Enabling Next Generation Synthetic Biology Leadership

National Academies Committee on Science, Technology & Law
Forum on Synthetic Biology
October 21st 2013

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Executive Director, Synthetic Biology LEAP
Deputy Director of Practices, Synberc
Research Fellow, UC Berkeley
Visiting Scholar, Stanford

Challenges for Young Syn Bio Practitioners

"The biggest issue facing us young folk is *lack of long-term, stable* (i.e. NIH-like) *funding.* We are all *privileged to be plugged into Synberc* and all it brings (community, policy considerations, etc.), but I think in some sense *we all lack a plan to fund this research past the 5 year horizon*. There are tons of young faculty awards (that is what I am bootstrapping my SynBio effort on), but the long term NSF grant-based strategy won't cut it. *Big DARPA and DOE grants go to the big labs and few of us will be able to run like that.* I for one have only half my effort on SynBio for that reason - the other half is fundamental biology funded by NIH, and to be honest the way things are now I see my long term future being that with more of *a sideline SynBio effort* that I can cobble together.

If 'we' want to crystallize all the great gains we have made, then *we better find a way to have a stable funding outlet where we can take innovative high-risk, high-reward projects on the 5-10 year time scale.*"

Challenges for Young Syn Bio Practitioners

Challenge: Survive Early Success - Manage Complex & Uncertain

- Disciplinary Identity
- Community Organization
- Resources
- Public Roles

Need: Beyond Survival - Leadership & Strategy Development

- *Leading* Positive Social and Technical Change in Practice

Strategic Experiment: LEAP

Early Success

Growing Community

Growing Community

Globally Distributed Community

Oldham P et al. (2012). PLoS ONE.

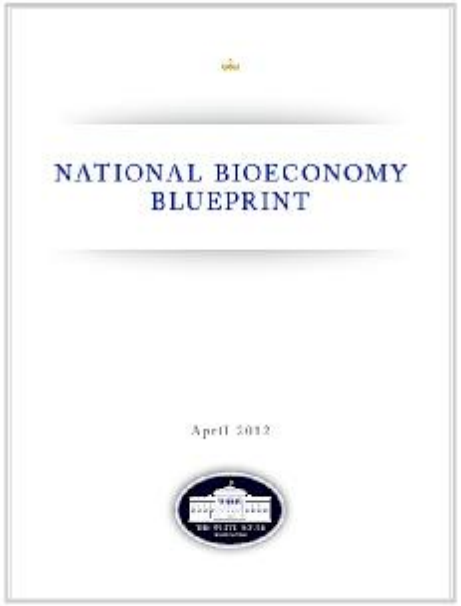
Reorganizing Community

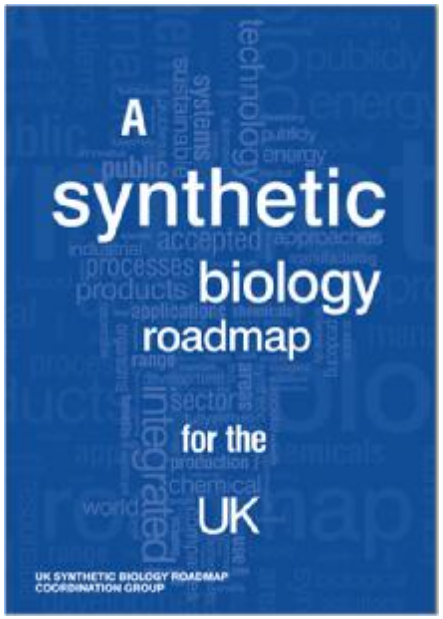
Fast Company Photos: Ian Allen, Fastcompany

