The Lab to Market Transition: Lessons from Faculty, Students, and Other Research Staff

Wednesday, February 16, 2022

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BOSTON UNIVERSITY

Boston University Office of Research

Agenda

- Welcome Remarks
- Presentations
  - Sean Anderson & Nicholas Vickers
  - Uros Kuzmanovic
  - Josh Javor
  - George Daaboul
- Q&A
- Innovator of the Year Award Presentation
- Closing Remarks

Spinning out a real time tracking microscope

Sean Andersson

Mechanical Engineering and Systems Engineering, College of Engineering

Nic Vickers

Mechanical Engineering, College of Engineering

Who are we?

- **PhD Candidate, MechE (2022)**
- Expertise in optics and controls
- Veteran of 3 startups
- Interested in ***technology adoption***

- **Professor, MechE and SE**
- Expertise in control, estimation, and robotics
- Interested in ***technology transfer***

What's our objective

Nic

- Positive Impact on society
- Help Sean get ***impact beyond publication*** – people can't build it themselves easily
- Transition from PhD to post-PhD is a **good time to take risks**

Sean

- Good time in my career to try something new
- Want to have an impact - ***people don't use this technology if just in a paper***
- To support Nic as he goes through this- ***he has passion here***

Our potential customers have questions they want to – but currently cannot -- answer!

Biophysicists

"We are limited by the available tools. We spend too much energy on tool development."

Professor of Biophysics, Boise State University

Medical Researchers

Pharmaceutical developers

"I am a biologist. I don't want to build a microscope."

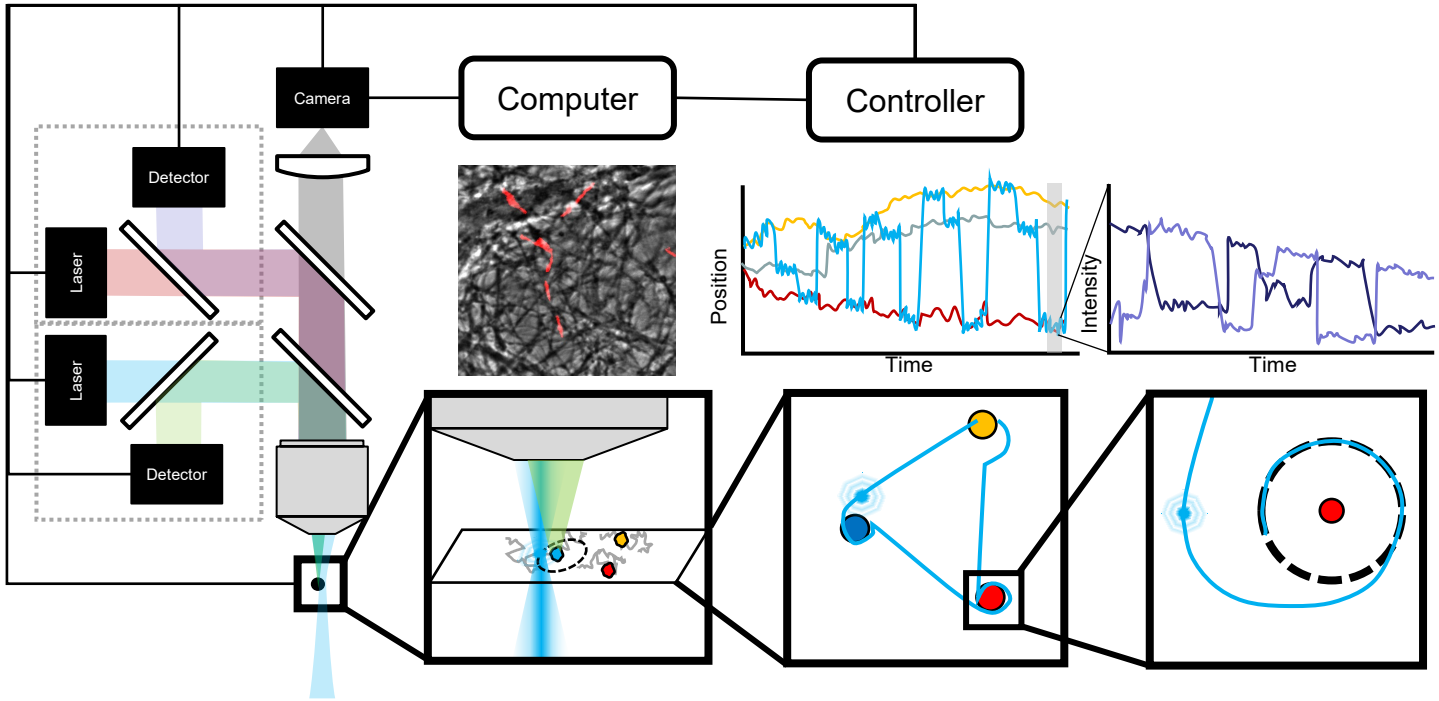
Group Leader, Netherlands Cancer Institute

Basic science breakthroughs!

New understanding of disease mechanisms!

New drugs

Our Solution: **Real-time direct tracking of individual biological macromolecules (with spectroscopic readout and contextual imaging)**



"Tracking individual molecules allows us to see behavior that is obscured by the aggregate."

Group Leader, NIH National Cancer Institute

Where are we?

Grants

Treadmill of research

Publication

Uh oh!

Tech Disclosure

Customer Discover/ Primary Market Research

Now!

Idea

2008-present

Prototype

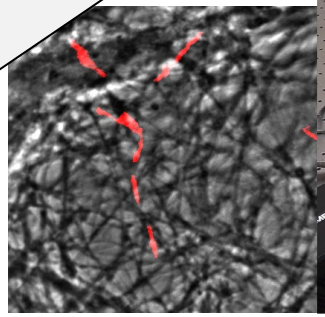
2022-23

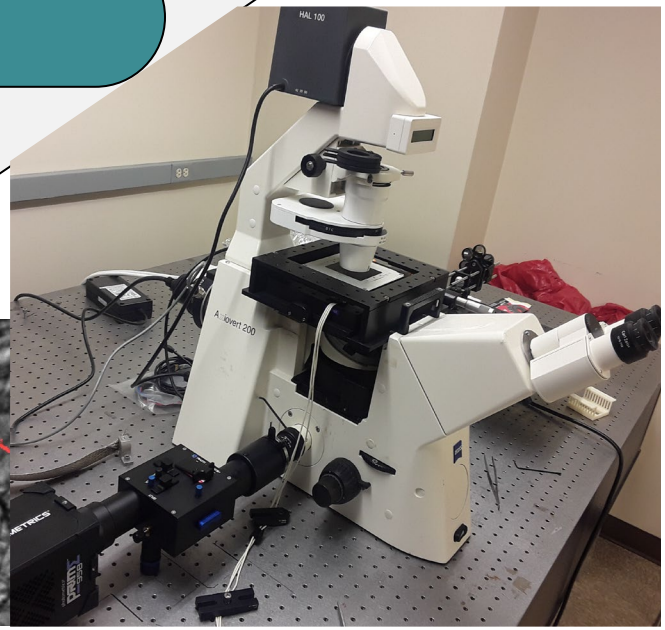
Alpha users

2023

Commercialization

2024-25





What to convey, Lessons learned in this process so far

Nic

- File a technology disclosure into the OTD before publishing. Without it, it will be harder to spin out a company.
- Participate in I-Corps Spark.

