

What I learned about technology and pharma at a venture capital firm



Erik Reinertsen
@erikrtn



Basic science

Clinical research

Commercialization

Applied science
and engineering

Entrepreneurship

External Industry Relationships	Company Name(s)	Role
Equity, stock, or options in biomedical industry companies or publishers	BioRad Novo-Nordisk	Stockholder
Board of Directors or officer	None	None
Royalties from Emory or from external entity	Medibio	Patent royalties
Industry funds for research	Medibio Amgen Foundation	Research funding Travel support
Other	Takeda Ventures	Consultant





TAKEDA VENTURES, INC.

Digital pharma

Venture capital

Opportunities for you

Is pharma in dire straits?

An Industry Overdue for Disruption

Current biopharma R&D costs ‘unsustainable’, warns report

20th June 2017

BIOTECH VOICES, R&D

Pharma’s broken business model: An industry on the brink of terminal decline



by KELVIN STOTT — on November 28, 2017 08:44 AM EDT
Updated: 08:56 AM

Pharma industry’s return on R&D investment falls sharply

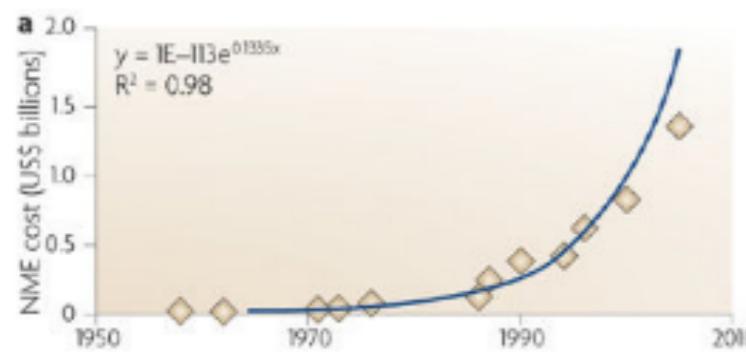
Will Pharma Reach a Negative Return on its R&D Investments?

DEALS & FINANCE

Evelyn Warner on 30/11/2017

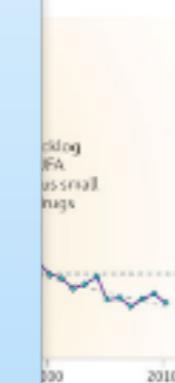
R&D productivity has declined

Munos 2009: A Problem 60
Years In The Making

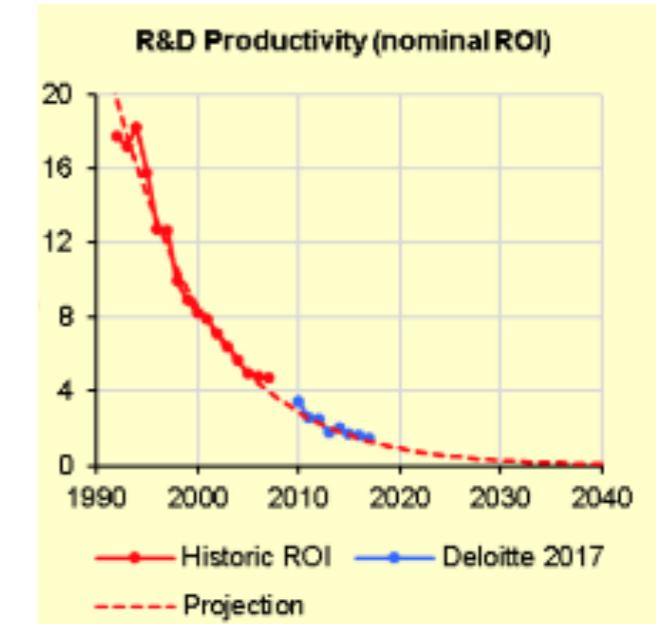


Scannell 2012:
Concept of “EROOM’s Law”

Narasimhan sets the stage by pointing out the industry's miserable attrition rate: of the twenty drugs that enter clinical studies, only one makes it. Worse, this rate apparently hasn't moved in the last fifteen years, while costs have continued to increase). This is the fundamental problem (as I've also emphasized) for which the industry is trying to solve.



