

# **From Bench to Bedside & Market – A Researcher’s Perspective**

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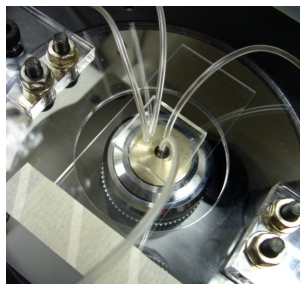
# Long List of KPIs for the Researcher

- Publications – Journal papers; citation count; h-index
- Research grants
- PhD students trained
- International/National Research Awards
- Invited/Keynote/Plenary talks at major conferences
- Editorial Board membership of major journals
- Leadership in the professional or international community
- Invitations to serve on review panels and advisory boards
- “Success stories” highlighted in national & international media
- **Patents/licensing/spin-off companies (last or least of all?)**

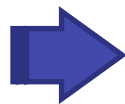


# Going beyond Just Publications: From Bench to Bedside/Market

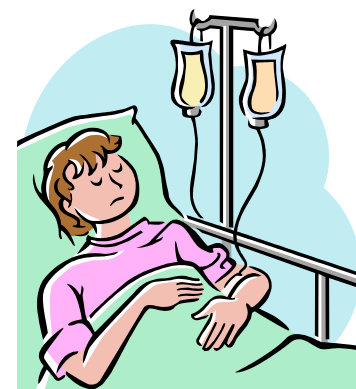
Technologies developed on the bench can only make an impact when they move from the lab to the market.



**Prototype  
(Bench)**



**Market Ready  
Product**



**Application  
(Bedside/Market)**

# Can an Academic/Researcher be an Entrepreneur?

- Among the many roles and responsibilities, can an academic/researcher also be an entrepreneur?
- The ANSWER is an absolute “YES”!
- It is possible to go beyond “Publish or Perish” and translate our scientific outcomes.

# First Thing First

Many researchers are confused with the following:

- **Novelty**: Something new but may not be useful
- **Creation**: Something new and valuable but may lack utility
- **Invention**: Something new, having potential value through utility
- **Innovation**: Something new and uniquely useful

**Novelty does not equate to commercializability!**

# My Own Entrepreneurial Experience



- Robust Dynamics (2000)

- Clearbridge NanoMedics Pte Ltd (2009)



- Clearbridge Biomedics Pte Ltd (2009)



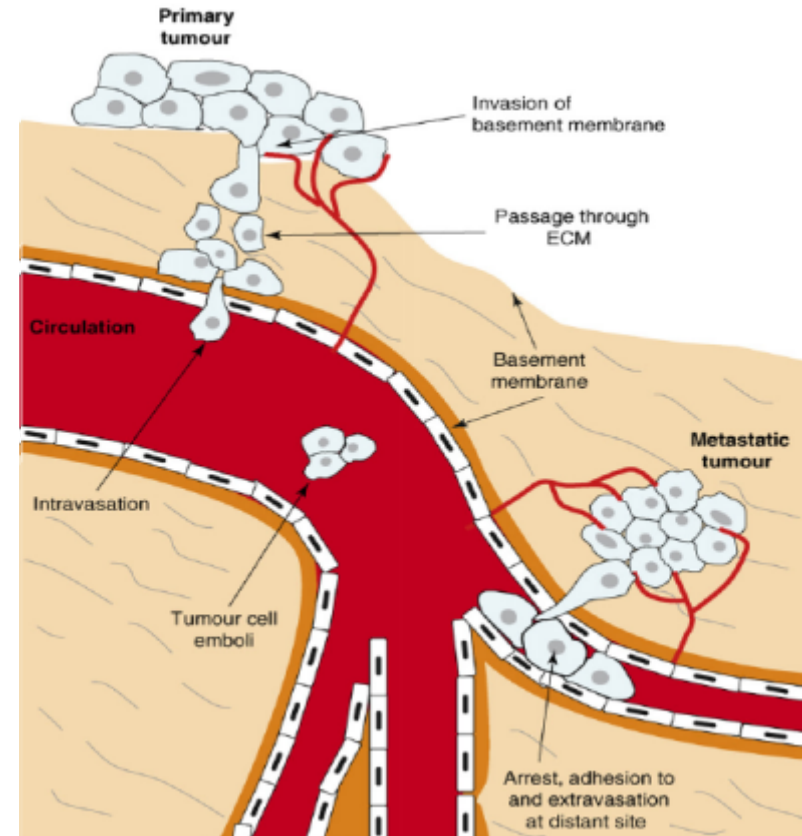
- Clearbridge mFluidics Pte Ltd (2013)

