

## A Model for Catalyzing Translational Research

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Clinical Research Excellence

## CIMIT 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



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## Who We Are - A highly developed network for multidisciplinary, inter-institutional innovation

Problem Rich Clinical Environment	Solution Rich Technological Environment
Beth Israel Deaconess Medical Center	Boston University
Boston Medical Center	Draper Laboratory *
Brigham and Women's Hospital *	Massachusetts Institute * of Technology
Children's Hospital Boston	Center at Harvard Medical School
Massachusetts General Hospital *	
Newtown Wellesley Hospital	
Partners HealthCare *	
VA Boston Healthcare System	
	International Affiliate - MIMIT Manchester, Integrating Medicine and Innovative Technology



\* Founding Member  
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## A Model for Engaging...

Public, Private & Non-Profit Sectors

Small / Large Industry primarily Medical  
Technology Companies

- Foundations
- Venture Capitalists
- National & Local Government
- National & International Affiliations

First International Affiliate



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## Barriers to Creation of Novel Solutions

### Healthcare Team

- Too busy
- Resist change
- Unaware of technology
- Unable to find right collaborator
- Lack prototype experience

### Scientists/Engineers

- Lack exposure
- Unaware of potential power of technologies
- Lack experience testing prototypes with end user

Don't know  
or understand  
one another  
(culture & language)

Both: Lack resources to support early/high risk innovation



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## Domain

Our Areas of Concentration

Devices

Procedures

Processes



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## Fostering Innovation through...

**FINDING** Investigators across Consortium & beyond  
(National & International collaborations)

Talent Pool Locally

20,000+ Academic Clinicians

6,000+ Academic Scientists and Engineers

45,000+ Students

500+ Industry Partners

**Mechanisms**

Convene: CIMIT Forum, MIT Course, Conferences

Network: Site Miners, Program Leaders & CIMIT Facilitators



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## Fostering Innovation through...

**FUNDING** Multidisciplinary Teams

- Seed funding for high-risk early innovation
- No other funding source available
- \$20,000 to \$200,000/year
- Competitive

500 Projects (teams)

300 Principal Investigators over 10 years

50 New Teams each year

140 Active Projects



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## Fostering Innovation through...

**FACILITATING**

- Industry Connections / Collaborations
- Technology Implementation (including IP protection)
- Commercialization Plan
- Government Regulatory Issues
- Additional Collaborators
- Additional Funding

33% of CIMIT Budget to Faculty and Staff



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## CIMIT Programs

Programs are dynamic and formed due to:

- Major area of need / opportunity
- Threshold number of projects funded

Program Leaders chosen for expertise as clinical or scientific champions (protect 5 – 10% of time)



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## CIMIT Programs

**Clinical Need**

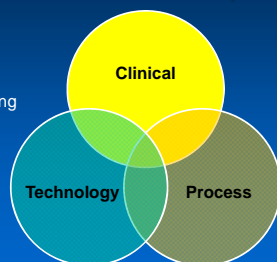
Cardiovascular Disease  
Minimally Invasive Surgery  
NeuroTechnology  
Trauma and Casualty Care

**Technology Opportunity**

Biodetection and Sepsis Control  
Biomaterials and Tissue Engineering  
Image-Guided Therapy  
Optical Diagnostics  
Simulation

**Process Change**

Clinical Systems Innovation  
Global Health



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## Site Miner

The Site Miner is scout, mentor, project manager, matchmaker, dealmaker, visionary, and reality tester

