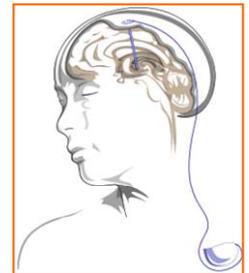
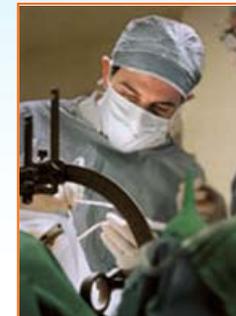


Advancing HealthCare Innovation & Entrepreneurship

CIMIT and the CIMIT Accelerator

Colin J.H. Brenan, Ph.D.
Director, Strategic Relationships

IEEE EMBC2011
Boston, MA USA
September 2, 2011



Agenda

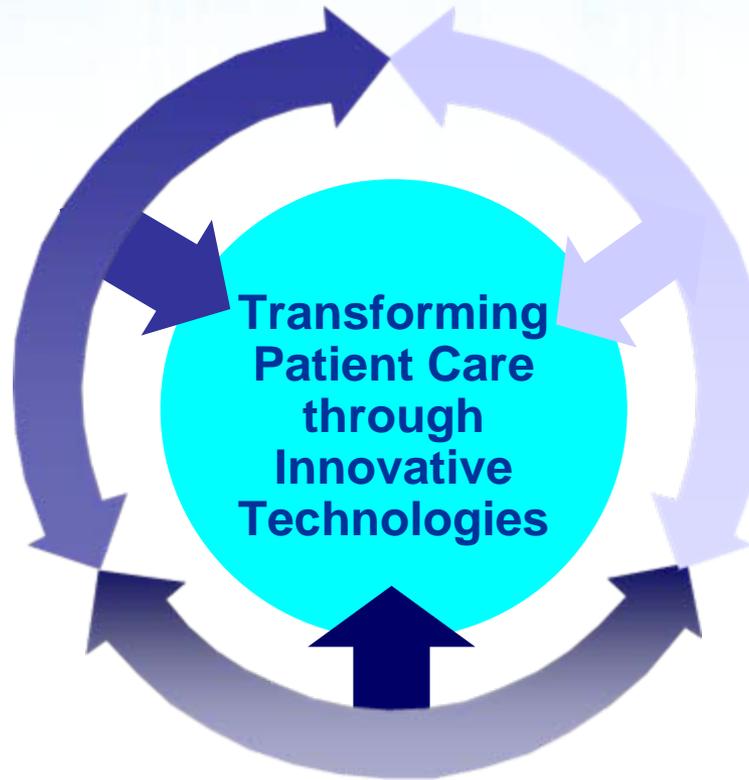
- **The Challenges of Healthcare Innovation**
- **Rising to the challenge: The CIMIT Innovation Model**
- **How have we done?**
- **Lessons Learned**

The Challenge of Healthcare Innovation

Translational work requires collaborations that are not easy ...

“Clinical” Environment

- Too busy
- Embedded in current standard of care
- Unaware of technology opportunities
- Unable to find right collaborators



“Science and Engineering” Environment

- Lack exposure to clinical needs and constraints
- Unaware of potential power of technologies
- Lack experience testing in a clinical environment

Commercialization

- Difficulty interfacing with academics and institutions (COI, staff with expertise, etc.)
- Challenge aligning risks and rewards; looking for technologies that are more “de-risked”

CIMIT – A Boston-wide Consortium with Over A Decade of Experience

1998



MASSACHUSETTS
GENERAL HOSPITAL



BRIGHAM AND
WOMEN'S HOSPITAL



Massachusetts Institute of Technology



In Collaboration with
Telemedicine and Advanced
Technology Research Center



Beth Israel Deaconess
Medical Center



NEWTON-WELLESLEY
HOSPITAL



International Affiliates

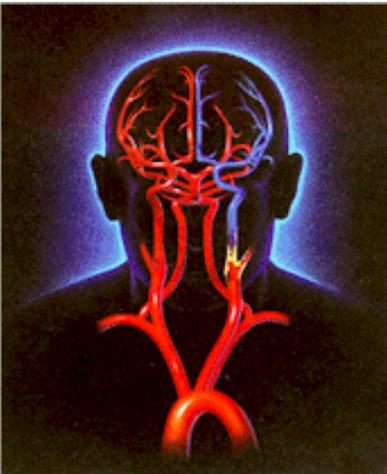


Agency for
Science, Technology
and Research



VA Boston

CIMIT Mission and Domain



CIMIT Mission

To improve patient care by facilitating collaboration among scientists, engineers and clinicians to catalyze the discovery, development and implementation of innovative technologies