Diversely Practicing Community

Academic Ÿ Industry Ÿ Government
NGO Ÿ Amateur

Public Community





Evolving Community

8,433
backers

$484,013
pledged of $65,000 goal

0
seconds to go

Consequences of Early Success

Juggle Multiple Unclear Disciplinary Identities

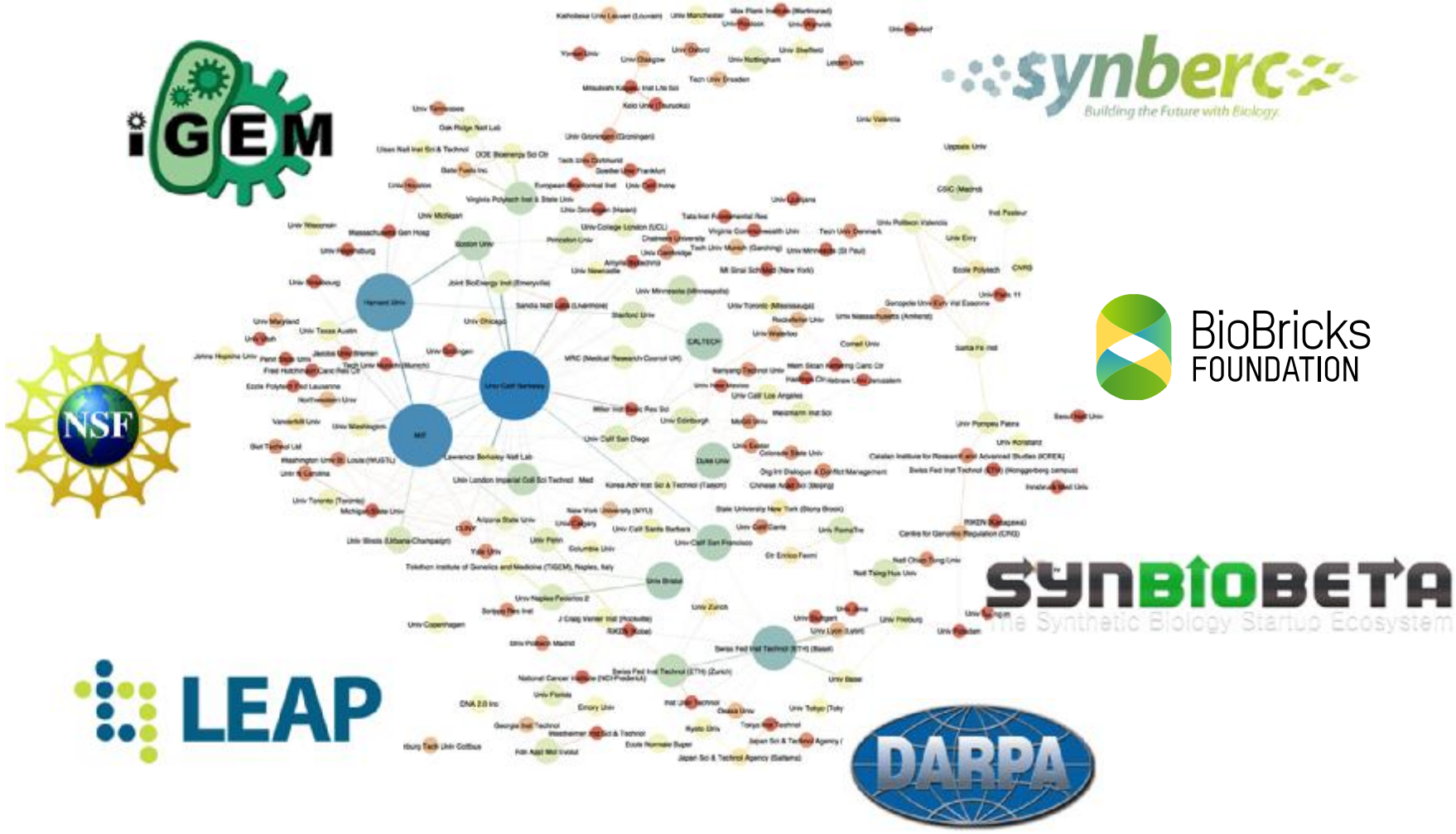
Biological engineering

From Wikipedia, the free encyclopedia

This article has multiple issues. Please help improve it or discuss these issues on the talk page. [hide]

- This article **needs additional citations for verification.** *(June 2009)*
- This article **should be divided into sections by topic, to make it more accessible.** *(September 2012)*
- This article **may be too technical for most readers to understand.** *(September 2012)*

