Transitioning from academic research to a career in biotechnology

Margaret Kiss

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Presentation Outline

• Career background
• Common misconceptions about industry jobs
• Changes you can expect
• Competencies important for success in industry
• Showcasing your competencies
• Reasons to seek a biotechnology job
Career Background

1997- BA in Biology from Cornell University

2003- PhD in Genetics from Yale University, Laboratory of Dr. Peter Glazer

2003-2007- Post Doc in laboratory of Dr. Patrick Sung at Yale University

2007-2008- Senior Scientist at Raindance Technologies

2008-2012- Scientific Manager at Affomix, Acquired by Illumina in 2010

2012-present- Director of Molecular Sciences at AxioMx, Acquired by Abcam in 2015
Thesis Research: Chromosomal Gene Targeting using Triplex-Forming Oligonucleotides

Margaret A. Macris, and Peter M. Glazer

J. Biol. Chem. 2003;278:3357-3362

Developed strategy for detecting oligonucleotide-mediated triple helix formation at chromosomal sites

Purified proteins involved in maintenance of genomic integrity and studied their mechanisms of action


Making the transition to industry
CURE Bioscience CT

CURE is a good resource for companies in the area and provides links to employment opportunities.
What to look for before deciding to join a start-up

• Is the company well supported by a venture capitalist(s)?
  • When was the last time the company raised money?
  • Do you have 6 months or a year to meet the next milestone?
• Is it a great company/idea?
• Is it a great team?
• What is the track record of the investors and CEO/CSO?
  • Look at the bios of the board members
Founders of Raindance Technologies, Affomix, and AxiomX had track record of success.

Dr. Jonathan Rothberg is best known for inventing high-speed, "read-and-cut" DNA sequencing. He founded 454 Life Sciences, striving to market the first new method for sequencing genomes since Sanger and Gilbert won the Nobel Prize in 1980. Dr. Rothberg sequenced the first individual human genome (The Human Genome Project with Trentin Plas), under R. A. Lederberg's supervision. Now, the institute he founded, 454 Life Sciences, has engineered a "read and cut" method that revolutionized the field.

In 2002, Rothberg co-founded Illumina Inc., the leading DNA sequencing company in the world, which is valued at $18 billion. The company has consistently outperformed industry averages and has revolutionized the way DNA is sequenced, making it faster, cheaper, and more accessible. Rothberg's vision and leadership have been instrumental in advancing the field of genomics, and his contributions have been recognized with numerous awards and honors.

**Track record of company founders can be good predictor of future success**

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**Christopher McLeod**

President and CEO

Throughout his career, Christopher McLeod has demonstrated expertise in growing companies through strategic collaborations, innovative marketing, and new product development. Mr. McLeod served as President and Chief Executive Officer of 454 Life Sciences from February 2005 through September 2011 and managed the integration with Roche Diagnostics following its acquisition in 2006. He led the development, manufacturing, and marketing of the company’s innovative DNA sequencing technology and products, which are sold to thousands of research laboratories worldwide. Previously, he served as Executive Vice President of Genetiq where he oversaw bioinformatics, strategic business development, and collaborative research, including the development of strategic partnerships with Affymetrix, Inc. and TragenNet AG.

Prior to joining Genetiq, Mr. McLeod spent over two years as Chief Executive Officer of House Interactive (formerly Condant Software), a leading international software developer with such leading brands as BizCard, Simis, and Knowledge Adventure, whose annual revenues increased in excess of 90 percent to over $200 million during his tenure. Previously, Mr. McLeod served as Executive Vice President and Director of O2C International where he was President of the Connect2 division, marketing-conference membership programs with partners including Citibank, Sears, Bank One and Chase.

Mr. McLeod earned his B.S. magna cum laude with a dual major in economics and engineering and a minor in political science from Carnegie Mellon University, where he is a Life Trustee. He is a member of the National Academy of Engineering, the Carnegie Academy of Science and Engineering, and is a Life Trustee of Carnegie Mellon University.

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**Michael Weiner**

President and CEO

Mr. Michael Weiner is a recognized leader in the life sciences and pharmaceutical industries, with over 30 years of experience. He has held leadership roles at numerous companies, including Abbott Laboratories, Amgen Inc., and Millennium Pharmaceuticals. His expertise in fundraising, business development, and strategic planning has been instrumental in driving the growth and success of these companies.

