From U. of M. to Silicon Valley

- This is a seminar on my experiences going from U. of M. to Si Valley in an effort to commercialize my dissertation research.
- This is also a story about “doing it”.
- And most of all, it is a lesson for you on what I know now (and wish I knew then) such that you are equipped for success.
Testing our 16b µC and CMOS clock generator in the lab at U. of M. January, 2004

Post-defense with my faculty advisor, Richard B. Brown, in the SSEL suite April, 2004
Of course we’re burning the midnight oil.

Mobius moves to Detroit

Mobius Microsystems
Detroit Design Center
Grand Park Centre
28 W. Adams Ave.
Detroit, MI

Suite 1600
The Design Center

Suite 1000
The Lab

Detroit Design Center (preconstruction)

Design Center (post-construction)
Lab (post-construction)

Convenient martini bar (for staff)
Mobius’ headquarters move to Sunnyvale (Silicon Valley), CA

Sunnyvale is more or less in the heart of Silicon Valley and the epicenter of start-ups
Questions

• How many of you have thought of starting your own company?
• How many of you have considered commercializing your research?
• Why?
• Reasons I was attracted to entrepreneurship
  – To build something new and creative
  – To work with great people who can build something bigger than I can alone
  – To have fun and continue exciting scientific investigation
  – To put MI and UMICH on the map (I was a tree-hugger)
  – To change the world
Many of us like to believe the world is this way. In reality, the world is much more like this way. We'll get some ideas about who Itchy is by the end of the seminar. And trust me, you're Scratchy.
Getting real

• What is the purpose of a business?
  – Businesses’ sole purpose is to generate profit for shareholders
    • Milton Friedman (Nobel Laureate in economics)

• You need to maintain your idealism, but understand the reality of the world to be successful
The reality of the entrepreneurship

Many of us believe entrepreneurship is magic.

In reality, entrepreneurship requires rather academic hard work and a little luck.
Overview

• **Mobius Microsystems (Background)**
  – Core technology, history and accomplishments
  – A quick primer on commercializing university research

• **Critical Analysis of Entrepreneurship (Data)**
  – Reality of “getting rich” in technology
  – “Bubbles happen”
  – Understanding VC-backed start-ups
  – New venture risks and ingredients for success
  – The reality of investment capital
  – Local initiatives

• **Recommendations (Conversation)**
  – Recommendations for entrepreneurs, educators and legislators

• **Concluding thoughts**
<table>
<thead>
<tr>
<th>Mobius: Background</th>
<th>Critical Analysis: Data</th>
<th>Rec’s: Conversation</th>
<th>Conclusions</th>
</tr>
</thead>
</table>

**Mobius Microsystems (Background)**
Technology background

- Quartz crystal is a piezoelectric material
  - It mechanically deforms when an electric field is applied across it
  - This deformation occurs at the resonant frequency of the crystal and depends on its geometry and the cut across its lattice
- Quartz as a frequency reference
  - Quartz has a very high quality factor, a measure of frequency selectivity
  - If manufactured properly, quartz can be used as a very stable frequency reference over all operating conditions
  - Quartz has been the mainstay reference for decades
Quartz manufacturing process

- **Growth**
  - Small chips of quartz are dissolved in sodium hydroxide and seed the growth of crystals
  - Requires ~21 days and a well-controlled environment

- **Cutting and lapping**
  - A quartz bar is sliced to small dimensions (e.g. mm) and at a specific angle (e.g. AT) to create blanks
  - The blanks are lapped to a geometry that approaches the target frequency

- **Finishing**
  - The crystal is cleaned and metal electrodes are deposited onto it under vacuum
  - Additional metal is deposited to set the final frequency
  - The device is hermetically sealed
Why replace quartz?

- **Manufacturing**
  - This is a long, slow and expensive process that can only become cost effective through economies of scale
  - Further, many different frequencies are required
- **Benefits to eliminating crystals (XTALs) and crystal oscillators (XOs) in systems**
  - Reduced cost
  - Reduced form factor and PCB footprint
  - Reduced time to market
  - Increased reliability
  - Increased integration
- **Quartz is one of the last great hold-outs for microelectronic integration**
Amortizing the cost of quartz lines

- **Silicon (CMOS) Frequency Synthesizers**
  - Developed in an effort to reduce XTAL component count: 1 XTAL, multiple output frequencies
  - Utilizes Silicon phase-locked loops (PLLs) to generate plurality of output frequencies
  - Degraded performance, but reduced cost and form-factor

Pre 1980’s

1980’s - present
XTALs in PC motherboards

- Master Timing Socket
  - ICS95022 PLL
  - 14.318MHz XTAL
  - 2 dedicated pins
  - 2 capacitors
  - 1 precision resistor
  - 5 insertions
  - Generates multiple clocks: USB, µP, etc.

