Yámana Science & Technology

Innovation – A Global Conversation

Science UnSummit 2012
Washington DC
April 23–25, 2012

We are in a time of fast-moving changes in society and in the world … and we are slipping on all innovation indicators.

— Robert Atkinson, Howard Wial, *Blueprint for American Prosperity*

This is a time that calls powerfully to science and technology to usher in the next era of innovation, with "all hands on deck." We are convening people from across diverse sectors, from beginning graduate students to seasoned policy makers, to evaluate the current systems of science and processes for innovation. We believe there is enormous potential on all fronts, but we have outgrown the old model. It is time for change.

We have seen a great deal of anecdotal evidence indicating that stakeholders *and* institutions are searching for a fundamental change in the academic and technology sectors' approaches to innovation. Yámana Science and Technology invites pioneers and forward thinkers to bridge this divide by participating in our landmark event, the Science UnSummit 2012.

OUR MISSION

At **Yámana Science and Technology,** we aim to be the touchstone for a fundamental change in the way we work together to "do" science, by bringing together the ideas, people, and resources to bring out the best in both science and technology. Our Science UnSummit is designed to identify the most important issues and concerns, providing a catalyst to allow potential solutions to emerge.

Innovation – A Global Conversation invites advocates of science and technology to explore the landscape of innovation—nurturing its strengths and removing the obstacles to its expansion.

This working conference will begin with brief panel presentations to develop and cross-fertilize the ideas and work of those leading innovation and change. The Open Space[1] forum immediately following the panel presentations will promote an unparalleled level of learning and sharing, allowing for novel

[1] Suzanne Daigle, of NuFocus, describes an 'Open Space' meeting (a technique created by Harrison Owen more than 25 yrs ago) as a tool to facilitate effective group focus and decision making when there are substantial issues to debate, high levels of conflict, high levels of diversity (in all aspects of the group, such as age, function, or opinions), with an urgency of getting something done 'yesterday.'

ideas and innovative strategies. Open Space is ideal when there are widely divergent points of view, high complexity, high levels of passion, and great urgency.

The unique approach of the Yámana Science and Technology UnSummit brings together stakeholders from different sectors and different levels of science and technology. This diversity becomes a catalyst for new ways of thinking and doing, while simultaneously providing immediate feedback from individuals representing multiple sectors. This in turn invites greater buy-in and advocacy, allowing old problems to be addressed in new ways.

Outcomes

This event will:

- Bring the diverse voices and advocates of science and technology together
- Engage new thinking about science and innovation
- Ignite personal and collective leadership (experiential)
- Inspire action leading to concrete deliverables—usable tools that provide access to new innovations
- Deliver a searchable PDF resource book capturing the highlights of the discussions
- Create long-standing relationships and expand professional collaboration

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Innovations in how we go about "doing" science, as prescribed by our corporate and academic reward systems and what our scientific and technology sectors produce is the primary focus of the Science UnSummit 2012. We aim to accelerate innovation by identifying current opportunities for innovation in research and technology, and structural impediments to these, through open dialogue -- leading to development of new approaches and new policy.

We are inviting individuals from across the following sectors to bring their expertise and diverse points of view to the table:

- Innovation – Leaders in innovation from technology, business and academia
- Funding – Individuals from institutions that fund science, including those from the National Science Foundation, the National Institutes of Health, and the Department of Energy
- Research – Members of the academic research community, including faculty, post-doctoral fellows, graduate, and undergraduate students
- Society – Members of the general public, some of whom will be from the USA Science and Engineering Festival attendees
- Policy –Science policy fellows, representatives from the National Academies of Sciences (NAS), and experts in creation of policy (including congressional staffers)
- Education –Educators in Science, Technology, Engineering and Math from both K-12 and University communities

PROPOSED TOPIC AREAS

We are inviting representatives from the following domains, which represent specific interfaces between Innovation, Science, and Technology:

Topic Area # 1 – Innovation as Collaboration – In the University and in Industry

Science and technology continue to be a driving force by which America and the global economy measure themselves. The American Council on Competitiveness speaks of "turning competitive disadvantage into collaborative advantage"—a true indication that leaders in business and technology are moving toward collaborative models. Indeed, increased focus on collaboration and new approaches for creating strong teams have been fast-moving developments in Silicon Valley. In academia, the request for increased collaboration comes from several branches of the National Academies, as well as a large number of foundations that support scientific research. It also comes from the next generation of science and business leaders, as the "millenials" are known for their interconnectedness through digital technology, resulting in increased comfort with (and expectation of) collaboration.