Stott, 2018: Pharma ROI
Approaching Zero



Shaywitz & Taleb, *Financial Times*, 2008

David Shaywitz and Nassim Taleb JULY 29, 2008



The molecular revolution was supposed to enable drug discovery to evolve from chance observation into rational design, yet dwindling pipelines threaten the survival of the pharmaceutical industry. What went wrong?

The answer, we suggest, is the mismeasure of uncertainty, as academic researchers underestimated the fragility of their scientific knowledge while pharmaceuticals executives overestimated their ability to domesticate scientific research.

Can a biologist fix a radio?¹

**Could a neuroscientist understand
a microprocessor?²**

1. Jonas, E. & Kording, K. Could a neuroscientist understand a microprocessor? bioRxiv (2016).
2. Lazebnik, Y. Can a biologist fix a radio?—Or, what I learned while studying apoptosis. Cancer Cell (2002).



advanced search

OPEN ACCESS

ESSAY

Why Most Published Research Findings Are False

John P. A. Ioannidis

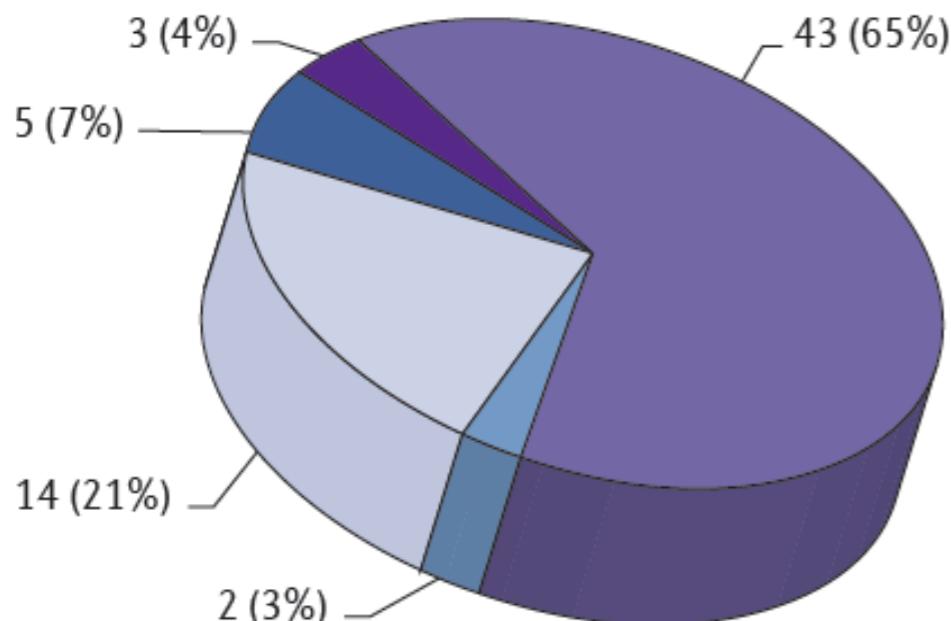
Published: August 30, 2005 • <https://doi.org/10.1371/journal.pmed.0020124>

68,836 Save	3,765 Citation
2,643,583 View	10,480 Share

Article	Authors	Metrics	Comments	Media Coverage
▼				

[Download PDF](#) ▾[Print](#)[Share](#)

Difficulties replicating academic data thwart pharma translation¹



- Inconsistencies
- Not applicable
- Literature data are in line with in-house data
- Main data set was reproducible
- Some results were reproducible

Investors wary of university results; insist on verifying²

Life Sci VC

Recovering scientist turned early stage VC | A biotech optimist fighting gravity

Academic bias & biotech failures

MARCH 28, 2011

I just met with an entrepreneur who was the founding CEO of a company created around an academic lab's discoveries. It was fascinating new approach to drugging hot receptor targets. To protect the innocent I won't mention the names, but Atlas Venture looked at it back in 2008 and, although intriguing, we ended up passing on the deal. Thankfully, because we missed a bullet – it recently was shut down.