Align with Many Evolving Organizational Hubs



Oldham et al 2013

Assume Uncomfortable Political Roles

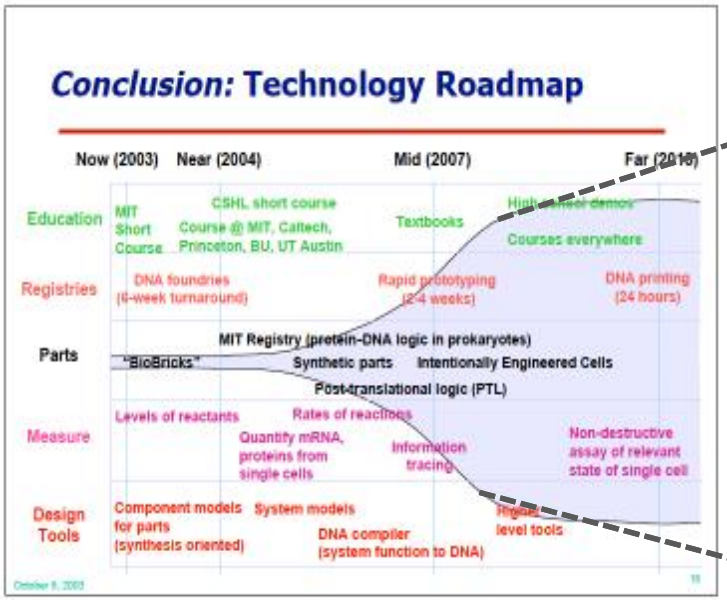
Navigate Complex Collective Futures

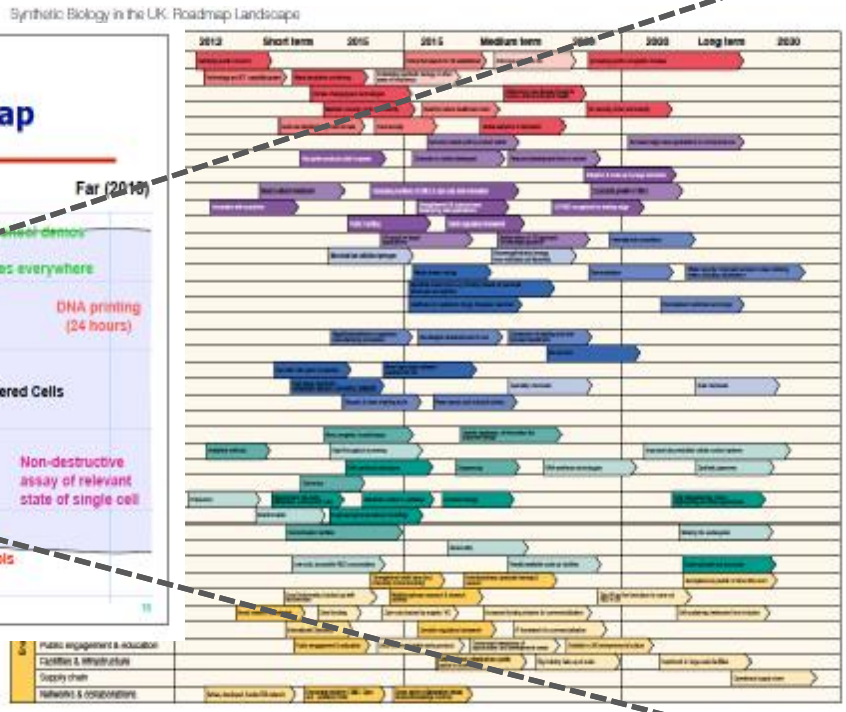
DARPA ISAT

UK SB Roadmap

2003

2013





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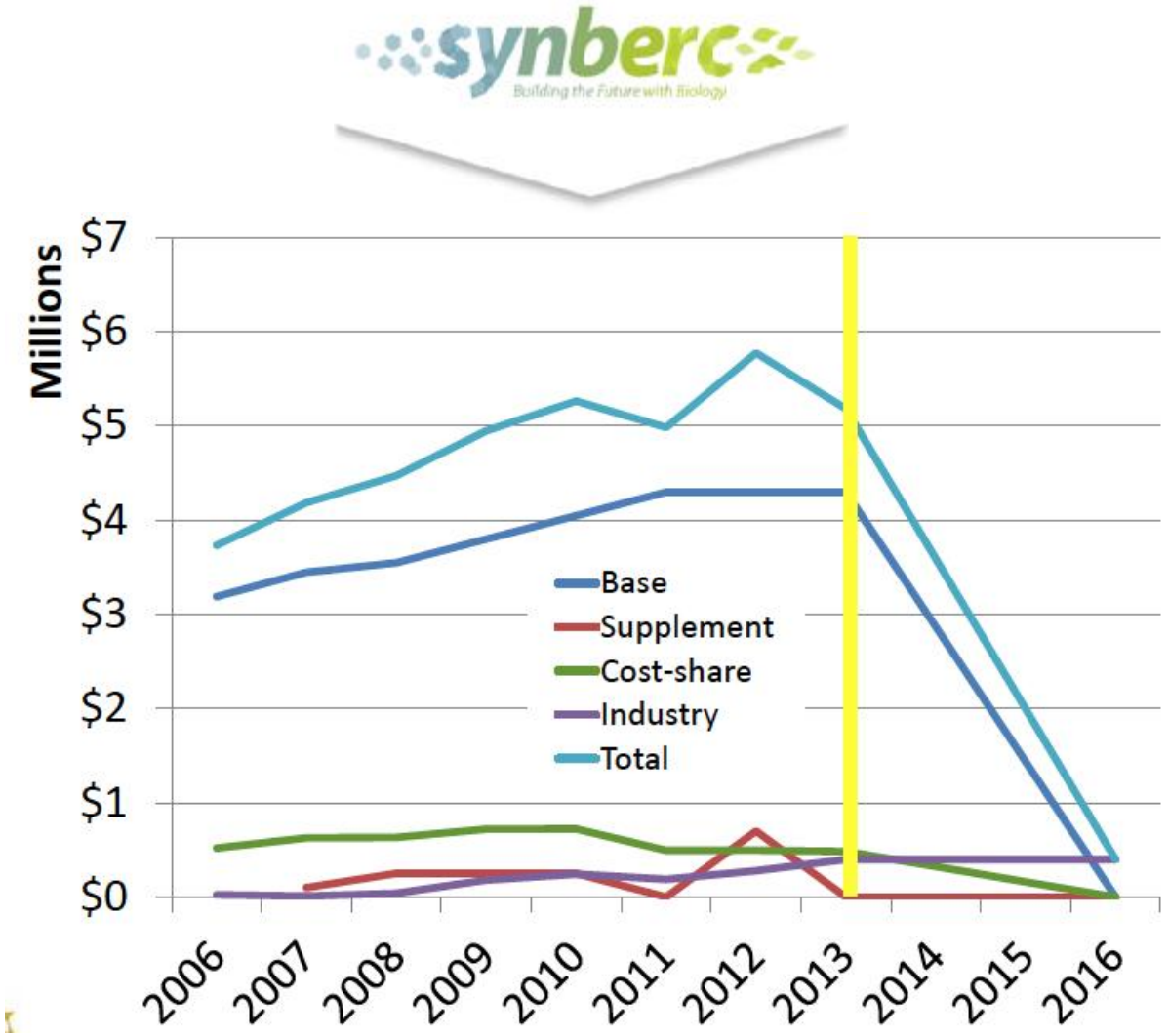
Plan for Uncertain Funding Stability



Planning to Manage Success(fully)

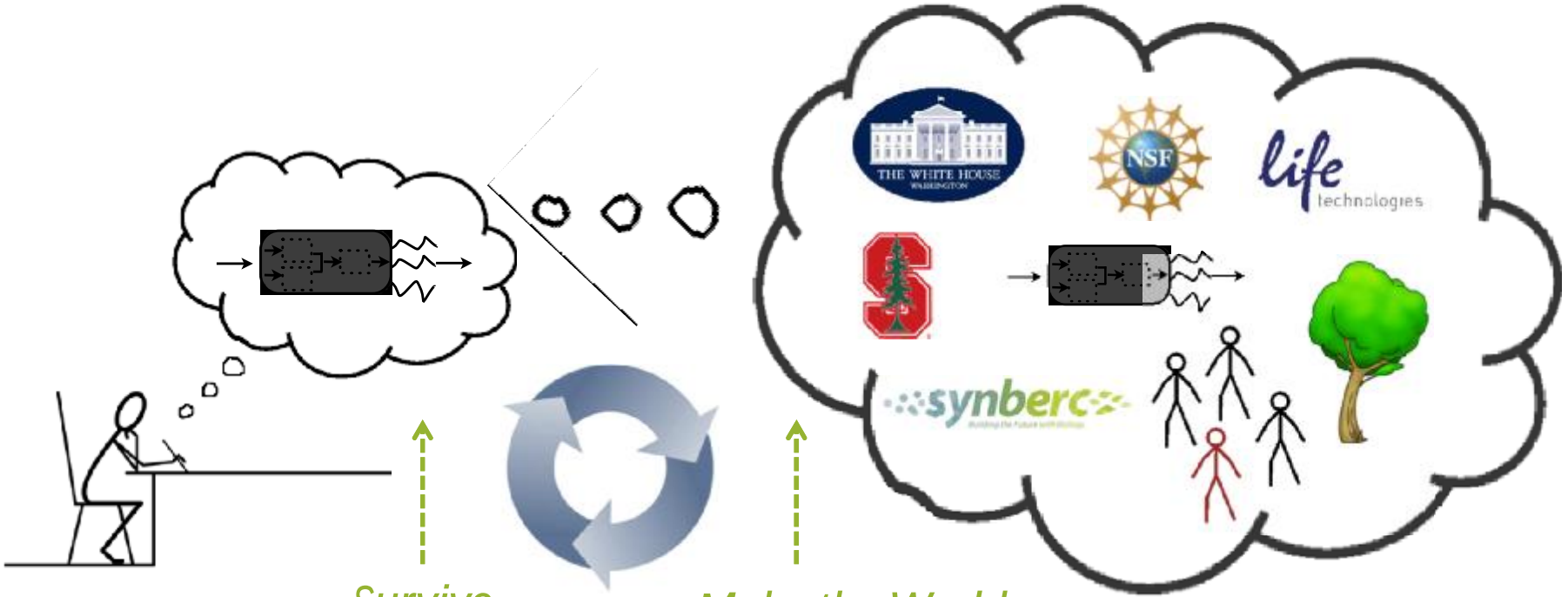
Planning to ~~Manage~~ Lead Success(fully)

“As a synthetic biologist, I have a great interest in not only the technical aspects of engineering cells but also the social and political dimensions involved in responsibly advancing biotechnology….