- Incubator: Clearbridge Accelerator (2009)



# Cancer & Circulating Tumor Cells (CTCs)

- One of the top killers in the industrialized world.
- One in three will develop cancer in their lifetime.
- Circulating tumor cells (CTCs) are cancer cells detached from primary tumor & released into bloodstream through **metastasis**.
- Metastasis is the main cause of cancer death.



Lee, G.Y. and C.T. Lim, Trends Biotech, 2007  
JP Thiery, CT Lim, Cancer Cell, 2013.  
CT Lim, D Hoon, Physics Today, 2014.

# Tumor & Liquid Biopsies

## Tumor Biopsy

- Invasive
- Painful
- Less frequent
- Tumor is heterogeneous, results depend on where we sample



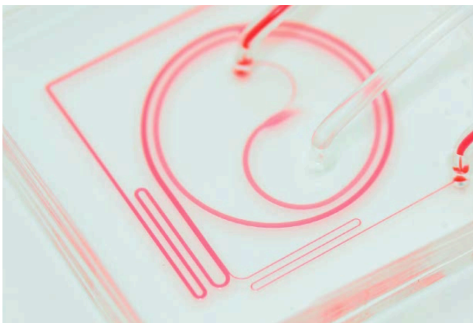
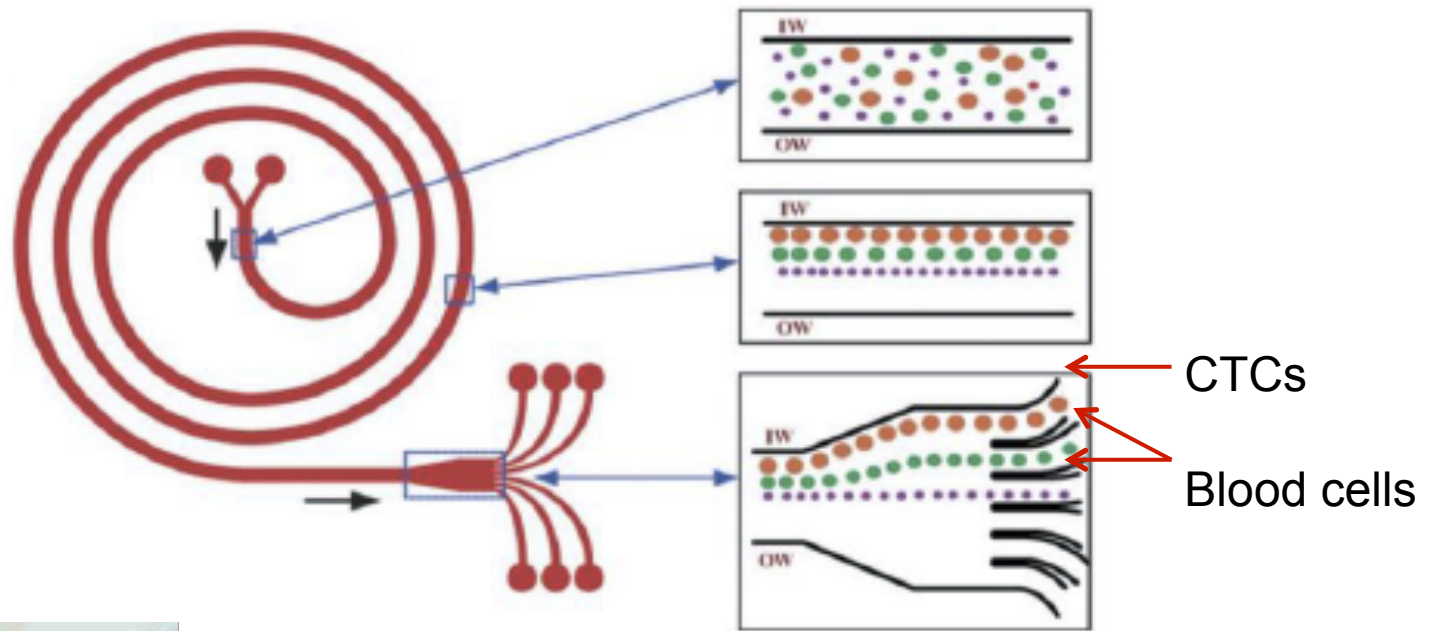
## Liquid Biopsy