52 tweets
retweet

The reason: **the foundational academic science was not reproducible outside the founder's lab.**

The company spent \$5M or so trying to validate a platform that didn't exist. When they tried to directly repeat the academic founder's data, it never worked. Upon re-examination of the lab notebooks, it was clear the founder's lab had at the very least massaged the data and shaped it to fit their hypothesis. Essentially, they systematically ignored every piece of negative data.

Sadly this "**failure to repeat**" happens more often than we'd like to believe. It has happened to us at Atlas several times in the past decade.

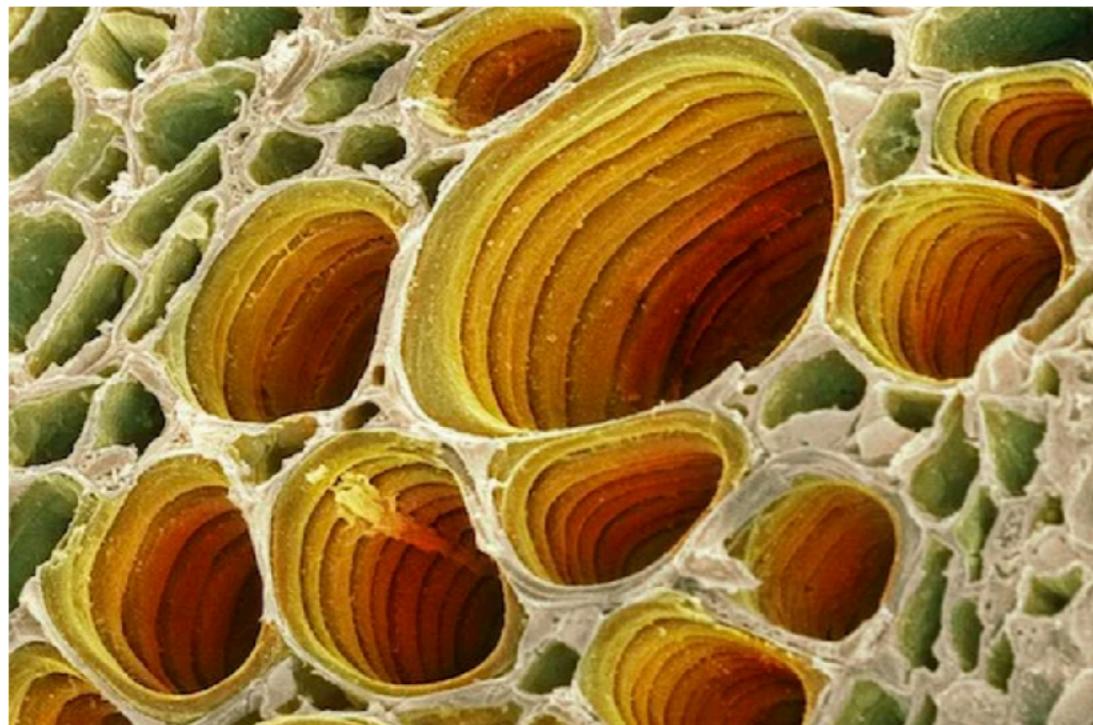


Observations

How to Engineer Biology

Billion-dollar bridges rarely fail—whereas billion-dollar drug failures are routine

By Vijay Pande on November 8, 2018



LATEST NEWS



Physicists Lay Out Plans for a New Supercollider



Hollywood's Portrayals of Science and Scientists Are Ridiculous

Blockchain

Big data

Wearables

Can Silicon Valley save pharma / healthcare?