…yet as a postdoc I rarely have focused time to concentrate on these aspects alongside my specific research questions ”

- Christina Agapakis

Increasingly Complex Career Trajectories



Synberc Practices Strategy: Scale by Enabling

synberc
Building the Future with Biology.

VISION: Enable the (Synberc) community and its partners to consider and develop leading examples of responsible synthetic biology in practice.

Vision: Enable Excellence in Biotech Leadership

LEAP

Synthetic Biology
Leadership Excellence Accelerator Program

Catalyzing a community of emerging leaders in synthetic biology to create bold new visions and strategies for developing biotechnology in the public interest.

Invest in People

People : Practices : Institutions

Model: Germinate Practical Sense for Strategy

Place
In-Residence Program

Peers & Partners
Mentorship Network

Proficiency
Leadership Skills

Practice
Addressing YOUR Top Gaps

Productivity
Strategic Action Plans

Critical Support: Strategic Partners

Alfred P. Sloan Foundation

BioBricks Foundation

Woodrow Wilson International Center for Scholars

Synthetic Biology Project

Pilot: Call for Real-World Visions & Challenges

Do you have great ideas for advancing synthetic biology in the public interest?
Do you want time, tools and partners to develop your ideas into action?
Do you want to build a community working to best advance biotechnology?
Then join us!

>150 Applications

Diverse Practitioners at Career Transitions

Photography by David Sung Kong

Diverse Practitioners at Career Transitions

Diverse Practitioners at Career Transitions

Diverse Practitioners at Career Transitions

Diverse Practitioners at Career Transitions

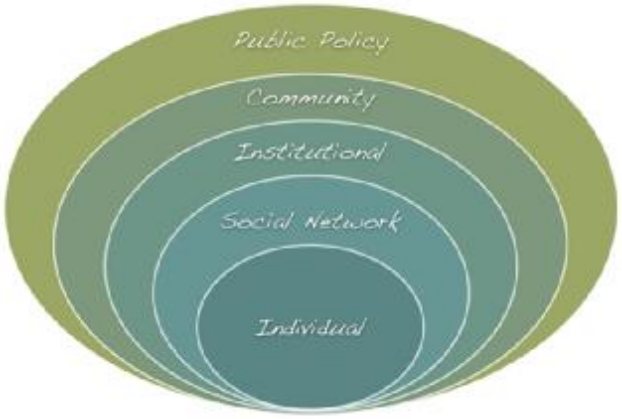
Diverse Practitioners at Career Transitions

Time & Space to Think & Plan

Time & Space to Think & Plan

Professional Leadership Skills Facilitation

know innovation



Leadership (Action; Accountability)
Reflection (Values)
Networks (Organization & Change)

Mentors with Real-Life Leadership Experiences






Rob Carlson
David Grewal
Richard Johnson
Peter Jutro
Chitra Krishnan
Mary Maxon

Laurie Zoloth
Hemai Parthasarathy
Spencer Addler
Ed You
John Warner
Margaret Dick

Eleanore Pauwells
Natalie Kuldell
Nancy Burgess
Thane Kreiner
Ken Oye
Randy Rettberg

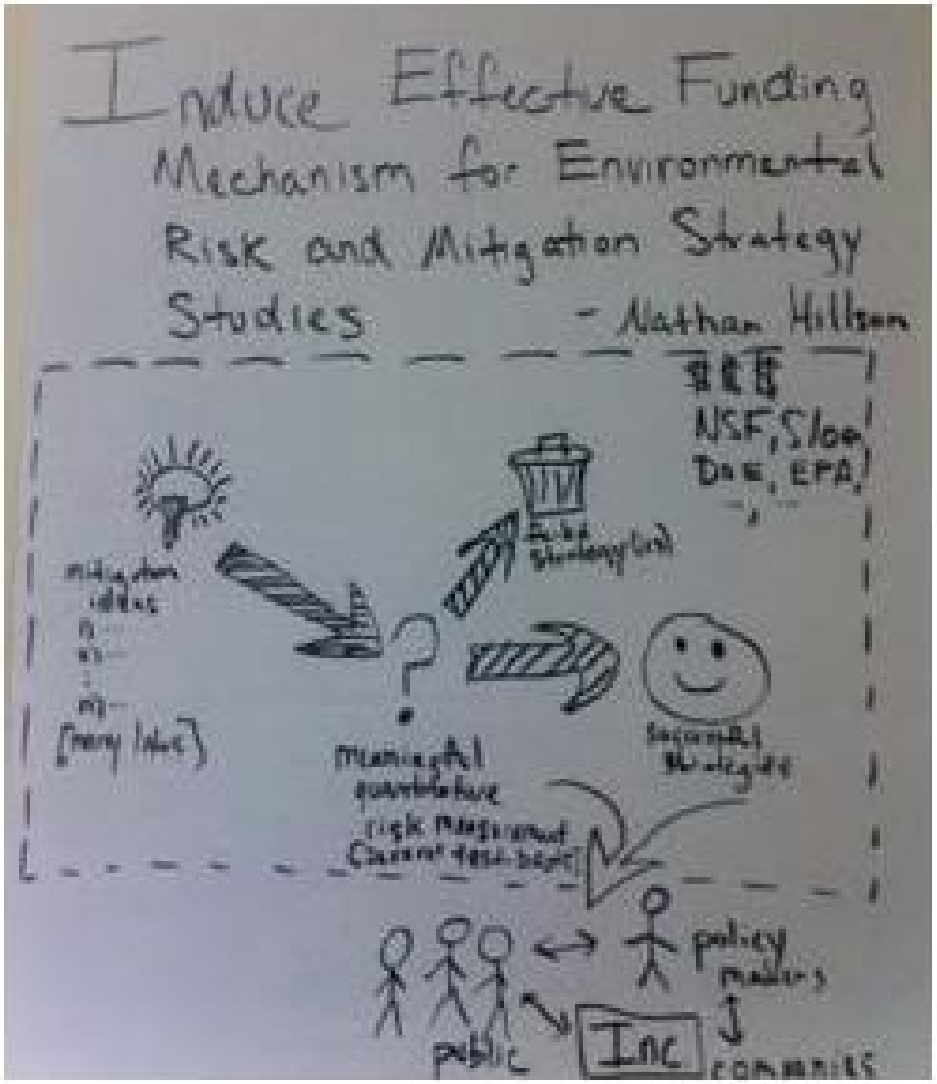
Dan Sarewitz
Lauren Ha
Holly Million
Keith Roper
Paula Olsiewski
Jameson Wetmore

Practice Vetting Visions & Strategies

Constructive Feedback From Key Supporters

Success?