- Plus more XTALs
  - Ethernet, PCI
1. Example of a typical consumer electronics application that *Mobius* is focused on.
2. Strong value proposition with reduced footprint and form-factor.
3. 2 sockets to replace.
Opportunity and market

• Opportunity
  – Disrupting the timing market with a viable quartz replacement technology is probably one of the largest opportunities in the semiconductor industry

• Quartz quantities
  – Over 10B quartz crystals are manufactured yearly

• Timing market ~$4B total
Emerging technologies

- **MEMS microresonators**
  - Like a silicon guitar string at a distinct frequency
  - Integrated in microelectronic form with custom manufacturing process
  - Device requires vacuum-sealed packaging (flip-chip)

- **MEMS microresonators**
  - Similar technology to Discera, different resonator structure
  - “In-die” packaging technology developed at Bosch
Mobius went “back” to CMOS

- MEMS work is impressive, but it is an entirely new technology with manufacturing challenges.
- Mobius leveraged the advent of RF CMOS.
- Mobius recognized the history of using CMOS for frequency synthesis and control.
- Mobius invented the CMOS harmonic oscillator (CHO™) as a way to meet the requirements for most clock generation applications entirely in standard CMOS.

12MHz USB IP implementation of CHO™

• Mobius was launched with an IP business model as capital requirements were low
• Achieved design win for a USB to RS-232 bridge controller for cables and thumb drives
• CHO™ replaced the XTAL + PLL with an all-Si clock generator and reduced the clock module cost to pennies while implementation vs. fully integrated
• CHO™ was first commercial quartz replacement and occupies only 0.18mm² in 0.35µm CMOS

Component implementation: programmable XO-replacement

After proven IP implementation, *Mobius* transitioned to a discrete, or component, business model for the CHO™ technology.

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**Mobius’ 0.25µm wafer leaving foundry**

Packaged component implementation

**Abracon 48MHz**
4-Pin Can XO

**Mobius’ MM8201 0.5–480MHz**
Programmable CHO™
DFN-8 or TSSOP-8

Technology: Quartz + CMOS

Technology: All-CMOS
• **Mobius** will be announcing its product at the Global Press Electronics Summit in San Francisco, CA on April 3, 2008

• Initial product offerings will serve the timing requirements for a variety of consumer electronic applications
How did we get here? It’s a 10 year story

Fundamental Research and Incubation

1998 2000
McCorquodale works with Nguyen on MEMS resonators at UMICH

Q2 00 Q3 00 Q4 00 2001
Brown and McCorquodale initiate work on CMOS timing references

Q2 01 Q3 01 Q4 01
Fundamental research pursued under fellowship

McCorquodale enrolls in B-school entrepreneurship and engineering IP law courses
How did we get here? It’s a 10 year story

**Fundamental Research and Incubation**

- **2002**
  - Patent disclosures are filed with TTO
  - Mobius is incorporated through start-up program with Perkins-Coie LLC

- **2003**
  - Full-utility patent apps are filed with USPTO through TTO

- **2004**
  - Mobius 1st office is established in Ann Arbor with $170k in awards/grants

- **Q2 02**
  - MBA students recruited

- **Q4 02**
  - Technical publications begin to appear including a 1st DAC/ISSCC design award

- **Q2 03**
  - Mobius wins 1st place at 6 (and awards at 11) national/international b-plan competitions

- **Q3 03**

- **Q4 03**

**Mobius: Background**  |  **Critical Analysis: Data**  |  **Rec’s: Conversation**  |  **Conclusions**
How did we get here? It’s a 10 year story

**Incubation**
- Q2 04
  - Prototypes complete, license executed, McCorquodale defends and serves as CEO

**Spin-Out and Seed-Stage Execution**
- Q2 05
  - McCorquodale seeks $10M series-A from nearly every Midwest investor
- Q3 05
  - McCorquodale moves to CA to fundraise; interim CEO appt.
- Q4 05
  - Mobius closes an additional $1M seed/angel round, due to inability to raise series-A locally