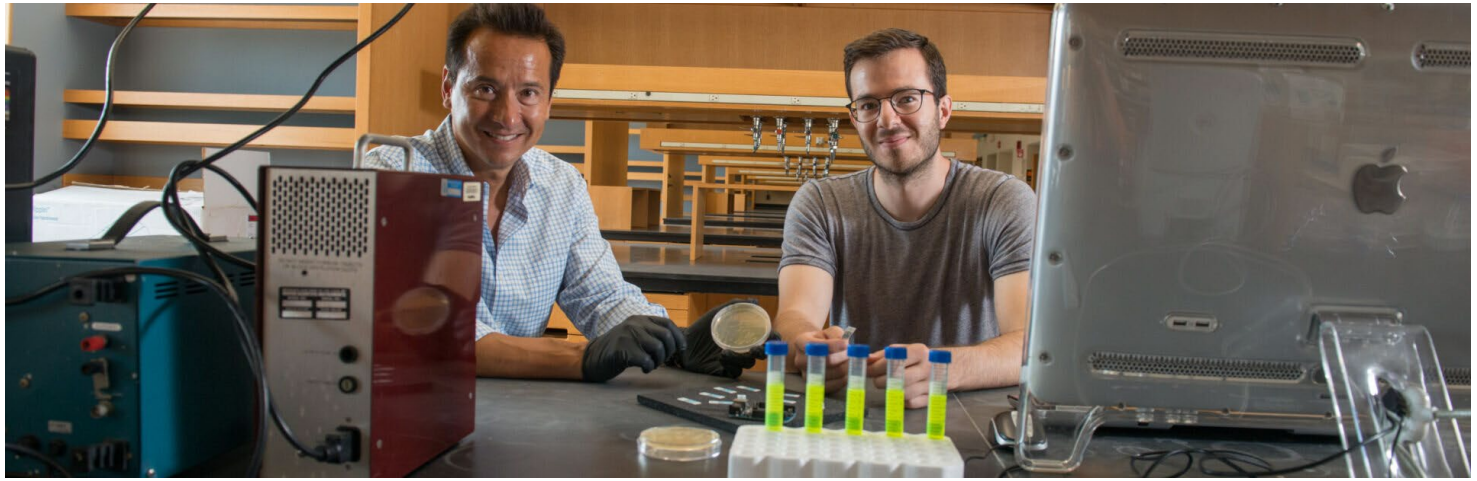
Sean

- Put in that technology disclosure before you start publishing!! Many faculty just don't think of this; it's not in our typical path
- I-Corps is THERE. Take advantage of that and other great resources BU has to offer. Ask for help for the tech transfer team- that's what they are there for.
- Need a champion: I'm not giving up my day job…but Nic is!

From Academia to Startup

Uroš Kuzmanović

BME PhD Candidate / BioSens8 CEO & Co-Founder



Uroš Kuzmanović:
Passionate about driving societal impact through biotech

2009-2013
UNIVERSITY OF ILLINOIS URBANA-CHAMPAIGN
BS Molecular & Cellular Biology
Minor in Chemistry
Myotonic Dystrophy Research

2012
iGEM
UIUC Team VP
Piceatannol RNA Scaffold Engineer
Lightbulb Moment!

2013-2014
ENERGY BIOSCIENCES INSTITUTE.org
Research Fellow
Yeast Metabolic Engineer

2015-Present
UNIVERSITAS BOSTONIENSIS CONDITA MDCCCXXXIX
PhD Biomedical Engineering
Novel Biosensor Development
Impact through Biotech

2020-Present
biosens8
CEO & Co-Founder

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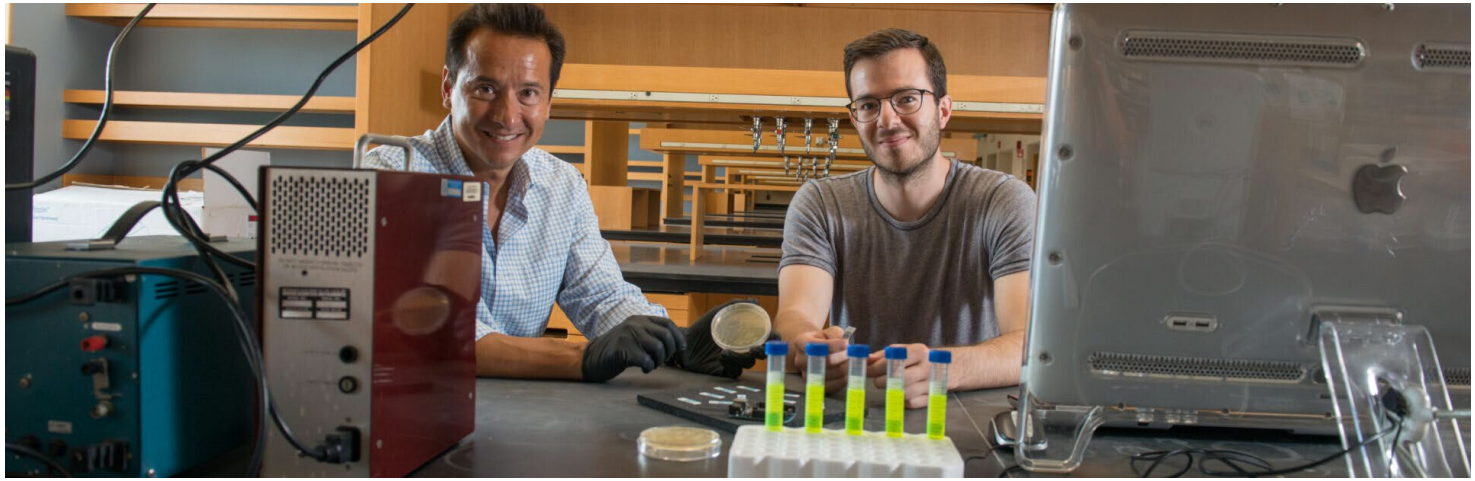

James Galagan:
Mining microbes to create impactful & novel technology

Whitehead Institute
Software Engineer
Computational Biologist
Center for Genome Research
1998-2005

BROAD INSTITUTE
Associate Director
Visiting Scientist
Microbial Genome Analysis & Annotation
2005-2017

MIT
Visiting Faculty
Department of EE & CS
2008-2010

NEIDL
Associate Director
System Biology
2008-2017

Universitas Bostoniensis Condita MDCCCXXXIX
Professor
Biomedical Engineering
Biosensor Engineering
2008-Present