Produce Actionable Plans



Produce Actionable Plans

LEAP
Synthetic Biology
Leadership Excellence Accelerator Program

Coherent Block Funding for Microbial Environmental Risk Assessment and Mitigation Strategy Development

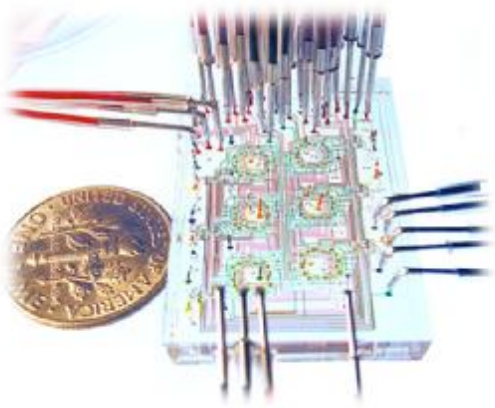
Nathan J. Hillson
Lawrence Berkeley National Lab
njhillson@lbl.gov

Synthetic Biology LeAP Strategic Action Plan
Version 2: January 28, 2013[1]

Synopsis

Coherent Block Funding is a mechanism for government, industry, and institutional agencies to support and coordinate the assessment of environmental risks posed by genetically engineered microbes, and the development of strategies to mitigate these risks. In short, a single block of funding would support several testing facilities in addition to multiple individual investigators developing mitigation strategies. Unlike current funding mechanisms which distribute funding piecemeal at 5% or less of larger science projects, do not align the incentives of separate investigators, and make it difficult to accomplish meaningful outcomes, Coherent Block Funding can sustain real-world test-bed infrastructure and provide return on investment through establishing which mitigation strategies are actually effective. This strategic action plan aims to garner high level support within federal and institutional agencies to prioritize Coherent Block Funding as the support mechanism for genetically engineered microbe environmental risk assessment and mitigation strategy development.

Plans Interfaced with Technical Goals



LEAP
Synthetic Biology
Leadership Excellence Accelerator Program

Metafluidics

David Sun Kong
Massachusetts Institute of Technology
dkong@MIT.EDU

Synthetic Biology LeAP Strategic Action Plan
Version 2: January 28, 2013[1]

Synopsis

Synthetic biologists need great tools to realize their creative visions. Microfluidic, or "lab on a chip" instrumentation has the potential to be such a foundational tool for synthetic biology. Despite numerous examples of microfluidic devices performing complex processes central to synthetic biology, ranging from automating and miniaturizing DNA synthesis to performing single cell analyses, they are not commonly used. Microfluidics are not easy to make or use, and researchers are typically unable to leverage the designs and hardware of other groups. To help address these issues I propose in this action plan to develop metafluidics, a toolkit for microfluidics. The metafluidic toolkit leverages digital fabrication to make devices easy to manufacture, abstraction hierarchies for enabling intuitive interfaces to make them easy to use, and finally an open repository of device and hardware designs to make them easier to share and reproduce. Through metafluidics, microfluidics will hopefully become more accessible to synthetic biologists of all types, from students just learning about biology to cutting-edge innovators re-engineering organisms.

Collaborative Plans Emerged Across Orgs





ginkgobioworks

UNIVERSITY of WASHINGTON

NIST

BROOKINGS

LEAP
Synthetic Biology
Leadership Excellence Accelerator Program

A Vision for a Synthetic Biology Standards Consortium

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Jeff Ullman, Ayyris, jeff.ullman@gmail.com

Synthetic Biology LEAP Strategic Action Plan
Version 2: March 18, 2013[1]

Synopsis

The promise of synthetic biology to be instrumental in improving global quality of life and economic security can not be realized if there is not a concerted effort to transform synthetic biology innovations into useful, safe, and affordable products. As synthetic biology continues to develop, growing numbers of government and non-government organizations have focused on how synthetic biology could be used to responsibly improve global quality of life while considering environmental and health safety issues. The development of measurement, performance, and safety standards for synthetic biology by a multi-stakeholder consortium could be the most effective way of ensuring the responsible development and wide acceptance of this technology.

Topics Spanned Many Problems of the Commons

EDUCATION AND COMMUNITY

Enhancing Undergraduate Education to Drive Responsible Growth of the Bioeconomy
Marc Facciotti

Worldwide Network of Community Labs
Ellen Jorgensen

ORGANIZATION AND COLLABORATION

Love Our Monsters –
Radical Collaboration in a Post-Disciplinary Age
Christina Agapakis

International Synthetic Biology Society
Andrew Chang, Anne Cheever, Michael Fisher, Jeff Ubersax, Louise Horsfall

Opening New Channels for Industry-Academic Relations
Derek Lindstrom and Nathan Hillson

GOVERNANCE AND RESPONSIBILITY

Circumventing the Paradox of Regulating Emerging Technologies
Walter Valdivia

A Call for a Public, Democratically Deliberative Facet in Synthetic Biology Policymaking
Ryan Ritterson

RISK RESEARCH AND MANAGEMENT

Synthetic Biology Biosecurity Tabletop and Corresponding Educational Tools
Ryan Morhard

Coherent Block Funding for Microbial Environmental Risk Assessment and Mitigation Strategy Development
Nathan Hillson

STANDARDS AND SHARING

A Vision for a Synthetic Biology Standards Consortium
Michal Galdzicki, Sarah Munro, Patrick Boyle
Jeff Ubersax

Metafluidics
David Kong

Incentive-Driven Information Sharing for Engineering Biology
Karmella Haynes

IDENTIFYING NEEDS

SBICE: Synthetic Biology Integrated Concurrent Engineering Framework
John Cumbers

Synthetic Biology for Global Health: A Problem-Driven Approach to Healthcare Innovation
Keith Tyo

Read More

LEAP
Synthetic Biology
Leadership Excellence Accelerator Program

Learn More

synbioleap.org

Fellows Have Carried Forward Plans (and More)

Policy Advice

09.20.13 COMMUNITY NEWS

Louise Horsfall Facilitates University of Edinburgh Comments on Convention on Biological Diversity

read more » | more community news »

Courses

07.30.13 COMMUNITY NEWS

Karmella Haynes organizes inaugural syn bio Cold Spring Harbor course

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Organizations

07.12.13 COMMUNITY NEWS

Michal Galdzicki helps organize 5th International Workshop on Bio-Design Automation meeting in London

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Workshops

07.12.13 COMMUNITY NEWS

Sarah Munro hosts the National Institute of Standards and Technology (NIST) – Advances in Biomedical Measurement Science (ABMS) roadmapping workshop at SB6.0

Co-hosted by Imperial College, the National Academy of Sciences, and the BioBricks Foundation Organizers Sarah Munro, NIST-ABMS Program Marc Salit, NIST-ABMS Program "The NIST-ABMS Workshop to Develop a Metrology Roadmap for Synthetic...

