

Report  
on the  
BME-IDEA  
Meeting

Chicago, Il  
October 11, 2006

Abigail Garner  
Matt Glucksburg  
Mary Gorman  
Christine Kurihara  
Jack Linehan  
David Schneeweis  
Phil Weilerstein  
Paul Yock

# Table of Contents

Status of BME-IDEA	3
Meeting October 11, 2006 Agenda	4
Panel presentations: Needs assessment & design of products addressing clinical needs in developing countries	6
Panel Presentation: Getting devices into the clinic: Social E-ship	7
Keynote speaker: Nancy Patterson	8
Breakout session: Teaching the Design Process in the Context of Resource-Poor Environment	9
Going Forward - Action Items for next year	11

## Status of BME-IDEA

After five years, the goals continue to be to:

- Share best practices
- Develop joint educational resources
- Build community

The 6<sup>th</sup> Annual meeting planning committee included: Abigail Garner (Stanford University), Matt Glucksburg (Northwestern University), Mary Gorman (Stanford University), Christine Kurihara (Stanford University), Jack Linehan (Stanford University), David Schneeweis (University of Illinois, Chicago), Phil Weilerstein (NCIIA), Paul Yock (Stanford University). BMES coordinator Barb Dunlavey assisted with organization support and Stanford University, University of Chicago, Northwestern University, Marquette University, NCIIA, NSF and Boston Scientific provided personnel and financial support. Our thanks to Phil Weilerstein (NCIIA), Semahat Demir (NSF), and Bruce H. KenKnight (Boston Scientific) for financial support.

### History of BME-IDEA

Our **first** meeting was held in conjunction with IEEE/EMBS-BMES (Houston, TX, 2002) where 11 universities, 18 faculty members attended. Groups formed around the topics:

- Structures for teaching design
- Industry involvement in design
- Design tools & contest
- Issues in design instruction

The **second** meeting, the SF Forum, was held in San Francisco, CA 2003 and included 19 universities. Each university presented program snapshots and breakout groups were held on:

- Life sciences & Core engineering science
- Design & Business/entrepreneurship
- Resources for funding
- Shared educational resources

The **third** meeting was the first held in conjunction with BMES in Nashville, TN in October, 2003. There were 44 universities represented with many presenting program snapshots. The afternoon breakout groups were held on:

- National contest
- Bmesource portal
- Industry needs

At that time we established name (BME-IDEA for **B**io**M**edical **E**ngineering – **I**nnovation, **D**esign and **E**ntrepreneurship **A**lliance).

The **fourth** meeting held in October 2004 included 64 attendees and represented 48 universities. Approximately 60% were universities that had representatives at an earlier BME-IDEA meeting. We formally announced the contest at this meeting and

continued to promote and recruit for participation in the bmesource.org portal.

Breakout sessions covered topics including

- Achieving Entrepreneurial Literacy
- What is industry looking for?
- How do you assess students/teams?

The **fifth** meeting was held in Baltimore, MD on September 28, 2005 and included 80 attendees from university faculty, government colleagues and foundation representatives. Of the sixty-seven universities 27% were new to the BME-IDEA meeting and 20% of the repeating universities sent new representatives. The morning session was devoted to Fostering Innovation with university and industry perspectives on innovation. Breakout sessions discussed challenges in creating high-quality innovation and design experiences for students covering:

- Courses and curriculum design
- Resources for teaching

At the reception the first BME-IDEA contest winners were presented with their awards.

## **BME-IDEA, October 11, 2006 Meeting**

The meeting, held in conjunction with BMES in Chicago, was the best attended yet. The overall topic was to fostering innovation by looking at the opportunities for biomedical engineers to address clinical needs in underserved populations in US as well in developing countries. We had over one hundred attendees including 16 newly represented universities, 59 repeat universities (with 28 sending new representatives). Thirteen department chairs were in attendance. Of the attendees twenty one percent were women.

We maintain a catalog of BME-IDEA programs and resources on our website:

<http://www.bme-idea.org/>

The agenda for the day was as follows:

7:30 – 8:00            Continental Breakfast

### **Morning session – Fostering Innovation – Opportunities for biomedical engineers to address clinical needs in underserved populations in US as well in developing countries**

8:00 – 8:15            Welcome Matt Glucksberg (Northwestern) & Paul Yock (Stanford)

8:15 – 9:15            Presentations: Needs assessment & design of products addressing clinical needs in developing countries

- Bruce H. KenKnight (University of Minnesota) Moderator
- David Kelso (Northwestern University)
- Cato Laurencin (University of Virginia)
- Robert Malkin (Duke University)
- Paul Yager (University of Washington)

9:15 – 10:00 Panel discussion: How do we introduce students to needs assessment & design of devices addressing clinical needs in developing countries?

