The Region — Central Maryland

- Unrivaled Research Assets -
- Unfulfilled Commercial Promise -
State of Maryland: Federal & University Resources

- Population: 5.9 million people
- 59 Federal Laboratories, Centers, & Institutes in Maryland
- Maryland Federal R&D investment exceeding $12 billion annually

JHU and USM represent another $3.5 billion in annual R&D
Challenges to Innovation Economy

- Lack of connection of innovation resources
- Lack of an entrepreneurial culture and C-level executives
- Lack of early-stage funding for commercializing technologies
- Lack of spin-offs from federal and university R&D

BHI Value Proposition

- Connect regional innovation assets
- Develop an entrepreneurial talent and support pipeline
- Attract funding for technology commercialization
- Evaluate commercially relevant federal and university technology
BioHealth Regional Innovation Cluster Assets
What is A Regional Innovation Intermediary?

An organization at the center of the Central Maryland region’s efforts to:
- Align local technologies, assets and resources
- Advance Innovation

- Regionally-oriented
- Private-public partnership, 501(c)(3) nonprofit
- Market-driven, private sector-led
- Neither a government initiative, nor a membership organization
BHI: An Innovation Intermediary that Connects

- Connects Private, Public and Academic Sectors
- Connects Bio-Health Cluster Industries
- Connects Central Maryland Communities
- Connects Regional, National and Global Markets
Regional BioHealth Ecosystem Partners

**ACADEMIA**
- Research/T2
- Lifelong Learning
- Economic Development

**INDUSTRY**
- Profit
- Process
- Product

**GOVERNMENT**
- Sustainability
- Infrastructure Support
- Economic Policy

**FOUNDATIONS**
- Economic Growth
- Community Investment
- Regional Collaboration

**INSEPARABLE MISSIONS**
# BHI Partners and Sponsors

## Private Sector
- GlaxoSmithKline
- AstraZeneca
- BD
- Adventist HealthCare
- SR-One
- MedImmune
- QIAGEN
- Emergent BioSolutions
- VENABLE LLP
- Northrop Grumman
- Kaiser Permanente
- United Therapeutics Corporation
- M&T Bank
- Capital Management LLC
- Deloitte
- Perceptron Inc.
- China Growth and Development
- Olds
- Dreamit Health Baltimore
- GenVec
- Ernst & Young
- NEA
- Cassidy Turley Commercial Real Estate Services
- Noble Life Sciences
- SAIC

## Government
- Montgomery County Business Innovation Network
- Montgomery County Economic Development
- Maryland Economic Development
- EDA
- NIH National Institutes of Health Office of Technology Transfer
- NIH National Heart, Lung, and Blood Institute
- BIOxMARYLAND
- INNOVATE Maryland’s Innovation Initiative
- RYLAND OF OPPORTUNITY
- Frederick Economic Development
- InvestMaryland

## Academia
- University of Maryland UM Ventures
- University of Maryland BioPark
- Johns Hopkins University
- Johns Hopkins University
- Mtech Maryland Technology Enterprise Institute
- bwtech@UMBC Research & Technology Park
- Maryland Technology Development Corporation

## Non-Governmental
- Economic Alliance of Greater Baltimore
- Tech Council of Maryland
- Rockville Economic Development, Inc.
- Maryland TEDCO
## BHI Board of Directors

<table>
<thead>
<tr>
<th>Company/Position</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>emergent biosolutions</td>
<td>Daniel J. Abdun-Nabi</td>
</tr>
<tr>
<td>VENABLE LLP</td>
<td>Michael J. Baader, Esq.</td>
</tr>
<tr>
<td>Viable Solutions</td>
<td>Richard A. Bendis</td>
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<tr>
<td>Noble Life Sciences</td>
<td>Kenneth Carter</td>
</tr>
<tr>
<td>BioHealth Innovation</td>
<td>Cynthia L. Collins</td>
</tr>
<tr>
<td>Clariant</td>
<td>Scott Dagenais</td>
</tr>
<tr>
<td>M&amp;T Bank</td>
<td>Ronald J. Daniels</td>
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<tr>
<td>SR-one</td>
<td>Jens Eckstein</td>
</tr>
<tr>
<td>Cassidy Turley</td>
<td>David M. Gillece (Secretary)</td>
</tr>
<tr>
<td>BD Diagnostics</td>
<td>Rick Ivey</td>
</tr>
<tr>
<td>University System of Maryland</td>
<td>William E. Kirwan</td>
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<tr>
<td>Qiagen</td>
<td>Douglas Liu</td>
</tr>
<tr>
<td>New Enterprise Associates</td>
<td>David Mott</td>
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<tr>
<td>Adventist HealthCare</td>
<td>William G. Robertson</td>
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<td>EAGB</td>
<td>J. Thomas Sadowski</td>
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<tr>
<td>MedImmune</td>
<td>Reginald Seeto</td>
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<tr>
<td>ACAO</td>
<td>Thomas Street</td>
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<tr>
<td>MoCo Government</td>
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CEO, Emergent BioSolutions                            |
Managing Director, Venable LLP                        |
President & CEO, BioHealth Innovation, Inc.           |
Chair, Noble Life Sciences                             |
CEO, Clarient, GE Healthcare                           |
Senior Vice President, M&T Bank                       |
President, Johns Hopkins University                    |
President, SR One (GSK)                                |
Vice President, R&D, BD Diagnostics                   |
Chancellor, University System of MD                    |
Senior VP of GO, Qiagen                                |
General Partner, New Enterprise Associates             |
President & CEO, Adventist HealthCare                  |
President & CEO, EAGB                                  |
VP, Partnering and Strategy, MedImmune                 |
Astrazeneca                                            |
AACAO                                                  |
Mission
BioHealth Innovation connects market relevant research assets to appropriate funding, management, and markets to facilitate the development of commercially viable biohealth products and companies.
BHI Technology Focus