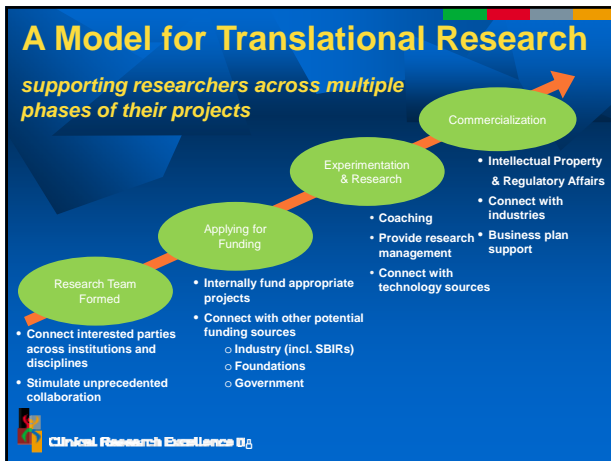
Overarching responsibility to assure that institution is maximally utilizing expertise and resources of CIMIT and to thoroughly mine to rapidly translate enabling technology into healthcare.

**Site Miner backgrounds**

Neurology, Thoracic Surgery, Internal Medicine, Ob/Gyn, Physics, Biomedical Engineering, Pulmonary, Orthopedics, Pathology, Nephrology



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- ## Collaborative Innovative Research
- ### Examples
- I. Health Care Education
  - II. Hospital Processes
  - III. Devices and Procedures
  - IV. Technology Down the Acuity Curve
- Clinical Research Excellence

- ## I. Health Care Education
- ★ **Combat Medic Training System (COMETS)**
    - VIRGIL: Chest Trauma Training System
    - Smallpox Inoculation Training Unit
    - Acute Stroke Intervention Simulator
    - Computer-Enhanced Laparoscopic Training Simulator
    - Real-Time Incident Preparedness Simulator
    - Cross-Training in Interventional Cardiology & Cardiac Surgery
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## Education Innovation: Combat Medic Training System (COMETS)

Steve Dawson MD, MGH and Ryan Bardsley, CIMIT

**Problem**

- Clinicians practice skills on humans
- Current mannequins not realistic enough

**Solution**

- Full body autonomous casualty mannequin with stand alone operational capabilities (screams, winces from pain, can become unconscious, and sensors record all treatment)

**Results**

- Manufacturable prototype 2009

**Impact**

- Learner experiences broader range of problems and gets immediate feedback

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- ## II. Hospital Processes
- ★ **Operating Room of the Future (ORF)**
    - A 'Living Laboratory' within a working hospital
    - Medical Device Plug and Play (MDPnP)
  - Ambulatory Practice of the Future
  - ER of the Future
  - NICU of the Future
  - Hospital of the Future
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## 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**

- Compared outcomes of traditional to new OR design - Time between cases reduced > 50%
- Industry Partnership with 11 companies

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## ORF Industry Partnership

### Active RFID Indoor Location System

Michael Dempsey, Co-Founder, Radianse, Inc.

#### Problem

- No reliable system to locate patients, hospital, personnel, equipment
- Most solutions require manual scanning

#### Solution

- Develop GPS-like active RFID system for real-time location

#### Results

- Commercial product now in 29+ hospitals
- \$17M in venture capital; 9 patents

#### Future Plans

- Develop automated process optimization algorithms

#### Impact

- Real time location & flow (patient, staff, equipment)
- Increased safety & efficiency



## ORF Industry Partnership

### Integrated Data / Displays / OR Dashboard

Warren Sandberg MD, PhD, MGH and Jeffrey Robbins, CEO, LiveData, Inc.

#### Problem

- Patient care data isolated; not integrated; not real-time

#### Solution

- Electric grid experts interested in health care
- Dashboard integrates clinical data; patient/clinical positioning; and physiological monitoring

#### Results to Date

- Equipment integration successful
- Data visible real-time to all caregivers
- Product commercialization

#### Future Plans

- Develop dashboards for other clinical sites

#### Impact

- Real time patient data integration incorporated with RFID tracking & EMR



## ORF Industry Partnership

### Integrated Data / Displays / OR Dashboard

Warren Sandberg, MD, PhD, MGH and Jeffrey Robbins, CEO, LiveData, Inc.