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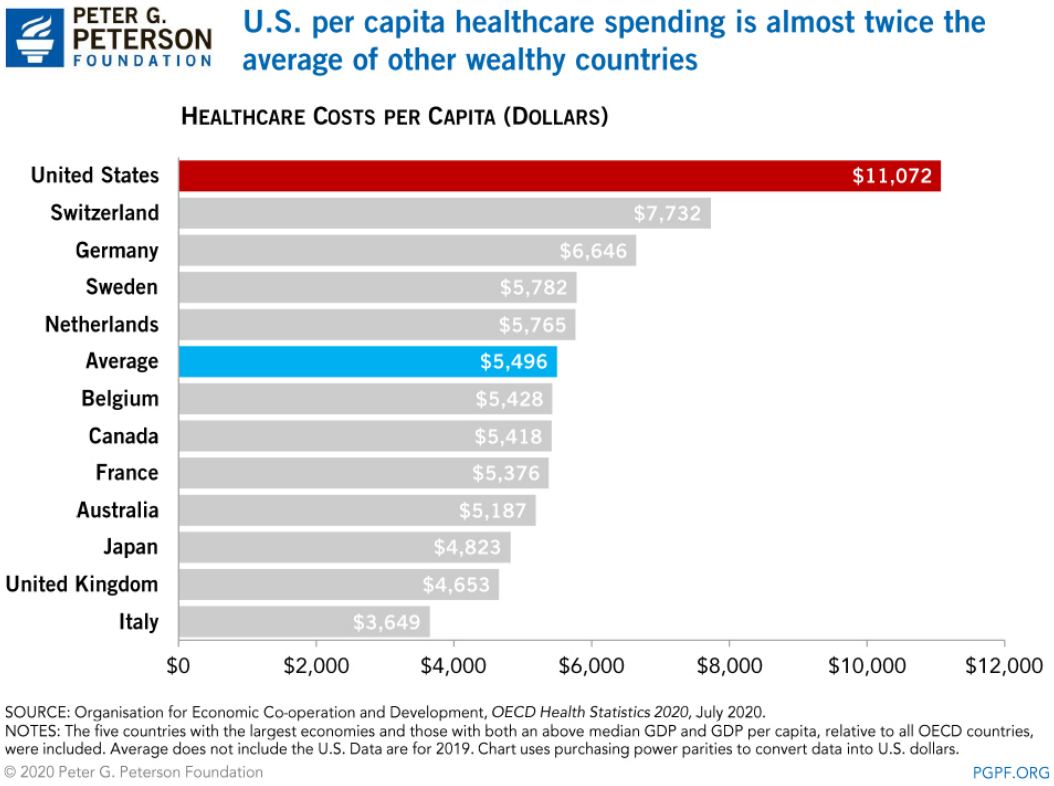
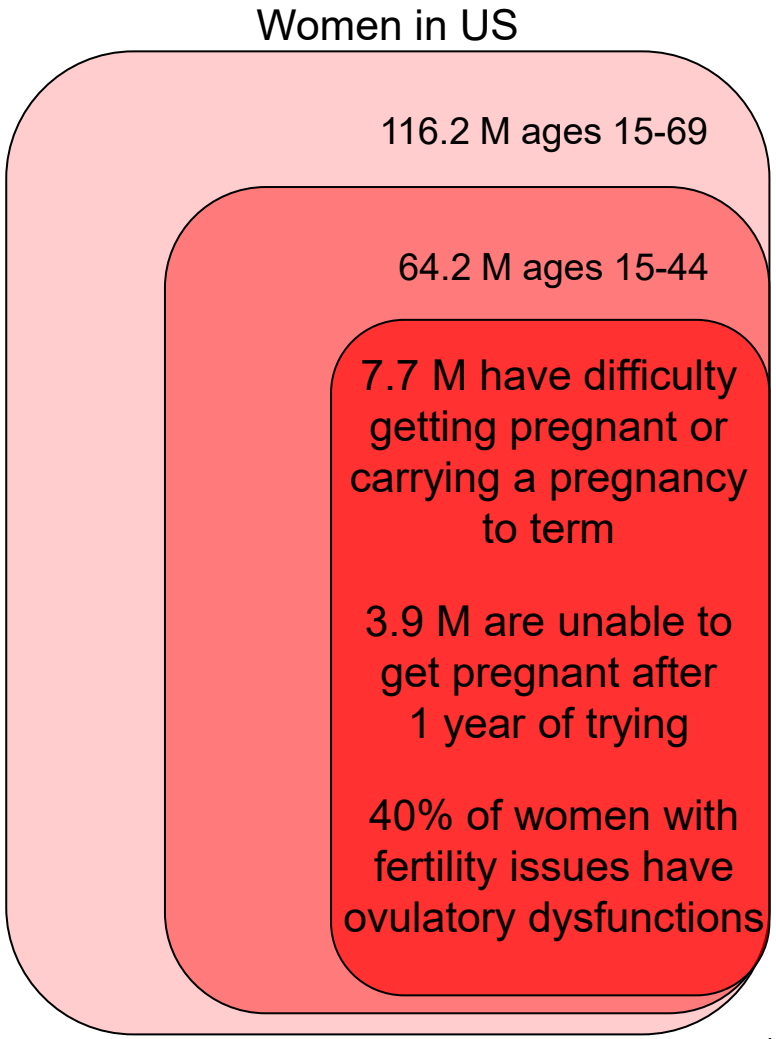
What's my objective?



What's the problem?

Infertility is a growing national and global problem



What's the need?

Beachhead

Struggler

Name: Lisa

Age: 31

Status: trying to get pregnant for 6 months; more **proactive and using ovulation prediction tests** (LH strips) but frustrated by their lack of accuracy and inability to confirm the underlying problem. Might have PCOS -> no LH spike.

>40 customer interviews

- **Assess fertility → Check ovulation → PRG test**
  - Easier way to read test results → **reduce frustration, stress, and confusion**
  - Avoid peeing on a stick every day for 2 weeks → **reduce annoyance and degradation**
  - Blood-based test → **gain trust in test results**
  - Test at home → **gain privacy and convenience**
  - Quick time to result → **gain free time in their day**
  - Ability to share results easily → **gain comfort and support from community**

What's the idea?

MySens™

Avoid anxiety, frustration & stress by confirming ovulation **instantly, quantitatively & 4-10 days faster** than the competition

Take comfort in having to take only **1 test** and being able to **relay results** to their physician and support group

Gain trust by **measuring from blood** like the gold standard and get results from the **privacy** of their home

Where are we?

