



EE 542

# Final Lecture: Career Advice

Internet and Cloud Computing

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*Based on UC Berkeley Prof. David Patterson's slides on his advice*

# Course Schedule

- Nov 22-26: Thanksgiving Break
- Nov 27: Final Project Progress Presentation 1
- Nov 29: Final Project Progress Presentation 2
- Dec 13: Final Project Demo Video
- Return MultiTech Gateway by Dec 13

# Outline

- Part I: Key Advice for a Bad Career while a Grad Student
- Part II: Key Advice on Alternatives to a Bad Graduate Career
- Part III: Key Advice for a Bad Career, Post Graduate School
- Part IV: Key Advice on Alternatives to a Bad Career, Post Graduate school

# Part I: How to Have a Bad Graduate Career

- Concentrate on getting good grades:
  - postpone research involvement
  - might lower GPA
- Minimize number and flavors of courses
  - Why take advantage of one of the top departments with an emphasis on excellent grad courses?
  - Why take advantage of a campus with many excellent courses
  - May affect GPA
- Don't trust your professor
  - Professor is only interested in his or her own career, not your's
  - Professor may try to mentor you, use up time, interfering with GPA
- Only work the number of hours you are supposed to
  - Don't let master class exploit the workers!

# Part I: How to Have a Bad Graduate Career

- Concentrate on graduating as fast as possible
  - Winner is first in class to receiving a degree
  - People only care about that you have a degree and your GPA, not on what you know
    - Nirvana: graduating in 1.5 years with a 4.0 GPA!
  - Don't spend a summer in industry: takes longer
    - How could industry experience help with selecting a topic?
  - Don't work on large projects: takes longer
    - Have to talk to others, have to learn different areas
    - Synchronization overhead of multiple people
  - Don't do a systems degree: takes longer
- Don't go to conferences
  - It costs money and takes time; you'll have plenty of time to learn the field after graduating
- Don't waste time polishing writing or talks
  - Again, that takes time

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## Part II: Alternatives to a Bad Graduate Career

- Concentrate on getting good grades?
  - Reality: need to maintain reasonable grades
    - I have not give a grade below B- in any of my courses
  - What matters on graduation is letters of recommendation from 3-4 faculty/PhDs who have known you for 5+ years
- Minimize number and flavors of courses?
  - Your last chance to be exposed to new ideas before have to learn them on your own
  - Get a real outside minor from a campus with great departments in all fields
- Don't trust your professors?
  - Primary attraction of campus vs. research lab is getting to work with grad students
  - Faculty career is judged in large part by success of his or her students
  - try taking advice of professors?

## Part II: Alternatives to a Bad Graduate Career

- Concentrate on graduating as fast as possible?
  - Your last chance to learn; most learning will be outside the classroom
  - Considered newly “minted” when finish a degree
    - Judged on year of a degree vs. year of birth
    - To a person in their 40s or 50s, 1 or 2 more years is round off error ( $27 = 29$ )
- Don't go to conferences?
  - Chance to see firsthand what the field is like, where its going
  - There are student rates, you can share a room
  - Talk to people in the field in the halls
  - If your professors won't pay, then pay it yourself; almost always offer student rates, can often share rooms
    - Some faculties paid their own way to conferences while grad student
- Don't waste time polishing writing or talks?
  - In the marketplace of ideas, the more polish the more likely people will pay attention to your ideas
  - Practice presentation AND answering tough questions



## Part II: Alternatives to a Bad Graduate Career

- Only work the number of hours per week you are paid?
  - Campus Faculty average is 65-70 hours/work; CS higher
  - Students should be in that range
  - Organize each day: when most alert? nap? exercise? sleep?
  - When/how often/how long: write, read, program, email?
  - To do lists: daily, weekly, semester
- Industrial Experience?
  - 1st or 2nd summer get work experience, or 1 semester off
- Sutherland's advice (Father of Computer Graphics)
  - Be bold; Take chances on hard topics
- Advice from a very successful recent student
  - Great ideas, did lots of papers, well thought of
  - When asked: Why do you think you did so well?
  - He said a professor gave him advice the first week he arrived
  - When I asked: What did he say?
  - He said 3 observations, and still good advice today