Though pressure is mounting to create interdisciplinary teams on university campuses, there are formidable obstacles to this. One significant obstacle is the structural and bureaucratic organization of universities. Higher education institutions are structurally organized into academic disciplines and departments that promote specialization of faculty work, and impede formal and informal interactions with colleagues across a campus. Faculty often work in isolation on their respective research projects, with little to no incentive to work across departments or colleges. Reward structures in the form of tenure and promotion are founded on single discipline expectations; success of an individual, as judged by such criteria, is undermined by engagement in cross disciplinary work.

As we move into the knowledge economy, academia has an enormous potential to catalyze exponential growth of this 'new economy.' In their recent work, "Organizing Higher Education for Collaboration," Kezar and Lester point out specific approaches that remove barriers and create synergistic cross-campus teams. Several successful exemplars, to be presented at the Science UnSummit, create a rich resource for other communities of scholars wishing to create interdisciplinary systems in academia.

Starting points for discussion:

- What are the emergent practices in Silicon Valley for collaborative environments, and how are those practices affecting work and workers?
- How does collaboration occur in science? What are the levels of collaboration? How do different departments in universities collaborate, if at all?
- Are current University or institutional structures inhibiting interdisciplinary studies and work? Are their examples of structures that support interdisciplinary work that can be emulated?
- What connects interdisciplinarity with innovation?

Topic Area #2 – Innovation in a Data-Intensive World

Prolific production of data is currently confounding efforts to effectively organize, share (or protect), and manage data resources. The advent of vast amounts of electronic data has generated novel challenges for the scientific community.

This proliferation of data, and subsequent (hoped-for) knowledge, creates widening gaps between scientific understanding and the ability to share knowledge, both in the scientific community and with the general public. This may account for the increasing number of University programs designed to produce "science communicators." Additionally, new approaches to communication have been found to increase scientists' passion for their own work, as truly novel approaches (including improvisational theater, utilized by the Center for Communicating Science) allow scientists to see new correlations and connections. We are truly in a time of change.

Starting points for discussion:

- Open access (free access to research publications): Publicly funded research produces a majority of publications that are not accessible outside of institutional subscriptions. Conversely, journals need to support administrative and editorial costs. How can we make research findings freely available while providing financial support for the process of publication?
- The National Science Foundation has recently added a requirement for Data Management Plans in scientific grant proposals (see http://www.nsf.gov/bfa/dias/policy/dmp.jsp), to allow public access of research findings separate from the publication process. Members of the research community, including and perhaps especially science librarians that support researchers, are now tasked with figuring out how to fulfill on this requirement.
- How do we manage and share terabyte data sets?

Topic Area #3 – Innovation and Development: The Discovery-to-Product Pipeline - Current Challenges in Drug Development

Urgent calls to action suggest that the drug development pipeline is in a crisis state. Others question the sustainability and efficiency of drug development pipelines that focus solely on blockbuster drugs. Suggested limitations in the system include regulatory issues, globalization, off-shoring, loss of R&D, unforeseen issues with large clinical trials (Ioannidis et al.), and uncertainty in the patent landscape.

We feel that these point to an even larger shift, as the era of "silver bullet" cures may be coming to an end. A complex landscape is emerging, with new opportunities in diagnostics, patient-defined care, and preventive health-care along with traditional pharmaceutical-based cures. This topic area is wide-open for debate, with passionate, often highly divergent, points of view.

Starting points for discussion:

- For academia, what, besides technology transfer offices, is in the space between the scientific discovery process and delivering a product to market?
- Where do our current approaches aid vs. inhibit innovation and time to market?

- What are the limitations to innovation in the private sector? What role do regulations and governmental policies play in protecting the public effectively while allowing innovation to thrive?