Artificial intelligence

Digital health

Machine learning

Data science

Cloud platform

Software-Enabled Clinical Trials



Many companies offer products that span across categories. To keep the map simple, the logo is in the "primary" product.
Have an update? Share via www.ElektraLabs.org/decentralized-trials



Conduct Study

Start-Up Study¹



Manage Operations²



Drug & Supply Logistics

Collect and Analyze Patient-Level Data

Patient Data Management (e.g., EDC, eCOA, Digital Biomarkers)³



Decentralized Trials



0 Unlike the other for-profit ventures on this map, CTTI is a Public-Private partnership & AllTrials is a registered charity

1 Includes startup tools like eConsent and site training

2 Includes clinical trial management systems, risk-based monitoring, site monitoring, payment automation

3 Includes EDC (electronic data capture), informed consent, Imaging, Lab Data, Digital Biomarker Data and Validation, eCOA (Electronic Clinical Outcomes Assessment)

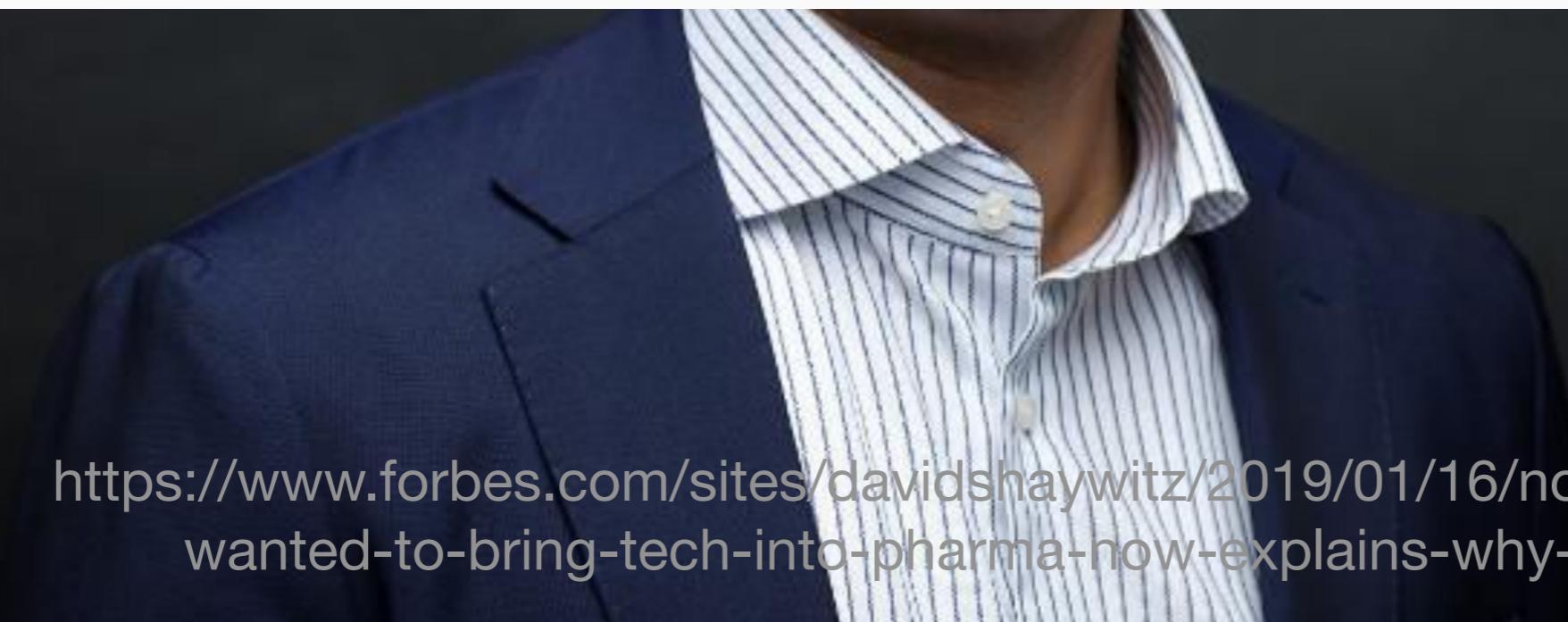
2018 by @AndreaCoravos



Novartis CEO Who Wanted To Bring Tech Into Pharma Now Explains Why It's So Hard