## Part II: How to be a Success in Graduate School

### 1. “Swim or Sink”

- Success is determined by me(student) primarily
- Faculty will set up the opportunity, but its up to me leverage it

### 2. “Read/learn on your own”

- “Related to (1) I think you told me this as you handed me a stack of about 20 papers”

### 3. “Teach your advisor”

- “I really liked this concept; go out and learn about something and then teach the professor”
- Fast moving field, don’t expect prof to be at forefront everywhere

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# Bad Career Move #1: Be THE leading expert

- Invent a new field!
  - Make sure its slightly different
- Be the real Lone Ranger: Don't work with others
  - No ambiguity in credit
  - Adopt the Prima Donna personality
- Research Horizons
  - Never define success
  - Avoid Payoffs of less than 20 years
  - Stick to one topic for whole career
  - Even if technology appears to leave you behind, stand by your problem

## Bad Career Move #2: Let Complexity Be Your Guide (Confuse Thine Enemies)

- Best compliment:  
“Its so complicated, I can’t understand the ideas”
  - If no one understands, how can they contradict your claim?
- It’s easier to be complicated
  - Also: to publish it must be different; N+1st incremental change
- If it were not unsimple then how could distinguished colleagues in departments around the world be positively appreciative of both your extraordinary skills and talents

## Bad Career Move #3: Never be Proven Wrong

- Avoid Implementing
- Avoid Quantitative Experiments
  - If you've got good intuition, who needs experiments?
  - Why give grist for critics' mill?
  - Takes too long to measure
- Avoid Benchmarks
- Projects whose payoff is  $\geq 20$  years gives you 19 safe years

# Bad Career Move #4:

## Use the Computer Scientific Method

### Obsolete Scientific Method

- Hypothesis
- Sequence of experiments
- Change 1 parameter/exp.
- Prove/Disprove Hypothesis
- Document for others to reproduce results

### Computer Scientific Method

- Hunch
- One experiment & change all parameters
- Discard if doesn't support hunch
- Why waste time? We know this

# Bad Career Move #5:

## Don't be Distracted by Others (Avoid Feedback)

- Always dominate conversations: Silence is ignorance
  - Corollary: Loud is smart
- Don't read
- Don't be tainted by interaction with users, industry
- Reviews
  - If it's simple and obvious in retrospect => Reject
  - Quantitative results don't matter if they just show you what you already know => Reject
  - Everything else => Reject



# Bad Career Move #6:

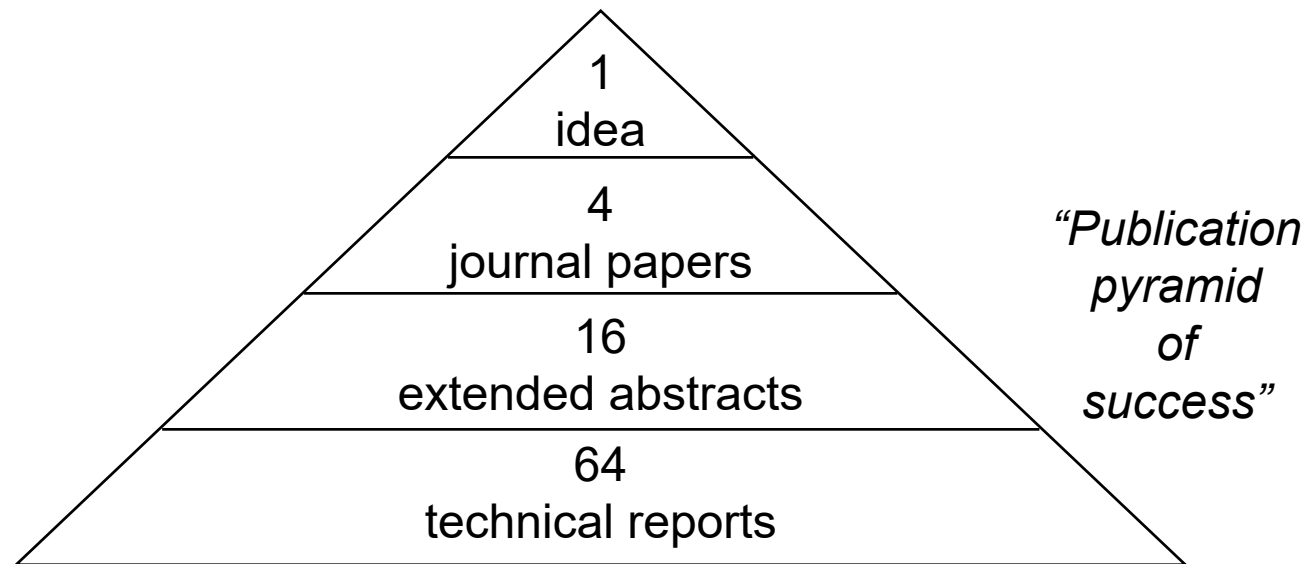
## Publishing Journal Papers IS Technology Transfer

