Case Studies in Funded External Collaborations

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NIChE Workshop, June 12th 2013

Outline

- Pfizer pre-competitive landscape
- The collaborative journey
  - Alignment, idea generation, partnerships, funding, execution
- A few examples of our journeys for laboratory and synthetic enabling technologies
- Some things we learnt along the way
- Thoughts on the future

Headline

- Pfizer Pharmaceutical Sciences wholeheartedly support pre-competitive collaborations that are aligned with our technology strategy
  - Aim to develop better solutions, faster, at lower cost, with less internal resource and with reduced risk

Partnership

“Bristol-Myers Squibb and Pfizer Announce U.S. FDA Approval of ELIQUIS® (apixaban)”

“Rival giants team on diabetes as Merck partners with Pfizer on SGLT2 combo”

“In the long history of humankind, those who learned to collaborate and improvise most effectively have prevailed.”

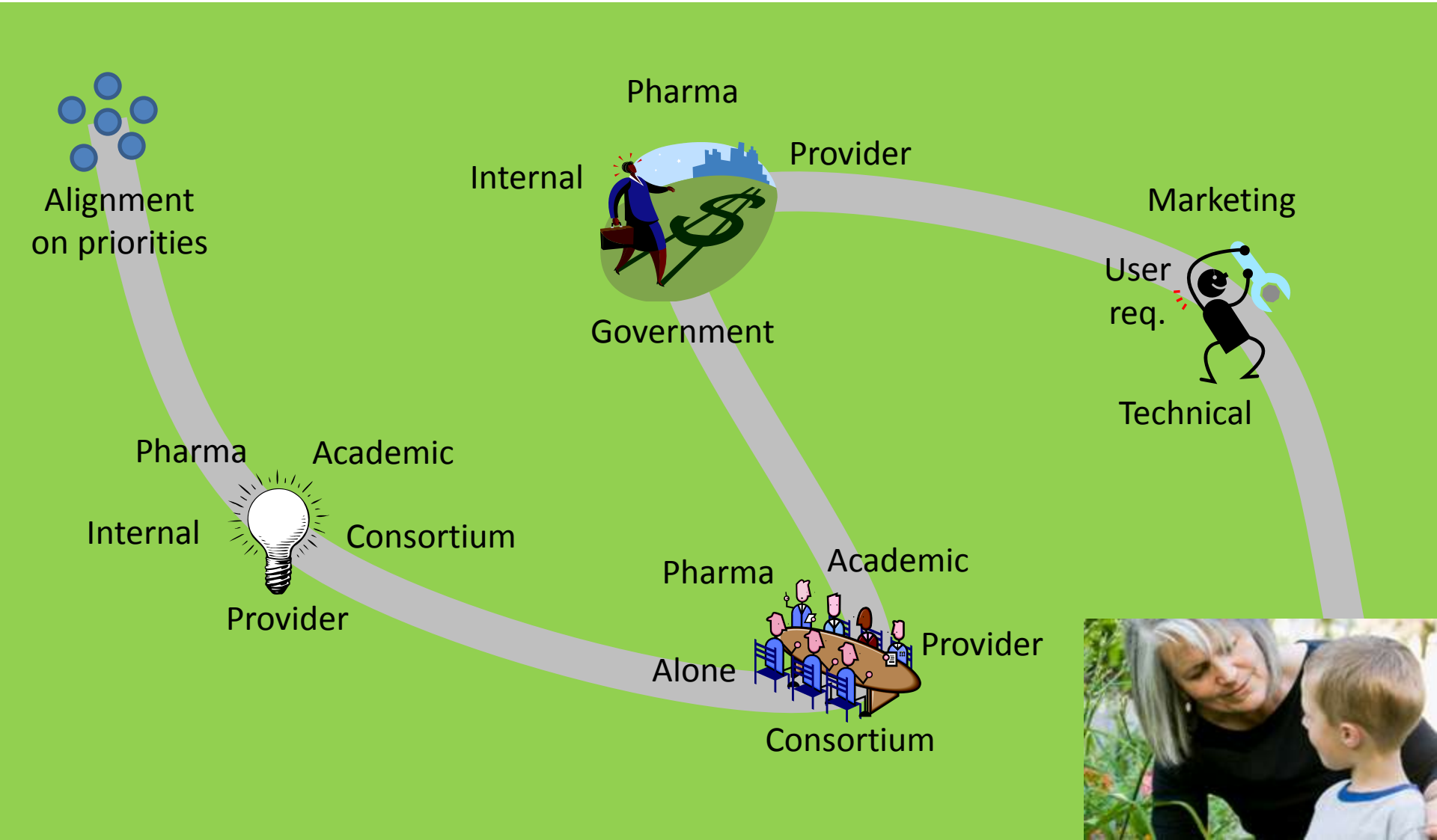
-Charles Darwin

Trust and Anti-Trust

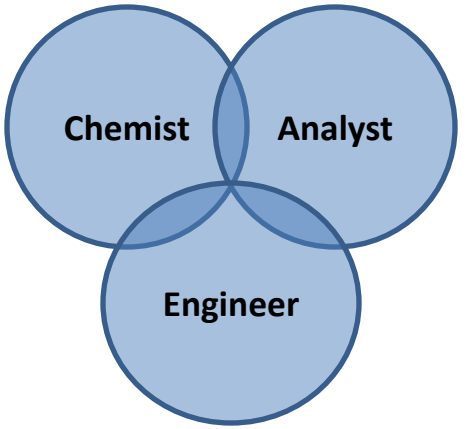
Diocletian, 301 AD

INTERNATIONAL CONSORTIUM for INNOVATION & QUALITY in PHARMACEUTICAL DEVELOPMENT

The Collaborative Journey



Alignment



gsk GlaxoSmithKline

AMGEN

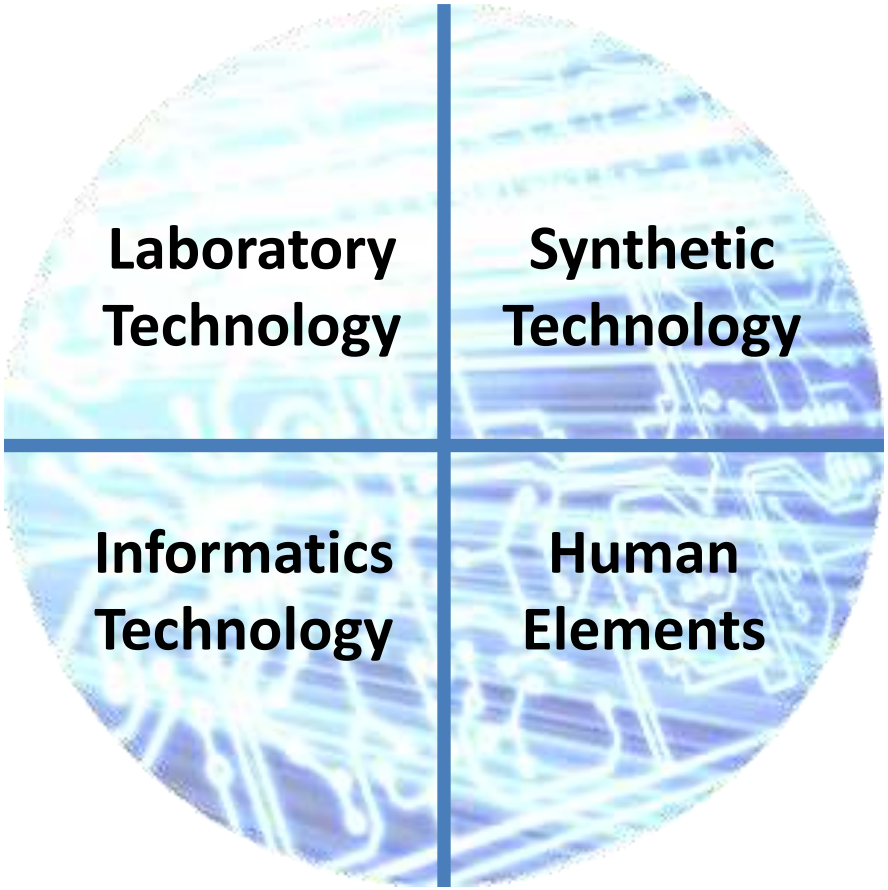