Mr. Weiner currently serves as President and CEO of Alacrin Therapeutics, a纳斯达克上市的生物技术公司, and is also a member of the Board of Directors of a number of other companies. He has previously served as President and CEO of Affymetrix, Inc., a leading provider of gene expression analysis solutions, and as President and Chief Executive Officer of Affomix, a biotechnology company focusing on the development of diagnostics and therapeutic agents.

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**28 February 2017**

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Developed real-time PCR on chip using droplet-based microfluidics

Affomix: Recombinant antibody development

Developed water-in-oil emulsion method for isolating cells secreting phage particles that display desirable antibodies
AxioMx: How fast can you make an antibody?

Developed technologies to reduce antibody development timeline from months to weeks
Common misconceptions about industry jobs
Misconception #1: You cannot publish in industry

AxioMx published all pipeline improvements in peer-reviewed journals.
Scientific writing

• Most companies encourage scientists to communicate their work to the external community
  • *May be delayed until intellectual property considerations have been addressed*
• Publication showcases the high quality work of its employees
• Publication helps bolster the overall reputation and scientific credibility of the company
  • *Help in recruiting future employees*
  • * Garner favor with potential investors*
Misconception #2: There is no opportunity to work on your own ideas

- Companies depend on creative and motivated scientists to come up with new ideas and develop transformative technologies
  - Justify investment of resources by showing value of proposed research to upper management
  - Government funding available for small business research projects (SBIR-Small Business Innovative Research)
SBIR Program from NIH

<table>
<thead>
<tr>
<th>Grant Number</th>
<th>Description</th>
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<tbody>
<tr>
<td>1R43GM112204-01A1</td>
<td>Vector and strain system for the in vivo conversion of antibody fragments into IgG molecules (16)</td>
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<tr>
<td>1R41GM113301-01</td>
<td>Engineering a phosphotyrosyl-tRNA Synthetase (36)</td>
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<tr>
<td>1R41DK104602-01</td>
<td>Functional-selection of affinity reagents against DNA-protein complexes using targeted chromatin sequences (20)</td>
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<tr>
<td>1R43GM112385-01</td>
<td>System for Multiplex Protein:Protein Interaction Studies Modeled with Antibodies (26)</td>
</tr>
<tr>
<td>1R43GM105080-01</td>
<td>A novel pre-defined CDR library for selection of affinity reagents (27)</td>
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AxioMx's research program was largely funded through NIH SBIR grants
Misconception #3: Industrial science is not the same caliber as in academia

• The success of the company depends on the quality of the science

• Ultimate product of industrial research is usually a tangible entity (eg. new drug)
  • Publications are byproducts of industrial research rather than key products
• Combinatorial changes are restricted to complementarity determining regions (CDRs).
• Recombinant affinity reagents can be tagged and used as traditional antibodies, or can be recombined back to Fc fusions, Fabs, IgGs, etc.
Example Project: Conversion of scFvs to IgGs

- Current technologies take >1 week, cost hundreds of dollars, and are not scalable
- Can we develop a low-cost method to accurately subclone our scFvs into IgGs?
Problem Solving: Applying known concepts

- Phage integrases can be used to recombine two pieces of DNA in a site-specific manner.
- By selective encoding, the same DNA sequence can be used to catenate different control elements.

Phage integrases

Catenated promoters
Novel Vector Design: *In vivo* Overnight Conversion of scFv into IgG

Intron splicing and integrase recombination do all of the subcloning

Results: System Validation

- scFv containing attP linker shows equivalent function to standard scFv
- IgGs expressed from pMINERVA show functional activity

**System Versatility**

<table>
<thead>
<tr>
<th>Tag type</th>
<th>Examples of 3’ fusion constructs</th>
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<tbody>
<tr>
<td>Enzyme</td>
<td>βGal, Alk Phos, HRP</td>
</tr>
<tr>
<td>Purification</td>
<td>His6, FLAG, protein A/G</td>
</tr>
<tr>
<td>Labeling</td>
<td>GFP, Halotag, sfp, SNAPtag</td>
</tr>
<tr>
<td>Endosomal</td>
<td>Ubiquitin ligase, FKB12</td>
</tr>
<tr>
<td>Fc</td>
<td>Rabbit, cow, mouse, goat, human (IgG1, IgG2, IgG3, IgG4, IgM)</td>
</tr>
<tr>
<td>Other</td>
<td>Avitag, sfp synthase, ACP-tag, TCR T-cell receptors with different membrane spanning sequences</td>
</tr>
</tbody>
</table>

Constructed rabbit (with and without FLAG tag), mouse, and goat pAcceptors to facilitate production of chimeric antibodies
Changes you can expect
A lot more meetings!

