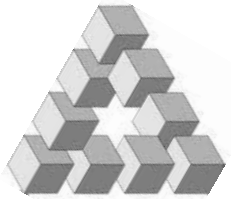
ReAct
Action on Antibiotic Resistance

Harnessing Open Innovation

to Tackle the Dearth of Novel Antibiotics



InnoThink

Bernard Munos
Founder

InnoThink Center For the Study of Biomedical Innovation
Brussels

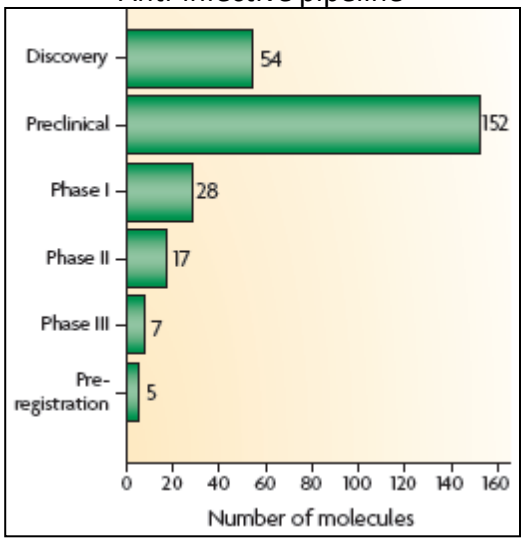
May 23, 2011

Outline

- A bleak outlook
- A broken R&D model
- Alternative models

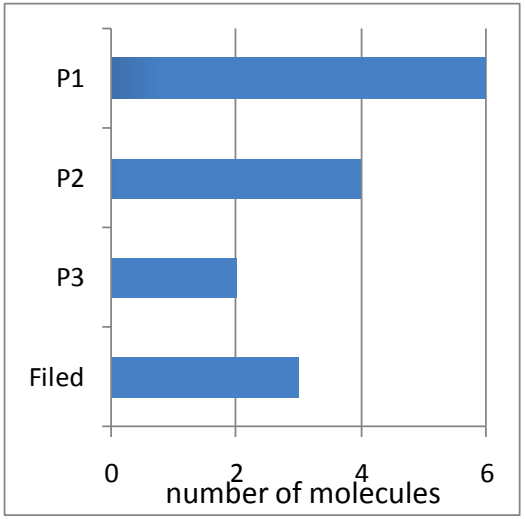
A depleted pipeline

Anti-infective pipeline



Source: IMS (2009)

Novel modes of action



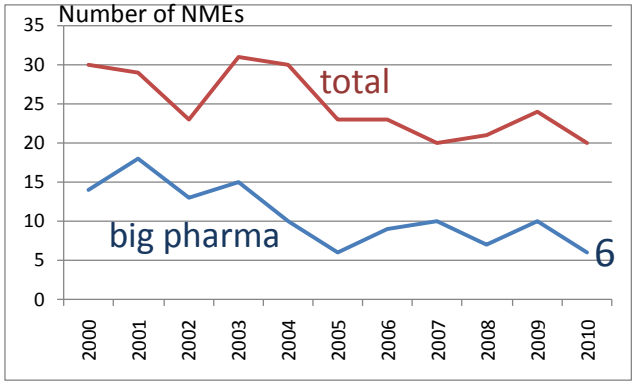
Source: EMA (Sept 2010)

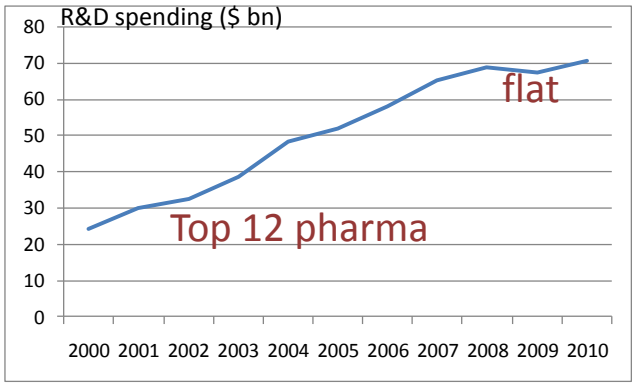
- Most big pharmas have deprioritized anti-infective research
- Much of their remaining involvement focuses on HIV and hepatitis
- Big pharmas only fund one-third of anti-infective trials
- Most of the research focuses on known targets; only 15 novel modes of action (out of 209 molecules in development)