**Mobius: Background**
- 2004
  - Mobius opens $1M seed/angel round, led by Waypoint Ventures, and launches IP business
  - Mobius acquires design win for USB application
  - Mobius acquires design win for μP application
  - Mobius wins High-Tech MEGA to build space in Detroit and moves

**Rec’s: Conversation**
- 2005
  - Governor awards Mobius for largest potential hi-tech. job creation

**Conclusions**
- 2006
  - Mobius’ USB customer completes qualification
  - Mobius’ USB customer samples
How did we get here? It’s a 10 year story

**Series-A Stage Execution**

- **Q2 06**
  - Mobius’ USB
  - customer goes to production

- **Q3 06**
  - Component marketing requirements definition and development effort

- **Q4 06**
  - Mobius’ recognized for developing the “Innovation of the Year” in MI

**Series-B Ex.**

- **Q2 07**
  - Mobius’ is FSA “start-up to watch” nominee in Si Valley

- **Q3 07**
  - Permanent CEO hired and major reorg of management team

- **Q4 07**
  - Mobius’ closes $10.75M series-B round

- **2006**
  - Mobius’ closes $8.1M series-A; headquarters moved to Si Valley; mgmt team hired

- **2007**
  - Component released

- **2008**
  - Mobius: Background
  - Critical Analysis: Data
  - Rec’s: Conversation
  - Conclusions
The process of incubating academic research

1. Win an IP clean research grant
2. Pursue fundamental research
3. Disclose inventions to OTT
4. File provisional patent application with USPTO
5. Develop functional prototypes
6. Publish results
7. File full utility patent application with USPTO
8. Develop business plan and build team
9. Negotiate and execute license option?
10. Negotiate and execute license
11. Incorporate and spin-out
12. Financing

The process of spinning-out academic research

Recruit start-up team → Raise money → Execute business plan → Recruit engineering and M&S teams

Get design win or sale and deliver → Refine M&S strategy → Achieve milestones before next round → Raise next round

Some UMICH resources to get you started

• **CFE**
  – Finally, UMICH CoE is taking ownership of entrepreneurship
  – This didn’t exist when I was a student

• **Office of Technology Transfer**
  – IP development and licensing
  – Business development support
  – Grants: GAP, OVPR, MUCI, MI TTC

• **Zell Lurie Entrepreneurial Institute**
  – Preparation/sponsorship for b-plan competitions
  – Much more collaboration with CoE
  – MBA internship program (Marcel Gani) and Dare to Dream grant program
  – Business development support
Critical Analysis of Entrepreneurship (Data)
### The reality of getting rich

<table>
<thead>
<tr>
<th>Sector</th>
<th>Number of Billionaires on <em>Forbes</em> Top 400 List</th>
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<td>Investments</td>
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<td>Other</td>
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Only 8.5% of America’s richest people are in technology.

Nearly 40% are in the financial and real estate sectors.

Almost twice as many are in investments alone.

A summary of the 34 tech-sector billionaires on the *Forbes* 400 list

<table>
<thead>
<tr>
<th>Rank</th>
<th>Name</th>
<th>Net Worth</th>
<th>Company</th>
<th>Founder</th>
<th>Technologist</th>
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<td>8</td>
<td>Michael Dell</td>
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It pays to be a founder 80%

But being a technologist is not mandatory 50%

CA is where it’s at 59%
The take-away's are

- **Technology does present tremendous opportunities**
  - Founders: it’s worth it to be part of a founding team – so go found something
  - Technologists: though technology is exciting, you don’t need to be a technologist to start a technology company
- **But let’s not fool ourselves; let’s set appropriate expectations**
  - You are very unlikely to found the next *Google*
  - Many other sectors of the economy are more lucrative
  - And that’s OK – do what you love
- **Further, we’ll see that many other factors play into success, some of which are out of your control**
“Bubbles Happen,” a macro-view

7,138 IPOs with an offer price below $5.00 per share, unit offers, ADRs, closed-end funds, partnerships, acquisition companies, REITs, bank and S&L IPOs, and firms not listed on CRSP are excluded.