12/20

3/21

5/21

8/21

10/21

12/21

10/20

11/20

1/21

2/21

4/21

6-7/21

9/21

11/21

NE I-Corps
New England Regional Innovation Node @ MIT

Research
TECHNOLOGY DEVELOPMENT
IGNITION AWARDS

10 YEARS M2D2
UMASS $200K CHALLENGE

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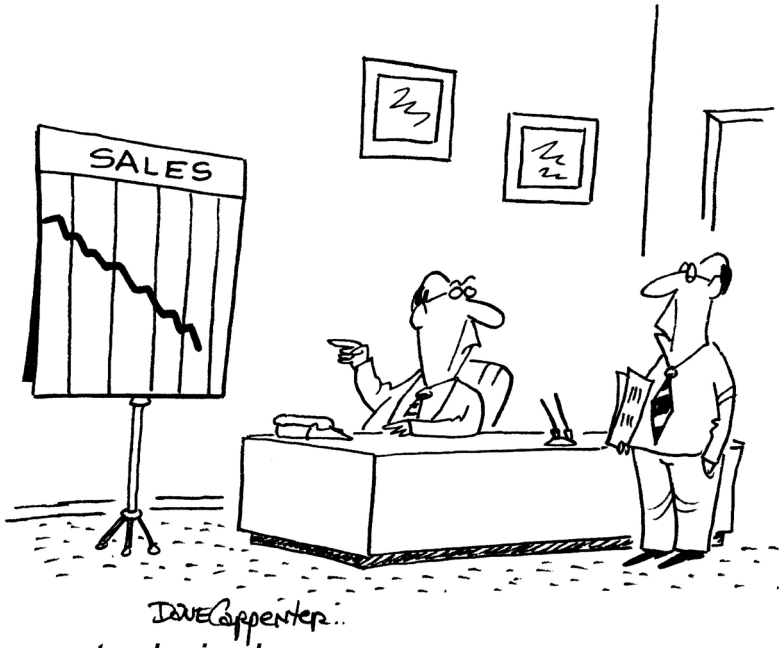
My learnings



technical

" The ~~sales~~ team did all they could, so I'd have to say the blame for that must fall on the consumer."

Spinout of Novel Magnetic Sensor Technology

Josh Javor

Founder, Gradient Magnetics, LLC
Postdoctoral Associate, Bishop Lab
Department of Mechanical Engineering

About the champions of this technology

- I am a developing scientific entrepreneur
- My **objective** is to bring technology from my PhD thesis to market, while learning valuable transferrable skills in entrepreneurship
- Professor Bishop's **objective** is to enable a dynamic future for students of his lab and to bring novel MEMS technologies to market.

Josh Javor
Founder

- 10+ years developing electromagnetic sensing technology
- 5 years studying contractility of cardiac tissue
- PhD in Mechanical Engineering from Boston University

David Bishop
Technology Advisor

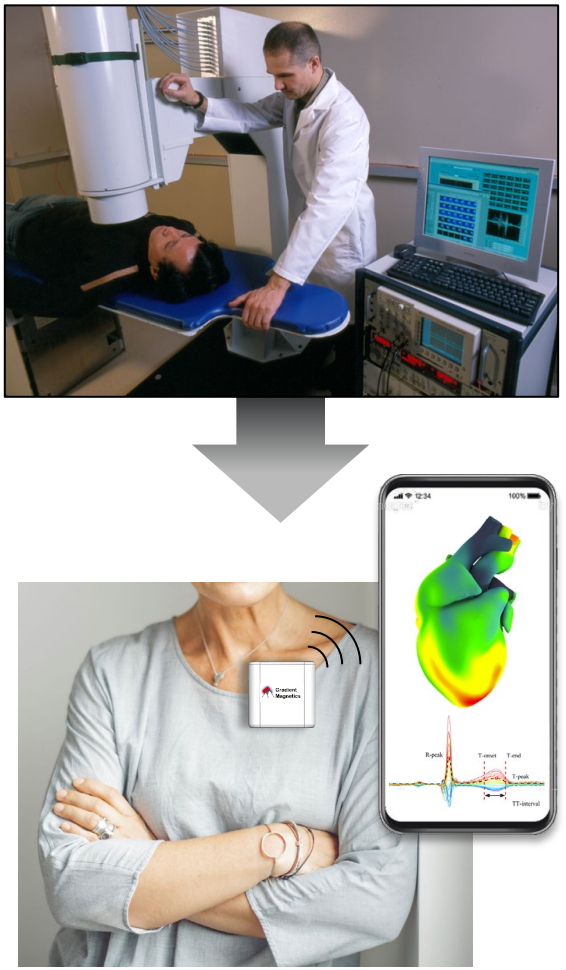
- Led a team of 150+ people at Bell Labs in the commercialization of MEMS devices
- Over 23,000 citations and 50 issued patents
- Professor of Physics, MSE, BME, and Mechanical Engineering at Boston University

The Need

- ER Physicians – Diagnosing emergency room chest pain will enable physicians to “rule out” emergencies and enable earlier and safer discharge of patients.
- Cardiologists - Predicting coronary artery disease outcomes will enable cardiologists to more accurately treat patients who fail stress tests and require cardiac catheterization.
- Channel
  - We will license or make and sell our product to existing companies (talking with two already) who serve physicians
  - Portable magnetic imaging will reach more MCG customers at a lower price.

Our technology enables portable biomagnetic imaging

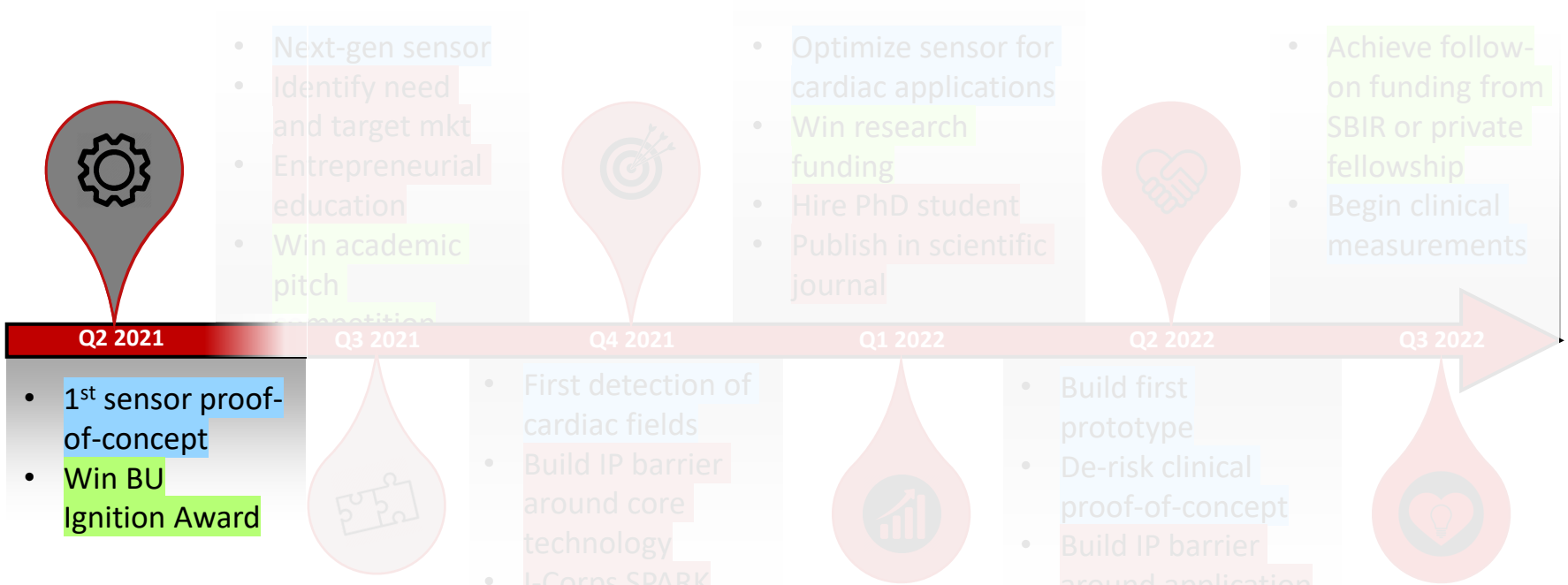
- Our IDEA is a new magnetic sensor…
  - Unshielded with intrinsic immunity to magnetic interference
  - Room temperature
  - Ambient pressure
  - Small package (~5mm side)
  - Low power requirements
- With our sensor, our customers will be able to expand into portable and wearable biomagnetic imaging markets, saving hospitals money and enhancing patients' quality of life.