CIMIT Domain

- *Devices*
- *Procedures*
- *Clinical Systems*

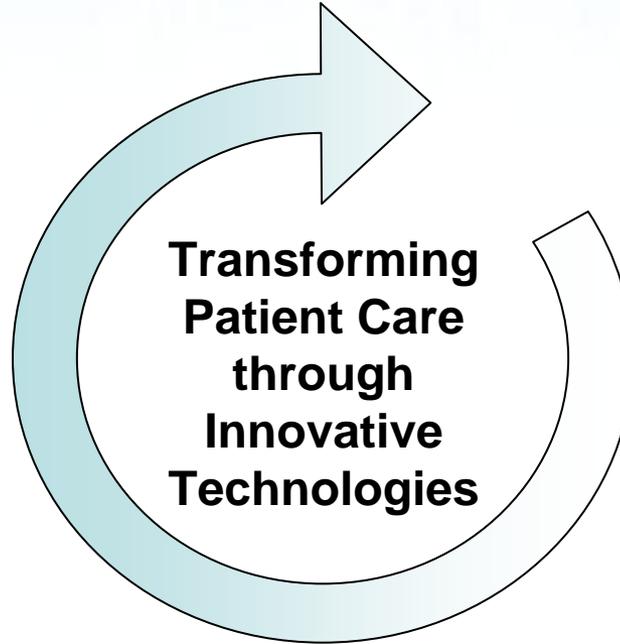
CIMIT Model: We Invest in Innovation at Multiple Levels

Process

Find, Fund & Facilitate – A validated innovation model with a proven track record of success.

Programs

Investment in targeted areas of unmet need to create a pipeline of innovation from concept-to-commercialization



Projects

Invest in ideas with potential for significant, near-term clinical impact

Platform

Inter- and intra consortium partnerships and collaborations

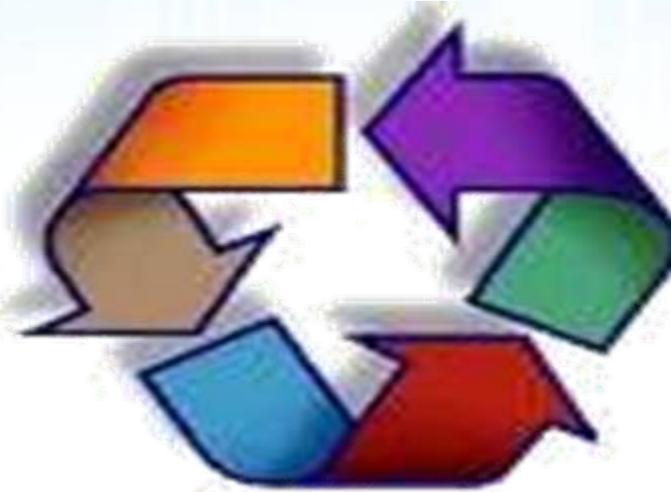
People

A network of collaborating academic, engineering, clinical and business organizations

Key Elements of the CIMIT Innovation Process: Find, Fund & Facilitate

Find

- Site Miners
- Program Leaders
- CIMIT Forums
- Conferences
- Courses



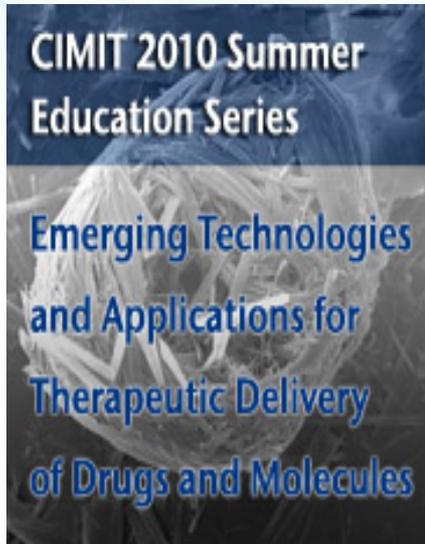
Fund

- Innovation Grants
- Accelerator Program
- CIMIT Prize for Primary HealthCare
- Young Clinician Award

Facilitate

- Support proposals
- Find collaborators
- Understand & protect IP
- Create commercial options and plans
- Address compliance issues
- Anticipate & address regulatory issues
- Assist in follow-on funding

Bringing People Together: The Power of Convening



CIMIT 2009 Innovation Congress “Accelerating Healthcare Solutions Through Technology”

- Bringing together innovators in government, industry, academia, foundations and the military to explore novel technology-based solutions that have the potential to transform healthcare.