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Presentations

07.09.13 COMMUNITY NEWS

Christina Agapakis Presents on Synthetic Biology and Design at SB6.0

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Grants

07.02.13 COMMUNITY NEWS

David Kong secures funding from the MIT Lincoln Laboratory for his Metafluidics Strategic Action Plan

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Lessons Learned

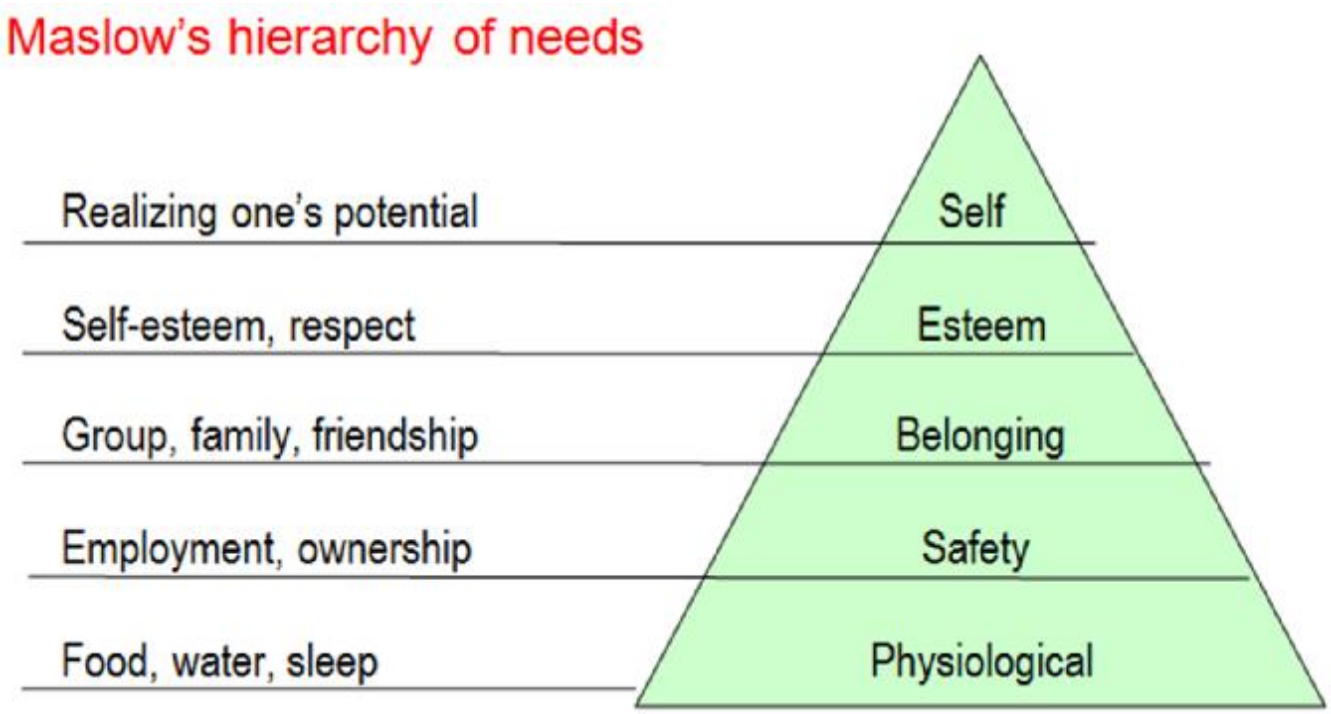
Key was Focus on *People* (as well as Plans)

Resource Barriers Impeding Action Often Small

“I'm totally happy to share a room, sleep on someone's couch to save some $$.”

