How To Succeed in Engineering

by trying really, really hard!

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No One Formula

- Like best engineering problems, there's no single algorithm to follow
  - But there are "Best Practices"
  - There are Things To Avoid

    And fun observations too…you judge utility

- Don't make all the mistakes yourself,
  - Learning from others' errors is much better ☺

How do YOU Define Success?

1. Do you want to get really rich?
2. Do you just want a job with decent pay
3. Do you want to change the world?

Or did your parents put you up to this?

→ You may go 10-20 years without answering these questions, but eventually you have to

→ Set yourself up for success according to your own metrics, from the start

Getting Started In Engineering

- What are you passionate about? Do that.
  - *Mere competence will never trump real passion*
  - Find your point of highest leverage
    - Match your skills, interest to what world wants & needs

- Your answers will change with time
  - Let career evolve
  - You can find career value in any job
    - Just do outstanding work no matter the task
    - Seem glib? How many people do you know who do it?
    - It's mostly a choice you make, not innate talent or IQ

Which Job to Take?

- Look 20 years out & place your career as a bet
  - Which technologies are most powerful/promising?
    - I bet on computers in mid-1970's
    - 2007 equiv.: bio, energy, environment, military, comm, health…?
  - Which line up with your personal belief system?
    - Defense, medicine, consumer, corporate, academia
- Of surviving job prospects, which have best teams?
  - You will learn more from co-workers than anywhere else
  - Don't worry about being compared (unfavorably) to them
    - They started out just like you
- Manage your career, but don't micro-manage it
  - Do a great job and most of your career takes care of itself

Startups vs. Big Corporations

- Good idea to do both over course of your career
- Startups are easier when you're young
  - More time, more energy, less to lose
  - Startups can sometimes change world explosively
    - But most fail
  - Less overall stability
- Big companies have more opportunities to change world incrementally
  - Remember that those increments can add up over time
  - They set standards
  - More stable, but sometimes that also means stultifying
- Both can be exhilarating, and both can be very frustrating

Getting Hired: Where?

- Where to work
  - Weight these factors heavily:
    1. Do you believe in the mission
    2. How outstanding is the team
    3. How well-run is the company
    4. Would this position leverage your strengths yet demand intellectual growth
    5. Geography, local culture, place-to-raise-kids, spouse's enthusiasm, add'l educational opportunities
  - *Then* consider salary, bonuses, stock, benefits

Beware "which group likes me best"

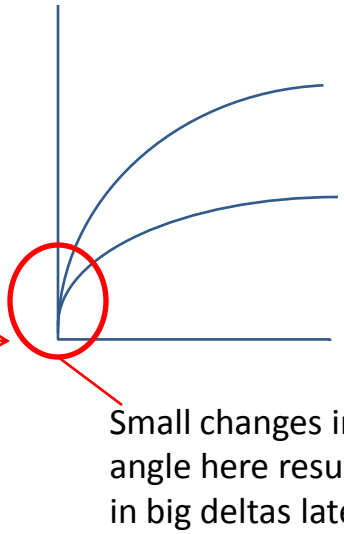
My 1st corp job: 6 months of hell. Couldn't eat, couldn't sleep, hated work…don't just "get in door"…YOU decide which match is best

Getting Hired: Practicalities

- Standard advice abounds
  - Dress up, be on time…
  - Check books & websites
  - Faculty recommendations DO matter
  - Don't fail the drug test
  - *Try* to answer all questions
- Beware "good at everything"
  - Your new employer can't turn that into profits
  - New hiring group has specific needs
- Do your homework
  - Prepare intelligent questions
  - Know basics about company

Your First Corporate Job

- No matter what it is, become best in world at it
  - Don't internalize or contribute to pecking orders
  - Plan on 2-3 years to get really comfortable & productive
- Work as hard as you can
  - You are setting your own reputation & trajectory
  - Only High-Flyers have choice of options for next project
  - Find mentors & role models (don't struggle in silence)
- Don't Let Your Team Down
  - Take your turn on the critical path but GET OFF IT fast!
  - Know when to stand your ground vs which battles aren't worth fighting
- Settle for nothing less than outstanding work. Every time.
  - Raises average of whole team



Working Engineer 1

- You-Centered
  - Know Your Career Path
    - Tech vs management
      - 1st line supervision is great, amplifies your IQ
      - Above that is management
    - Try to make career decisions according to your long-term strategy, not short-term exigencies
    - Identify the gurus and befriend them
    - Technology changes rapidly…avoid obsolescence
- Company-Centered
  - What is the mission?
    - Align your career to what company cares about
  - Watch for the cracks in projects & between them
    - Make the right thing happen, keep mgt apprised