<table>
<thead>
<tr>
<th>Years</th>
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<td>2001-2006</td>
<td>701</td>
<td>11</td>
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**In 1999-2000 vs. 2001 – 2006 (2 vs. 6 years)**

- Nearly the same number of IPOs
- 1999-2000 had 3x the number of technology IPOs
- 1999-2000 had less than ½ the median age
- 1999-2000 had nearly double the VC-backed companies

“Bubbles Happen,” a micro-view

- **Pixelworks (NASDAQ: PXLW)**
  - Best liquidity event for an Ann Arbor fund
  - IPO: May 19, 2000 at $10/share
  - Peak price: Sept. 29, 2000 at $47.69/share
  - Current price: $0.70/share
  - Listing status: D (Deficient)

- **Bluegill Technologies**
  - Best liquidity event for another Ann Arbor fund
  - Acquired: Mar. 2000 for $250M by CheckFree
  - Write-off: $107M of acquisition price in 2002
  - Closed: 2002 Ann Arbor office closes, 2005 Waterloo office closes

- **What’s the point?**
  - Bubbles happen; this is the “luck” component – get over it
  - Be wary of lessons learned from people who exited in “bubbles” as it is difficult to determine if sustainable value was created
The reality of VC-backed start-ups

• Profiles of VC-backed start-ups
  – Existing market opportunity (e.g. timing components)
    • Experienced management team with current technology
    • New technology in need of a management team (e.g. Mobius)
  – Emerging market opportunity
    • New or incremental technology (e.g. standard play) typically with experienced management
    • New technology out of left field (e.g. web, social networking) typically in need of management

• The quantitative requirements (approximately)
  – Market opportunity: TAM > $1B, SAM > $250M
  – Experienced management: with proven track record
  – New technology: 10x technology differentiator with IP
  – ROI: 10x return on liquidity event must be “possible”

• If your company does not fit in one of these bins and with these parameters, you will NEVER raise tier-1 VC
Proof: Recently funded timing companies

• With new timing technology (3)
  – *Mobius* (CMOS), UMICH spin-out, needed management
  – *Discera* (MEMS), UMICH spin-out, needed management
  – *SiTime* (MEMS), Berkeley/Bosch spin-out, needed management

• With experienced management & current timing technology (4)
  – *Silego* (PLLs), former Cypress/IC Works timing management
  – *SpectraLinear* (PLLs), former Cypress/IMI timing management
  – *InPhi* (PLLs), formerly in 40G timing market (*Mobius*’ CEO is from *InPhi*)
  – *SiliconClocks* (PLLs), former Cypress/IC Works timing management

• The quantitative benchmarks for these companies
  – Market: TAM > $4B, SAM > $1B for all
  – Experienced management: all with track-records
  – New technology: all with 10x differentiator and multiple patents
  – ROI: latest liquidity event in timing is *IDT*’s acquisition of *ICS* for $1.7B on $260M (6.5x revenue)
The reality of how venture funds operate: Structure and philosophy

• Structure
  – A VC fund is a partnership with limited partners (LPs) who invest in the fund and expect a return
  – Partners raise money from LPs which can be large and institutional investors (e.g. the Regents of Michigan)
  – Multiple funds are raised and are typically numbered
  – Individual partners review deals and select those he or she wishes to invest in
  – That partner, along with the company, must “sell” the deal to the partnership
  – To a certain extent, partners within the same fund compete with each other for returns

• Philosophy
  – High-risk investments with large returns are most attractive
  – Capital compresses time (organic growth and VC are incompatible)
  – Once you raise a large round, the VC owns your company
The reality of how venture funds operate: My observations

• VC is institutionalized and becoming “broken”
  – Most current VCs were never operators
  – Most current VCs are MBAs (and are younger than me)
  – Never let a non-operator MBA VC tell you how to run your company
    • That’s like asking a movie star to perform open-heart surgery on you

• VC is necessary, dangerous but manageable
  – Capital is required to build businesses – period; VCs have an important role so it’s absurd to shun them
  – Capital can make you inefficient (e.g. act like a big co.)
  – Understanding your capital requirements and how VC works empowers you to run your business
New venture risks

- **Market**
  - Not a risk for existing markets
  - A large risk for emerging markets

- **Technology**
  - Will it work? Primarily an issue for new technology
  - Adoption: is it differentiated in a “good” way so customers want to purchase it?