• Most industry projects involve collaborating with multiple people on multi-disciplinary teams
• Meetings are required to coordinate work across teams, and PhD level scientists are often asked to run the meetings
  • Have an agenda
  • Write down actions and decisions and email them out after
  • Learn how to steer conversation
More attention to timelines

- Research projects can follow timelines
  - Must manage towards decision points rather than end points
- Since projects are collaborative, others are organizing their work around you
  - Important to accurately estimate timelines and follow through on promised dates for doing something
- Familiarity with project management tools is helpful
  - Microsoft Project
  - Visio (Flow chart/Decision tree software)
Flow charts help outline the project plan

- Go/No Go decisions and failure recovery paths are identified
- Timelines can be tracked to decision points rather than end points
GANNT charts track dependencies of project steps

Failure to meet deadline on one task will impact timelines of other tasks
Your progress is measured consistently based on performance

- You will have goals and defined timelines to meet those goals
- You are rewarded for being a leader and showing initiative
- Your supervisor will be held accountable for measuring your progress
  - Progress tracked throughout the year
  - Your goals, manager’s goals, and company goals are aligned
Goal Setting

Goals are generally reviewed on a quarterly basis

- **Specific**: State exactly what you want to accomplish (Who, What, Where, Why)
- **Measurable**: How will you demonstrate and evaluate the extent to which the goal has been met?
- **Achievable**: Stretch and challenging goals within ability to achieve outcome. What is the action-oriented verb?
- **Relevant**: How does the goal tie into your key responsibilities? How is it aligned to objectives?
- **Time-bound**: Set 1 or more target dates, the “by when” to guide your goal to successful and timely completion (include deadlines, dates and frequency)
Your performance affects your compensation

- Most companies reward strong performers with bonuses and/or merit-based raises
  - Both individual performance and company performance often influence the bonus amount
- Individuals who have gone above and beyond the expectations of their role or have taken on a new responsibility in the company may be promoted to a new role
  - Most companies have career ladders, and there may be multiple tracks (e.g. scientific track versus management track)
- Stocks or stock options may be granted as part of your compensation
  - Stocks often vest over a period of time
Differences between small biotech and large pharma companies
Job Stability

• Although there are job cuts and downsizing in the pharmaceutical industry, biotech companies are inherently more risky

• Biotechnology companies often depend on funding from venture capitalists
  
  • Venture capitalists typically put up millions of dollars to form a company around a concept with the idea that funding will last through the proof-of-concept (POC)
  
  • If the POC works, the venture capitalists may provide more funding or sell the company to a bigger company
Roles and Responsibilities

- Small biotechnology companies often require scientists to be jacks-of-all-trades whereas pharmaceutical company scientists may be more focused on specific duties and roles
  - Opportunities in start-up company for scientists to gain skills in business, operations, etc.
- Work hours may be longer and more variable in biotechnology because of the shorter financial window and clock constantly ticking
Culture

- Every company has its own unique culture
  - At a small company you’ll know everyone
  - If the team gets along, it may feel like a family, but if they don’t get along, you don’t have the distance of a big company
- The bigger a company gets, the more bureaucratic it becomes and often more conservative
  - There are more hoops you have to jump through to get anything done in a larger company
  - Small businesses typically have less rules and more flexibility
Compensation

• Based on the American Association of Pharmaceutical Scientists’ 2015 Salary Survey, the mean base annual salary for full-time employees in the US in biotechnology and pharmaceutical jobs was similar (~$130,000)

• Biotech companies often offer stock options
  • Do some research to understand what you’re being offered
  • There is a difference between preferred shares that venture capitalists hold and common shares held by employees
Your success is visible at a small company

• Unless you work in upper management, accomplishing something significant at a large company may never get noticed by the CEO

• At a small company, great work will be seen by everyone and it may be easier to distinguish yourself
  • Being able to speak directly to upper management and voice concerns or pitch ideas can result in faster career progression

• If you’re starting out in a new career, working for a small company is a great way to establish your abilities and gain references and reputation
What happens after a start-up company is acquired?

