic work environment that rewards and recognizes creative problem solving*

- *Pathfinder Innovation Projects*
- *Innovation in Research Plans*
- *PeerOvation Awards*
- *Apps and Sensors for Air Pollution (ASAP)*

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### Demonstrate the power of transdisciplinary research

*Learning how to connect scientists in new ways and engage practitioners and users*

- *Within ORD (IdeaScale)*
- *Federal Environmental Research Network*
- *Design Labs*
- *Apps and Sensors for Air Pollution (ASAP)*

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### Use open innovation to broaden network of environmental problem solvers

*Bring in new ideas and creative solutions from external scientists and others*

- *InnoCentive and TopCoder challenges*
- *Challenge.gov*
- *Partnering with OSTP, NASA, HHS, DOD*
- *Apps and Sensors for Air Pollution (ASAP)*

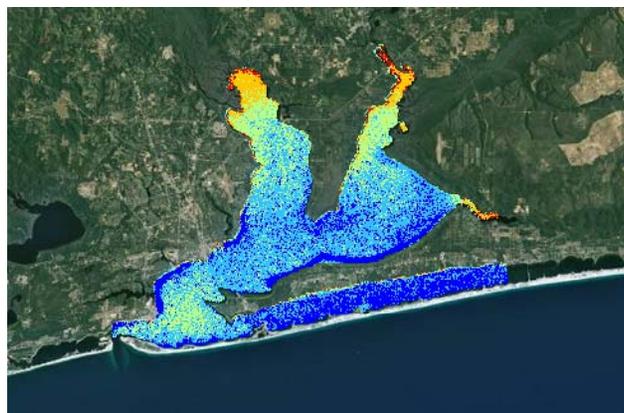
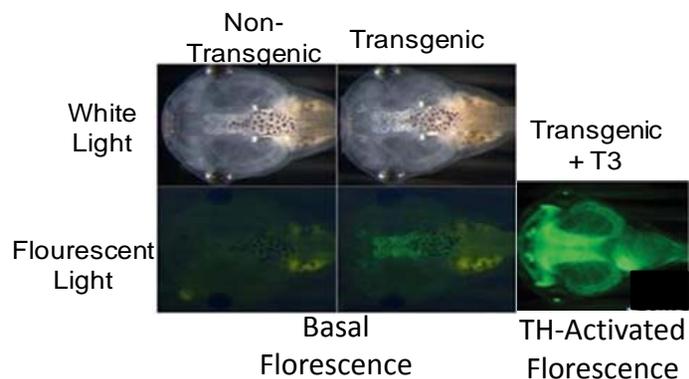
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### Showcase research that exemplifies the principles of Path Forward

*Expand understanding of innovative research and sustainability*

- *Signature projects*
  - *Pathfinder Innovation Projects*
  - *Apps and Sensors for Air Pollution (ASAP)*
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# Pathfinder Innovation Projects (PIP): From Satellites to Tadpoles



Contents lists available at [SciVerse ScienceDirect](http://SciVerse ScienceDirect)

Science of the Total Environment

journal homepage: [www.elsevier.com/locate/scitotenv](http://www.elsevier.com/locate/scitotenv)



Using biomarkers in sewage to monitor community-wide human health:  
Isoprostanes as conceptual prototype