Productive to Seed, but Not Prescribe, Goals

Sustained Attention Requires Sustained Support



Need for Reliable, Credible Paths to Action

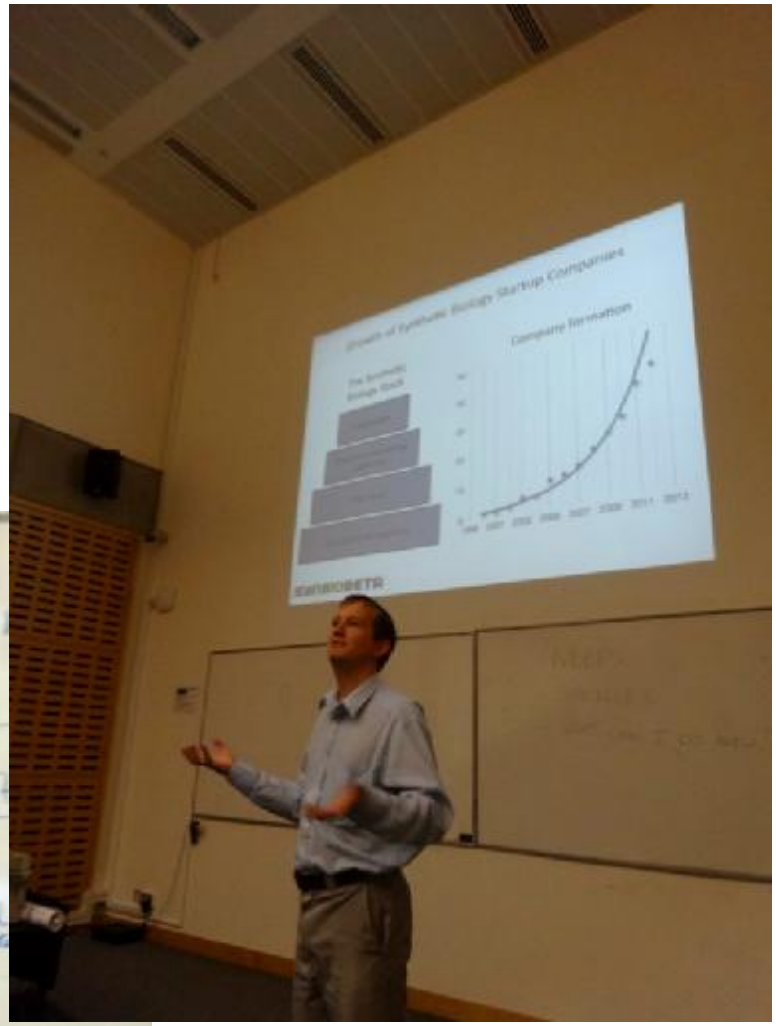
Defense Science Study Group

KECK FUTURES INITIATIVE

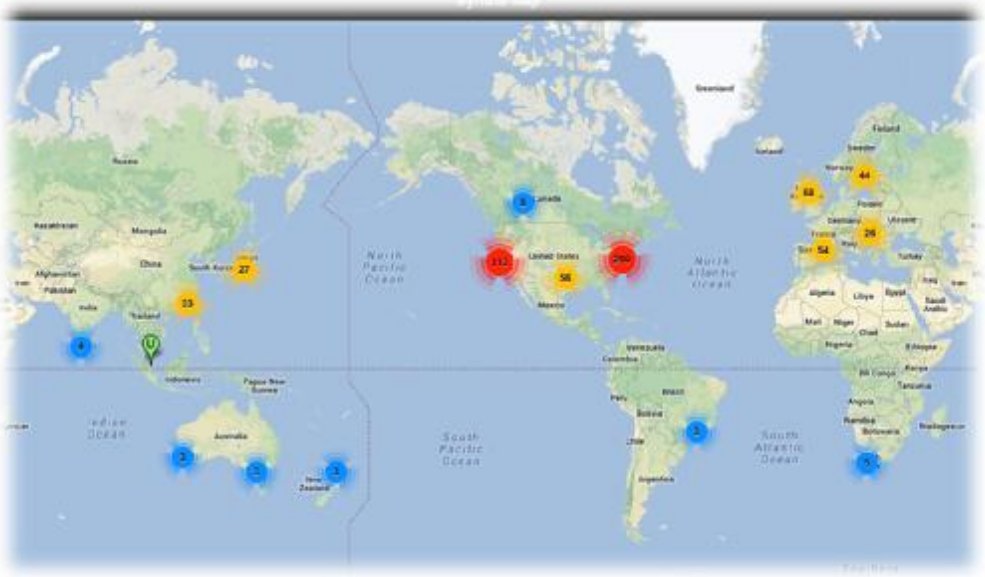
THE NATIONAL ACADEMIES
Advisers to the Nation on Science, Engineering, and Medicine

Where Do We Go From Here?