Our Venture Timeline

Funding
Technology
Business Development

We are here



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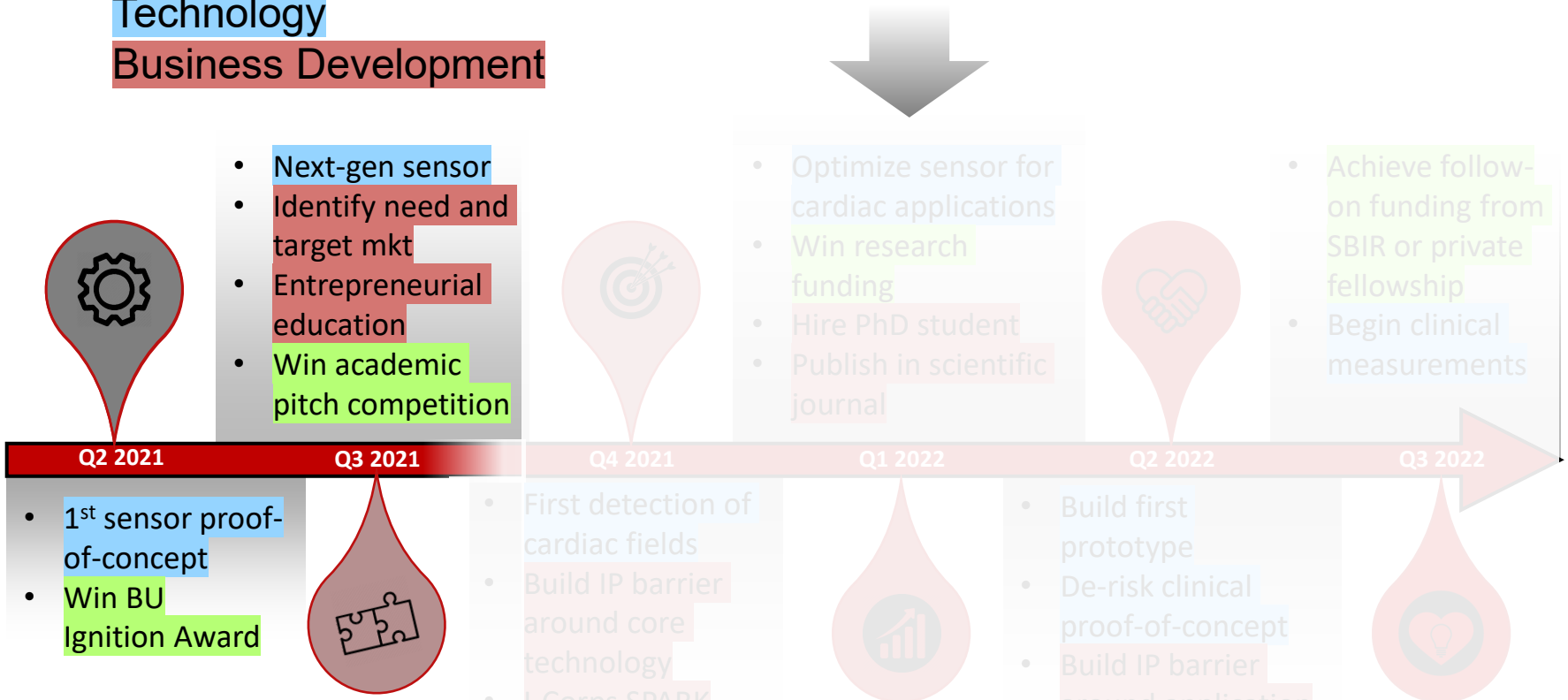

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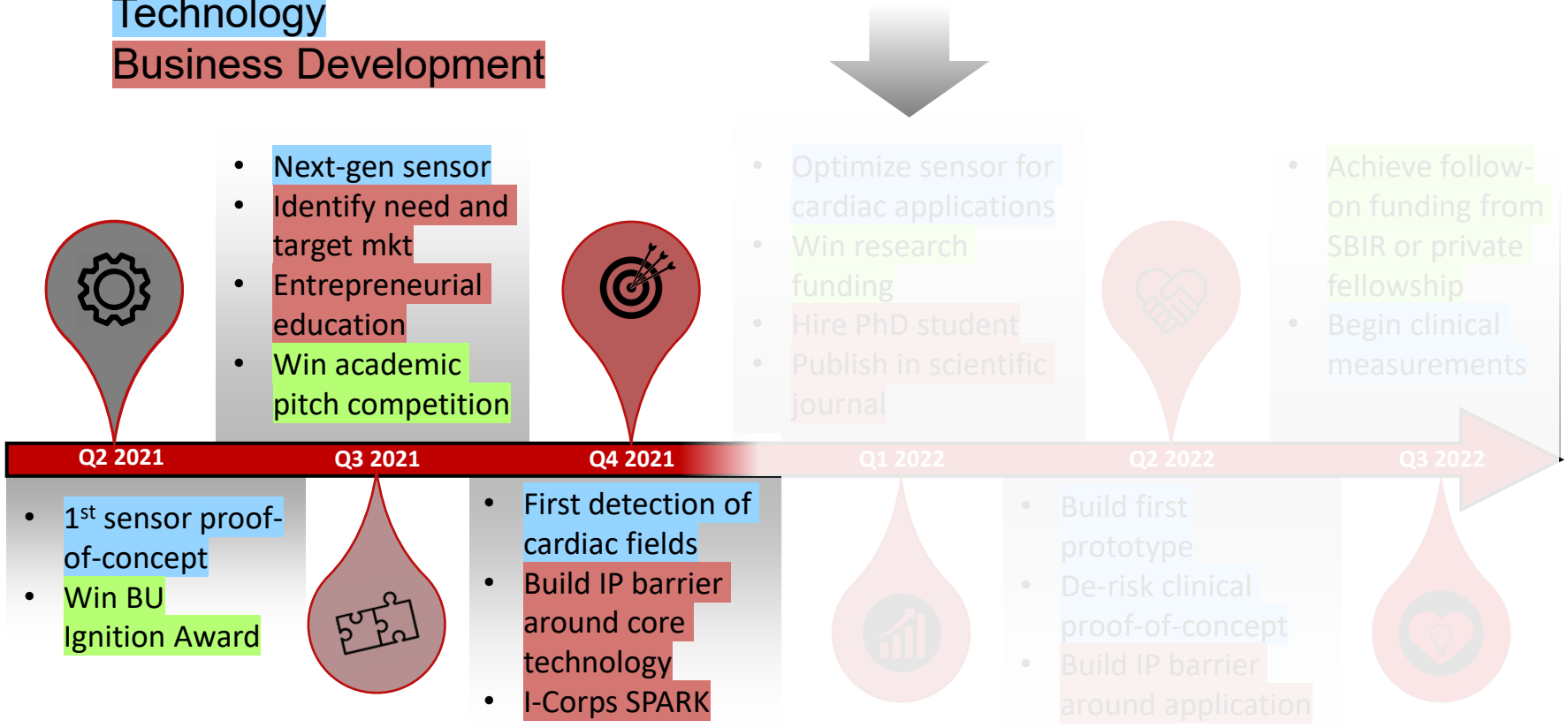