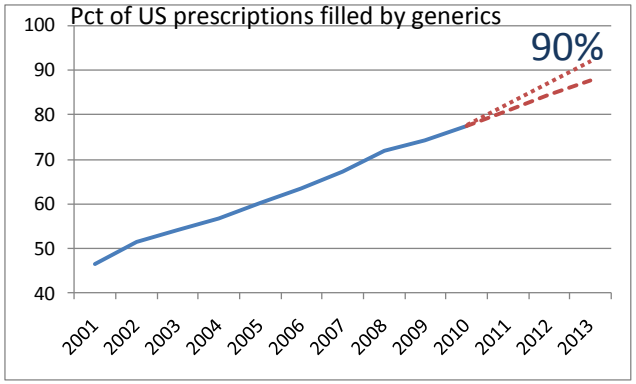
"We need new and better drugs- and we need them now. Yet the R&D pipeline is distressingly low"

Margaret Hamburg, FDA Commissioner

A broken R&D model



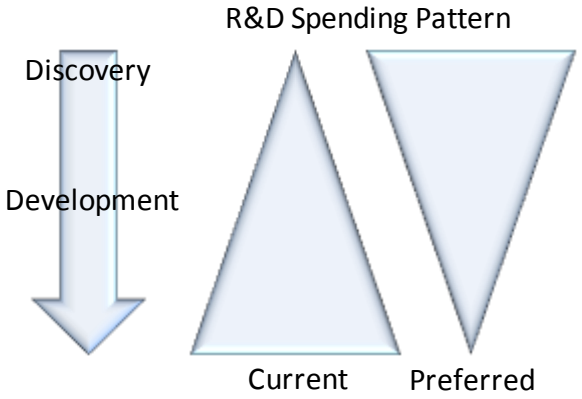




- $125 bn annual industry R&D spending yields ~20-25 NMEs
- R&D spending/NME at big pharmas is ~$5-10+ bn range
- Big pharma's retrenchment from anti-infective R&D was likely the first signal that the R&D model was failing
- It has failed again in neuroscience and cardiovascular research, causing further retrenchment from these areas
- Much of the problem seems to be with:
  - A narrow approach to translational research that shuns new innovation pathways (e.g., nanotech, synthetic bio)
  - A poor understanding of the pathogens' biology
  - The model's inability to produce affordable innovation
- Under pressure, most big pharmas have become cautious, seeking the safety of proven targets and drug classes, which lowers the likelihood of achieving breakthroughs, and heightens the risk of failure

How to get out of this?

- Nearly all the major biomedical breakthroughs (~300 in the 20th century) have been the results of high-risk, unconventional research
- Risk-aversion, caused by increasing pressure, has redirected R&D spending toward fewer costly "safe" late clinical projects
- Resulting greater risk-exposure portends disaster
- The focus on blockbuster has distracted from the quest for breakthroughs



- Alternative R&D models, especially collaborative research, show large cost-savings opportunities
- We need to redirect R&D spending towards discovery, re-engage in high-risk translational research by assembling large portfolios of potential breakthroughs and pay for it by embracing open innovation, restricting clinical research to genuine breakthroughs, and defunding other projects

Examples: Breaking the Rules with Open Innovation

"There are rules that chemists follow when looking for new drugs.
To make an antibiotic, you have to break those rules.
They are different from anything else we make
because they are designed to kill a living organism inside another living organism"