“The Holy Grail of having unstructured machine learning go into big clinical data lakes and then suddenly finding new insights – we've not been able to crack, mostly because the data...to link it up.....We are spending a lot of our energy just trying to get all of our data harmonized, so that some algorithm could maybe find anything of use.”



AI Doesn't Ask Why -- But Physicians And Drug Developers Want To Know



David Shaywitz Contributor ⓘ
Healthcare

- 1. No demonstrated wins**
- 2. Wary of “black boxes”**
- 3. TAs**
- 4. Assets > internal R&D**

<https://www.forbes.com/sites/davidshaywitz/2018/11/09/ai-doesnt-ask-why-but-physicians-and-drug-developers-want-to-know>



Life Sci VC

Recovering scientist turned early stage VC A biotech optimist fighting gravity

Four Decades Of Hacking Biotech And Yet Biology Still Consumes Everything

Posted April 26th, 2017 in [Drug discovery](#), [Pharma industry](#), [R&D Productivity](#)

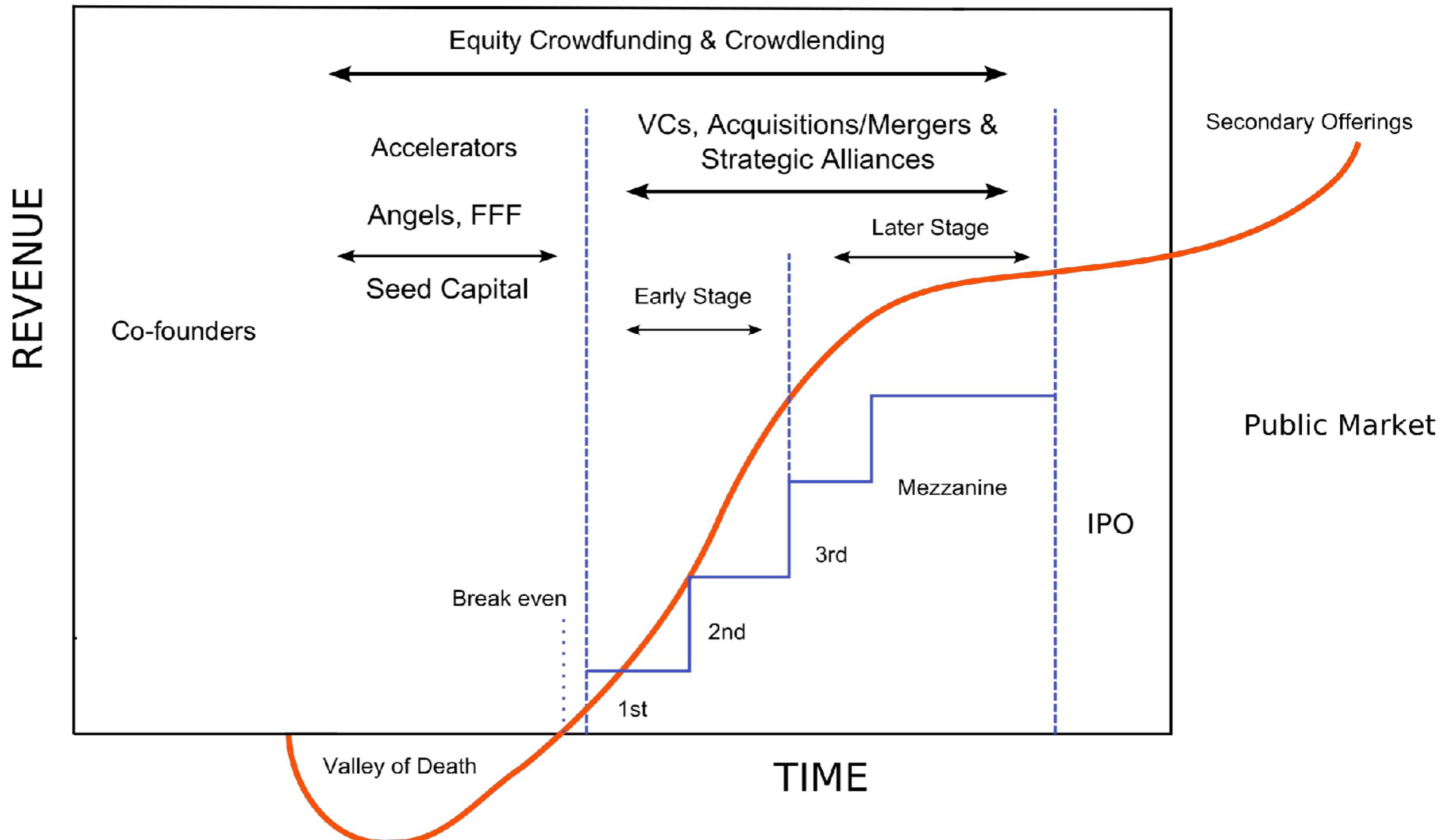
“[Computation] is only one of many contributors to overcoming the challenges of drug discovery today. There remains a wonderful abundance of artful empiricism in the discovery of new drugs, especially around human biology, and this should be embraced.