- Therapeutics
- Diagnostics
- Medical Devices
- Healthcare Services
- E-Health
- Mobile Health
- Electronic Medical Records
- Health Informatics
- BioHealth Cyber Security
Innovation Paradigm Shift

PROOF OF CONCEPT
(Technological Feasibility)
Laboratory Push
“It Works!”

PROOF OF COMMERCIAL RELEVANCE
(Market Pull)
“It Works To Solve A Problem”
“I’ll Buy It”
BHI Commercial Relevance Advisory Board

- 31 experienced biohealth professionals assisting BHI in evaluating market-relevant research and product development opportunities

- The CRAB helps determine the commercial applicability of emerging entrepreneurs, companies and their science or technology.
## Innovation Capital Valley of Death

<table>
<thead>
<tr>
<th>Stage</th>
<th>POR / Pre-Seed</th>
<th>Seed/Start-Up</th>
<th>Early</th>
<th>Later</th>
</tr>
</thead>
<tbody>
<tr>
<td>Source</td>
<td>Founders, FFF</td>
<td>Angels, IBED, SBIR</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bootstrapping</td>
<td>Accelerator Seed</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Crowdfunding</td>
<td>Funds</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Demand</td>
<td>$0K</td>
<td>$500K</td>
<td>$2.5M</td>
<td>$5.0M</td>
</tr>
</tbody>
</table>

"VALLEY OF DEATH"

Funding Gap

Secondary Funding Gap
# BHI Innovation Capital Map

## Pre-Proof of Concept
- NIH R01
- NIH R03
- NIH R21

## Translational Research/Proof of Concept
- SBIR/STTR Grant Phase 1
- NCATS Cures Acceleration Network (CAN)
- Maryland Stem Cell Research Fund (MSCRF) - Various
- TEDCO Technology Validation Program - Proof of Concept
- TEDCO Maryland Innovation Initiative - Phase 1
- JHU - Coulter Translational Research Partnership

## Proof of Commercial Relevance/Pre-Seed
- Maryland Industrial Partnerships (MIPS @ UMD)
- TEDCO Maryland Innovation Initiative - Phase 2
- Maryland Stem Cell Research Fund (MSCRF) - Pre-Clinical
- TEDCO Technology Validation Program - Market Assessment
- BHI SBIR/STTR Federal Funding Assistance Program

## Seed/Start-Up
- Dingman Center Angels (UMD)
- BioMaryland Biotechnology Dev. Award - Translational Res.
- TEDCO Patent Assistance Program
- TEDCO Technology Commercialization Fund
- TEDCO Maryland Innovation Initiative - Phase 3
- SBIR/STTR Phase 2
- BHI Commercial Relevance Fund (CRF)

## Early Stage
- Propel Baltimore Fund
- TEDCO Veterans' Opportunity Fund
- Invest Maryland: Maryland Venture Fund
- BioMaryland Biotechnology Dev. Award - Commercialization
- Maryland Health Care Product Development Corporation
- Abell Venture Fund
- MMG Ventures LLP
- TDF

## Later Stage
- Maryland Venture Fund Authority
- ABS Capital Partners
- Greenspring Associates
- Novak Biddle Venture Partners
- Sterling Venture Partners
- Harbert Venture Partners
- JMI Equity
- New Enterprise Associates

### Associations
- Association of University Resource Parks (AURP)
- Association of University Technology Managers (AUTM)
- Licensing Executive Society (LES)