- Target Archival Journals: the Coin of the Academic Realm
  - It takes 2 to 3 years from submission to publication=>timeless
- As the leading scientist, your job is to publish in journals not your job to make you the ideas palatable; wastes valuable research time
  - Travel time, having to interact with others, serve on program committees, ...

# Bad Career Move #7:

## Writing Tactics for a Bad Career

- Papers: It's Quantity, not Quality
  - Personal Success = Length of Publication List
  - “The LPU (Least Publishable Unit) is Good for You”



- Student productivity = number of papers
  - Number of students: big is beautiful
  - Never ask students to implement: reduces papers
- Legally change your name to Aaaanderson

## 5 Writing Commandments for a Bad Career

- I. Thou shalt not define terms, nor explain anything.
- II. Thou shalt replace “will do” with “have done”.
- III. Thou shalt not mention drawbacks to your approach.
- IV. Thou shalt not reference any papers.
- V. Thou shalt publish before implementing.

## 7 Talk Commandments for a Bad Career

- I. Thou shalt not illustrate.
- II. Thou shalt not covet brevity.
- III. Thou shalt not print large.
- IV. Thou shalt not use color.
- V. Thou shalt not skip slides in a long talk.
- VI. Thou shalt cover thy naked slides
- VII. Thou shalt not practice.

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# One Alternative Strategy to a Bad Career

- Caveats:
  - From a project leader's point of view
  - Works for me; not the only way
  - Primarily from academic, computer systems perspective
- Goal is to have impact:  
Change way people do Computer Science & Engineering
  - Academics have bad benchmarks: published papers
- 6 Steps
  - 1) Selecting a problem
  - 2) Picking a solution
  - 3) Running a project
  - 4) Finishing a project
  - 5) Quantitative Evaluation
  - 6) Transferring Technology

# I) Selecting a Problem

Invent a new field & stick to it?

- No! Do “Real Stuff”: solve problem that someone cares about
- No! Use separate, short projects
  - Always takes longer than expected
  - Matches student lifetimes
  - Long effort in fast changing field???
  - Learning: Number of projects vs. calendar time; I’m on 9th project?
  - If going to fail, better to know soon
- Strive for multi-disciplinary, multiple investigator projects
  - 1 expert/area is ideal (no arguments)
- Match the strengths and weaknesses of local environment
- Make sure you are excited enough to work on it
  - Prototypes can be exciting



## 2) Picking a solution



### Let Complexity Be Your Guide?

- **No!** Keep things simple unless a very good reason not to
  - Pick innovation points carefully, and be compatible everywhere else
  - Best results are obvious in retrospect  
“Anyone could have thought of that”
- Complexity cost is in longer design, construction, test, and debug
  - Fast changing field + delays  
=> less impressive results

### Use the Computer Scientific Method?

- No! Run experiments to discover real problems
- Use intuition to ask questions, not answer them