Working Engineer 2

- Resources
  - Your alma mater (donate, stay connected)
  - IEEE/ACM: participate & network

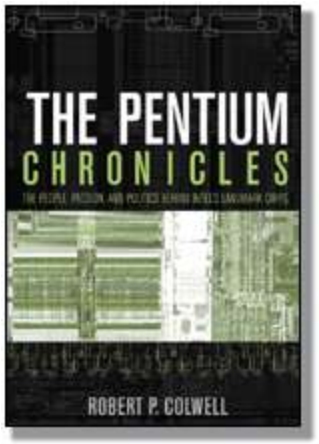
    Make yourself useful to others & notice who has been useful to you (and reward them)
  - Books (read outside your own specialty too)
- Balancing Home and Work
  - Design projects come and go, spouse & family are forever
    - *Don't confuse those priorities!*
    - You need your spouse's support to do your best engineering
      - Keep him or her in the loop on overtime, travel, office goings-on
    - Apologize often for your impositions
      - Send flowers, emails, phone calls

CMU and Pitt
(my alma maters)

And resign yourself to idea that when everybody's equally unhappy with you, sometimes that's the best you can do. ☹

Working Engineer 3

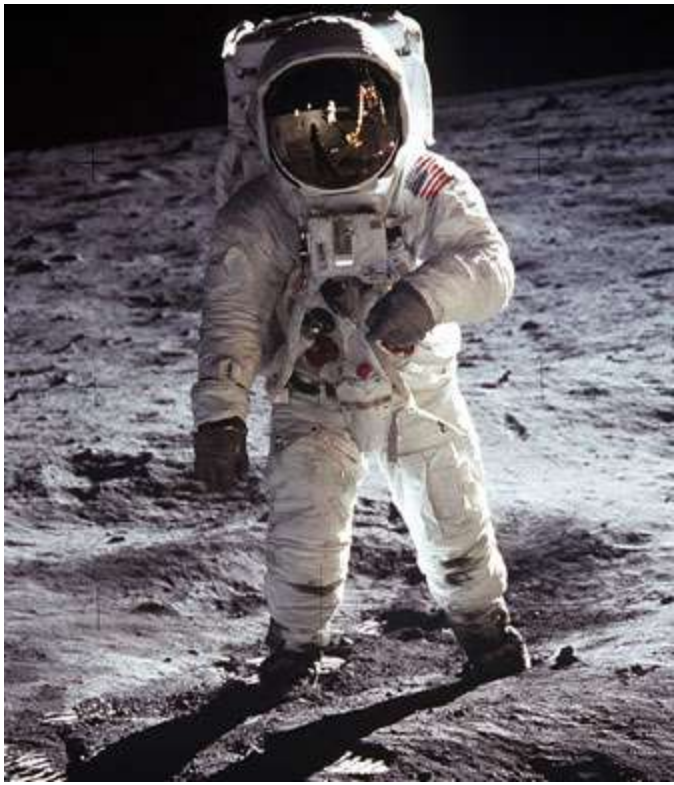
- Communications = Influence = Promotions
  - Writing
  - Presentations (not just data)
- Corporate/team culture
  - Overpromising vs overdelivering
  - P6 design humility vs hubris
  - Team play vs getting what's yours
  - "do your boss's job" (within limits)
  - Detecting/avoiding burnout
  - Use existing solutions where possible, innovate where necessary
- Legal Stuff
  - Take patents, IP very seriously; wording matters
  - Purge old emails; too easily misconstrued or purposely twisted in court

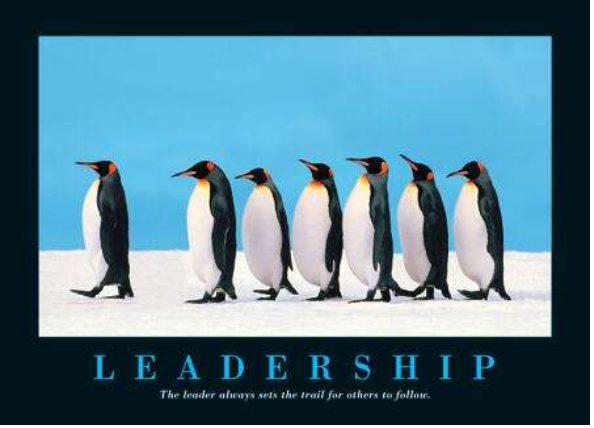


(Shameless plug)