CoLab: A virtual collaboration environment

Social Media: CIMIT Blog, Facebook, Twitter



The CIMIT Forum
The interdisciplinary
arena to promote the
exchange of ideas and
information to improve
patient care

C i W: CIMIT Innovation Workshop
October 26, 2010

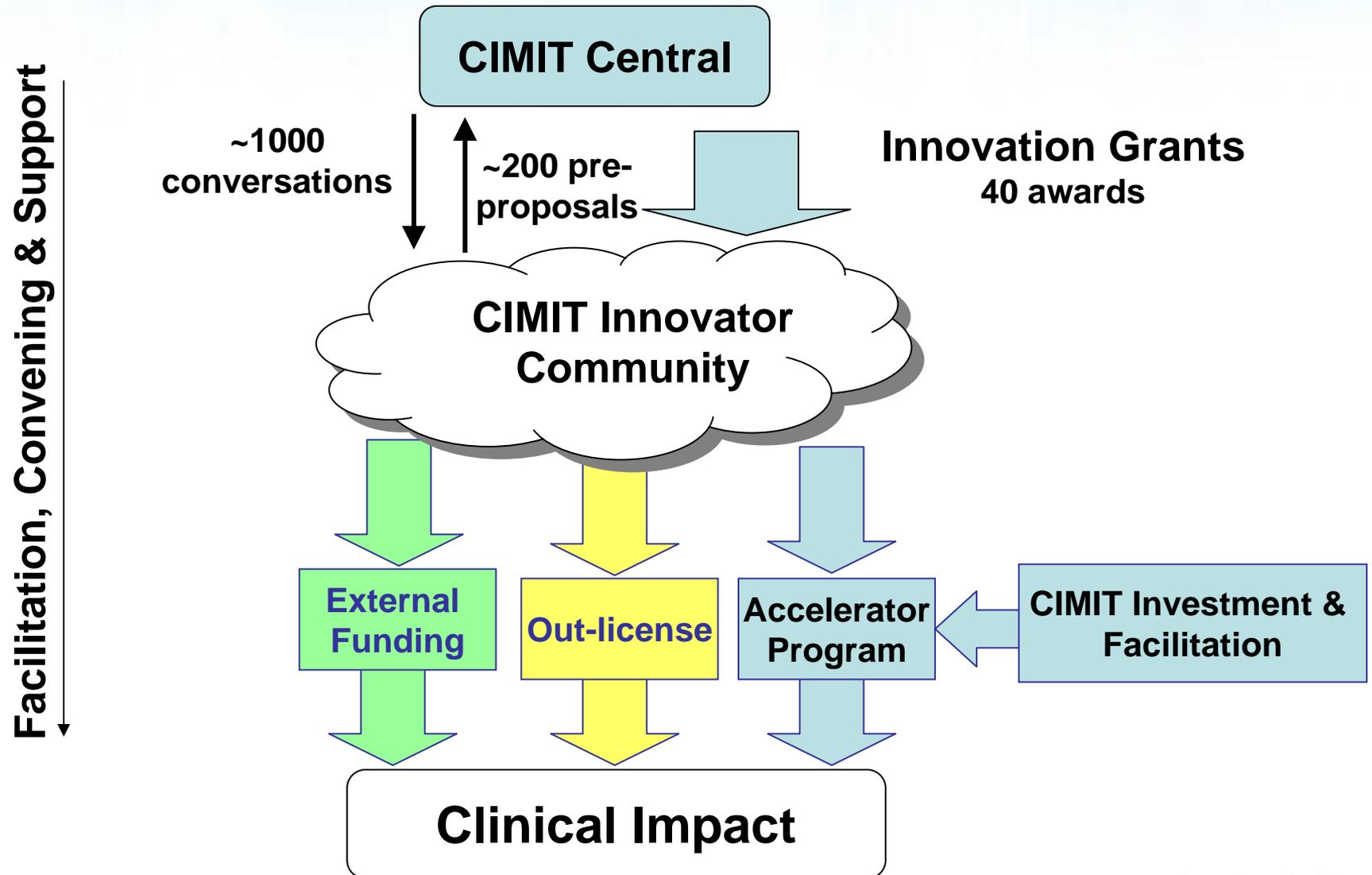
Early, Innovative Resuscitation
and Bleeding Control
After Injury

