Background

1967:
- John Parrish finished residency in internal medicine
- Sent to Vietnam as Battalion Surgeon with the 3rd Marine Corps Division

Observation:
- Sophisticated development and use of innovative technology to fight the war
- Little advancement to treat the injured soldier
1974: John Parrish founded MGH Wellman Center for Photomedicine

**Problem**
- No effective, minimally-invasive treatment for skin diseases and lesions (psoriasis, port wine stains)
- Lasers used in industry, not able to translate to health care

**Solution**
- Realize potential of optical laser technology
- Multidisciplinary, multispeciality team needed to translate
  - 4 “C’s” (Competent, Committed, Clinical Champion)

**Results to Date**
- Optical delivery systems developed and applied to broad range of diagnostics/therapeutics (dermatology, urology, GI, ophthalmology, ortho, etc., etc.)
- Dermatology went from inpatient to outpatient
Impetus to Grow a Consortium

GI, Surgeon, Gyn, Radiologist

Interdisciplinary; Interinstitutional; Collaborative; Creating the Environment
Critical Perspective:
Success based on clinical pull NOT technology push

Healthcare Clinician:
- See, live the problems
- Unaware of technology
- Unable to find right collaborator
- Develop, build a “one of a kind”

Technologists:
- Don’t understand the clinical problem
- Develop and commercialize products that are not clinically adaptable
- Unaware of potential power of technology in healthcare
- Lack experience developing/testing prototypes in the care environment
CIMIT
Center for Integration of Medicine & Innovative Technology

Mission:

To improve patient care by bringing together scientists, engineers and clinicians to catalyze development of innovative technology, emphasizing minimally invasive diagnosis and therapy

CIMIT’s mission and focus are aligned to address and solve the barriers to bringing technology to health care for civilians and soldiers
CIMIT Consortium Members

Problem Rich Clinical Environment

- Beth Israel Deaconess Medical Center
- Brigham and Women's Hospital
- Massachusetts General Hospital
- Partners Healthcare

Solution Rich Technological Environment

- Boston Medical Center
- Children's Hospital Boston
- Newton-Wellesley Hospital
- Boston University
- Draper Laboratory
- MIT
- A Center at Harvard Medical School

* Founding Member

UK Manchester: 1st International Affiliate
Domain

CIMIT Areas of Concentration

• Devices
• Procedures
• Clinical Systems Innovation (CSI)
  (Creating “Living Laboratories”)
Fostering Innovation through...

The 3 “F’s”

Finding
• 4 C’s
• Convening
• Site Miners

Funding
• 20K - 200K

Facilitating
• Knocking down barriers
Facilitating: Fostering a Model for Translational Research...

supporting researchers across multiple phases of their projects

- CIMIT experts review best ideas
- Connect interested parties across institutions and disciplines
- Stimulate collaboration

Research Team Formed

Experimentation & Research
- Provide research management
- 1:1 coaching
- Connect with needed technology sources

Applying for Funding
- Grant-writing support
- Fund appropriate projects
- Connect teams with potential funding sources
  - Industry (including SBIRs)
  - Foundations
  - Government

Commercialization
- Legal aid (intellectual property issues)
- Connect teams with industries
- Business plan support
Examples of Collaborative Innovative Research:

I. Health Care Education
II. Hospital Processes
III. Devices
IV. Technology Down the Acuity Curve
I. Health Care Education

“We are at a crucial time in medical education, where revolutions in computing, mathematics, engineering and education surround us. Our challenge in medicine is to grab the best of these revolutions and create a new way of medical learning.”

Steve Dawson, MD, CIMIT
I. Health Care Education:
Combat Medic Training System (COMETS)

Steve Dawson, MD and Ryan Bardsley, CIMIT

Problem
• Often we learn on humans
• Current mannequins do not allow training in ‘real’ environments with ‘real’ human responses

Solution
• Full body autonomous casualty mannequin with stand alone operational capabilities (screams, winces from pain, can become unconscious
• Sensors record all treatment, allow debriefing

Results
• Under development, ‘manufacturable’ prototype scheduled for early 2009

Impact
• Allows learner to experience broader range and get immediate feedback on care delivered
• Will change medical education model
II. Hospital Processes: Operating Room of the Future (ORF)

David Rattner, MD, MGH

Problem
- ORs inefficient and overcrowded
- Patient data not integrated in real-time
- Long turnover time between cases

Solution
- Improve efficiency, comfort and safety
- Measure outcomes

Results to Date
- Measures outcomes to traditional OR
  - Time between cases reduced more than 50%
- 11 industry partners
- Created a national program focused on interoperability (safe environment)
III. Devices

Optical Coherence Tomography (OCT): from concept to reality in 7 years

Brett Bouma, PhD; Gary Tearney, MD, PhD; Johannes de Boer, PhD; Andrew Yun, PhD, MGH

History of OCT

- 1997 - Physicists came from MIT to MGH

- 1998 - Research too early for funding from NIH, NSF, etc.
  - CIMIT funded early, conceptual research: $99K

- 1999 - Built first OCT prototype for clinical trials

- 2000 - OCT devices tested in clinical trials for GI cancer detection, cardiology vulnerable plaque

- 2004 - OCT Technology licensed to Terumo Corp. for cardiac applications
III. Devices

Optical Coherence Tomography (OCT):
Building a Laboratory

- Annual budget has grown from $99K in 1998 to over $3.0M today
- Total CIMIT funding $2.5M
- Total Enabled funding $19.7M
- OCT team has grown from 3 people in 1997 to 32 people today
IV. Technology Down the Acuity Curve: Remote Physiologic Monitoring
Nat Sims MD, Ron Newbower PhD, Penny Ford Carleton RN, Mike Dempsey

Problem
• Monitoring moving beyond traditional settings

Solution
• A miniaturized, body-worn “bandaid” monitor
• Sensors monitor heart rate, respiration, motion and temperature

Results
• Prototypes developed and handed-off to military
• Work underway for civilian version for use in Emergency Rooms, Home

“Smart, wear-and-forget, inexpensive physiologic monitoring”
Lessons Learned

Facilitating Translational Research is “what we do”

- It takes commitment
  - Of the institutional leadership
  - Of the CIMIT core facilities
  - Of the investigators

- Supporting early, high risk innovation is what is needed to change patient care - with results within 3 - 5 years

- Long term investment must come from government, local institutions and foundations
<table>
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<td>Technology Strategy Board (TSB) Government Department for Business, Enterprise and Regulatory Reform</td>
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