John Rex, AstraZeneca

Open Innovation in Action

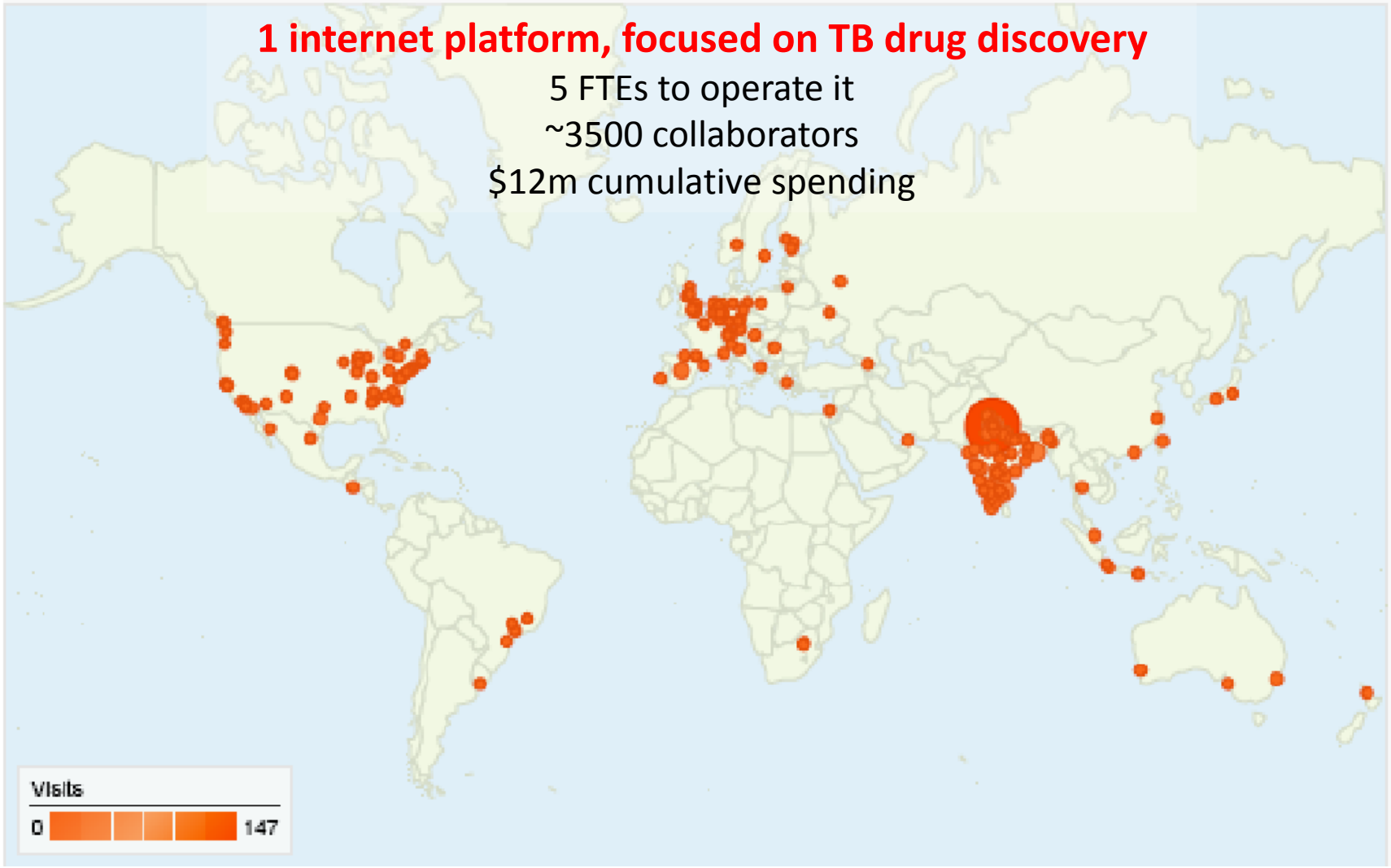
OPEN SOURCE DRUG DISCOVERY

1 internet platform, focused on TB drug discovery

5 FTEs to operate it

~3500 collaborators

$12m cumulative spending



Source: OSDD.net

OSDD projects

OPEN SOURCE DRUG DISCOVERY

Drug Target Identification | Virtual Screening | Chemical Synthesis/ library | Screening/ Hit identification | Hit to Lead

18

19

9

6

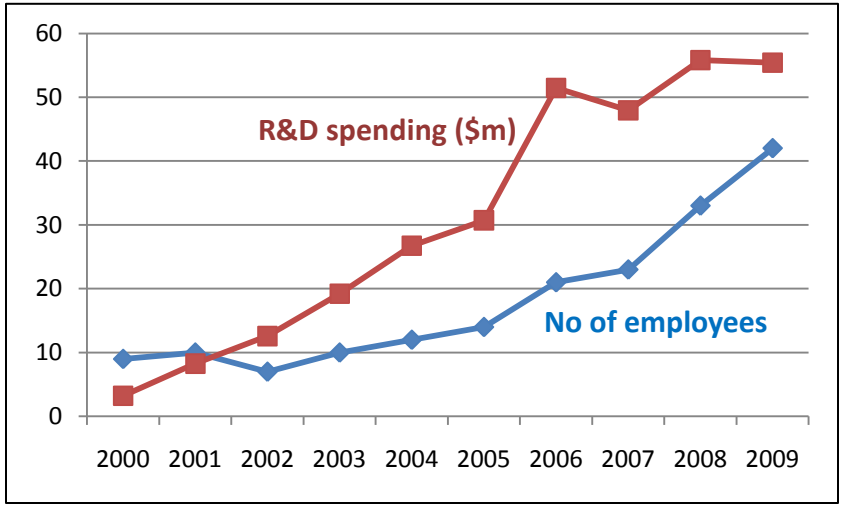
2

Other projects aim to develop tools, databases and repositories for the OSDD community