- **Competition**
  - Entrenched and emerging
  - Will someone get your account?
And the #1 risk…

- Please take a guess…
- A “subtle” hint…

- People are the #1 risk
  - If you’re not careful, you can end up with a bunch of clowns
- How can that be?
  - It’s hard to find good people willing to accept risk
  - There is tremendous competition for good people at start-ups
  - Recruiting is a huge effort and expense
  - VCs tend to hold an illusion that experience de-risks the venture
  - In the end intelligence always trumps experience, but finding experienced and intelligent people is best – and very difficult
How to succeed

**What are the ingredients for success**
- Opportunity: the intersection of differentiated technology and market
- Plan: a good business plan that turns the opportunity into financial return
- Capital: to build the product
- Execution: experienced management
- Customers: the people who pay you money because you made a good product

**What skills are really required for success**
- Education: ability to evaluate good technologies and opportunities in the market
- Education: ability to develop a sound and competitive plan around the opportunity
- Prestige and network: ability to recruit experienced management and engineering staff
- Salesmanship: ability to sell to customers and to raise money
• **Top 10 Colleges of Engineering in the U.S. in 2008**
  1. Massachusetts Institute of Technology
  2. Stanford University
  3. University of California—Berkeley
  4. Georgia Institute of Technology
  5. University of Illinois at Urbana-Champaign
  7. California Institute of Technology
  8. University of Southern California
  9. University of Michigan—Ann Arbor
  10. Cornell University

• **2 in the Midwest, 2 in N. Cal., 2 in S. Cal., etc.**

# The reality of investment capital

<table>
<thead>
<tr>
<th>University</th>
<th>Region</th>
<th>CoE Research Expenditures</th>
</tr>
</thead>
<tbody>
<tr>
<td>UC-Berkeley</td>
<td>N. CA</td>
<td>$110M&lt;sup&gt;1&lt;/sup&gt;</td>
</tr>
<tr>
<td>Stanford</td>
<td>N. CA</td>
<td>$130M&lt;sup&gt;2&lt;/sup&gt;</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>$240M</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>University</th>
<th>Region</th>
<th>CoE Research Expenditures</th>
</tr>
</thead>
<tbody>
<tr>
<td>UIUC</td>
<td>Midwest</td>
<td>$167M&lt;sup&gt;3&lt;/sup&gt;</td>
</tr>
<tr>
<td>UMICH</td>
<td>Midwest</td>
<td>$133M&lt;sup&gt;4&lt;/sup&gt;</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>$300M</strong></td>
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</tbody>
</table>

The reality of investment capital

Total U.S. post-bubble VC investment from Q1/02 – Q4/07
$143B and 19,677 deals

- **Si Valley**
  - Emerging: $1.44B and 443 deals
  - Semiconductors: $8.2B and 831 deals
  - Total: $49.5B and 5,928 deals

- **Midwest**
  - Emerging: $138M and 126 deals
  - Semiconductors: $162M and 35 deals
  - Total: $5.5B and 1,115 deals

10x more capital in Si Valley than the Midwest for emerging businesses and almost 50x more in semiconductors

The reality of investment capital

Total U.S. post-bubble VC investment from Q1/02 – Q4/07
$143B and 19,677 deals

- Si Valley
  $49.5B and 5,928 deals
  - Emerging
    $1.44B and 443 deals
  - Semiconductors
    $8.2B and 831 deals

- Michigan
  $363M and 75 deals
  - Emerging
    $25M and 21 deals
  - Semiconductors
    $39M and 7 deals

60x more early-stage capital in Si Valley than in MI and 210x more in semiconductors; *Mobius* has raised $23M in 3 years and MI has invested $39M in semiconductors in the past 5 years

The coming decentralization of capital?