- Less invasive
- Less painful
- Frequent
- Where tumor biopsy is not possible
- CTCs are heterogeneous but they are the important metastasizing ones

**'Liquid biopsy' blood test can complement Tumor Biopsy and radically change cancer treatment.**



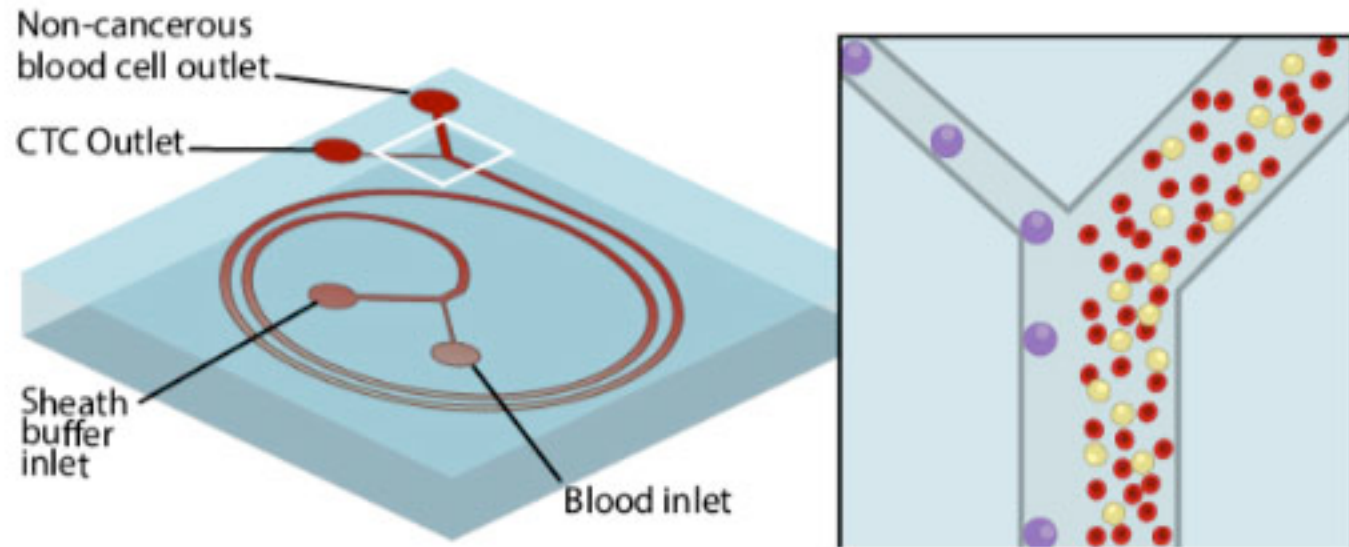
# Spiral CTChip®



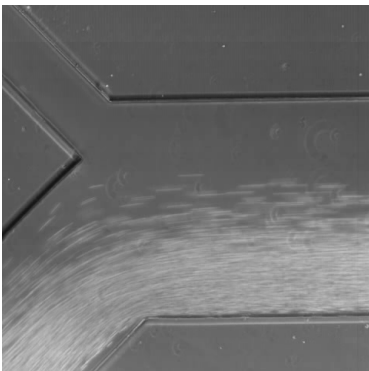
CT Lim et al, Patented, 2011.  
HW Hou, et al, Scientific Reports, 2013.  
EW Majid et al, Nature Protocols, 2016.

# Spiral microfluidic Biochip

## Spiral microfluidic chip for CTC isolation



CT Lim et al, Patented, 2011.  
HW Hou, et al, Scientific Reports, 2013.  
EW Majid et al, Nature Protocols, 2016.