- Bruce H. KenKnight (University of Minnesota) Moderator
- David Kelso (Northwestern University)
- Cato Laurencin (University of Virginia)
- Robert Malkin (Duke University)
- Paul Yager (University of Washington)

10:00 – 10:15 Break

10:15 – 11:00 Presentations: Getting devices into the clinic: Social E-ship

- Phil Weilerstein (NCIIA) Moderator
- Michael Diamond (World Resources Chicago)
- Paul Polak (IDE)
- Mladen Poluta (Groote Schuur Hospital / University of Cape Town)

11:00 – 11:45 Panel discussion: Getting devices into the clinic: Social E-ship

- Phil Weilerstein (NCIIA) Moderator
- Michael Diamond (World Resources Chicago)
- Paul Polak (IDE)
- Mladen Poluta (Groote Schuur Hospital / University of Cape Town)

12:00 – 1:00 Networking Lunch

### **Afternoon session – Teaching Innovation, Design and Entrepreneurship**

1:00 – 1:30 Keynote speaker: Conveying Concepts for Commercialization

- Nancy Patterson (The Alfred E. Mann Foundation for Biomedical Engineering)

1:30 – 2:00 BME-IDEA Project updates

- BME national design contest (Phil Weilerstein, Jay Goldberg, Humera Fasihuddin)
- BMEsource design portal (Abigail Garner and John Linehan)

2:00 – 4:30 Teaching the Design Process in the Context of Resource-Poor Environment

Amy Lerner (University of Rochester), Paul King (Vanderbilt), David Schneeweis (UIC), Maria Oden (Rice University)

4:30 – 5:00 Wrap-up: moving forward

- John Linehan (Stanford University)

5:00 – 6:00 Reception

## **Panel presentations: Needs assessment & design of products addressing clinical needs in developing countries**

Moderator: Bruce H. KenKnight, Boston Scientific

Presentations by:

- Robert Malkin (Duke University), Identifying and Fulfilling Needs in Developing World  
His conclusions were
  - Ignore the problem: WRONG
  - Public Policy: WORKS, but
  - Inventory: WRONG
  - Broken equipment analysis: WORKS, but
  - The long interview: WORKS!
- Paul Yager (University of Washington), Design and Global Health at UW  
His summary includes:
  - UW Bioengineering is just now coming to grips with teaching design to the undergrads
  - There are excellent resources available in Seattle (particularly PATH and SBRI) for partnering with teams working on critical health issues in the developing world
  - The ongoing formation of the new Global Health department will have a major impact on how this can be done at UW
  - We hope to connect the dots in the next 12 months
- David Kelso (Northwestern University), Needs Assessment & Product Design for the Developing World  
His message was that reviewing the process of user needs, design input, design process, design output to medical device at all points keeps it on target.
- Cato Laurencin (University of Virginia), What I've Learned From Two International Science Initiatives in the Developing World
- Dr. Laurencin discussed two International Science Initiatives: African Institute of Science and Technology, to focus on problems specific to Africa, and Biomaterial Science Initiative: Egypt, collaborative initiative with Egypt's National Science Foundation.  
His lessons were
  - Must understand the needs of the developing world
  - Stakeholder relationships must be established on the terms of the developing country
  - Once established and 'institutionalized' potential for sustained growth is high.
  - Barriers must be addressed in consideration with local needs
  - Global vs. local, what's more important?
  - What's most important to my international collaborator?

## Panel Presentation: Getting devices into the clinic: Social E-ship

Moderator: Phil Weilerstein, NCIIA The Ruthless Pursuit of Affordability in the Biomedical Sphere

Presentations by:

- Paul Polak (IDE), Design for the Other Ninety Percent: The Ruthless Pursuit of Affordability

He presented practical steps for designing cheap:

- Set specific cost targets
- Carefully analyze what the tool does
- Identify key cost contributors
- Design around each cost point by finding acceptable tradeoffs
- Ask customers to use it and make changes based on what they say
- Always field test and adapt a tool if you move it to a new place

- Michael Diamond (World Resources Chicago)

- Mladen Poluta (Groote Schuur Hospital / University of Cape Town)

He identified three challenges:

1. Responsiveness
  - Changing Environment
  - Dynamic disease burden
  - Rapid rate of innovation
2. Appropriate Solutions
  - Affordability
  - “Institutional” fit
  - Skills and knowledge
  - Sustainability
3. Resources
  - Match delivery to capacity
  - Prioritisation
  - Asset management
  - HR– building and retaining capacity
  - Information ⇔ Evidence ⇔ Practice

The discussion that followed touched on issues associated with getting devices into the hands of people who need them globally with a focus on design for **affordability, suitability and sustainability**

- Market driven solutions and the role of the customer
- The importance of integrated solutions
- Examples of effective and ineffective practices
- Thoughts on how to prepare & educate students to lead this revolution in design

## Keynote speaker

Nancy Patterson from The Alfred E. Mann Foundation for Biomedical Engineering, spoke on Concepts for Commercialization.