# (And Pick A Good Name!)

Reduced

Instruction

Set

Computers

Redundant

Array of

Inexpensive

Disks

Enhanced

Frequency

Associated

Time

Hybrid

Analysis

Advanced

Personal

Presence

Emulated

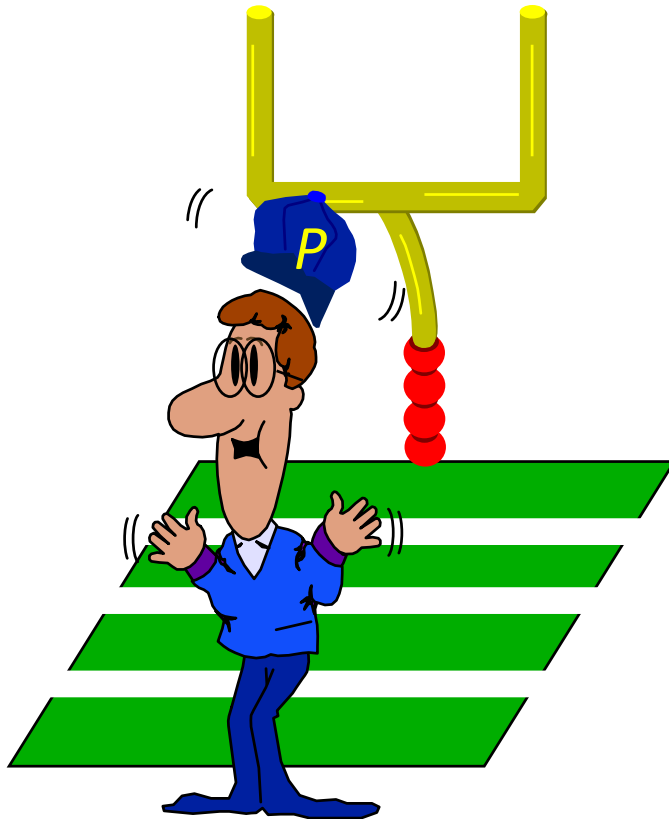
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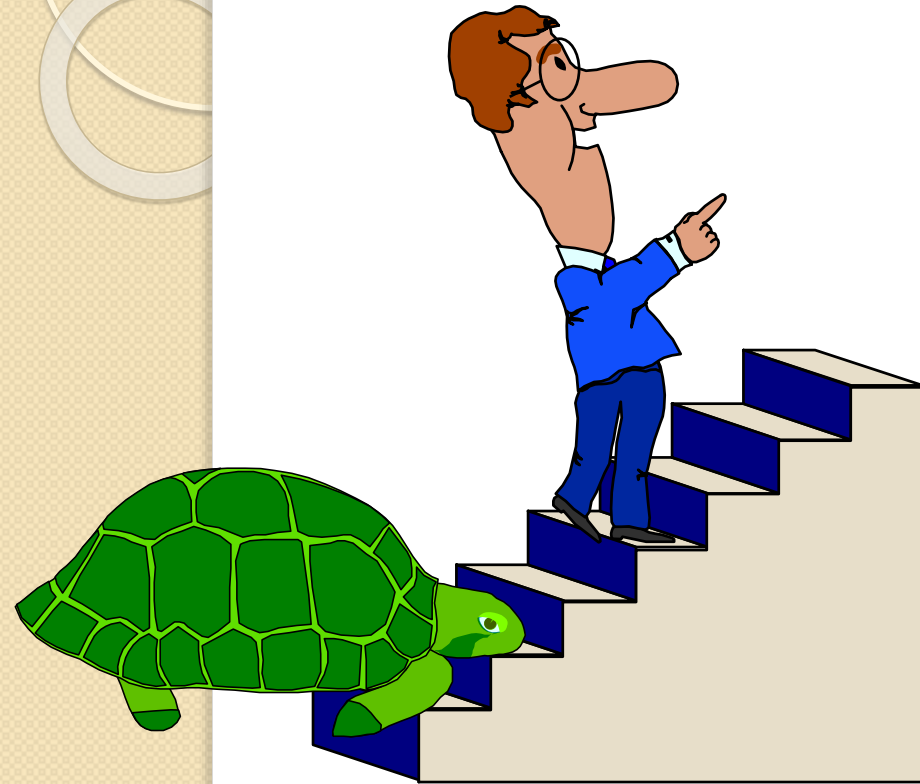
# 3) Running a project