Digital pharma

Venture capital

Opportunities for you

Startup Financing Cycle





TAKEDA VENTURES, INC.

- Life science VC firm
- \$25M per investment
- Palo Alto, San Diego, Cambridge, London
- Everyone has a PhD (+/- MD)



TAKEDA VENTURES, INC.

GI

Onc

Neuro

Rare
Dz



TAKEDA VENTURES, INC.



Data science & technology

**Will DST disrupt/
revolutionize/save pharma /
life science / healthcare?**

Nope.

What emerging DST could significantly impact an important aspect of drug discovery & development?

**We identify and invest in
grounded, implementation-
focused tech-powered startups
that can improve how impactful
new treatments are discovered,
evaluated, and delivered.**

We seek solutions that

- Apply tech to a relevant pharma business problem.
- Have founders with domain expertise in tech and pharma.
- Pragmatically focus on implementation (vs. tech development).

Three Investment Categories

Digital Biology

- Genetics: geno/pheno integration to identify and prosecute targets
- Chemistry: AI to accelerate lead generation
- Imaging: cellular and phenotype extraction

Re-imagined clinical evidence generation

- Siteless trials using smart phones
- Leveraging RWE from EHR, claims, combo
- Digital phenotypes

Patient Engagement – Beyond The Pill

- Tech-enabled services to guide patients thru rx
- Adjunctive digital therapeutics
- Patient-empowerment tools & platforms