Next Gen Community & Leadership @ SB6.0



International Focus



EU 2014/2015

Asia 2015/2016

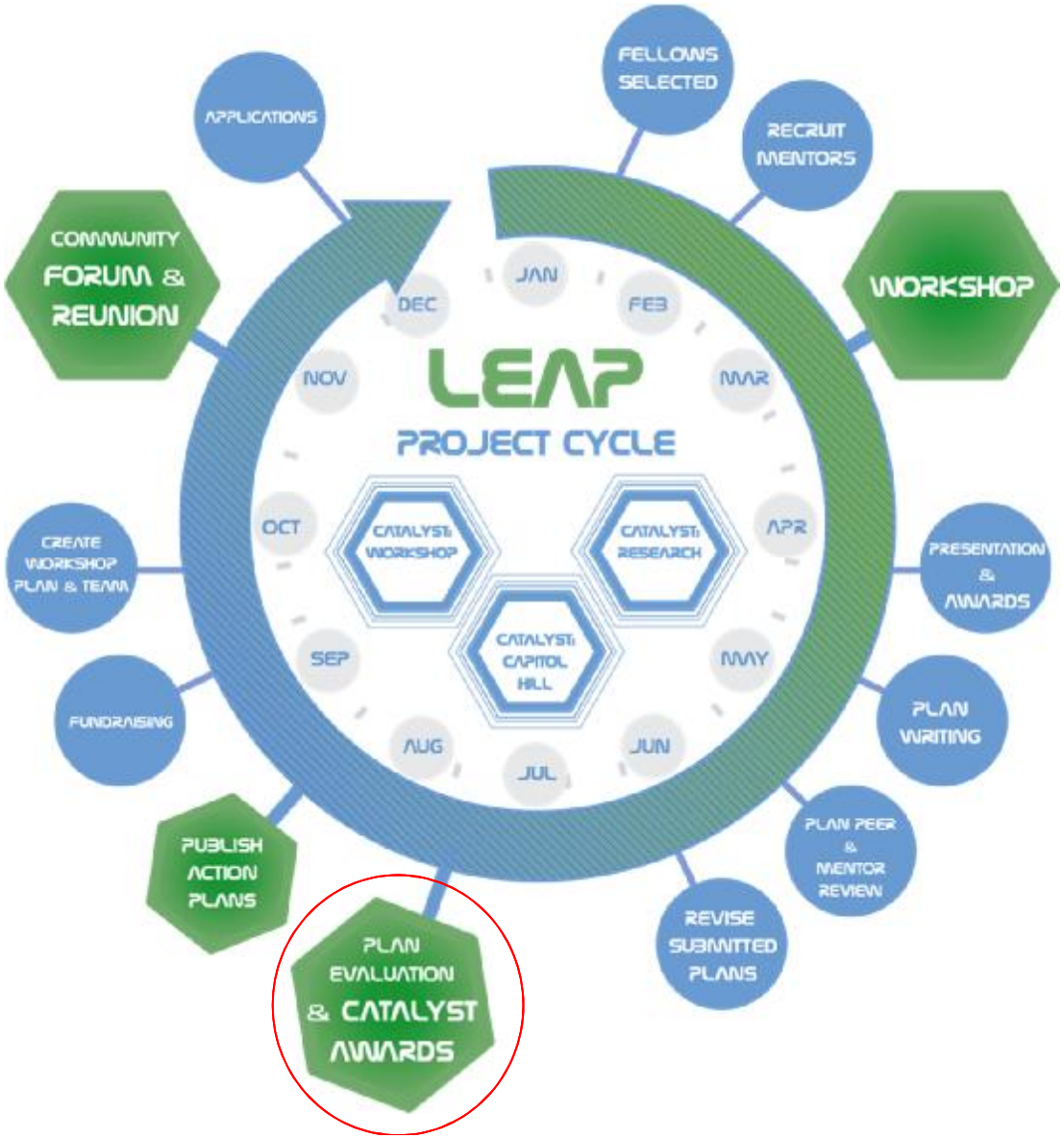
Recruit Domestic & Intl Partners

Alfred P. Sloan Foundation

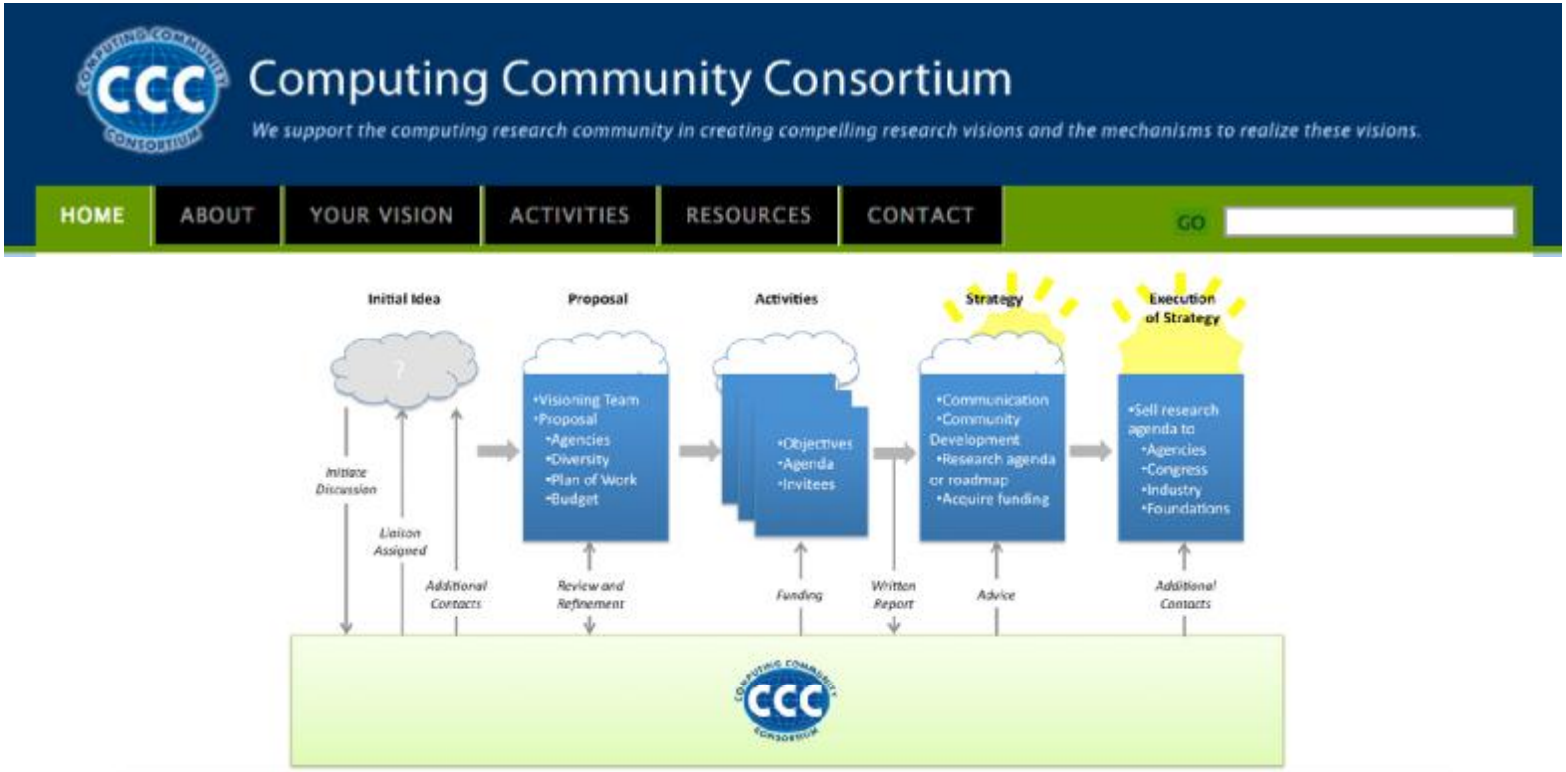
Woodrow Wilson International Center for Scholars

& People to Hire!

Yearlong Program



Vision


Computing Community Consortium
We support the computing research community in creating compelling research visions and the mechanisms to realize these visions.
HOME
ABOUT
YOUR VISION
ACTIVITIES
RESOURCES
CONTACT
GO
Initial Idea
Proposal
Activities
Strategy
Execution of Strategy
•Visioning Team
•Proposal
•Agencies
•Diversity
•Plan of Work
•Budget
•Objectives
•Agenda
•Invitees
•Communication
•Community Development
•Research agenda or roadmap
•Acquire funding
•Sell research agenda to
•Agencies
•Congress
•Industry
•Foundations
Initiate Discussion
Liaison Assigned
Additional Contacts
Review and Refinement
Funding
Written Report
Advice
Additional Contacts
Computing Research Initiatives for the 21st Century
WhitePapers
21st Century Computer Architecture
New!
A community white paper
May 25, 2012
PDF

Challenges for Young Syn Bio Practitioners

Challenge: Survive Early Success - Manage Complex & Uncertain

- Disciplinary Identity
- Community Organization
- Resources
- Public Roles

Need: Beyond Survival - Leadership & Strategy Development

- *Leading* Positive Social and Technical Change in Practice

Strategic Experiment: LEAP

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- *Endy Lab*
- *SynBERC Central*
- *Jameson Wetmore, CSPO*
- *Samuel Evans, David Winickoff*
- *SBPWG/ LEAP Community*
- *David Kong (photos)*

Alfred P. Sloan Foundation

BioBricks Foundation


AIRLIE