<table>
<thead>
<tr>
<th>Region</th>
<th>2007 Number of Companies</th>
<th>2007 Investment ($M)</th>
<th>1997 Number of Companies</th>
<th>1997 Investment ($M)</th>
<th>% Change Number of Companies</th>
<th>% Change Investment</th>
</tr>
</thead>
<tbody>
<tr>
<td>New Mexico</td>
<td>21</td>
<td>128.26</td>
<td>3</td>
<td>27.03</td>
<td>650%</td>
<td>375%</td>
</tr>
<tr>
<td>Pittsburgh/Tristate</td>
<td>44</td>
<td>198.17</td>
<td>12</td>
<td>32.32</td>
<td>267%</td>
<td>513%</td>
</tr>
<tr>
<td>Seattle</td>
<td>132</td>
<td>1253.41</td>
<td>65</td>
<td>403.2</td>
<td>103%</td>
<td>211%</td>
</tr>
<tr>
<td>Los Angeles</td>
<td>124</td>
<td>1146.04</td>
<td>73</td>
<td>459.41</td>
<td>72%</td>
<td>155%</td>
</tr>
<tr>
<td>DC Metroplex</td>
<td>180</td>
<td>1282.16</td>
<td>105</td>
<td>558.24</td>
<td>71%</td>
<td>130%</td>
</tr>
</tbody>
</table>

- These top 5 regions all have national labs or research institutions.
- Data indicate that a new era of venture investing may be starting.
- Unfortunately, in 2007, MI invested only $105M in 22 companies.

Are the returns still there?

- The “writing on the wall” – maybe
  - “A Kink in Venture Capital’s Gold Chain”
  - “VC kills fund because technology not worth the effort”
    - Richard Martin, *EE Times*, October, 10, 2006
- 2006, *Sevin-Rosen*, a 25 year old well-respected fund in Silicon Valley, returned its 10th fund of ~$300M to investors
  - “The traditional venture model seems to us to be broken.”
  - “We have decided to take the radical step of returning the commitments you have given us for Fund X.”
  - “We have properly diagnosed the problem, but haven’t figured out for this patient what the therapy is.”
- Is this a further indicator of less opportunity with the current VC model and more of an opportunity in places like MI?
The challenges

• Recap (what we’ve discussed so far in this analytical section)
  – Setting expectations and acknowledging “bubbles”
  – The types of companies which get funded and how VC works
  – The ingredients for success, including management
  – New venture risks
  – Regional consolidation of capital and its potential decentralization

• The challenges in MI
  – Insufficient capital, particularly early-stage
  – Lack of managers with start-up experience (particularly in high-tech)
  – Immature/underutilized financial instruments for technology transfer
  – Insufficient/misplaced university education in entrepreneurship
  – Poor culture
  – On top of all of this: the typical risks for a new venture

• These are the “real” challenges in MI
Local initiatives

- **Metro Detroit Entrepreneurial Organizations**
  - Spark (Ann Arbor)
  - TechTown (Detroit)
  - Automation Alley (Oakland County)

- **What do they do? (actually from their websites)**
  - Help you identify space requirements
  - Basic education
  - Recognition with awards
  - Hold forums
  - “Connect” you to the university

- **None of this addresses the challenges I outlined**

- **You can leverage the University instead**
State of MI initiatives

- **Michigan Venture Fund**
  - ~$100M total for early-stage VCs
- **21st Century Jobs Fund**
  - Life sciences; Alternative energy; Advanced automotive, manufacturing and materials; Homeland security and defense
- **Capital Access Program**
  - For collateralized bank financing (i.e. debt)
- **MEDC**
  - Tax abatements and financial incentives
  - A lot of marketing (have you seen Jeff Daniels on TV?)
- If you qualify, apply, but don’t expect a lot
- *Mobius* is one of the only start-ups to ever receive a tax abatement incentive (MEDC’s High-Tech MEGA)
Recommendations (Conversation)
So what the heck am I trying to tell you?
Advice for entrepreneurs

• First and foremost
  – Learn and understand how this whole thing works – it’ll empower you
  – Set proper and practical expectations (remember, you’re Scratchy)
  – Take the risk – especially while you are young
  – Accept failure and learn from it

• Accept that you will likely need to leave the region (and that’s OK)
  – Remaining in the region delays inevitable fundraising challenges
  – Infrastructure/personnel in the region are expensive/difficult to relocate
  – Small workforce with start-up management experience
  – Remember Milton Friedman: you’re running a business not a charity

• Stick to UMICH resources
  – Only CoE, OTT, and ZLI ever helped *Mobius*
  – I doubt that you’ll fit in the box of state initiatives or the agenda of local orgs.