At the Outlets

**“Everything Should Be Made as Simple as Possible, But Not Simpler.” Albert Einstein**

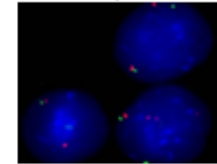
# CTCs for Targeted Therapy & Personalized Medicine



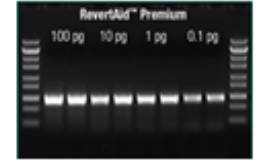
CTChip Technology



CTCs, plasma,  
ctDNAs, buffy coat

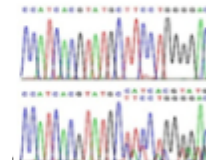


FISH

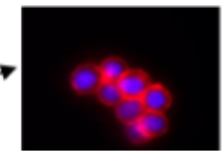


qRT-PCR

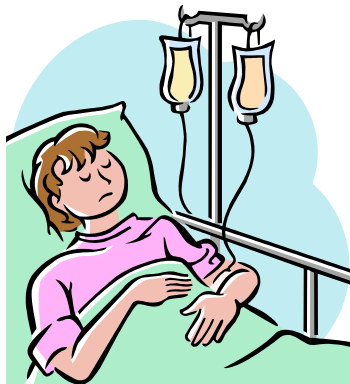
## Genetic & molecular Analysis



Sequencing



Staining & Enumeration



Personalized  
treatment

## Medical Report

Name : XXXXXXXX

XXXXXX XXXX XXXX

XXXXXX

XXXXXX

XXX

XXX

XXXXXX

### CTC Analysis:

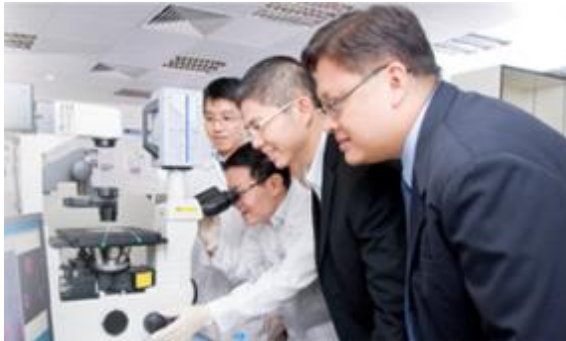
Cell Count XXX

Druggable Mutation – XXXX

XXXXXX

XXXXXX

## Founders



Johnson Chen



Prof Lim C.T.