Investments in Human Capital: Fostering Rising Stars in Translational Healthcare

- **Young Clinician Awards:** Selected by each hospital to recognize and support clinicians with promising translational research careers
- **Primary Care Prize:** A national competition open to graduate and undergraduate engineering students from accredited engineering programs to stimulate ideas for technologic innovations with great potential to support and catalyze improved delivery of healthcare at the frontlines of medicine
- **Trauma Fellowship:** National fellowship in conjunction with the American Association for the Surgery of Trauma (AAST) in field of technology in trauma and critical care.
- **CIMIT Engineering Fellows:** A two-year award for graduate level engineers at MIT and BU pursuing technology solutions for important unmet medical needs
- **Translational Courses (MIT, BU, Harvard):** Bringing clinicians and real-world problems into the class room for students learn about applying engineering to medical/clinical problems.

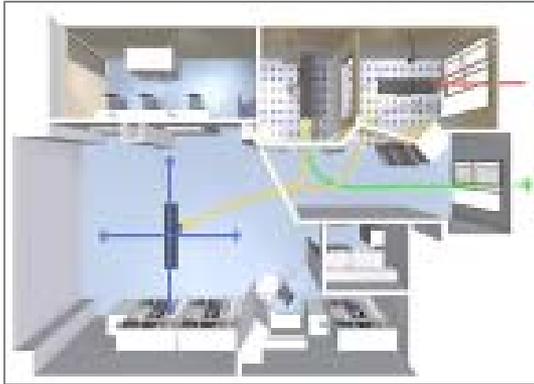
“Fuel for the Innovation Engine”

CIMIT Funding Mechanisms

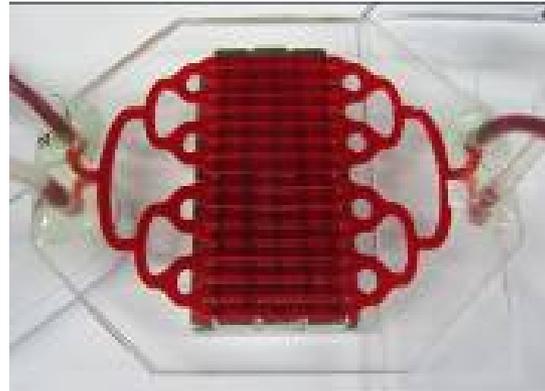


Broad Portfolio of Projects ... (6 of more than 500)

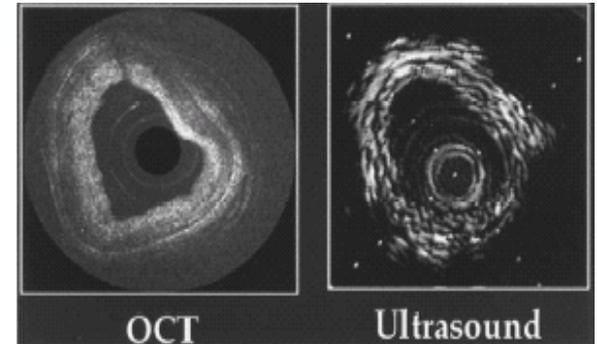
Learning Lab OR of Future



Microfluidic Blood Filter for Sepsis



Optical Diagnostics



Simulators for Training



Hand Hygiene System



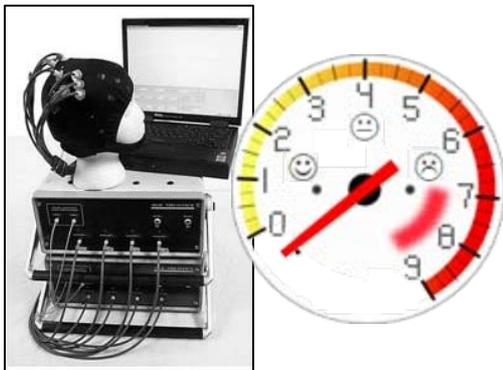
Seizure Detection System



Example: Medical Devices

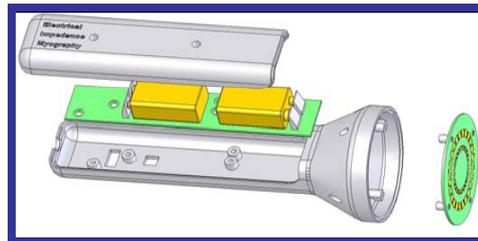
Determination of Pain Level

- Patient awareness/pain during anesthesia or sedation can be traumatic, go undetected
- Detection of brain signals with non-invasive near infrared provides objective determination of patient pain level
- Enables pain control
- Proceeding to Clinical Trials