Science 37

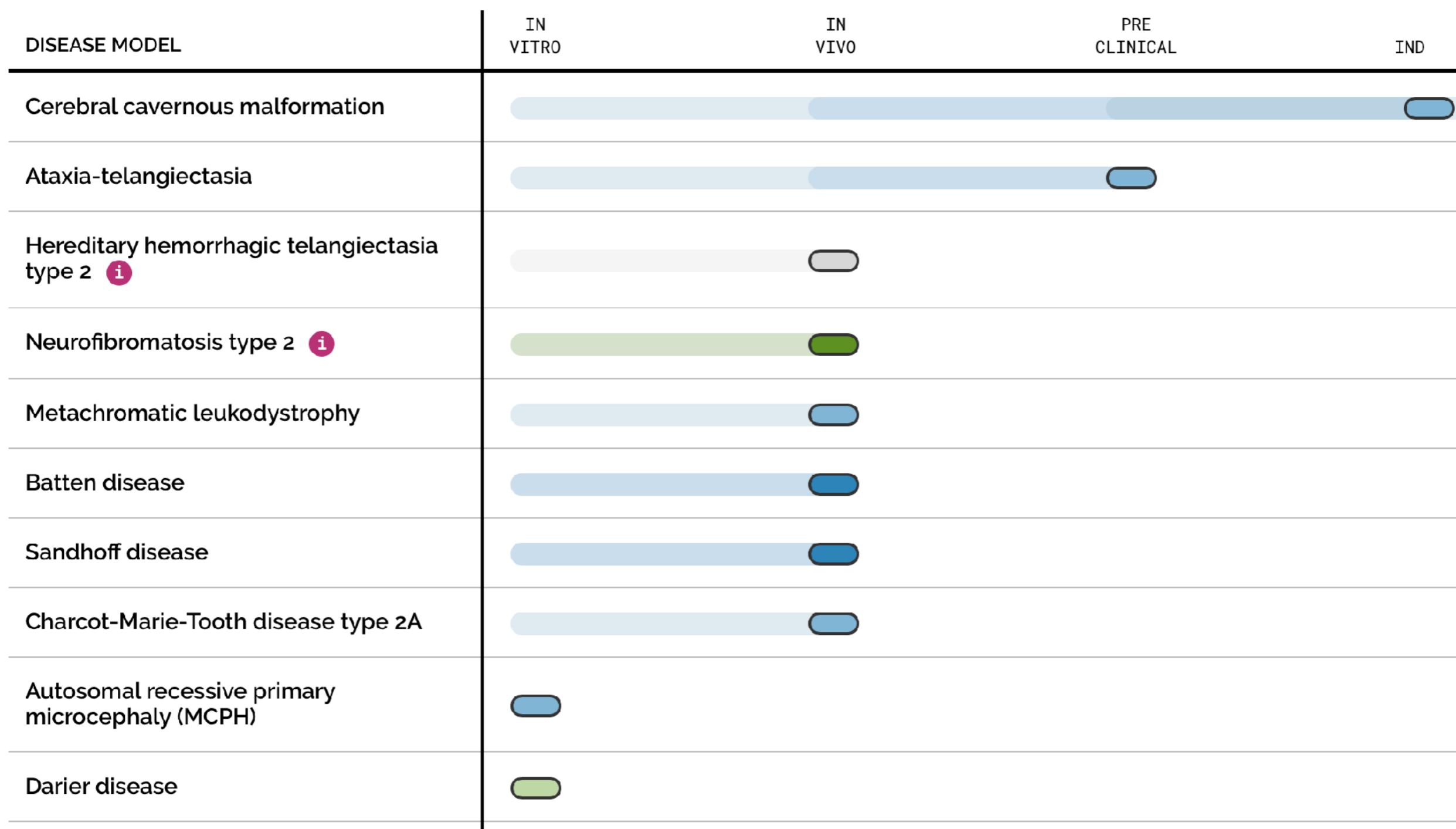
Smartphone-enabled clinical trials

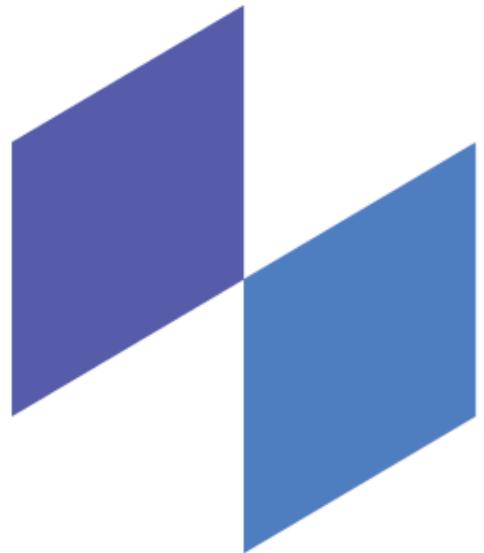
In March 2018, Novartis announced major collaboration with Science37, anticipating the launch of 10 studies this year in dermatology, oncology, and neuroscience.