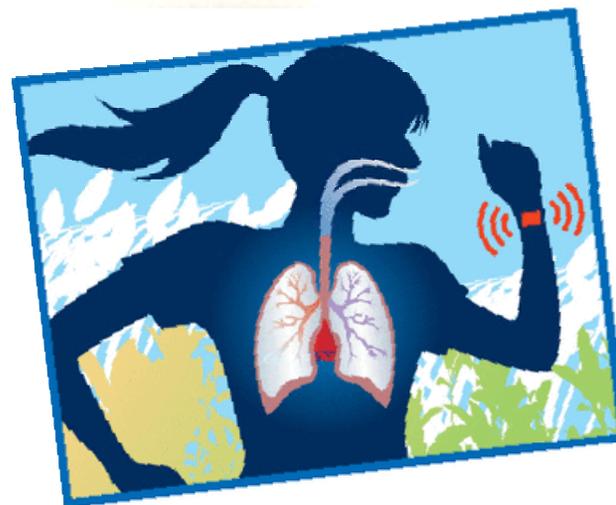
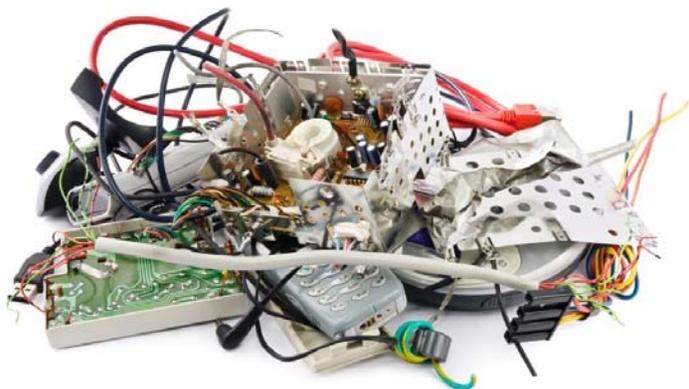
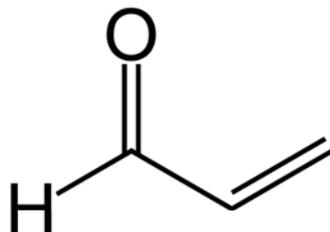
Christian G. Daughton\*

*Environmental Sciences Division, National Exposure Research Laboratory, U.S. Environmental Protection Agency, 944 East Harmon Avenue, Las Vegas, NV 89119, USA*

**The Bottom Line:** Pathfinder Innovation Projects provide:

- Implementation of a research strategy proven effective in industry and other agencies
- Opportunities to create a culture of innovation among EPA scientists
- Potential for game-changing scientific results and products
- Direct value for EPA programs and regions

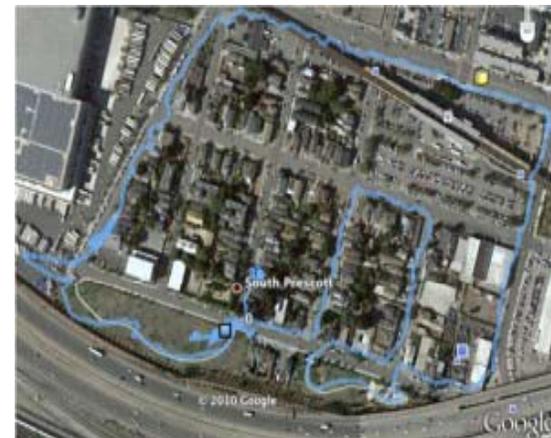
# Open Innovation



## Benefits of Challenges

- Pay only for success, and establish ambitious goals without having to predict which approach is most likely to succeed
- Reach beyond the “usual suspects” to increase the number of minds tackling a problem
- Bring out-of-discipline perspectives into the mix
- Increase cost-effectiveness to maximize the return on taxpayer dollars

## Apps and Sensors for Air Pollution

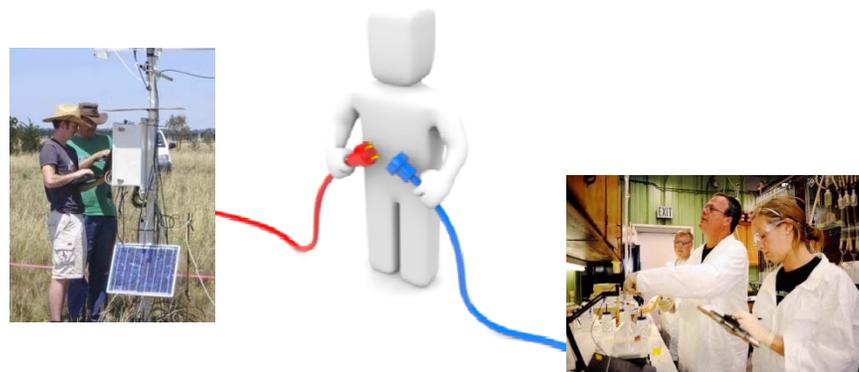


**The Bottom Line:** The potential benefits of low-cost, powerful, air quality sensors could enable us to:

- Track the most common and hazardous pollutants in every area
- Customize detailed, real-time information to meet local needs
- Reduce air pollution monitoring costs
- Create learning tools and graphics that make data easy to understand
- Connecting health care to the whole environment
- Engage and empower communities and partners, including those who have been historically under-represented, to support and advance environmental protection and human health

