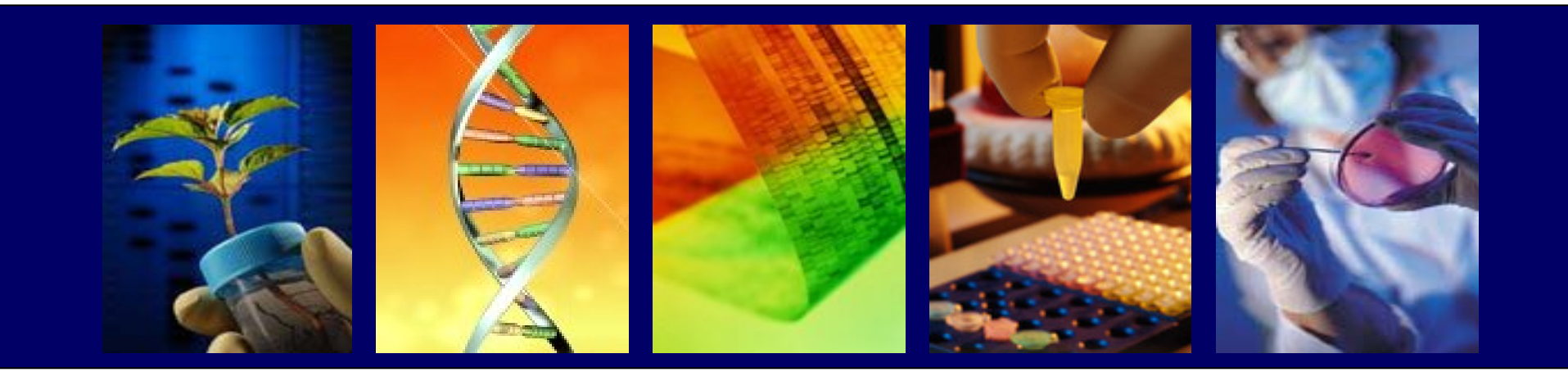
Progress Report of the NSABB Working Group on Outreach and Education



NSABB Meeting

June 23, 2011

Working Group Members

Voting Members

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Department of Health and Human Services

Daniel Strickman, Ph.D.
U.S. Department of Agriculture

Edward You
Federal Bureau of Investigation

Initial Working Group Charge

- **Guide NSABB and staff on the development of strategies to educate the scientific community and public about dual use research;**
- **Recommend strategies for soliciting input from key stakeholders on Federal policy proposals; and**
- **Advise on development of specific outreach and education activities to include:**
  - **Message development**
  - **Audiences**
  - **Vehicles for information dissemination.**

Implementation of Strategic Plan

- Web site as the portal for information on the NSABB, its meetings, work products; email inbox for public queries; listserv for updates
- Presentations and workshops to key constituency groups
- Exhibits at major meetings
- Poster presentations at meetings and conferences
- Video and educational brochure

The Changing Nature of Biotechnology Research

- Projects that once cost millions of dollars can now be accomplished for only a few thousand, e.g. genome sequencing
- Increasing accessibility of biotechnologies to individuals outside of traditional institutions
- A growing hobbyist community (DIY and other amateur biologists)
- Lack of institutional infrastructure for training and oversight raises a host of biosafety and biosecurity concerns

The Changing Nature of Biotechnology Research

- Historically, science developed in discrete disciplines of study
- Recent technological advances create opportunities that require disciplines to work together
- Synthetic biology, for example, brings together molecular biologists, computer scientists, engineers, and others

Additional Tasking for the Working Group on Outreach and Education

The Federal government tasked the NSABB to recommend outreach strategies to:

- **Amateur biologists**
- **Scientists in non-life science fields**

Amateur Biologists

- **Conduct biological experiments as an avocation (not profession)**
- **Also known as "Do-it-yourself" biologists**

Do-it-yourself biology on rise

New breed of scientists using technology to experiment outside usual lab settings

By Julian Guthrie
CHRONICLE STAFF WRITER

In a kitchen in Saratoga, an electrical engineer is working with pure strains of E. coli purchased over the Internet in hopes of creating a handheld diagnostic tool to detect dangerous bacteria.

Out of a garage in Sacramento, a bioengineer is designing low-cost equipment to allow people to see and construct DNA.

From a studio in San Francisco, an artist is building houses from a medicinal fungus.