Chong Chee Wah



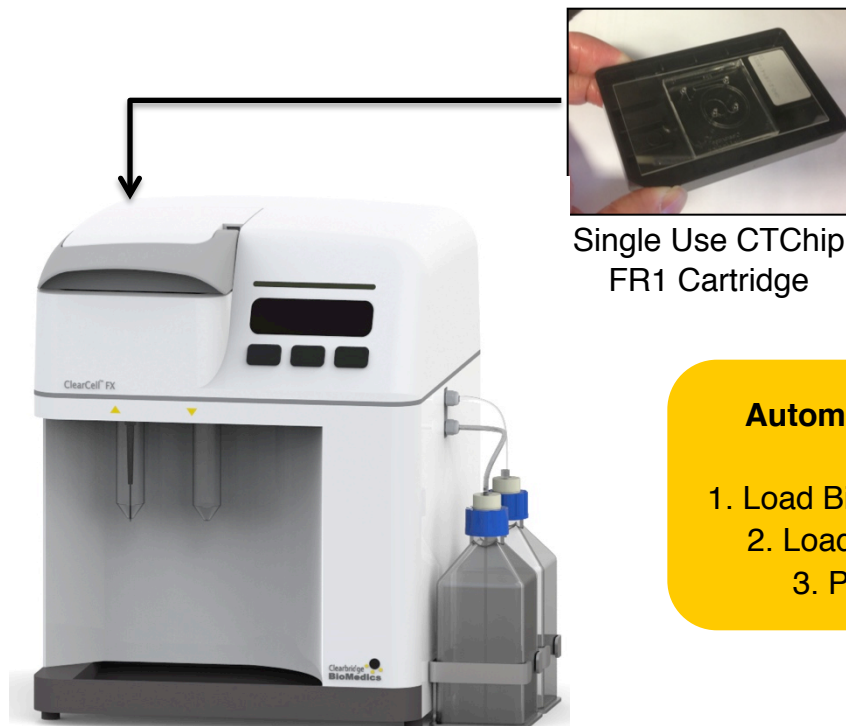
Dr Tan Swee Jin

## Milestones

- 2009 Company incorporation
- 2010 Incubation by Clearbridge Accelerator, Series Seed Financing
- 2011 TECS Proof-of-Value Grant, SPRING Singapore
- 2011 Series A Financing
- 2012 Launch of ClearCell CX system
- 2013 Series B
- 2014 ClearCell FX system achieves CE Mark

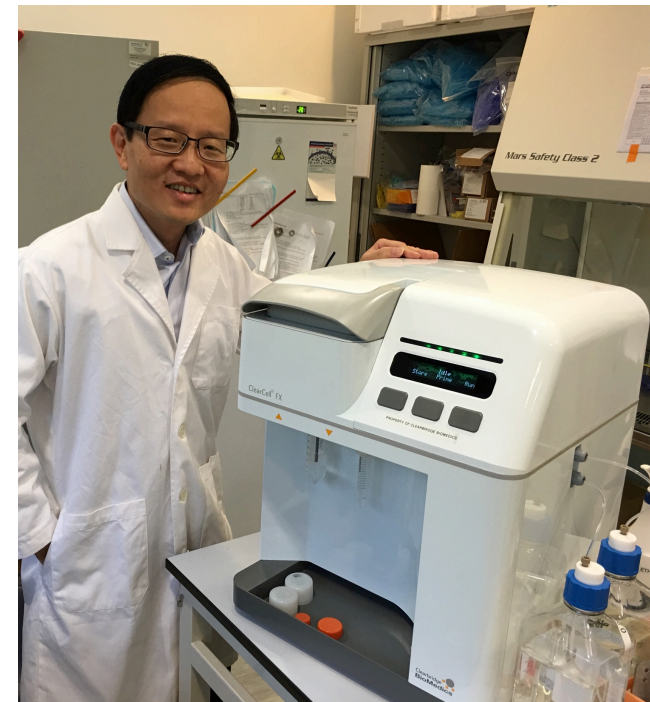
# ClearCell FX System

- Clearbridge BioMedics is **ISO 13485 certified**
- **CE Mark approved in December 2013**
- BioChips manufactured in Singapore by a leading contract manufacturer