Pfizer

Boehringer Ingelheim

Bristol-Myers Squibb Company

janssen

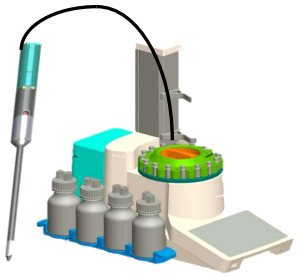
Alignment on Technology Strategy



Laboratory Technology

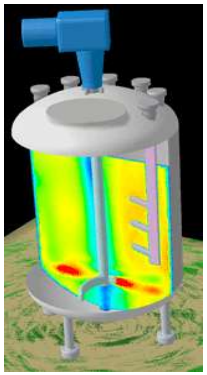






1998 → **Present**






Lab of the Future Investment

2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014

Development of Prototype Labs

Implementation Deployment of Ready Technologies

Set up of new LOTF environment in US and UK facilities

- Multi-million dollar investment over 5 year period

METTLER TOLEDO

TELEDYNE ISCO

Waters
THE SCIENCE OF WHAT'S POSSIBLE.™

SYSTAG
automatically better

CHEMGLASS

HEL better chemistry - faster

Biotage

Optimization and Sustainability of LOTF

Continued Evolution of Technologies

Development of LotF Culture

Automated Parallel Lab Reactor Example

Argonaut AS 3400

Control experimental parameters

- Mimic scale up
- Minimize extraneous variables

Collect more **data**, e.g. calorimetry:

- “Rate meter”
- Safety data during route development

Shared back plane for **parallel** reactions

- a series for optimization
- or totally independent

Greater Quantity and Quality of Data

The Collaborative Journey

Alignment on priorities

Pharma

Internal

Provider

Government

Marketing

User req.