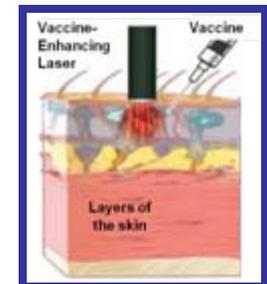
Neuromuscular Assessment

- Traditional electromyogram (EMG) to study nerve or muscle damage is invasive, expensive, painful
- Handheld electrical impedance myography (EIM) device developed for real-time, non-invasive neuromuscular assessment
- Commercializing with Convergence Medical Devices
- **Awarded \$1M from Prize4Life**



Laser-based Vaccine Delivery

- Critical need for more effective vaccines
- Laser-based, not chemical or biological adjuvant, to enhance immune response without significant inflammatory response
- Compact, off-the-shelf laser technology achieving up to 10x vaccine response
- Clinical studies proceeding
- Boston company formed, two subsidiary companies formed



Example: Clinical Systems

Handwashing Reminder System

- Proper hand cleansing critical to decrease hospital infections
- Ultrasound-based “zone of safety” around patient measures hand hygiene compliance
- Provides real-time reminders to caregivers
- Start up company in 2010
- DoD/VA JIF award in 2010 for clinical trials



**Washing
Transmitters**



**ID Badge
Receiver**



Protection Zone Transmitters

Radiofrequency ID Tracking

- Lack of hospital-based system to track equipment/ patient flow in real time
- Active RFID with web browser interface allows real-time tracking to minimize asset losses, optimize patient flow
- Developed with industry partner as part of the Operating Room of the Future initiative
- Obtained millions in SBIR and VC funding
- Commercial product used across US



Medical Device Plug-and-Play

- Medical devices are designed as proprietary, stand alone systems
- Data not integrated
- Networked medical device systems will produce complete, accurate electronic health records, create error-resistant systems, and reduce healthcare costs
- Standards now in place
- Multiple large hospital system purchasing agreements now require compliance with standards



“Learning Laboratories” for Primary Care

“Living” Learning Laboratory for Primary Care at MGH

David Judge, MD (MGH)

- Innovative patient-centered practice providing care “in the right place, at the right time”
- Focus on prevention/wellness /coordinated care for acute and chronic illness
- Integration of novel technologies and supporting information systems
- Redesigned physical space and virtual practice
- Collaborative, team-based care
- Opened July, 2010



“Living” Learning Laboratory for Primary Care at BWH

Asaaf Bitton, MD MPH (BWH)

- Adoption of Patient-Centered Medical Home (PCMH) model
- Patient-oriented , comprehensive team-based care delivered with better use of health information technology and population-based disease management tools.
- Focus on better coordination of care transitions (handoffs)
- Re-orientation of practice around patient and family goals
- Practice under construction. To open summer, 2011



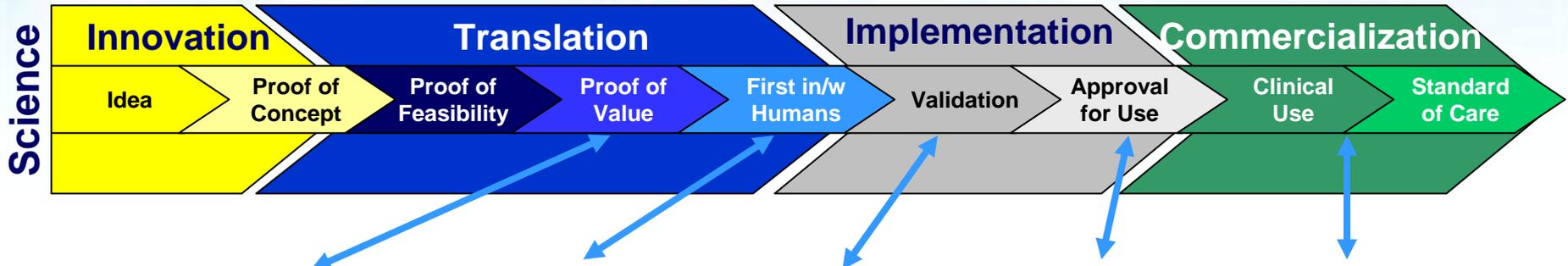
Health and Wellness Virtual Care

Ronald Dixon, MD (MGH)

