# **From DNA to the Cloud** My journey to making the R&D easier

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#### Agenda

- 1. A bit about me
- 2. How did I end up here?
- 3. Lessons learned

You have brains in your head. You have feet in your shoes. You can steer yourself any direction you choose.

### A bit about me in a nutshell

Born and raised in NJ

#### **Rutgers University**

- BA: Math, Bio-Math and Computer Science
- PhD 2010: Computational Science and Molecular Biophysics
- Department of Energy Computational Science Graduate Fellow

#### **Prior to AWS**

- Connotate Technologies
- Chubb Group of Insurance Co
- Children's Hospital of Philadelphia (CHOP)
- Bristol-Myers Squibb (BMS)









### A bit more about me

#### What/who inspires me

- The potential science of what we can achieve with the data we have
- The brilliant people past and present
- The patients my little bit at making the world a better place

#### What am I passionate about?

- Revolutionary science
- Creative problem solving
- Beautiful natural spaces





#### But that is not all that I am

#### What else?

- Live in Highland Park, NJ
- Family

#### If not working where do you find me?

- Cooking
- Laundry
- Driving the kids





### How did I end up here?

AWS re:Invent 2023 - Omics innovation with AWS HealthOmics: Amgen's path to faster results (AIM215)



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### Data Science and the People who do it

**Data Science** 

**Generalized** Extraction of knowledge from data

Builds on techniques and theories from many fields

Goal of extracting meaningful data and creating data products

Science is key

#### **Data Scientist**

Love Data – many people don't



Math/stats/machine learning in practical terms



Software engineering / data architecture



Hacking – ability to glue stuff together



Visualization and communication

### The Journey





#### Was the previous experience useless?

### What did I do in my PhD

Discovered in 1865

Role in genetic inheritance 1943

Genetic structure identified 1953



#### De novo assembly & error modeling





H. sapiens ~25,000 genes 3,200,000,000 bp



D. rerio 35,000 genes 1,700,000,000 bp



S. cerevisiae 6,250 genes 12,500,000 bp



C. elegans 18,425 genes 100,300,000 bp



D. melanogaster 13,600 genes 130,000,000 bp



A. thaliana 25,500 genes 157,000,000 bp

#### What did I walk away from my PhD with

Deep knowledge of NGS Sequencing

#### 4

How to communicate your science simply High Performance Computing

#### 5

A diverse community of experts I am still in touch with Understanding what scale means and the nuances involved

3

6

There are other options than PI....

#### Now what.....



#### Networking

### Job #1: CHOP



### **Children's Hospital of Philadelphia**



EMPLOYEES



Main Hospital Philadelphia, PA, USA

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BREAKTHROUGHS. EVERY DAY.

Let's get started.





## Creative Problem Solving @





Can Next Generation Sequencing be used for clinical diagnostics?



Can Next Generation Sequencing be used to reveal more about the MHC?



Can we identify this fusion in this brain cancer?



Can we use scale to understand complex disease



# From Bench to Bassinet: Targeting Pediatric Diseases with Analyses and Bioinformatics Tools

The clinical sequencing pipeline for WGS, WES, and targeted

Shared pipelines leading to robustness, reproducibility, reduced cycle times

Pediatric Cardiac Genomics Consortium (PCGC) – analyzing the causes of congenital heart disease

Cool projects identifying the causes of rare pediatric disease

Worked on projects around disease and the MHC



### What did I walk away from CHOP with

1	2	3
Networking across groups is really important	More High Performance Computing	More scaling nuances
4	5	6
How academic institutions functions	A bigger community of experts	Solving complex problems to help scientists is amazing

#### Job #2: Bristol-Myers Squibb



More Networking! Keep your eyes open for opportunities!

### **Bristol-Myers Squibb**



#### EMPLOYEES **34,000+**



Headquarters Princeton NJ, USA



# Histol Myers Squibb



## Creative problem solving @



Can I help BMS do Oncology at scale?