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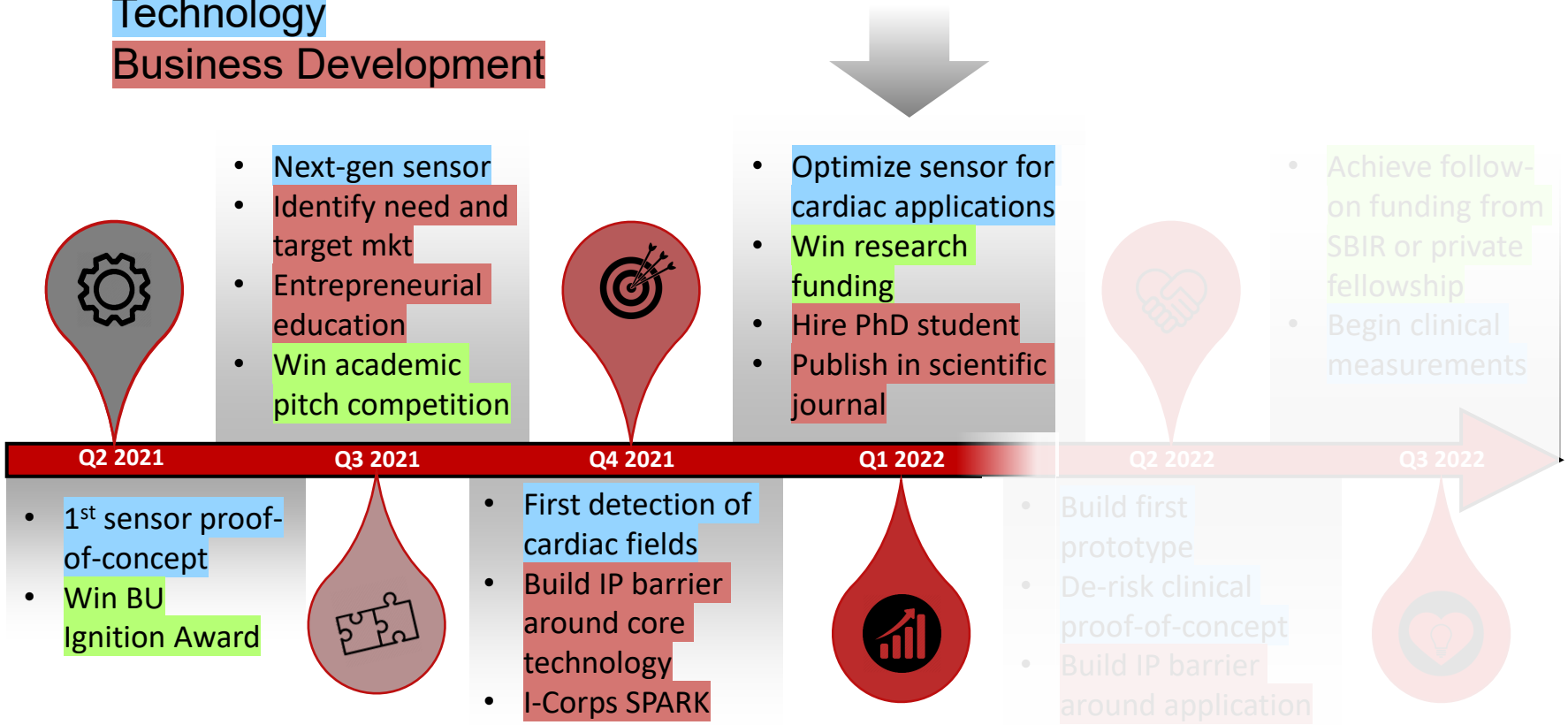