• Your stock options may become fully vested and cashed out or converted to stock in the new company
• Retention packages may be offered to keep key employees
• Expect some changes in goals, processes, and reporting structure
Competencies important for success in industry
Leadership and Management

• Teaching and mentoring are integral parts of doing research within the context of project teams

• PhD scientists are generally given supervisory responsibility and are expected to mentor, both scientifically and in terms of career guidance, those who report to them
Interpersonal skills

- Facilitate group discussions or conduct meetings
- Motivate others to complete projects
- Respond appropriately to positive or negative feedback
- Effectively mentor subordinates and/or peers
- Collaborate on projects
- Teach skills or concepts to others
Communication skills

- Organize and communicate ideas effectively in oral presentations to small and large groups
- Explain complex or difficult concepts in basic terms and language
- Write at all levels- brief abstracts to longer manuscripts
- Debate issues in a collegial manner and participate in group discussions
- Use logical arguments to persuade others
Project Management and Organization

• Manage budgets
• Work in a team and on multiple projects
• Solve problems
• Organize meetings and events
• Prioritize tasks while anticipating potential problems
• Maintain flexibility in the face of changing circumstances (e.g. changes in project priorities, reporting structure, etc.)
Developing skills for success in biotechnology
Developing Leadership and Management Skills

• Supervise undergraduates or less experienced graduate students
• Manage a project involving multiple scientists
• Be a mentor in a formal program
• Start something (eg. a journal club, biotech club, etc.)
Developing Teamwork and Collaboration

• Collaborate with another lab, in another field maybe, and publish
• Join a lab that has multiple collaborations, even with industry labs
• Work on a big project that relies on a division of labor
• Serve on a committee and do something big like plan a conference
Developing Communication Skills

• Teach classes
• Go to workshops and conferences- Give a talk or present a poster
• Practice your English if needed, eg. go to ESL classes
• Practice your presentation skills (lab meetings, research in progress talks, conferences, etc.)
• Write papers and grant proposals
Developing Innovation and Creativity

• Pursue speaking invitations by inviting others (eg. be on a speaker committee)
• Follow industry publications like FierceBiotech to “learn the trends”
• Attend events with local networking and trade organizations (eg. Cure)
Showcasing your competencies: Building a resume, interviewing, and networking
Maximize Productivity

• Justify time spent in academia
  • What did you gain by doing a second post-doc?
  • A 1st year post-doc versus a 3-time post-doc after 9 years can be viewed the same, depending on what skills are acquired and highlighted

• How do your publications translate to adding value to your future company?
  • Pick a company in the same field or scientific discipline
  • Demonstrate innovation and problem solving skills
Resume Tips

• One to two pages showcasing accomplishments that would be most impressive

• Highlight examples of working under tight timelines, leading teams, and working with groups of peers

• Tailor the resume to each job you are applying for and highlight your skill sets to make it stand out

• Quantify your results

• Mix in soft (behavioral) skills with hard (technical) skills
Resume Tips (Examples):

• **Quantify your results:**
  - Discovered x, y, and z, which resulted in 2 first author publications in peer-reviewed journals

• **Mix in soft (behavioral) skills with hard (technical) skills:**
  - Effectively demonstrated scientific writing skills and met grant deadline two weeks ahead of schedule
Interviewing Skills

• Many companies use behavioral interviewing
• Important to present relevant skills (e.g. project management, presentation delivery) in addition to scientific knowledge
• Read relevant articles and be familiar with industry trends prior to interview
• Research the company you are interviewing at
Behavioral Interviewing: Sample Questions

• **Question:** Tell me about the manager/supervisor/team leader who was most difficult to work for. How did you handle this difficult relationship?

• **Goal:** Evaluate candidate’s adaptability

• **Question:** Give me an example of a new way you were able to apply existing knowledge to solve a problem

• **Goal:** Evaluate candidate’s innovation
Networking

• Meet people face-to-face: Job fairs, networking events (eg. Cure), conferences

• Talk to former colleagues and collaborators
  • Often it is about “who you know” even more than about “what you know”
  • Referrals are the #1 source of hiring in industry because they give you credibility

• Networking helps to demonstrate and further develop interpersonal skills
Reasons to seek a biotechnology job
See your knowledge translated into a tangible product

Anti-Myelin Basic Protein antibody [IGX3421] (ab209328)

1st phage display-derived antibody in Abcam’s catalog
Be part of a collaborative team working toward a common goal

AxioMx Team 2012

AxioMx Team 2016
“At the end of the day, it’s not about what you’re working on, it’s about the people you are working with.”
Questions?