## Avoid Feedback?



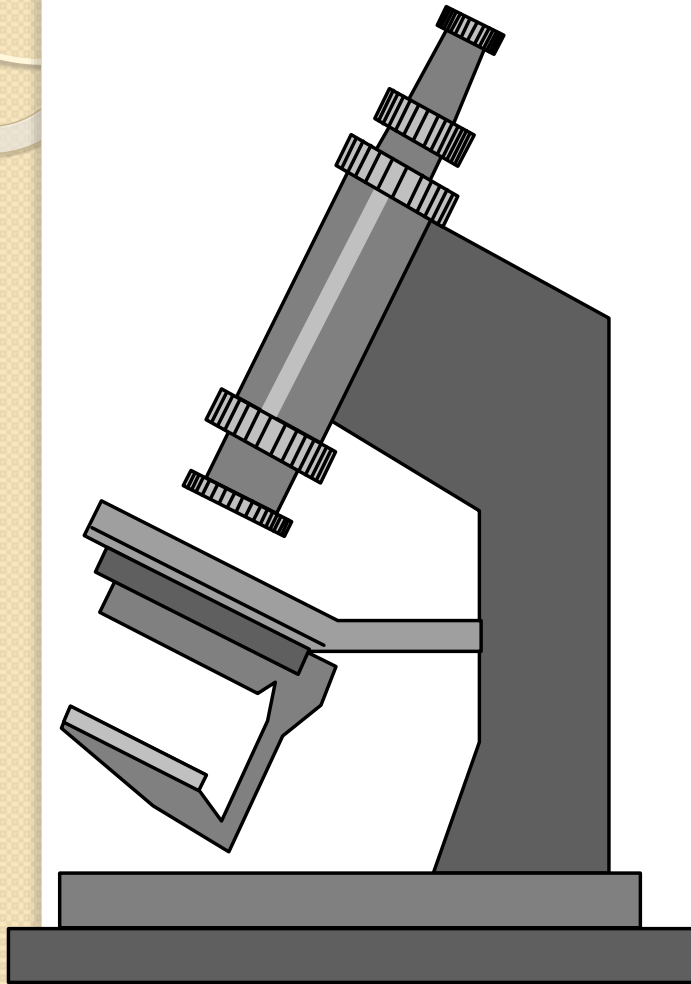
- No! Periodic Project Reviews with Outsiders
  - Twice a year: 3-day retreat
  - faculty, students, staff + guests
  - Key piece is feedback at end
  - Helps create deadlines
  - Give students chance to give many talks, interact with others industry
- Consider mid-course correction
  - Fast changing field & 3-5 year projects => assumptions changed
- Pick size and members of team carefully
  - Tough personalities are hard for everyone
  - Again, 1 faculty per area reduces chance of disagreement

## 4) Finishing a project



- People count projects you finish, not the ones you start
- Successful projects go through an unglamorous, hard phase
  - Design is more fun than making it work
  - “No winners on a losing team; no losers on a winning team.”
  - “You can quickly tell whether or not the authors have ever built something and made it work.”
- Reduce the project if its late
  - “Adding people to a late project makes it later.”
- Finishing a project is how people acquire taste in selecting good problems, finding simple solutions

# 5) Evaluating Quantitatively



## Never be Proven Wrong?

- If you can't be proven wrong, then you can't prove you're right
- Report in sufficient detail for others to reproduce results
  - can't convince others if they can't get same results
- For better or for worse, benchmarks shape a field
- Good ones accelerate progress
  - good target for development
- Bad benchmarks hurt progress
  - help real users v. help sales?