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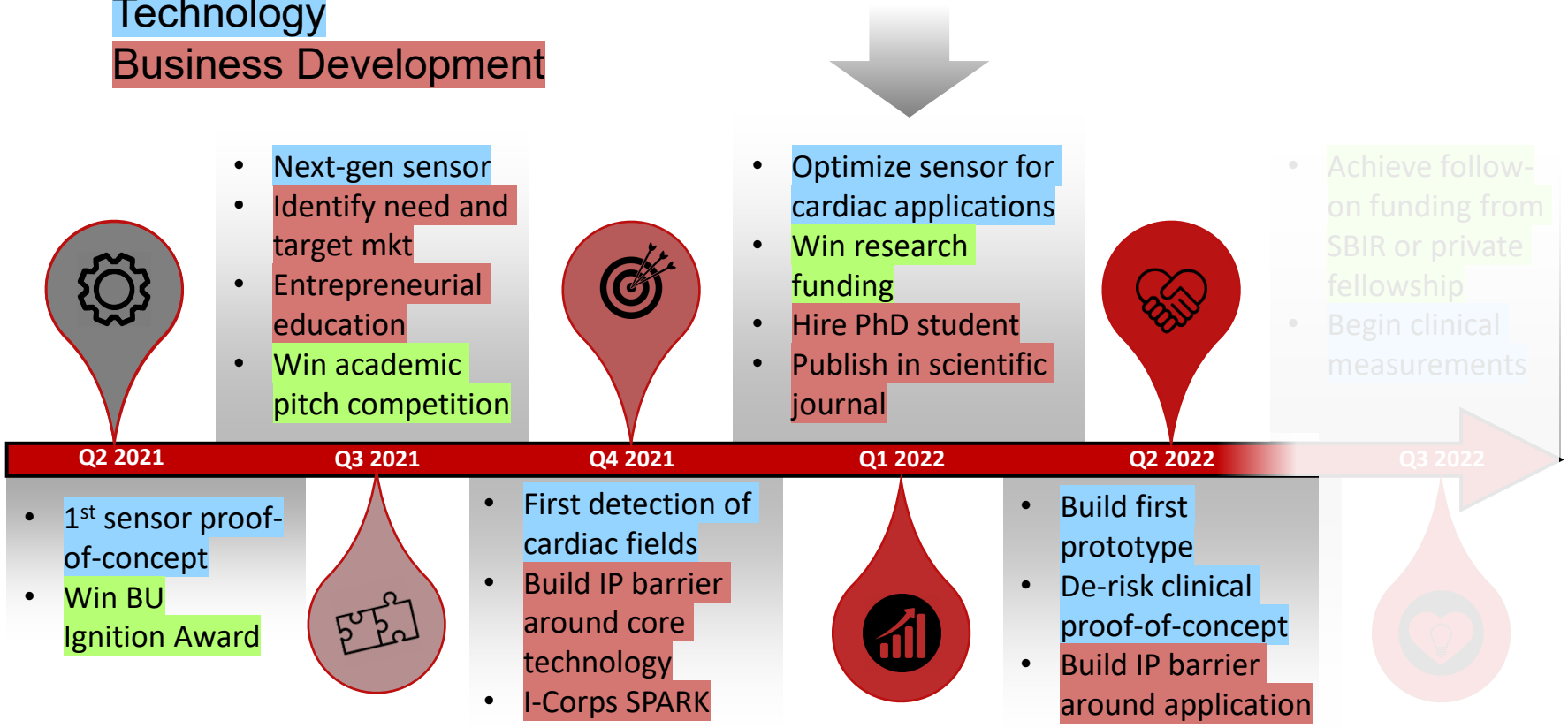

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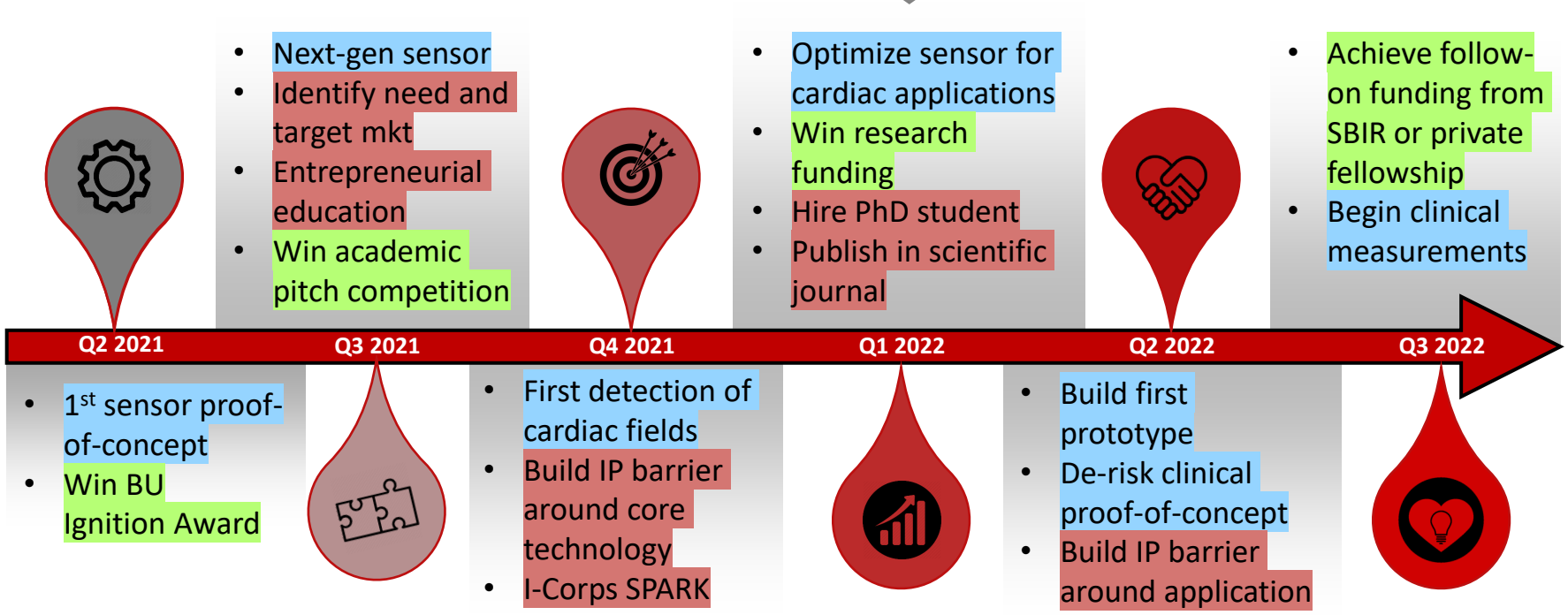

Primary Learning: Approaching the business with the scientific method can work for tech spinouts

- Some “hand-wavy” parts of business planning can feel like they lack credibility, especially when there is always a right and wrong answer - a ground truth – in science.
- However, your training as a PhD scientist can actually make you a very effective science entrepreneur.
- Whether your business viability would rely on 100 technical customers buying an expensive scientific tool, or 1M general users integrating a part of your technology into their daily life, you can do research on these items and prepare arguments to defend these estimates. At the end of the day, nothing should actually be “hand-wavy,” even though there may be a higher degree of uncertainty.
- To be successful here, you can apply the scientific method: develop hypotheses, methods for gathering information, and organize results to prove to yourself (and your future investors) that a need exists.

Thank You

George Daaboul

Co-founder and CSO
NanoView Biosciences

Who are we?

George Daaboul
Biomedical Engineering Ph.D, 2013
Mentor/PI: Selim Unlu
Biomedical Engineering B.S, 2009
Boston University

David Freedman co-founder
Electrical and Computer Engineering Ph.D, 2010
Biomedical Engineering Post-Doc, 2012 (PI: Selim Unlu)
Boston University

Objective

Why a startup?

- Academia was not for me but wanted to pursue my own ideas.
- Attracted to independence
- Right time to take risk

Once you raise VC some of the independence is gone.

NanoView BIOSCIENCES

The Need: Our customer is a researcher (corporate or academic) looking to characterize composition of biological nanoparticles.

ExoView Platform provides multiple data points like size, protein composition and amount all in a single easy to use assay/measurement.