Getting Ahead

- The Prime Directive: do outstanding work and trust that rewards and accolades will follow
  - How? *Work with people who do outstanding work*
- Be visible outside your own company
  - Good for company, good for industry, good for you
  - Write papers, attend conferences, do peer reviews
  - Be active in IEEE/ACM (more on this shortly)
  - Careful with self-promotion, remember Buzz Aldrin

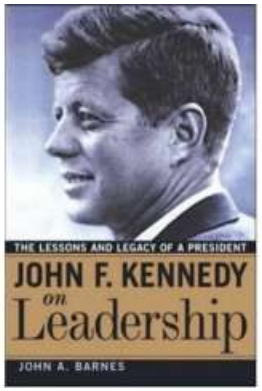




Technical Leadership 1

- You will eventually find yourself in a leadership position
  - You'll be asked, or
  - you'll seek one out when you realize you can do a better job than the people making decisions above you
- Leadership
  - If you're already on top, be lavish with credit
  - Take team where they need to go, not where they want to go
  - Know who's good at what, and balance team accordingly
  - Know your own strengths and weaknesses
    - Leverage strengths, fill in weaknesses with other people
    - Only invoke ego at end, when product is great
  - It's all about influence, deftly wielded
    - Positional authority alone won't get world-class results

Leadership 2



- Leaders are also managers
  - Responsibility: convey management messages to troops
  - Responsibility: get your troops what they need & convey their messages to mgt
    - If in conflict, do what's right for the company
- Don't be threatened by stellar performers below you
  - **A's hire A's; B's hire C's**
    - **If B's get away with this, whole organization declines**
  - Remember the prime directive*
  - Develop these people, get them what they need, shield them from corp. nonsense; these are the folks who will make your enterprise succeed
- IF YOU NEVER FAIL, YOU AREN'T TRYING HARD ENOUGH
  - Not all failures equally forgivable
  - Well-conceived risks: good. Outright gaffes: bad.

*Forgot already?
"Do Outstanding work."

Technical Leadership/Management

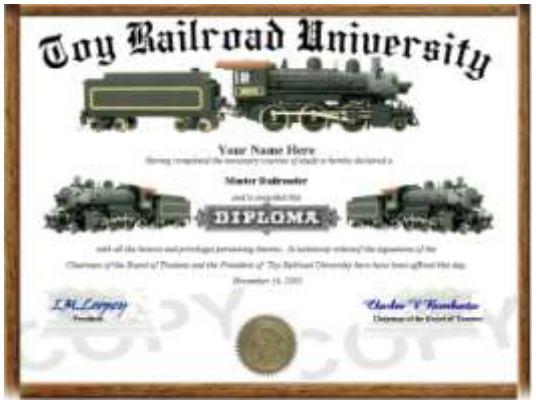
- This one may surprise you…

You Must Exercise!

  - Bill Daniels, behavioral psychologist:
    - After age 40, if you don't exercise to combat effects of stress, aging, diet, and a sedentary occupation, you will have a heart attack by 50

I'm not sure I ever got better advice.

Education



- BS, MS, PhD
  - MS is really new entry level
  - PhD required for research
  - My advisor's advice: "If you're really good, you can do fine with just a BS. If you need a little extra help, get an MS. In your case, do a PhD."
    - I'd rather have a PhD and not need it than vice versa
    - School gets more fun as you go along
- Stay viable & current
  - Ongoing education/training
  - Go to conferences, monitor what universities are working on
  - IEEE membership & participation
    - Review papers, submit papers, attend conferences, be active in local organizations (networking & cont. educ.)
  - Don't give up your non-engineering interests
    - They will inform your engineering
    - They'll keep you connected to the non-techie world
    - They'll keep you from burning out

Engineering in the 21st Century 1

- Always consider the buyer of your products
  - Don't assume you, a techie, represent The World At Large
    - READCPUID fiasco, FDIV
  - How do buyers think?
    - What's in an IPOD? Nobody cares about tech per se
    - How high do cell phones bounce?
- Challenges the world is facing, what they mean to you
  - Climate change, pandemics, global markets, outsourcing, energy, water
  - Solutions are likely to come from technology (engineers)

Engineering in the 21st Century 2

- READ. A LOT.
  - Learn about humans, culture, co-workers, buyers
  - Align products to real problems, not just short-term profits
- Competition
  - Don’t fool yourself by comparing your projections vs their current offering
  - Don’t scare paperware scare you into inaction either

Engineering Success

If product fails, team fails; if team fails, you fail.