• MI and Midwest still offer opportunities
  – Cost is substantially lower than VC-rich regions of the U.S.
  – Quality of life in the Midwest is perceived as high
  – Large skilled workforce in science and engineering, but little management
  – Substantial research resources at world-class institutions
  – Capital may eventually be available here if incentives are in place
Recommendations for educators

- Incubation is highly linear and analytical, though few academic programs address this.
- It is difficult for engineering students at many institutions to elect entrepreneurship courses.
  - Often courses are not within the CoE (Faley’s class is the exception).
  - Sometimes courses are not offered at all anywhere.
  - Most courses are too broad because they are taught in the MBA program (e.g. U. of M.’s course does not address IP at all).
Recommendations for educators

• Like incubation, “spin-out” is highly linear and analytical, though few academic programs address this either
• Financing is **required** to constitute a high-tech venture
  – Venture capital is the best resource for high-risk technology ventures which are capital intensive and w/o collateral
• **Professional managers with relevant domain expertise are required for success**
  – Founding engineers w/o significant management competency will be taken out of leadership roles – lost opportunities for engineers
Recommendations for educators

- Move entrepreneurship education into the CoE
- Propose the development of an academic program/curriculum focused on linear sequence of commercializing engineering research

Recommendations for legislators

- **Two critical issues which can be addresses with financial incentives**
  - Dearth of capital
  - Lack of management talent
- **Venture Capital**
  - Challenge: limited access to early-stage capital for high-risk technology ventures
  - Consequence: venture is never constituted due to undercapitalization (i.e. technology never sees the light of day) or it relocates
- **Management Team**
  - Challenge: limited access to management pool with relevant domain expertise
  - Consequence: start-ups relocate
Recommendations for legislators

• The example of the State of Michigan
  – Incubators and “enablers” receive substantial state funding
  – Though positive, are they really addressing the primary challenges?
• Again: what are the real challenges in Michigan?
  – Access to capital, particularly early stage
  – Access to management with specific start-up domain expertise
  – Education – need to educate researchers to take IP to market
• How can these challenges be resolved?
  – Capital: tax breaks for early-stage investment (now MI law)
  – Management: subsidies for commuter-managers; “parachute” grants for those who relocate
  – Education: new curriculum development in colleges of engineering
  – Certainly many more – these are just a few ideas
• But legislators need to focus on the “real” problems!
What else can we do in MI?

- **Let entrepreneurs fail and fund them again**
  - Tony Grover’s idea from *RPM Ventures* — a genius idea
- **Accept that MI has enough capital to seed deals**
  - Fund companies to a point and let them go — my personal, practical and realistic idea
  - Get over MI tree-hugging and accept that entrepreneurs need to run their businesses
  - They (and their money) are likely to come back (I’m here)
- **There is an opportunity on the horizon in MI**
  - But cut out the “ra-ra” rhetoric; be realistic
  - Again, focus on the key problems and fix them
What can we do at UMICH?

- **Education**
  - Bring entrepreneurship education into the CoE (e.g. NC State’s EEP)
- **Incentives**
  - Provide incentives to faculty and students (e.g. Utah’s USTAR)
- **Culture**
  - Develop a supportive entrepreneurial culture in CoE (e.g. Stanford)
  - Sanction and encourage networking (e.g. UMICH and Harvard MBAs)
  - Develop strong public relations (e.g. Berkeley and MIT)
- **Close the “gap”**
  - Decrease the complexity of tech transfer (e.g. Stanford: “give it away”)
  - Make funds available for transferring technology (UMICH is doing this!)
Closing Thoughts
• Keep away from people who try to belittle your ambitions. Small people always do that, but the really great make you feel that you, too, can become great.
  – Mark Twain

• Idiots and losers try to crush your ambition. Only great people enable you to be great so always work with great people.
• In the long run men hit only what they aim at. Therefore, though they should fail immediately, they had better aim at something high.
  – Henry David Thoreau

• Nothing worth doing is easy; failure is part of success; and you better try to do something meaningful if you do anything
Acknowledgements

• **University of Michigan**
  – Thomas Zurbuchen and CFE for the invitation
  – You for attending

• **Mobius colleagues**
  – Elizabeth Zimmerman for collecting and formatting data
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  – Ashok Dhawan, *Mobius’* CEO, for helping me “figure it out”
  – The entire *Mobius* team (both Detroit and Sunnyvale)

• **Personal**
  – Ruba Borno for extensive review and discussions
You can do it; I hope this seminar will help

And GO BLUE!

Questions are welcome