Technical

Academic

Pharma

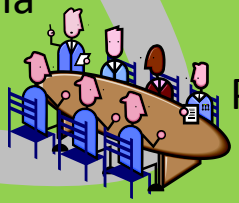
Internal

Consortium

Provider

Pharma

Academic



Provider

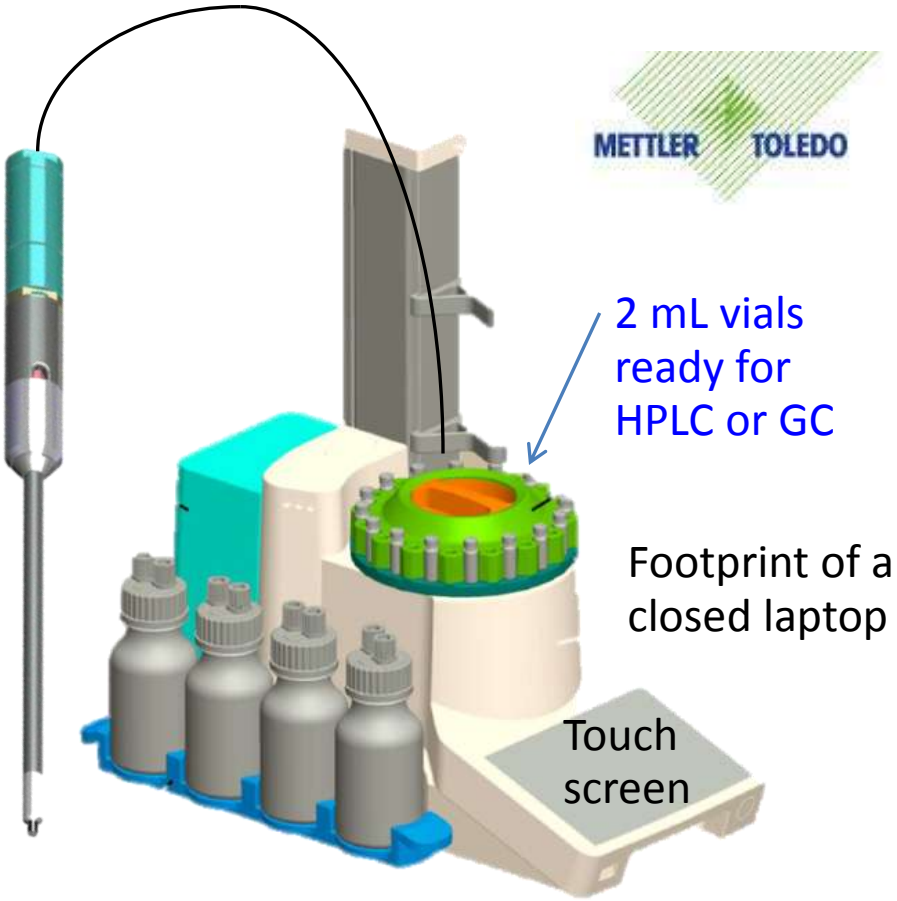
Alone

Consortium

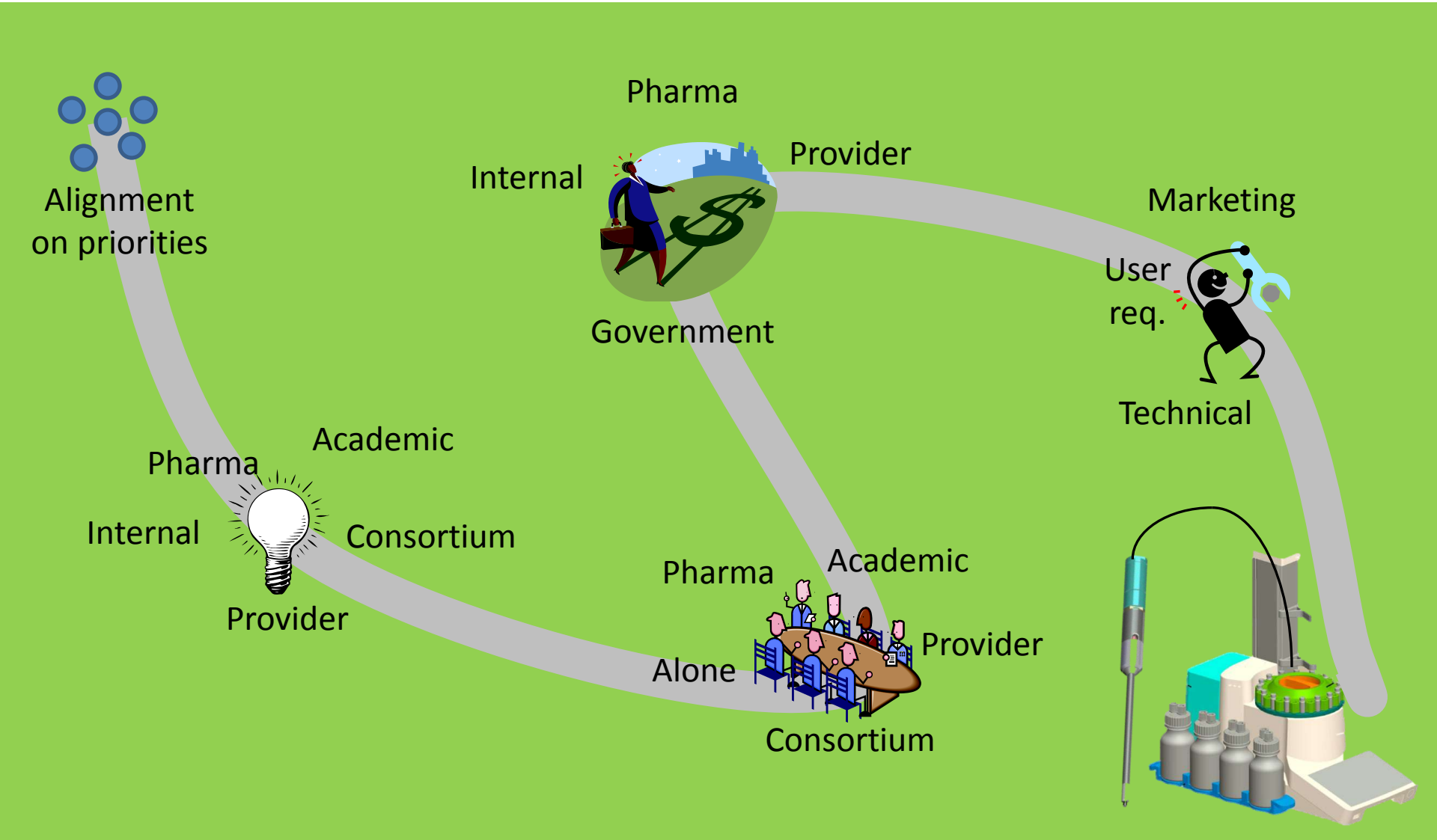
Automated Sampling Example

Goal to sample:

- Without air exposure
- From hot tanks without the need to cool first
- From cold systems with immediate quenching at the reaction temperature with proton or other electrophiles
- From slurries where the solids are sampled representatively
- With continuity of analytical method from lab to scale up
- Utilize the high dynamic range of HPLC to profile the main transformation and impurities



The Collaborative Journey



Continued Evolution

Technology Areas of Focus
Automated Parallel High Throughput Screening
Automated (parallel) lab reactors
Faster broader analytics - UPLC MS
In situ Monitoring and Characterization (Raman, FTIR and FBRM)
PAT Data Management
Computational Chemistry Algorithms
Predictive Tools for Chemical Properties
In-silico tools for Process Modeling (CFD, mixing, kinetics)
Crystallization Screening Technologies