## Plug and Play – controlling, integrating medical devices

Julian M. Goldman, MD, MGH

#### Problem

- Patients die due to non-interoperability of medical devices
- No industry or government standards for medical device interoperability

#### Solution

- Establish national – international program
- Engage clinicians, industry, government regulators to define/promote adoption of standards
- Develop standards through regulatory bodies (ISO, IEC ...)
- Use Case Demonstrations



## III. Devices and Procedures

- ★ Optical Frequency Domain Imaging
- Natural Orifice Transluminal Endoscopic Surgery (NOTES)
- Polymer Film Drug Delivery
- Seizure Detection and Intervention
- Non Surgical Repair ACL
- Real Time Breath Analysis



## Minimally-Invasive, Real-Time Optical

### Cancer Detection (Esophageal, Laryngeal, Cervical and Bladder)

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

#### Problem

- Esophageal cancer five yr. survival rate 9 – 16%\*
- No real-time method to detect & treat *epithelial cancers*

#### Solution

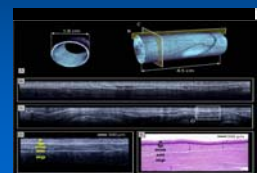
- Modify and improve Optical Coherence Tomography (OCT) technology from 'point' to 'comprehensive volumetric' scanning

#### Results

- Scans entire esophagus in 45 seconds
- Developing 'dual use' device (screen & treat)
- Technology licensed

#### Future Plans

- Implement OCT volumetric screening and laser ablation treatment

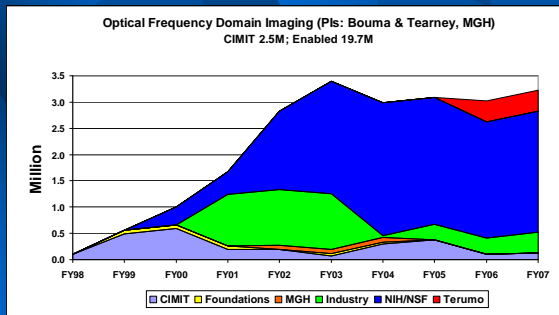


360 degree comprehensive screening

\*American Cancer Society 2005



## “Enabled” Funding



## IV. Down the Acuity Curve

- ★ Remote Physiological Monitoring
  - Virtual Home Visits
  - Kiosks
  - Traumatic Brain Injury Rehabilitation
  - Robotics for Rehabilitation

## Down the Acuity Curve Remote Physiologic Monitoring

Nat Sims MD, Ron Newbower PhD, Penny Ford Carleton RN, Mike Dempsey MGH

### Problem

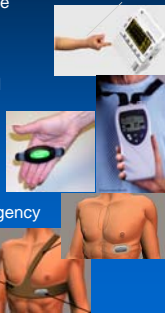
- Monitoring is moving to remote surveillance in home

### Solution

- A miniaturized, body-worn “bandaid” monitor
- Sensors monitor heart rate, respiration, motion, and temperature
- Transmits data to remote medical facilities for surveillance

### Results

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



## A Model that Works

### Key Metrics

- Academic
  - Recruitment, retention, promotions
  - > 600 publications
  - > 100 national presentations
- Business
  - 200 disclosures
  - 80 patents (20 issued)
  - 30 licenses
  - 11 companies started or redirected
  - 60 industry partnerships
  - \$542k royalties and license fees
- Outside Funding
  - > \$140M direct to CIMIT
  - > \$150M enabled

### Impact

- Patient Care Improvements
- Exciting projects in the “pipeline”
- Career Fulfillment
- National / International Programs
  - NOTES
  - Plug and Play
  - Simulation

## A Look to the Future....

2008

- \$2.1 M investment in NOTES
- \$5 M investment in 53 novel innovative projects
- Manchester UK strategic alliance
- Inhalation Technology Program launched via \$1.5M gift

By 2012

- Collaborate with like-minded organizations
- Study CIMIT Model to encourage groundbreaking solutions
- Collaborate with National & International Alliances

## The CIMIT Model

A work in progress

We are eager to  
Share our experiences  
Learn from you