### Funding Type Key
- Academic
- State of Maryland
- Federal
- BioHealth Innovation, Inc.
- Economic Development
- Private Capital

### Tax Credits
- Maryland Biotechnology Investor Tax Credit
- Montgomery County Biotechnology Investor Tax Credit
**BHI Commercialization Pipeline**

- **Sources** and evaluates biohealth intellectual properties (IP)
- **Funds** market-relevant IP
- **Grows** and markets businesses and products
BHI Commercialization Model
BHI Entrepreneur-in-Residence Program

A team leader who combines scientific, financial/VC and entrepreneurial management experience to:
- Perform due diligence
- Develop biohealth project-focused companies

Proactively identifies and commercializes market-relevant intellectual properties from:
- Federal Labs
- Universities
- Private Sector

2013 Status

114 NIH
63 Industry
Technology Reviews Conducted

4 EIRs
1 EIR MOU

8 Current Clients
3 Pending Clients
4 Potential New Clients

Future
- Add 2 EIRs
- Create 5 spinouts or tech placements
- Develop education programs
BHI Entrepreneurs-in-Residence

Todd Chappell (NIH-OTT)
Todd assists the Office of Technology Transfer (OTT) in the evaluation of existing technologies, provide an entrepreneurial perspective on new licensing proposals from start-up companies, advise on opportunities for new ventures, assist with developmental strategies, and mentor scientists to help ensure their research becomes commercially valuable.

Ram Aiyar (NHLBI)
Ram assists the National Heart Lung and Blood Institute (NHLBI) in translating disruptive science into commercially viable technologies. He works with the relevant stakeholders within the NIH to develop commercial plans and/or develop licensing opportunities such that the NIH technologies can be translated into commercially viable entities that will solve unmet medical needs of patients.

Rich Moore (NIH-OTT)
Dr. Moore previously served as the Chief Scientific Officer for OpGen, Inc. In that role, Dr. Moore provided leadership over multiple R&D functions, and led the company's Scientific and Clinical Advisory Boards. Prior to that, he spent 12 years at BD Diagnostics holding various positions, most recently as R&D Director, Systems Integration and Advanced Technology.

Ken Malone (UM Ventures)
Ken has built his career on creating economic value from science. Whether it was developing new business lines for global corporations or spinning out new ventures from universities, he has engaged in the commercialization of hundreds of new products in advanced materials and life sciences.
How Do We Determine Commercial Relevancy?

The Entrepreneur-in-Residence process for determining commercial relevancy is what makes us unique.

Customer Needs

Novel Invention

IP

Regulatory

Market

ETC

Value Proposition

License opportunity? NewCo? Incubate / Mentor?
Identifying Opportunities

Lead Approach (NIH)

- Technology Review Committees
- Technology Transfer Branch Chiefs and Licensing Managers
- Successful Scientists

Systematic Approach (NIH + Other Institutions)

- Evaluation of market needs from regional players
- Directed analysis using database and meetings with scientists
- Commercial, development, and funding analysis
# BHI Client Companies

**BeneVir**  - Developing a therapeutic platform that can be adapted to target a wide variety of cancers.

**Living Discoveries**  - Specializes in automatically diagnosing medical conditions in medical scans, tests, and sensors with minimal human support.

**Mumeiras**  - Developing and marketing Organ-on-a-Chip solutions for the pharmaceutical industry.

**Mehr Medical**  - Developing devices for cardiovascular procedures that will solve high unmet needs in the transcatheter valve replacement space.

**MockV**  - Developing novel viral clearance kits to be utilized during process development bio therapeutics.

**N5 Sensors, Inc.**  - Developing sensors that can detect harmful chemicals mixed in air in very small quantities, such as industrial chemicals, and other pollutants.

**Perceptive Navigation**  - Developing medical devices related to image-guided, minimally-invasive niche markets.

**YLP Therapeutics**  - Developing a platform vaccine like particle technology that has the potential to be used for various diseases including cancer.
BHI Federal Funding Assistance

2013 Performance

<table>
<thead>
<tr>
<th>Total Number Reviewed</th>
<th>Grant Proposals Submitted</th>
<th>Not Yet Submitted</th>
<th>Not Further Pursued by Company</th>
<th>Flawed: No Action Taken</th>
</tr>
</thead>
<tbody>
<tr>
<td>55</td>
<td>18</td>
<td>13</td>
<td>14</td>
<td>10</td>
</tr>
</tbody>
</table>

Other Notable Activities

- NHLBI Innovation Conferences – evaluated SBIR companies to present at regional showcases (San Diego; San Francisco)
- NHLBI Centers for Accelerated Innovation – supporting performance metrics & process evaluation for CAIs
BHI Startup Package