- Developing secure, patient-centric and self-administered health kiosk in community settings
- Connected to clinicians and healthcare records
- Supports synchronous and asynchronous visits by patient
- Basic point-of-care testing capabilities that are as easy to use as an ATM
- Reduces low acuity work load and visits to office
- Shifts focus to patients that need more care, more often



Commercial Impact Summary: Commercial Exits and Status



- Alito Scientific
- Aurora Flight
- Bioengineering Networks
- Reflectance Medical Inc
- RenalWorks
- Robopsy
- Seacoast
- Sionex Corp

- Cardiosign
- MindChild
- Connective Orthopaedics

- Dentagenix
- Guidant
- Aura Medsystems, Inc.
- Boston Biocom LLC
- Intelesens
- Medtronic

- Convergence Medical Devices, Inc
- Cyberonics
- Daktari
- HanGenix
- Insightec
- NinePoint Medical
- Terumo

- Myomo
- LiveData
- Mobile Aspects
- Bioscale
- SRU Biosystems
- Visen
- CAE Healthcare
- Aeris Therapeutics
- Cynosure
- InfraReDx
- Omniquote
- Radianse

Over 3 dozen companies have been formed or impacted by CIMIT projects resulting in an estimate of:

- Over \$450M in commercial investment
- Tens of thousands of patients impacted
- More than 600 commercial sector jobs created

CIMIT Accelerator

- **Mission:** Find, fund and facilitate projects that have realistic chance of clean handoff to industry or widespread clinical adoption within 12-18 months.

- **Approach:** Formalize approach found in CIMIT's prior successes highlighted in CIMIT's Clinical Impact Study:
 - PI must be eager for “heavy facilitation” and focused on implementation.
 - CIMIT supports a “Project Champion” (who need not be the PI)
 - CIMIT Facilitators and outside experts “fill the gaps” and speed toward implementation and/or commercialization
 - Team must complete an Impact Plan

- **Goals:** Accelerator will be self-sustaining and provide a ongoing mechanism to:
 - Provide guidance to all CIMIT supported projects
 - Support at least 4 new projects a year
 - Be a resource for all Stakeholders

Selection Criteria

- **Projects are scored based on the following nine criteria:**
 - PI's willingness
 - Patient Impact
 - Market Size
 - IP Position
 - Competitive Position
 - Exit Strategy
 - Customer Validation
 - Customer's ROI
 - CIMIT Return
- **These criteria are analyzed against objective metrics**
- **Each criteria is ranked 0 to 3 and then are multiplied together and scaled to provide an overall score**

CIMIT Impact

A snapshot in 2009 of output metrics from \$37M of project funding (from '98 to '06, 261 projects in 117 clusters)

- **Clinical Adoption:** >20% with regulatory approval for human use.
- **Commercialization:** > 30% with a licensing agreement
 - 20+ NewCos
 - 10+ License agreements
- **Enabled Funding:** > 60% with some follow-on funding

Direct to Investigators	>\$115M
+ Commercial Inv	> <u>\$220M</u>
= Total	> \$345M+ (~9X of CIMIT funding to PIs)
- **Patents:** > 15% with at least one issued patent (a total of over 30)
- **Publications:** > 60% with at least one peer reviewed article (a total of over 700)

Lessons Learned

- “Clinical Pull” more effective than “Technology Push”
- Junior faculty are a great source of innovation; as successful as senior investigators in CIMIT model
- CIMIT’s greatest “bang-for-the buck” has occurred in projects with funding in the \$100K to \$300K range.
- Focus on building self-sustaining programs
- Building communities of interest (Programs) and connecting projects improves results
- Time alone is not correlated with clinical impact.
- Site Miners = great investment
- Making connections requires a variety of “convening” vehicles.
- Facilitation creates results but must be very pro-active.
- Continuity needed to bridge gap from Innovation Grants to commercialization

**Thank You!
Questions?**

www.cimit.org