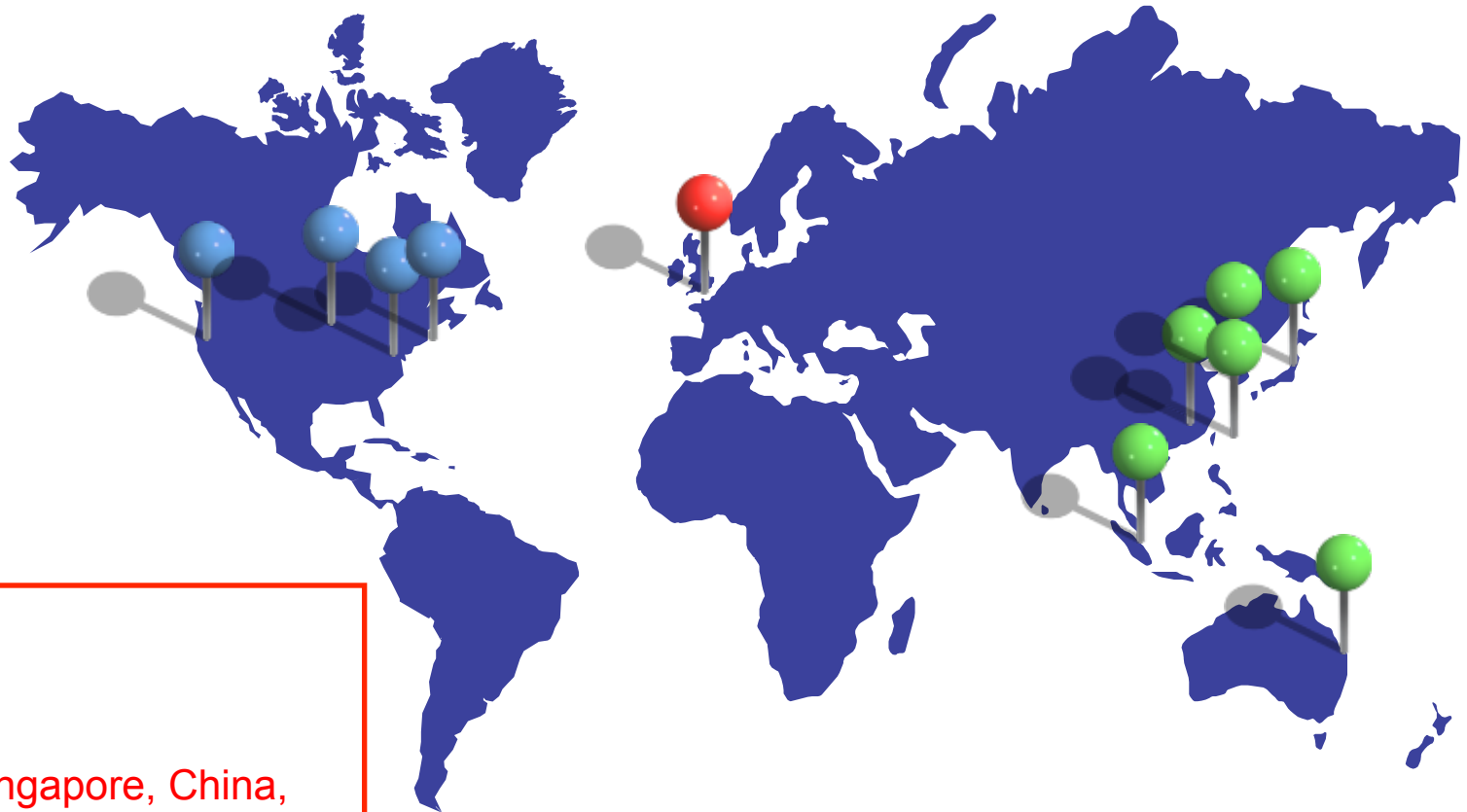
## Automated system

1. Load BioChip cartridge
2. Load in/out tubes
3. Press "Go"





# CTChip Users Network



- USA
- UK
- Asia - Singapore, China, Japan, Korea
- Australia

# Selected Awards & Honors

- Invented in Singapore, CNA, 2016
- 60 Minutes, CBS TV News Show, 2014
- TIE50 Award (Top 50 startups), TIEcon 2014 (Silicon Valley)
- Hottest Startup in Singapore 2014
- BBC World News 2013
- Top prizes : Winner, Wall Street Journal Asia Innovation Awards 2012, Credit Suisse Technopreneur of the Year 2012 & Credit Suisse Innovation Awards 2012
- 1<sup>st</sup> Prize : Asia Entrepreneurship Awards 2012 (Japan)
- President's Technology Award 2011
- Rising Star Innovator Award, TechVenture 2011
- IES Prestigious Engineering Achievement Award 2010



# A Multidisciplinary Effort

**Engineers /researchers /  
Students**

**Clinicians &  
Oncologists**

**Patients/  
Users**

**Industrialists /  
Investors**



**Biologists**

**Government /  
Funding Bodies /  
Regulatory Agencies**



# What I have Learnt

- **Critical components:** good idea back up by solid research
- **Discernment** to know which research are most likely to be commercializable
- **WARNING:** Develop solution to a problem, not solution looking for a problem
- **Network:** know **who** to work with, **who** to seek help from & **who** to ask for money!
- **Communication:** Be able to **communicate effectively** across different disciplines as well as to both users and the business communities

# What Not to Do

- **Wear too many hats** at the same time - Determine the role you want to play: CEO, CTO, scientific advisor or member of board of directors?
- **Being detached** from the startup & not maintaining the flow of information.
- Expecting this to be **a quick route to riches!**