RECUSION
pharmaceuticals

FILTER BY: THERAPEUTIC AREA ▾ STAGE ▾





flatiron

Organize cancer data to improve care and drive research

Secret sauce: Tech-enabled data abstraction of oncology-focused EHR data performed by carefully trained and supervised people.

Acquired by Roche in 2018 for \$2.2B

Amy Abernethy, MD, PhD

Deputy Commissioner of the FDA
Formerly CMO, CSO, & Senior VP of
Flatiron Health



Venture capital is hard.

**If you had \$10M, which
startup would you invest in?**

How I met David Shaywitz

 doximity



nature biotechnology

“If universities are to cultivate innovation in medicine and the life sciences, and do their best to facilitate the translation of science into clinical application, then they must learn to appreciate the opportunities for learning and discovery that entrepreneurship represents.”

Shaywitz, D. A. Entrepreneurs: the missing link in the training of medical scientists. *Nat. Biotechnol.* **23**, 1447–1448 (2005).

A Translational Innovator Career Track to Support Health Entrepreneurs?



David Shaywitz Contributor ⓘ
Pharma & Healthcare

“If start-ups are going to be an increasingly prominent part of the academic medical center landscape – as I hope they are and believe they should be – then there should be a meaningful career opportunity for faculty members who focus their efforts on advancing this translational interface.”

Nitty gritty

Q

A

Did you get paid?

\$5600 / month.

Did EUSOM give elective credit?

No.

How did you afford to live in the Bay Area?

Lived with my fiancée at UCSF.

What are you doing next?

Working on it.

Can you help me get an internship?

Maybe.

Opportunities for you

1. Think carefully about how industry can will advance your career as a physician-scientist.
2. Your depth, skills, and relationships are key; NOT your degrees.
3. Everyone I met in industry is trying to make a positive difference.

Opportunities for you

4. Great physician-scientists are rare, so many doors will open for you *especially later in your career.*
5. Assertively ask for advice & help.
6. Your own path will often not be the one laid before you.

Translate your work

If you are working on something with translational potential in **GI, oncology, neuroscience, rare disease, or DST**, let's talk!



TECH TONICS



Deb Kilpatrick — Evidation Health

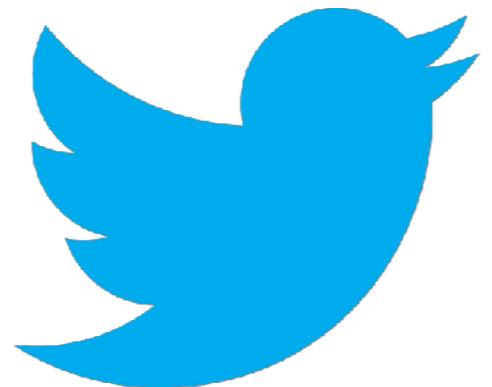
Zak Kohane — Harvard Med

Susan Desmond-Hellmann — Gates Foundation

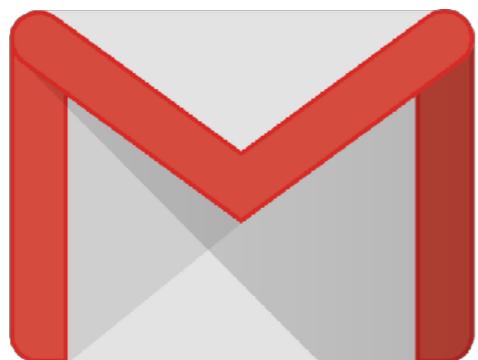
Atul Butte — UCSF

Jessica Mega — Verily

Simon Kos — Microsoft



@erikrtn



erikrtn@gmail.com

slides @