## 6) Transferring



### Publishing Journal Papers IS Technology Transfer?

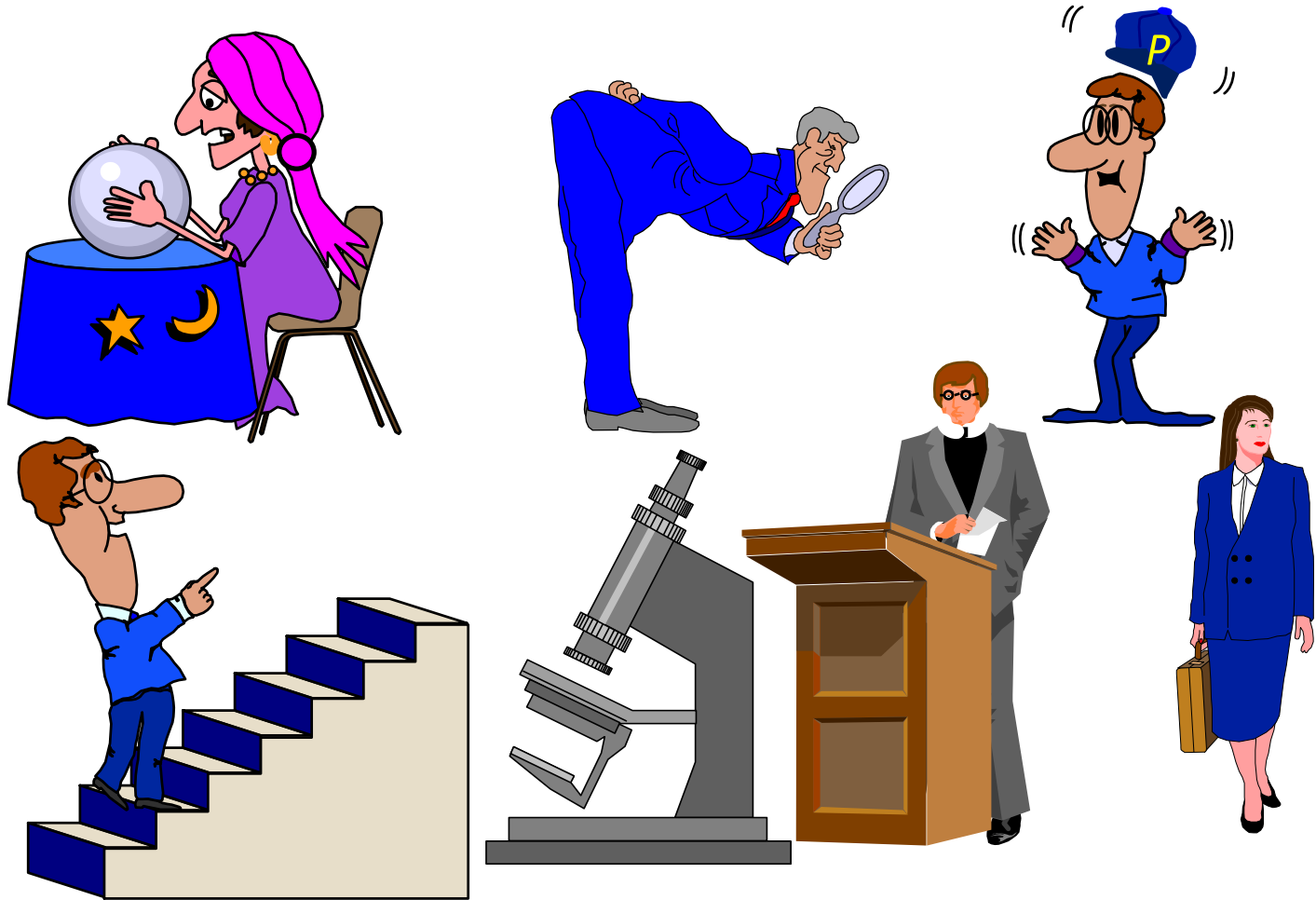
- No! Missionary work: “Sermons” first, then they read papers
  - Selecting problem is key: “Real stuff”
    - Ideally, more interest as time passes
    - Change minds with believable results
    - Prima Donnas interfere with transfer
- Industry is reluctant to embrace change
  - Howard Aiken, circa 1950:  
*“The problem in this business isn’t to keep people from stealing your ideas; its making them steal your ideas!”*
  - Need one bold company (often not no. one) to take chance and be successful  
RISC with Sun, RAID with (Compaq, EMC, ...)

# 6) Transferring Technology



- Pros
  - Personal satisfaction: seeing your product used by others
  - Personal \$\$\$ (potentially)
  - Fame
- Cons
  - Learn about business plans, sales vs. marketing, financing, personnel benefits, hiring, ...
  - Spend time doing above vs. research/development
  - Fame also if company not always successful

# Summary: Leader's Role Changes during Project



# Acknowledgments

- Many of these ideas were borrowed from (inspired by?) David Patterson, Tom Anderson, David Culler, Al Davis, John Hennessy, Steve Johnson, John Ousterhout, Bob Sproull, Carlo Séquin and many others



# Conclusion: Alternatives to a Bad Career

- Goal is to have impact:  
*Change way people do Computer Science*
  - Many 3 - 5 year projects gives more chances for impact
- Feedback is key: seek out & value critics
- Do “**Real Stuff**”: make sure you are solving some problem that someone cares about
- Taste is critical in selecting research problems, solutions, experiments, & communicating results; acquired by feedback
- Your real legacy is people, not paper or money:  
create environments that develop professionals of whom you are proud