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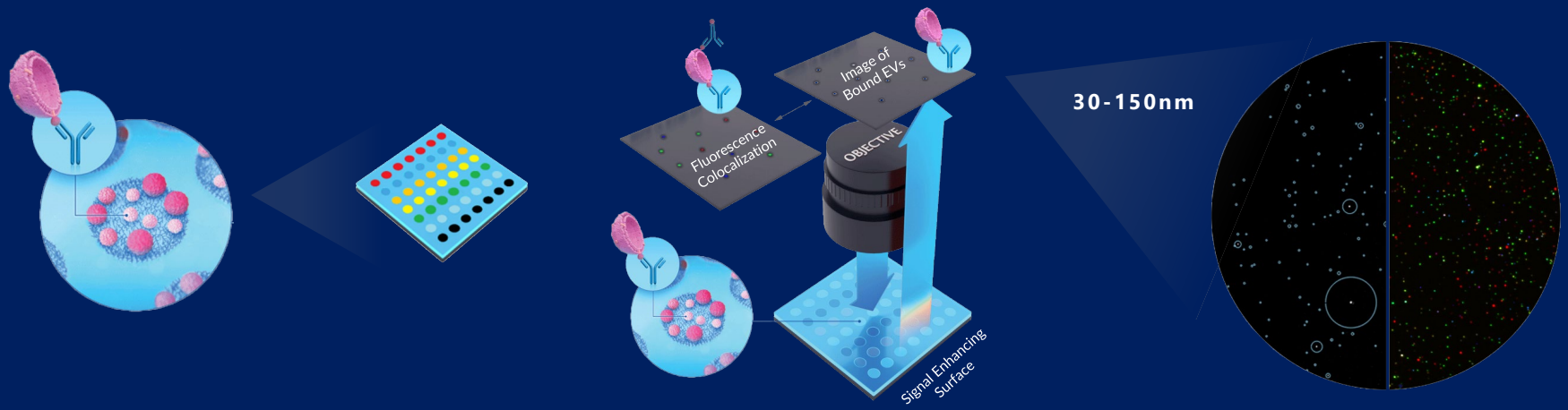
NanoView's SP-IRIS[1] Technology Delivers Single Vesicle Characterization

Affinity capture technique with interferometric & fluorescent imaging



1 HIGHLY SPECIFIC SAMPLING

A coated ExoView chip is tiled with multiple antibodies to provide specific capture of vesicle surface markers

2 ENHANCED LABEL-FREE IMAGING

Bright field light is scattered & enhanced through patented interferometric microscopy of the bound vesicles

3 MULTIPLEXED ANALYSIS

Multiple surface and internal markers can be characterized & colocalized to yield single vesicle sensitivity through the addition of fluorescent antibodies

[1]Daaboul, et al., Scientific Reports. 2016

Expediting the Current Workflow

ExoView® R100
ExoView® Kits
ExoViewer® Software

Current outdated industry workflow

Bulk Sample → Isolate & Purify → Enrich For Target → Analyze For Target

ExoView workflow

Minimal Sample → Analyze for Target

Advantages

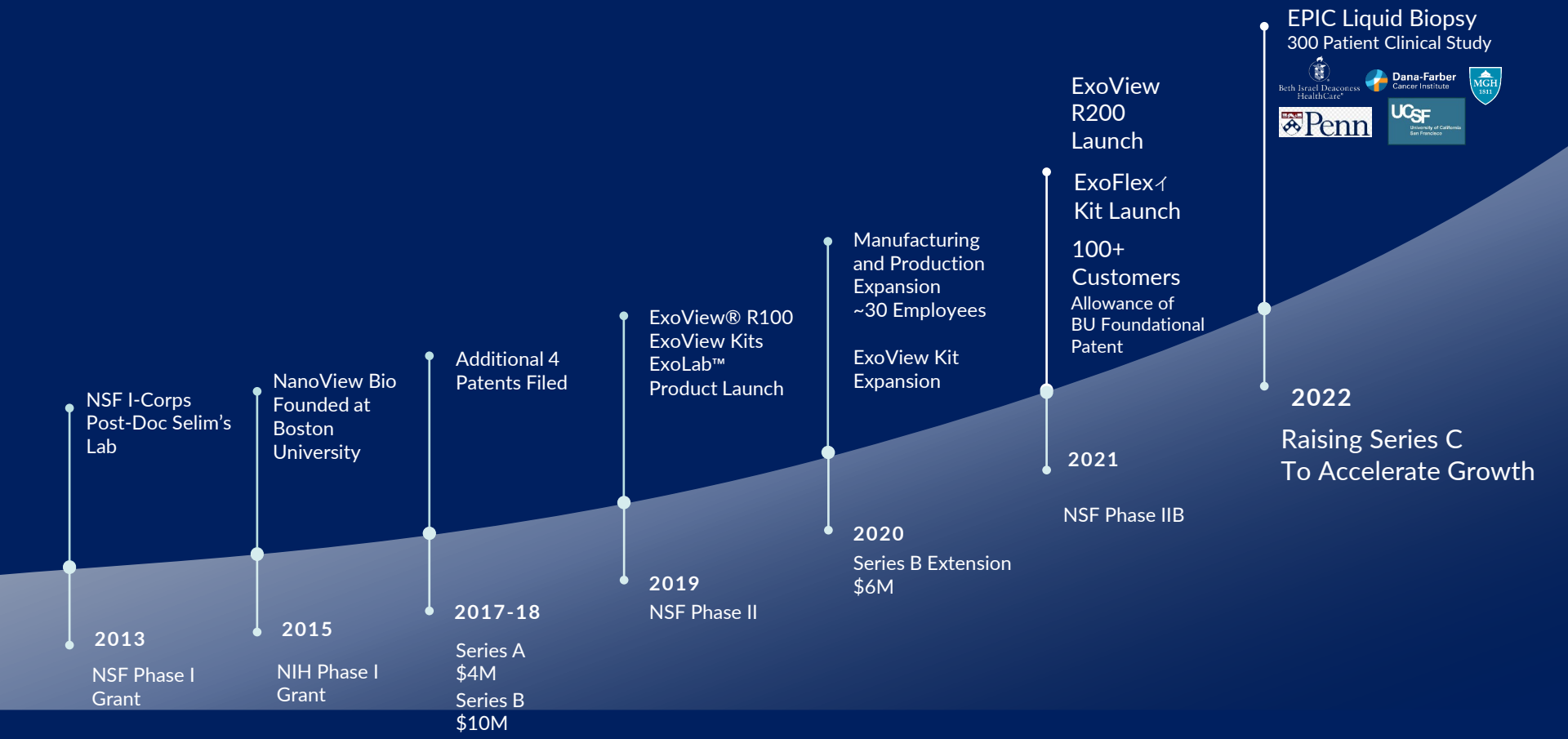
- Only 35 µl of sample needed
- Investigate any bodily fluid
- Measure sample, not biases from purification techniques
- Measure the concentration of subpopulations
- Measure size with high resolution
- Measure biomarkers on the surface and internal cargo

RESULTS

Automation and parallel batch processing reduce hands-on time while increasing sample throughput producing single vesicle characterization of biomarkers

Where is NanoView Now?

NanoView BIOSCIENCES



Learning from Starting NanoView:

Co-founder is key!

- Someone to lean on when things are tough
- Complimentary skills