Focus Areas

- Replacement of Endangered/Precious Metal Catalysts
- Catalytic Methods for Preparation of Chiral Amines
- Methods for “Direct” Amide or Peptide Formation
- “Direct” Substitution of Alcohols
- C-O and C-N Redox Interconversions

Gaining Knowledge

Horizon 1	Horizon 2	Horizon 3
Direct Portfolio Impact	**Targeted innovation for immediate portfolio**	**Broader funding of longer term innovations**
• Create internal technology champions • Establish best practices • Test against portfolio • Identify gaps • Opportunistically innovate new technology • Influence external environment	• Technology workflows in place (≥ 50% portfolio impact) • transferred to Pharma partners • Innovate solutions to targeted technology gaps	•Widespread value appreciation (private/public) • Broad uptake in academia and pharma
No external $ investment	**Focused Pharma $ investment**	**Selected Pharma $ investment**
Private Sector Pharma Consortium	Private Sector Pharma Consortium	Private Sector Pharma Consortium
	Private – Academic Alliances	Selective Private – Academic Alliances
		Government Funded Research Institute and GOALI grants

Non Precious Metal Catalysis

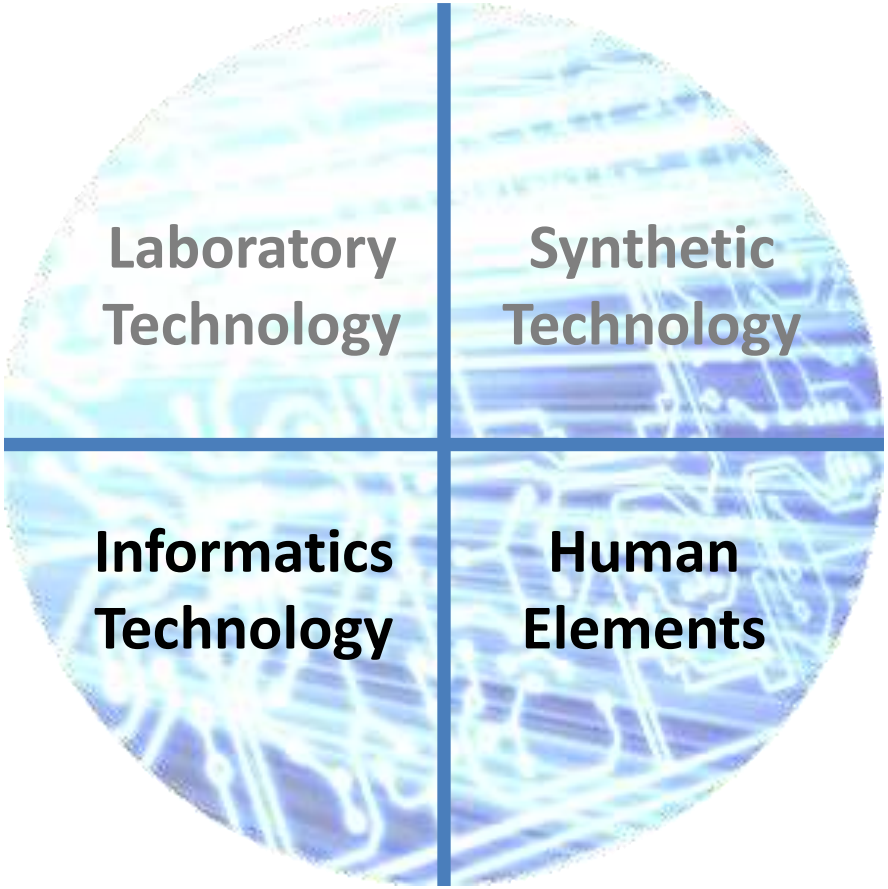
Boehringer Ingelheim