Her talk included:

Technology Transfer: A New Model

- Alfred E. Mann, Serial Entrepreneur, a short history of Alfred Mann
- “Bridging the Gap” discussed the funding gap between grants and sponsored research and late stage and public equity.
- Biomedical Philanthropy
  - **Philanthropic mission of Al Mann is to benefit mankind by expediting the delivery** of life-improving health sciences and products to patients.
  - Fundamental belief that in many cases accelerated commercialism is the best means to accomplish **expedited delivery** of health sciences and products **to patients**
- Alfred E. Mann Institutes Defined, a short history and description of the Alfred Mann Foundation for Scientific Research
- Analysis and Selection Process dissected the process that Mann Foundation uses to determine the disbursement of funds.
- Looking Into the Future

Her summary of an Alfred Mann Institute is:

- A generous philanthropy endowed by 81 year old Alfred Mann to change the way the technology transfer is executed
- Ultimate goal to ensure the commercialization of ideas that improve human health.
- Objective is to create significantly enhanced value for inventors and their respective universities
- Staffed with lifescience corporate business professionals to support the university researchers
- Designed to function in perpetuity under the university umbrella
- Revenue remains resident at the university
- Alfred E. Mann Legacy for the future of our nation and ultimately patient care

## **Breakout session: Teaching the Design Process in the Context of Resource-Poor Environment**

Moderator: Amy Lerner (University of Rochester), [Design Education in the Context of Resource-Poor Environments](#)

Organizational help from Matt Glucksberg (Northwestern University) and David Schneeweis (University of Illinois, Chicago)

Her goal for Workshops were:

- Identify challenges, issues and **opportunities** for design education...
- Learn about success stories
  - Students
  - Faculty
  - “Customers”
- Share ideas for resources
- Develop connections, partnerships, collaborations
- Develop ideas to carry forward...

The breakout session was broken into eleven different tables with 4 to 8 persons per table. Each table chose their own challenge (see below) and discussed it with reference to Discussion topics (see below).

Design challenges:

1. Accessible Dining Utensils
2. Point of Care Tuberculosis Diagnostics
3. Kangaroo Mother Care
4. Portable Oven for Fabricating Lower Limb Protheses
5. Upper Limb Prosthesis for Land Mine Victims

Discussion topics:

- Interviewing / Data Gathering in Resource-Poor Environments,
- Social / Ethical / Political Issues,
- Comprehensive Approach to Cost Analysis,
- Project Continuity - Broadening Impact
- Identifying Projects, Partners and Resources
- Balancing Simple Elegant Projects with Complex, High-Tech Projects in One Course

From the discussions that were refined after two iterations the following take home messages were presented:

- Industrial Design Schools for resources, facilities, etc.
- Continuity
  - Design education is key
  - Must focus on the needs of the 90%
  - Using students motivation to make a difference
  - Requires a champion to see the project through
  - Good documentation, follow regulations
  - Students Work before senior year

- Project Identification, Effectiveness
  - Have students present to the public
  - Courses for non-BME students, involve in engineering projects
  - Identifying needs, incorporate ideas in classes
- Available Funds
  - Evaluate the costs to the target community
  - Seek non-profit opportunities
- Simple vs. Complex design
  - All elements of design must be used
- Design of sub-standard equipment?
  - Policy statement needed?
- Project Identification
  - Seeking people who are in contact with costumers' needs
  - Bmesource.org, links with no restrictions
- Continuity
  - Continuing discussion of activity
  - Mutual understanding from both sides of design
  - Seeing the big picture while focusing on the small tasks
- Data Gathering
  - Identify the right questions
  - Quality vs. cost
  - Uncertainties remaining
- Social Issues
  - Cultural, local standards for testing
  - Brainstorm on social issues
- Cost
  - Manufacturing, lifecycle costs, profitability
  - Balancing among those without the funds
- Balance of Projects
  - Diversity of projects is important
  - Must set clear expectations
  - Reward the process, not just the outcome
- Continuity
  - Flow of information
  - Graduate Students and Mentors to guide
  - Allow them to get credit for their participation
- Cultural Taboos
  - Include contacts and links on bmesource
- Cross-functional teams
- Design Process
  - Stick with one and learn it

## Going Forward - Action Items for next year

Moderator: Jack Linehan (Stanford University)

This discussion was to determine the direction for the next meeting to be held in Los Angeles, September 26, 2007.

- Design “snapshots” and Design “snapshots” - reviewed/digested, This will come from a call for projects that are innovative in their teaching approach. Each group (university) will be given a short amount of time to present their program. A total of 20-30 programs will be examined in the morning session of the meeting.
- Directed/targeted areas, This is to continue by determining a specific area to focus on like this year with Global resource poor environments
- ↑ Diversity versus ↑ Technology, A discussion topic as to the increase in diversity within projects/universities and translating this into increased technology.
- Design at graduate level, How does design work at the graduate level. Presentation of working programs.
- ↑ Entrepreneurship, industry, non-governmental organizations, How do we increase the interaction with these groups?
- Coulter/translational work, How can one use the increased funding from the Coulter Foundation to stimulate translational work?
- Case studies, There are many case studies that could be presented.
- Business/elevator... etc
- Successful recent graduate projects, Many graduate students have had very good success in their projects. What are the keys to a successful project. Capture the ideas.
- Successful student input, As well many undergraduate students have had much success. Tell some of these success stories.
- NSF retrospective study
- Joan Walker - invite her back.

### Notes:

Slides presented during the meeting for which we have permission to show can be viewed online at: <http://biodesign.stanford.edu/forum/agenda/>