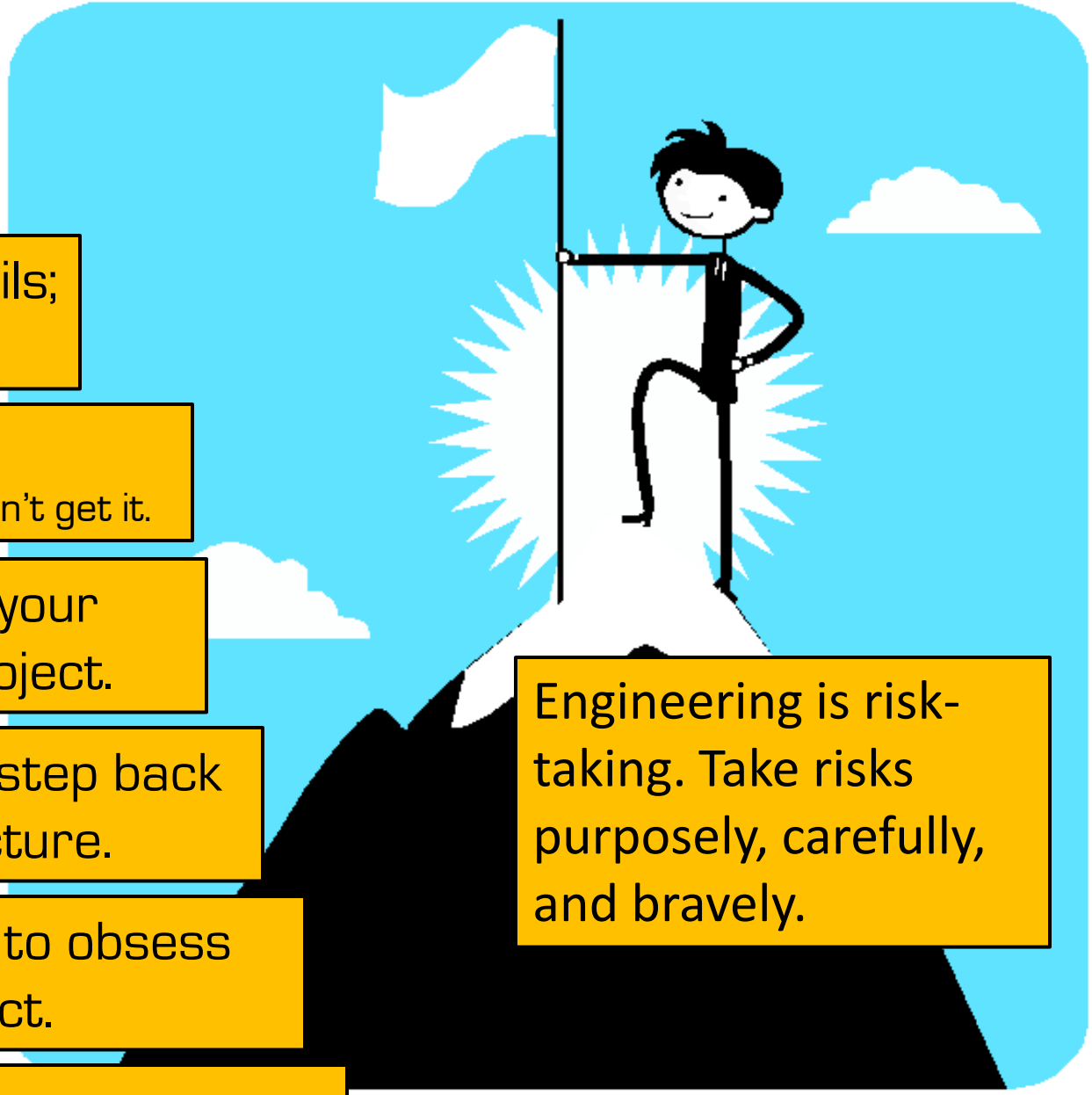
Strive for perfection.
But design assuming you won't get it.

Commit yourself & your sacred honor to project.

Periodically take step back and check big picture.

Don't be afraid to obsess over your project.

Exercise!



Engineering is risk-taking. Take risks purposely, carefully, and bravely.

Q & A