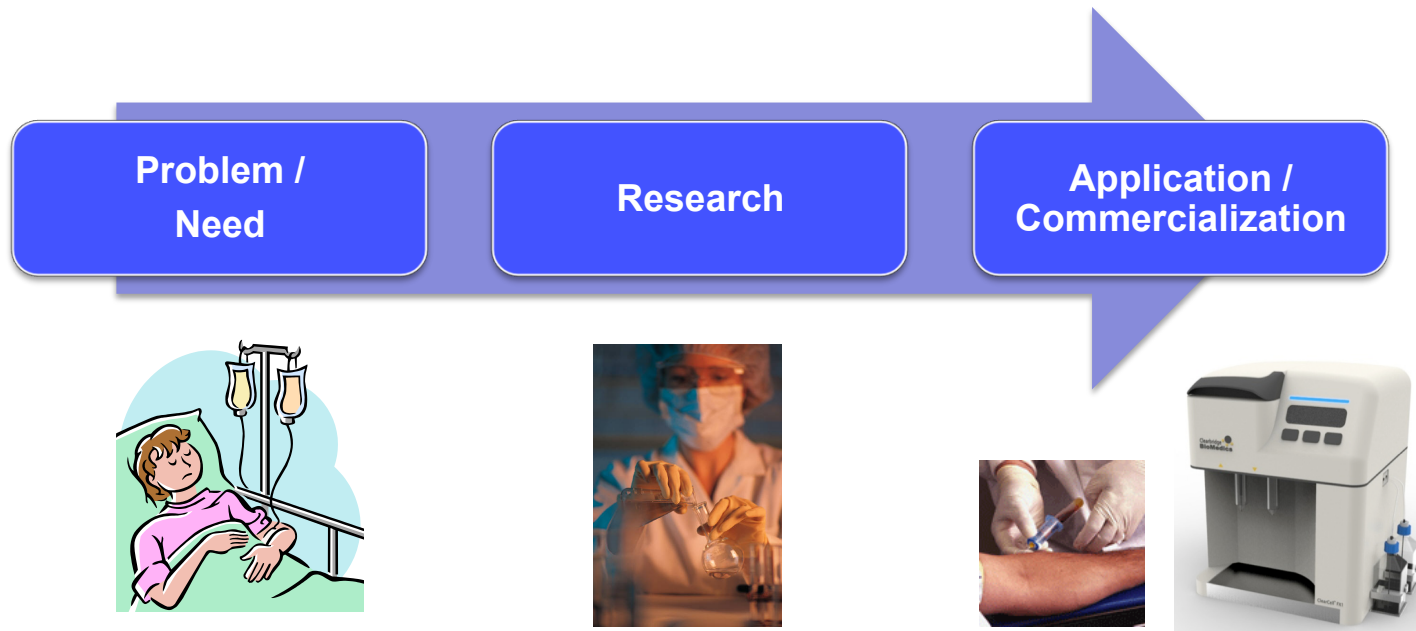


# For me as a Researcher ...

- Keep abreast of the **most cutting edge research**
- Enable me to **think more broadly and creatively**, and how to **develop and transfer technology** that could lead to new business opportunities
- **Hone my presentation and negotiating skills**
- Acquire ability to **manage multiple teams and multi-task** given limited time and resources
- Open **new doors** such as securing academic-industry funding, engage important collaborators, and access to new talents



# How to Make a Real Impact



Use the **NABC** approach towards value creation. Example:

- **N**eed – Better detection, diagnosis & real-time monitoring for cancer
- **A**pproach – Liquid biopsy via our microfluidic biochip (potentially disruptive)
- **B**enefits – Less invasive & painful, real-time monitoring, cheaper, ease of use
- **C**ompetition – Ours is more sensitive, accurate, cheaper, easier to use than competition. Our technology has been patented.

# How to Make a Real Impact

- Focus on **tackling the most urgent societal challenges** – aging population, urban sustainability, energy, water, healthcare.
- Will need researchers with the **drive, passion and perseverance** as well as **technical know-how** to **turn discoveries into everyday realities**.

"Genius (Innovation) is one percent inspiration and ninety-nine percent perspiration." - **Thomas A. Edison**

It's not just about ideas. It's about how to make them happen.

# Thank You

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