gsk GlaxoSmithKline

Academic Partners

Pfizer

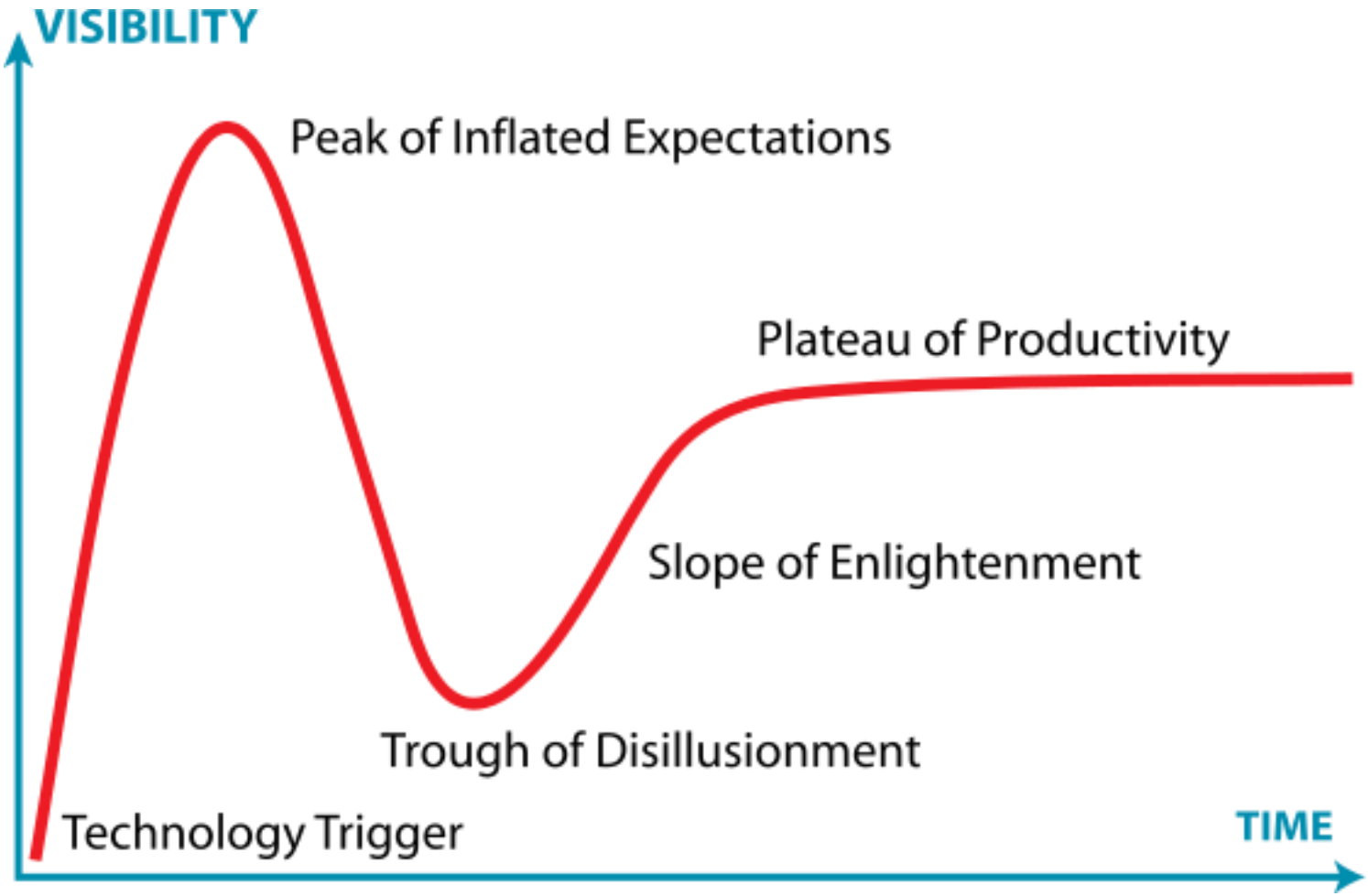
	Cost		Toxicity	Sustainability	
Metal	**Cost ($/oz)[1]**	**Annual Production (tonnes)**	**Oral Exposure limits (ppm)**	**Natural Abundance (ppm)**	**Supply Risk Index**
Pd	607	24	10	0.015	8.5
Ni	0.52	1,350,000	25	90	4.0
Cu	0.23	15,000,000	250	68	4.5
Fe	0.006	1,200,00,00	1300	56,300	3.5


Laboratory Technology
Synthetic Technology
Informatics Technology
Human Elements

Some Key Learning

- We should have gotten to this point through innovation rather than economic drivers
- Pet projects don't usually end well- align
- Appreciate the science outside your walls
- Work with others to disseminate an improved common platform/solution across the industry
  - Share cost, risk, ideas and enjoy the sustainability
- Find the right partners with complimentary skills and knowledge
  - Similar mindsets but different perspectives
- Pre-competitive collaboration is a bedrock of future technology strategy

Where are We?


VISIBILITY
Peak of Inflated Expectations
Plateau of Productivity
Slope of Enlightenment
Trough of Disillusionment
Technology Trigger
TIME


TRUST

Acknowledgments

- Gerry Taber
- Joel Hawkins
- Chris McWilliams
- Juan Colberg
- Many others!