Topic Area #4 – Innovation and Development: The People Pipeline

This topic area addresses the need for more effective development and support of the next generation of scientists and innovative thinkers.

Though academic departments are the seed bed for science in this country, science educators in K-12 schools have only recently interfaced with academic science departments (e.g., the UTeach program run by the University of Texas). It is a time of high potential for bringing researchers, educators, and basic science departments together. Expeditionary Learning programs utilize knowledge experts in their learning process. The National Science Foundation's GK-12 program has brought graduate students in basic science into local underserved schools, to bring expertise in science knowledge to those who might otherwise miss out. Both represent innovative approaches that have garnered passionate support from the community.

Conversely, academic research departments focus on training PhD and post-doctoral scholars, to create the scientific workforce of tomorrow. However, current job openings requiring a PhD are far below the number of PhDs produced each year. Several leaders in the academic community claim an ethical obligation to stop training ever-increasing numbers of PhD scientists in America until we sort this out. Meanwhile we spend millions to attract more of our youth into science careers. This dichotomy between the need for more workers proficient in science and engineering, and a saturated job market at the top levels of science, is ripe for new strategies.

The number of candidates earning PhDs in science shows a strong desire for science knowledge and understanding. It's not that we have too many PhDs, it's just that we need a place for them to go. Fresh eyes and new ideas are needed for the outcomes we truly desire.

Starting points for discussion:

- Where do science education (K-12, as well as U/G and Graduate) and academic science Departments interface?
- What are the emergent teaching practices for science? Teach for America, U-Teach, Student-centered Learning, Expeditionary Learning, GK-12 – the innovative edge is growing quickly, providing an opportunity for academic institutions to engage in rich collaborations.
- Are we due for a major overhaul in the academic systems that produce PhDs while employing ever-smaller percentages of the resulting pool of scholars?
- How should the research enterprise be structured to best utilize our talent? Are scientists "waiting for Superman" – someone outside of the scientific enterprise – to solve their most critical issues?

Topic Area #5 – Innovation and Design

According to Tim Brown, CEO of Ideo and author of "Change by Design," design thinking helps spot patterns and break down complex problems, transforming organizations and inspiring innovation. Forefront work in this area is evident in Rhode Island School of Design's cross-over Science, Technology, Engineering, Art, and Math (STEAM) program. John Maeda (President of the Rhode Island School of Design), an artist and scientist himself, feels that superior innovation will come from bringing divergent thinkers (artists and designers) and convergent thinkers (scientists and engineers) together.

Starting points for discussion:

- How well are the outcomes of the "systems" of science and technology connected to society and societal needs? Are we as efficient as we could be?
- What are the interfaces (or are there?) between basic science, R&D and product pipelines (eg pharmaceutical, manufacturing, and devices).
- What can design thinking provide for the scientific community?

Topic Area #6 – Innovation and Policy, Including Social Responsibility

If you ask faculty, students and post-doctoral fellows, "Who or what is responsible for the current outcomes of the 'system' of science?" they will tell you it is the granting agencies. If you ask the granting agencies, "Who is responsible?" they will tell you they are constrained by policy set in Congress. If you ask members of Congress, they will tell you it is the American public whose will is being reflected by law. If you ask the American public, most support science and they think scientists are doing important work, but are unconnected to how the system works. So, where are the levers for change? What do each of these stakeholders really want and intend?

Great Britain and the Royal Society recognized a telling gap between scientists and the general public with the vocal public rejection of genetically modified organisms (GMOs), after years of scientific development. The GMO issue has prompted the Prime Minister's office and the Royal Society to engage the public in discussions with the scientific community at earlier stages in the research pipeline, leading the way in innovative practices in communication. Here in the United States, Arizona State University's Center for Science Policy and Outcomes has created venues for dialog between scientists and policy makers around complex societal questions at the interface of science and society.

Starting points for discussion:

- Is there a scientific social responsibility?
- What are the most effective ways to address unintended consequences of technology and innovation?
- How do the current reward systems support and/or inhibit leading-edge innovations in research and research areas in the United States?

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