Corporate Legal

Intellectual Property

Laboratory Space

Accounting

Banking

Grant Consulting
- Health IT Accelerator
- Help 9 companies achieve critical business milestones in 4 months
- Provide guidance from successful entrepreneurs
- Give companies the chance to tap into the region's wealth of federal healthcare institutions

### DreamIt Accelerator Companies

<table>
<thead>
<tr>
<th>Company</th>
<th>Product/Service</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aegle</td>
<td>Wearable biometric devices</td>
<td>Baltimore, MD</td>
</tr>
<tr>
<td>Avhana+</td>
<td>Next generation clinical decision support for the electronic health record</td>
<td>Baltimore, MD</td>
</tr>
<tr>
<td>Omocha</td>
<td>Cognitive rehabilitation of patients suffering from stroke and traumatic brain injury through mobile games</td>
<td>Tallinn, Estonia</td>
</tr>
<tr>
<td>Protenus</td>
<td>Mobile capture of data for medication adherence and clinical trials</td>
<td>Baltimore, MD</td>
</tr>
<tr>
<td>Respi</td>
<td>Digital management of patient consent and other administrative workflows</td>
<td>Baltimore, MD</td>
</tr>
<tr>
<td>PatientFeed</td>
<td>Smartphone-based spirometry and respiratory data platform</td>
<td>Athens, Greece</td>
</tr>
<tr>
<td>Photenns</td>
<td>Collaboration tools for inpatient care</td>
<td>Pittsburgh, PA</td>
</tr>
<tr>
<td>Photenns</td>
<td>Treatment of behavioral health issues through mobile augmented reality</td>
<td>Barcelona, Spain</td>
</tr>
<tr>
<td>Photenns</td>
<td>Integration and distribution of clinically relevant mobile health devices</td>
<td>Baltimore, MD</td>
</tr>
</tbody>
</table>
US Venture Capital Investment

2007
- 4,211 Deals
- $31.9 billion Investment
- $5.4 million Average Deal Size
- 410 Active* VC Firms

2013
- 2,505 Deals
- $21.1 billion Investment
- $8.4 million Average Deal Size
- 460 Active* VC Firms

*VC firms completing 4 or more deals per year

PriceWaterHouseCoopers | CB Insights
US Angel Investment

2007

- 258,200 Angel Investors
- 57,120 Companies Financed
- $27.3 billion Angel Investment
- $478,000 Avg. Deal Size

2013*

- 134,895 Angel Investors
- 28,590 Companies Financed
- $9.7 billion Angel Investment
- $337,850 Avg. Deal Size

*For Q1 & Q2
BHI Commercial Relevance Fund

- Will provide direct seed and early-stage equity investments ranging from $50,000 to $1,000,000
- Focused on BioHealth companies that fall into the 4 categories: Therapeutics, Medical Devices, Diagnostics, and Health IT
- Goal: Achieve a $5,000,000 to $10,000,000 initial fund
- Expectation: 30% of companies generating 10x the original investment
- 2014 — Identify Investors
BHI Global Outreach

- EIR MOU in place for a CLFD EIR to serve as a biohealth intermediary between BHI and China.

- 3 International DreamIt Health Accelerator companies
  - Cognuse (Estonia)
  - Respi (Greece)
  - Phobius (Spain)

- BHI Soft Landing Program
  - Mimetas (Netherlands)
Financing and Entrepreneurial Resource for Montgomery County and the Greater Baltimore Region

- Entrepreneur and Innovation Resource Network
- Innovator Financing Guide
- The Startup’s Guide to Intellectual Property
- Federal Labs Listing
**BHI Website and News**

**BHI Web site**
The BHI Web site has news, an events calendar, research publications, regional organization feature stories and resources for the biohealth industry.

http://www.biohealthinnovation.org

**BHI News**
BHI’s weekly e-newsletter highlights the Central Maryland Region’s news articles, national biohealth trends and feature stories.

http://www.biohealthinnovation.org/news
Entrepreneur Training Programs

DC I-corps is a custom commercialization program for biohealth related technologies and startup companies. The six-week program guides teams through a rigorous market assessment and validation process ultimately creating a viable business model.

The FastTrac program is a practical, hands-on, entrepreneur-learning program designed to help entrepreneurs hone the skills needed to create, manage, and grow a successful business.

The INNoVATE program provides applied training for postdoctoral fellows, research scientists, and other professionals who want to start life science based companies.

The BHI Commercialization Consulting Club is a place where BHI's EIRs and Commercialization Consultants can discuss all aspects of the technologies being researched and make new networking connections.
BHI: The Triple Bottom Line

Grows high-paying jobs and businesses

Expands tax base; improves economic vitality

...and Benefits human health!
BHI Key Staff

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