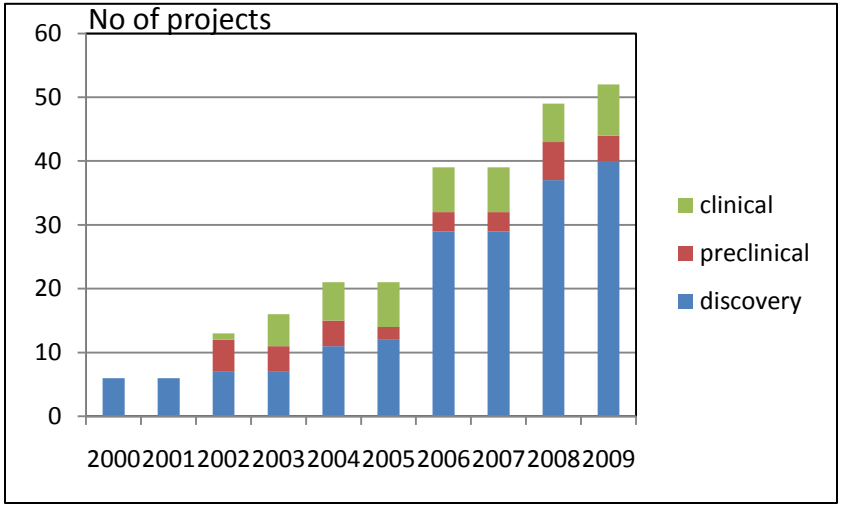
Open Innovation in Action: Public-Private Partnerships

Medicines for Malaria Venture

- **42** employees
- **130** partners (pharma and biotech) in **43** countries
- **55** clinical trial sites in **24** countries
- **38** on-going clinical trials
- **19** new classes of drugs under investigation
- **$55** million in total annual spending (**87%** toward research)
- **$311** million cumulative spending over the last **10** years
- **712** project ideas received from the worldwide scientific community (**47** investigated)
- **1** drug approved, **2** under regulatory review