Across the Bay Area, and in other high-tech hotbeds, a revolution is under way. Citizen scientists — or biohackers, as they're being called — are taking biology out of academia and closed-door laboratories and bringing it into garages and kitchens, studios and warehouses.

The dream is to make breakthroughs that will ultimately benefit humanity, in fields as diverse as biofuel and cancer

Biology continues on A18

Adam Lau / The Chronicle

Tito Jankowski, who works on DNA research tools in his garage, started the San Francisco chapter of DIYbio.

Amateur Biologists

- **Community characteristics**
  - May not be formally trained as in science, biosafety, or biosecurity
  - Mostly conducting low biosafety level work (BSL1), but interested in learning about biosafety
  - Highly creative, curious, young
  - Early adopters of new technologies

Amateur Biologists

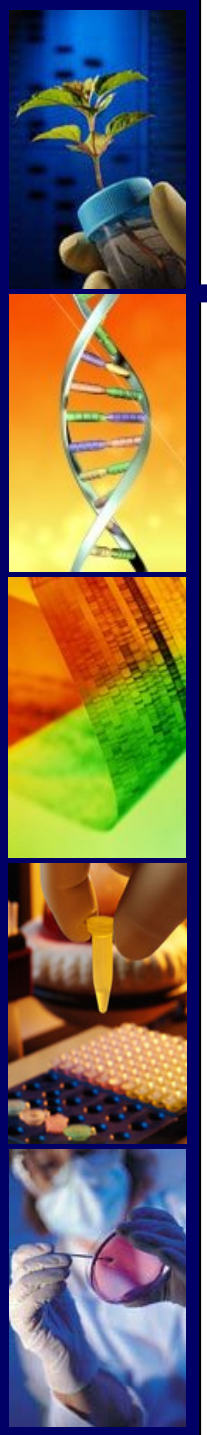
- **Community characteristics**
  - Work outside of settings with infrastructure and oversight
  - May assemble into community groups
  - May not consider themselves researchers
  - Often aim to promote public education about science

Scientists In Non-life Science Disciplines

- **Scope**
  - Those participating in life science research and collaborations
- **Community characteristics**
  - Span such fields as engineering, chemistry, computer science, mathematics, physics and others.
  - Not typically trained in biosafety and biosecurity
  - May not be subject to oversight by IBCs, IRBs, and IACUCs.
  - May be less familiar with oversight requirements even when subject to them

Approach To Understanding New Audiences

- **Interviews were conducted with individuals who are members of, or familiar with, the two groups.**
- **The speakers answered discussion questions that were provided prior to interviews and answered questions from individual Working Group members.**



Interviewees

- Ann Arvin, M.D.
  Stanford University
- Kavita Berger, Ph.D.
  American Association for the Advancement of Science
- Jason Bobe
  DIYbio
- Rob Carlson, Ph.D.
  Biodesic
- Drew Endy, Ph.D.
  Stanford University
- Michele Garfinkel, Ph.D.
  J. Craig Venter Institute
- Herbert Lin, Ph.D.
  National Academy of Sciences
- Edward You
  Federal Bureau of Investigation

Strategies for Reaching Amateur Biologists

Observation 1

Like computer hobbyists in the 1970s, most amateur biologists today appear motivated by curiosity and challenge.

Recommended Strategy

Because the field of amateur biology is still in its formative stages, the U.S. Government should capitalize on this unique juncture to foster education and utilize strategies that (1) promote positive motives for participation in amateur biology and stigmatize negative ones, and (2) lay the groundwork for developing a culture of responsibility in the hobbyist community.

Strategies for Reaching Amateur Biologists

Observation 2

To the extent that amateur biologists are organized, this occurs under such groups as DIYbio, BioCurious, and genSpace

Recommended Strategy

Emerging organizations are key conduits for reaching an important segment of this community's members

Strategies for Reaching Amateur Biologists

Observation 3

Community culture values reputation as "good citizen" and responsible user of research technologies

Recommended Strategy

Message points about dual use may resonate most if embedded in broader concepts of personal and social responsibility

Strategies for Reaching Amateur Biologists

Observation 4

Agencies and organization who have organized face-to-face meetings with DIYbio members have found this mode of interaction highly successful

Recommended Strategy

Federal agency representatives and members of the scientific community knowledgeable about the dual use issue should attend, and offer to participate in programs of, meetings organized by amateur biologists

Strategies for Reaching Amateur Biologists

Observation 5

Community has expressed desire to interact with many agencies, such as the FDA, USDA, etc.