# Creating an Innovative Research Culture

**PeerOvations** – peer-driven recognition for research and administrative innovation



**Federal Environmental Research Network (FERN)** – connecting ideas and experts across agencies



**Interactive Educational Tools** – Community-driven mobile tools for stormwater management decisions





## **NPD's have also made innovation a priority**

### **Sustainable and Healthy Communities**

Durham Pilot – heat island study

### **Safe and Sustainable Water Resources**

Water Technology Innovation Cluster

### **Air, Climate and Energy**

Innovative air pollution sensors and Apps

### **Human Health Risk Assessment**

Moving beyond single chemical/stressor-based assessments

### **Homeland Security**

Innocentive Challenge: Cost effective method for post-cleanup monitoring for Anthrax

### **Chemical Safety for Sustainability**

Sustainable Molecular Design



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# Innovation across the Government

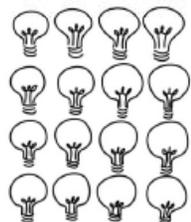
## HHS Innovates



## USAID:

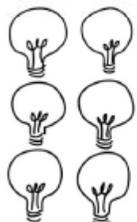
### Development Innovation Ventures (DIV)

**STAGE 1**  
<\$100k



seed  
financing

**STAGE 2**  
<\$1M



start-up  
&  
testing

**STAGE 3**  
<\$15M



transitioning  
to  
scale

## Launch.Org





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# Common Metrics to Measure Innovation Success in Companies

- % of Revenue Spent on R&D
- R&D Impact = Gross Margin / R&D Spend
- % of Revenue From Products Launched In The Last XX Years -- the “3M Metric”
- Patent quality
- % of Time Executives Spend on Innovation
- R&D Spend

Source: *6 Ways To Measure Innovation Success That Every Company Should Put In Place*  
<http://philmckinney.com/archives/2012/02/6-ways-to-measure-innovation-success-that-every-company-should-putinplace.html>



# Measuring Performance in Government Research Agencies

- R&D activities difficult to measure because outcomes:
  - Often can't be quantified in advance
  - May lag the output of the activities by several decades
- Common measures are number of patents or peer reviewed publications... but:
  - Difficult to judge the quality of the work being performed
  - Eventual impact on the scientific community, or the world
- Three appropriate questions for R&D at EPA
  1. Is the work relevant? -- Does anyone care about what we are doing?
  2. Is the program productive? -- Are we moving toward a goal and delivering products?
  3. Is the work of the highest quality? – Are we doing world-class work?

Source: Report by Edward Brown "*Measuring Performance at the Army Research Laboratory: The Performance Evaluation Construct.*"



# How do you Measure Innovation?

- Importance of qualitative factors
  - Things like culture, employee engagement, passion, the ability to network
  - And, ability to fail and even go bankrupt without cultural penalties. . . but they are much more difficult to measure, analyze and compare region to region.

Source: <http://www.innovationexcellence.com/blog/2011/04/30/dont-measure-innovation-the-easy-way/>