Can I work with the labs to identify better methods for sequencing?



Can we accelerate innovation by moving to the cloud?



Can we identify inefficiencies in the Labs generating the data?



Bristol Myers Squibb

#### What is Data at scale?

Building production pipelines leading to robustness, reproducibility, reduced cycle times

Using our understanding of the algorithms to build the best data sets for our translational scientists

Built large-scale processing pipelines and storage solutions for genomic, transcriptomic, proteomic and single-cell data from pre-clinical and clinical samples using both AWS and internal HPC platforms

Initiated and Realized the implementation of an internal variant warehouse



#### Sometimes looking for a job feels like.....



http://xkcd.com/399/

#### What did I walk away from BMS with

Learn to Matrix manage

#### 4

How Pharma works, R&D, Clinical Trials, & Manufacturing More High Performance Computing – AWS edition

5

A bigger community of experts

#### 3

6

More scaling for science and really what it means for disease

Failure is an option and sometimes the fastest way to success

### The Journey



#### Amazon Web Services, Amazon



EMPLOYEES



Headquarters Seattle WA, USA

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Founded Amazon/AWS 1994/2006



## What is Cloud? What is Amazon Web Services (AWS)?



A broad and deep platform that helps customers build sophisticated, scalable, secure applications

### The Cloud



https://xkcd.com/908/

### How did I end up here?

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## Creative problem solving @





How can I help genomics customer's achieve their goals?



Is it worth building a new service?



What is missing for our customer's?



#### Why moving to AWS was a good idea



#### Impact

I came to help push the Healthcare and Life Sciences forward. The only place to get signals of needs of an industry is from above the industry.

**Insist on the Highest Standards** 

Leaders are continually raising the bar and drive their teams to deliver high quality products, services, and processes.

# $\checkmark$

#### Learn and be curious

At the core of really every Amazonian. This is one of our most prized values



#### Team Culture

Amazon culture is peculiar, but I have truly never met a group of more talented colleagues.



#### Experience

One of the few places you can gather so much experience. From talking to C-suite of a top pharma about the art of the possible, to talking with startups about how to achieve their dreams, to helping launch a service.

https://www.amazon.jobs/content/en/ourworkplace/leadership-principles

### What I wish I knew then



Shoot for changing the world I keep striving for that every day.

#### Failure is an option



If not, the creative process dies. It is hard to pick yourself up afterwards but try again with the new knowledge you have.



Always keep your eyes open for opportunities

Life shuts lots of doors, but you don't want to walk by the open door meant for you.



Those who do not learn history are doomed to repeat it." ---George Santayana Don't reinvent the wheel without good reason to.



You can't have it all, but you can come pretty close.



There is always something that you don't like, but finding a job you are happy going to is a blessing.

### What I wish I knew then



#### Networking

Hang out with like minded people, a friend today may be a colleague tomorrow

Be mindful of connections to help you grow in your career or in finding the next job



#### Mentors

Find one now! Actually more than one if possible

They can help you keep perspective and help you find balance and grow



#### Understand the job role and the company Try to find a connection that knows the company and understand its levels, compensation and culture. You can't know everything, but do your homework.



Interviewing and resume writing is a skill At some point you just need to jump in and do it, but it is a process - **practice**.





Don't not apply for a job just because you don't check all the boxes.

Be prepared to advocate for yourself – with Data.

### How do you get there

- 1. Before you accept think about what you learned during the interview process
- 2. Talk to friends and extended network
- 3. Jump in and see

Keep your eyes open. – some positions just drop in your lap



### Technology is easy..... the people management can be hard

- Learn to take feedback it often isn't easy but it will be the fastest way to grow
- How to influence other and being influenced
- Working in teams with various personalities
- Global work different cultures time zones and job profiles
- Communicate your message to all levels

### The Journey



# KNOWING YOURSELF, IS THE BEGINING OF ALL WISDOM

ARISTOTLE

# **Questions?**



# Thank you!