Recommended Strategy

Create opportunities for broad Federal interaction

Strategies for Reaching Amateur Biologists

Observation 6

Community is skeptical of government's interest in their activities

Recommended Strategy

Message points should focus on the possibility that amateur biologists can develop findings and technologies that could be abused by those who would do harm

Strategies for Reaching Amateur Biologists

Observation 7

Amateur biologists tend to be tech savvy, using Internet tools such as mobile devices, blogs, Twitter, Facebook, and Google groups to exchange information and organize

Recommended Strategy

Speaks to the value of electronic modes of communication

Strategies for Reaching Amateur Biologists

Observation 8

The youth and natural curiosity possessed by many in this group leads them to migrate to novelty devices

Recommended Strategy

Novelty and unconventional items can serve as effective conduits of information and messages regarding responsible research conduct

Strategies for Reaching Amateur Biologists

Observation 9

Have an interest in adhering to biosafety standards as a means of personal protection and social responsibility

Recommended Strategy

Message points about dual use research may be appended to information regarding biosafety practices

Strategies for Reaching Amateur Biologists

Observation 10

Looking to the future, it will be the amateur biology community itself that will be best poised to recognize the potential malevolent applications of this work and to "patch" vulnerabilities in life science endeavors.

Recommended Strategy

Part of cultivating a culture of responsibility within this community should include fostering an ethos of not only conducting amateur biology activities safely and responsibly, but also to take measures to prevent others from misusing technologies and information with dual use potential.

Strategies for Reaching Scientists in Non-life Science Fields

Observation 11

Individuals who collaborate in life science endeavors are extremely diverse in terms of training, scientific disciplines, and professional interests

Recommended Strategy

Outreach should take advantage of interdisciplinary mechanisms of communication (via associations, institutions, thought-leaders)

Strategies for Reaching Scientists in Non-life Science Fields

Observation 12

Many disciplines, such as physics and informatics, historically have had to consider the dual use implications of their research, and hence there is a greater acceptance and understanding that research results can be misused.

Recommended strategy

The experience and familiarity of many non-life scientists with the dual use research issue can be leveraged for the purpose of communicating the issue to life science colleagues

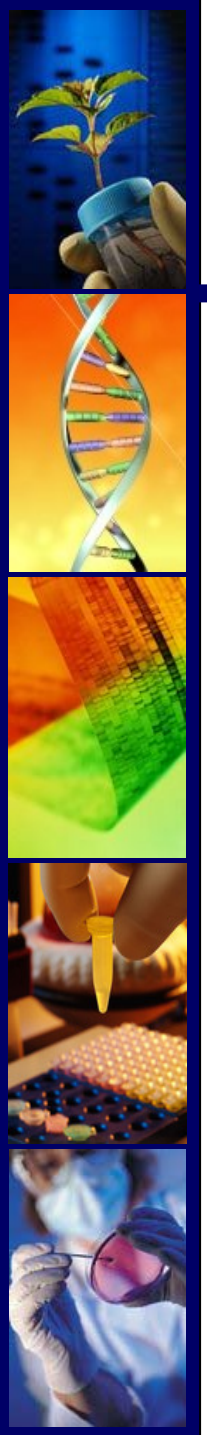
Strategies for Reaching Scientists in Non-life Science Fields

Observation 13

Practitioners of research in life science and non-life science fields share the responsibility for the integrity and safety of their work

Recommended Strategy

Message points should note that non-life scientists should consider the ways in which the life science dimensions of their work could be misapplied, as their field may have already done historically for more discipline-specific activities



Strategies for Reaching Scientists in Non-life Science Fields

Observation 14

Young people tend to be more receptive to the dual use message. Educational strategies have a more lasting impact, and a true culture shift is more likely to occur, when the educational intervention comes early in the educational process and is performed repeatedly.

Recommended strategy

As is true of life scientists, sensitization to the dual use issue should occur early in the educational process. It should occur beginning at the undergraduate level or, if appropriate, in high school.

Strategies for Reaching Scientists in Non-life Science Fields

Observation 15

Many of the educational tools developed to date have broad applicability

Recommended Strategy

Existing NIH educational tools have utility with respect to all scientific disciplines and should be fully utilized

Future educational tools should be developed with a scientifically diverse audience in mind

Conclusions

- Original strategic plan is still applicable
- Research on new audiences revealed special strategies that can be useful for these groups
- Opportunities for outreach and education are vast