- Partnership for Public Service: 2010 Survey

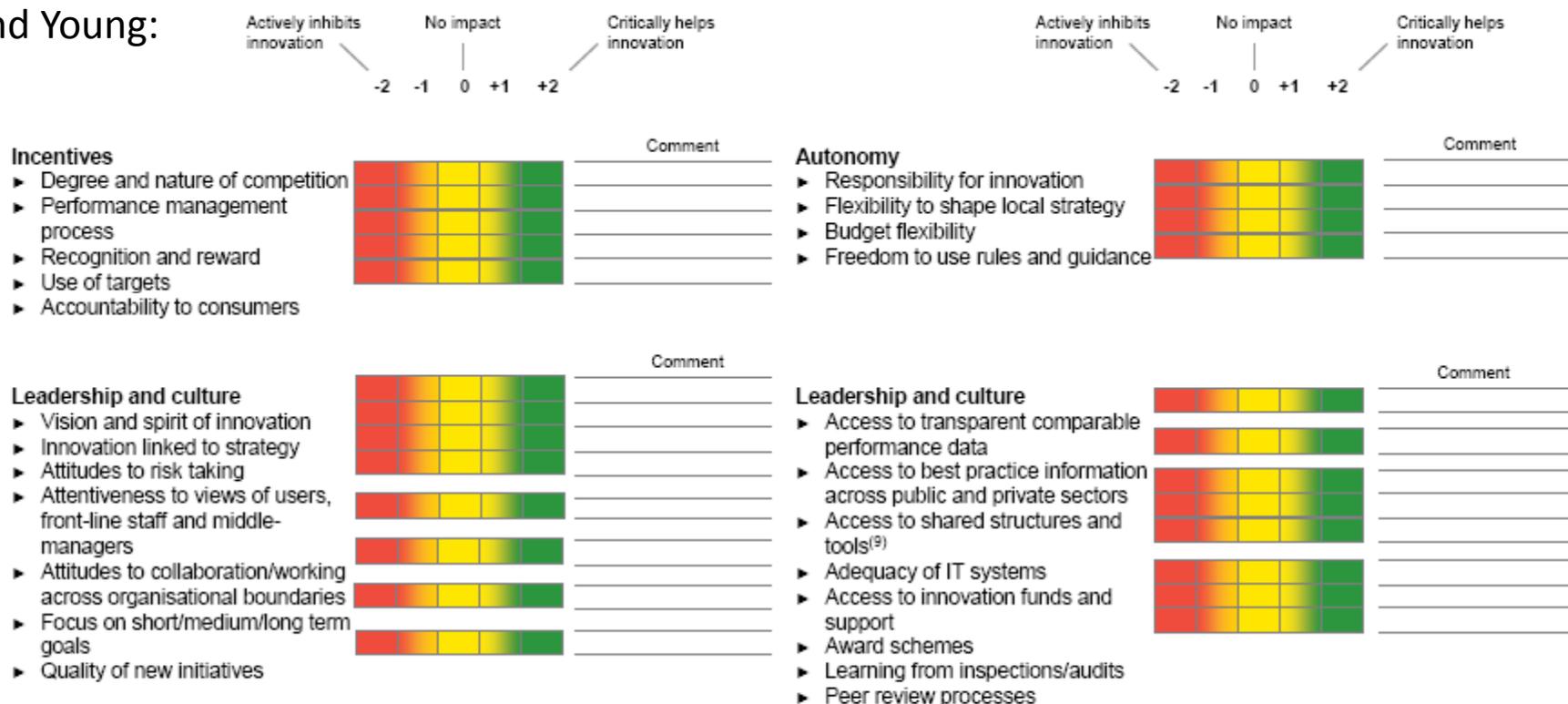
	Innovation Rank	Innovation Score	Percentage of Positive Responses Innovation Questions		
			I am constantly looking for ways to do my job better	I feel encouraged to come up with new and better ways of doing things	Creativity and innovation are rewarded
Agency (Army)					
Defense Information Systems Agency (DOD)	83	66.8	89.9	64.1	46.3
Office of Research and Development (EPA)	83	66.8	93.4	61.9	45.0

Source: [http://bestplacestowork.org/BPTW/agencies/Innovation\\_Rankings\\_Sub.pdf](http://bestplacestowork.org/BPTW/agencies/Innovation_Rankings_Sub.pdf)

# NESTA - - Innovation

**National Endowment for Science, Technology and the Arts (NESTA):** As part of NESTA's scoping work for developing an agreed methodology for a public sector Innovation Index in the UK, they commissioned exploratory projects to develop an organizational innovation diagnostic tool.

Ernst and Young:



Source: <http://api.ning.com/files/IDi7eHGnbjcaU0luBCSGsh-sU3eIUWTx5mQUSKXaafQi5V4xVFnW4nwU17anYesXOCX5YsO27Tz-wuVil6nttx1Wn9WDyKTW/ErnstYoung.pdf>



## Initial Thoughts on Moving Forward

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We believe that innovation in ORD will prosper with:

- **Smart risk taking**
- **Teams and partners**
- **Creative empowerment**
  - **Measurement and accountability**
  - **Visible leadership and commitment**
  - **Design-thinking and experimentation**