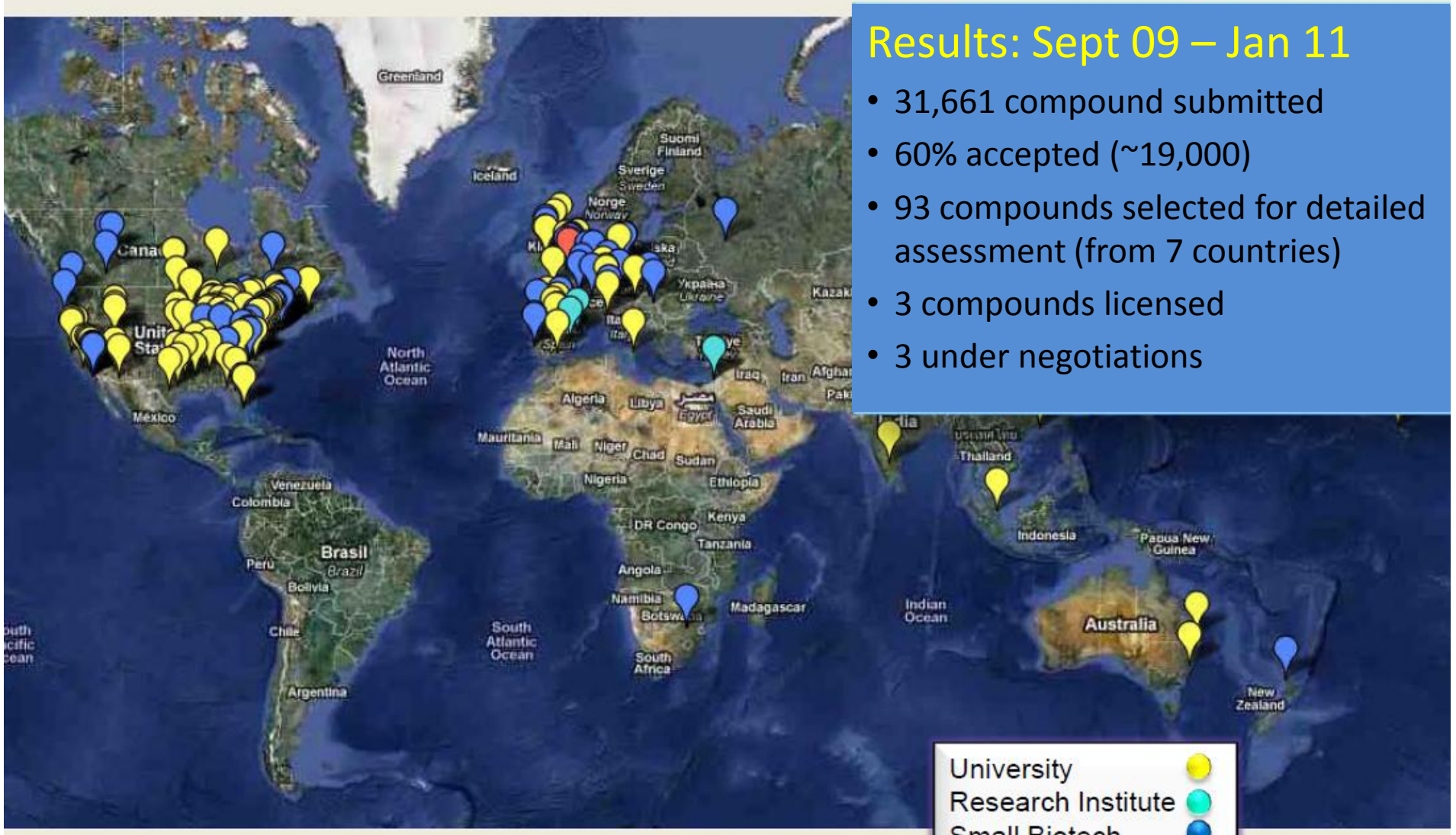
Source: MMV annual reports



Source: MMV annual reports

Open Innovation in Action: Courting the chemists of the world

Phenotypic Drug Discovery

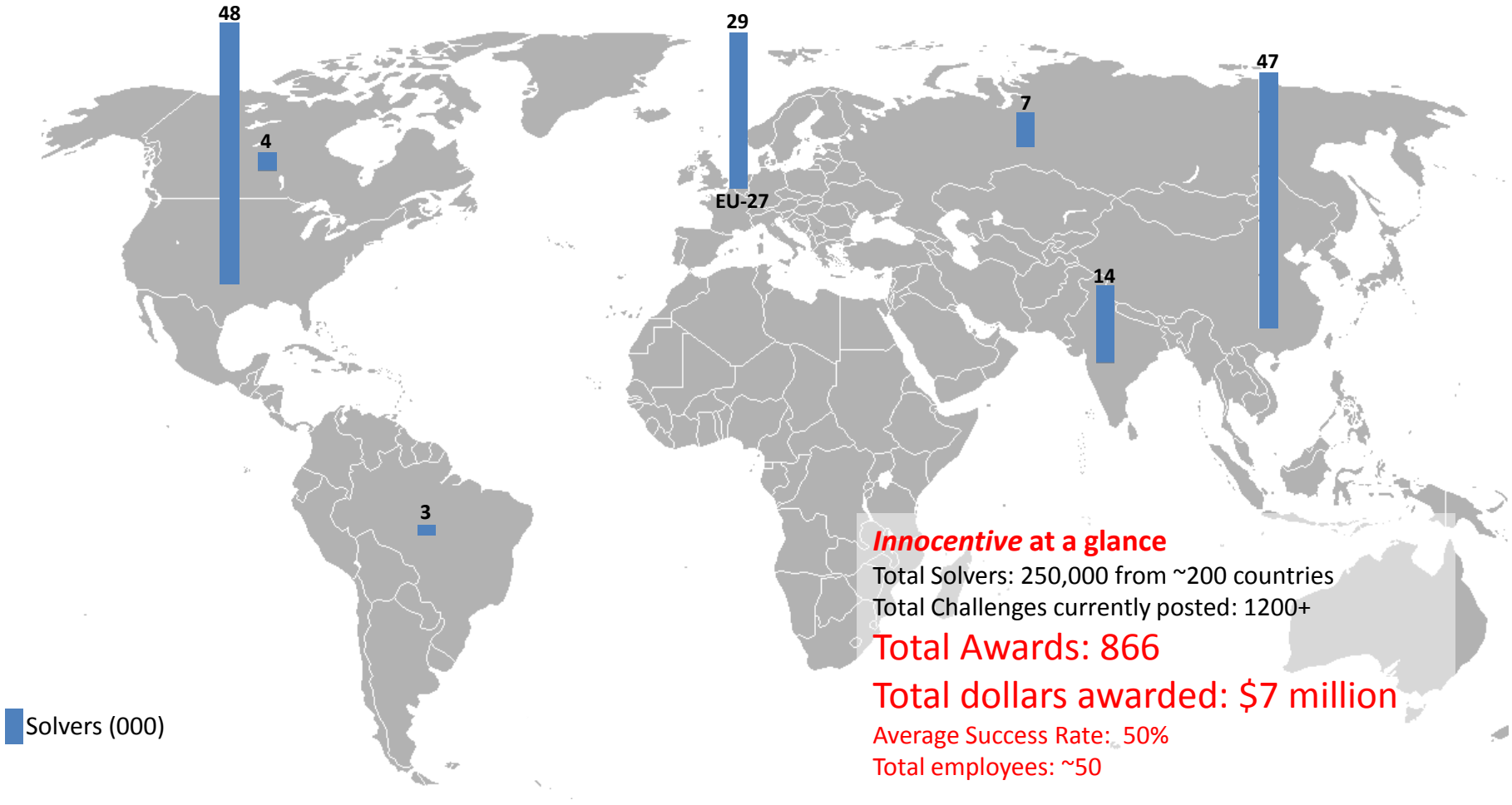


Results: Sept 09 – Jan 11

- 31,661 compound submitted
- 60% accepted (~19,000)
- 93 compounds selected for detailed assessment (from 7 countries)
- 3 compounds licensed
- 3 under negotiations

Open Innovation in Action

Top **Solver** Communities



***Innocentive* at a glance**

Total Solvers: 250,000 from ~200 countries

Total Challenges currently posted: 1200+

Total Awards: 866

Total dollars awarded: $7 million

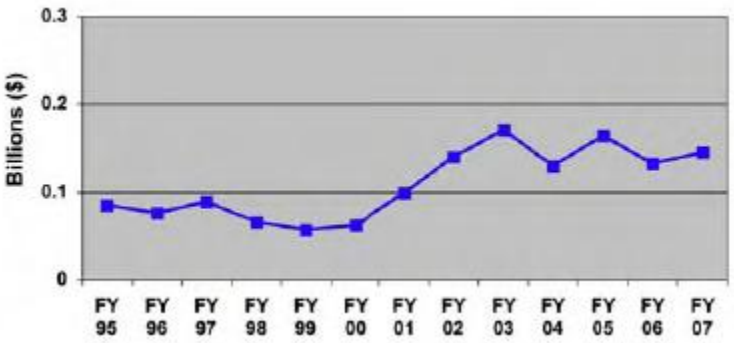
Average Success Rate: 50%

Total employees: ~50

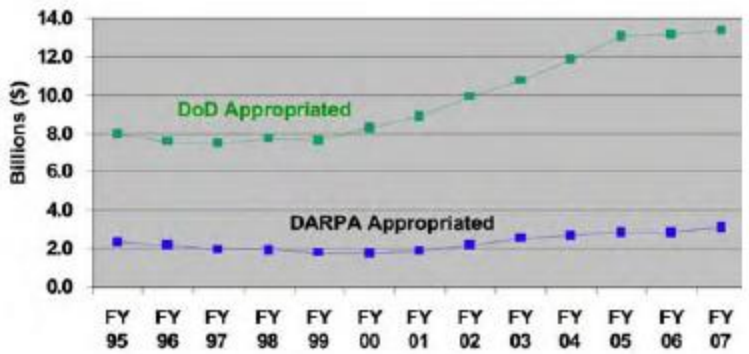
Source: www.innocentive.com

Open Innovation in Action

- The discovery engine of the U.S. military
- Created 52 years ago
- Changed the world with a steady flow of repeated breakthroughs:
  - The internet -- Biosensors -- Stealth fighters
  - The GPS -- Laser guidance -- Cruise missiles
  - Night vision -- unmanned vehicles -- Composite materials
  - Supercomputing -- Grid computing -- Remote-controlled warfare
  - Satellite imaging -- VLSI circuits -- Mini and micro robots
- Did it on a shoestring
  - Only 240 employees (including 140 professionals)
  - No labs, no facilities (beside a single office building)
  - R&D budget smaller than Lilly's



DARPA's 'Far Side' Basic Research funding



Total S&T funding in DoD and DARPA

Source: DARPA Strategic Plan

Thank you!

Questions?

(bhmunos@stanfordalumni.org)