

# Technical Interviewing

## For CSE Majors

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CSES

TBP

HKN

WIC



- Always get the interviewer's card
  - Name (spelled correctly), email
- Think (best) big-Oh complexity
- Think parallelism (multicore)
- Bring extra resumes, note pad
- Be there early

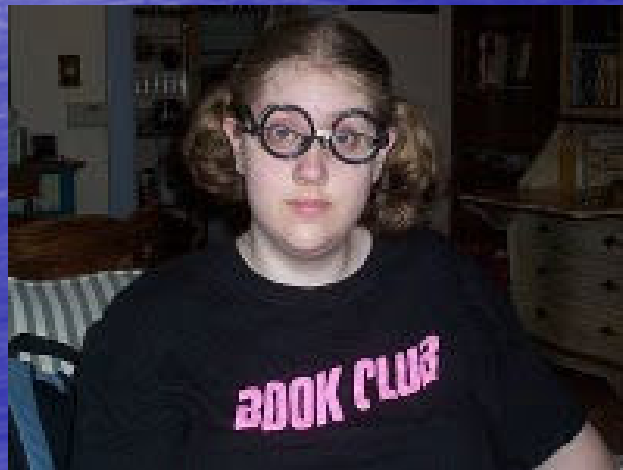
# Quick Warm-up

- All the ways to count the number of digits in a decimal number?
- All the ways to set 0 into an int  $x$ ;  
(you do not know the value already in  $x$ )

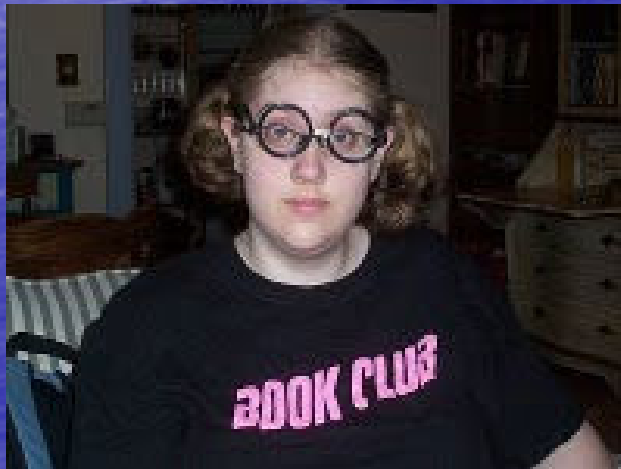
# What Companies Look For



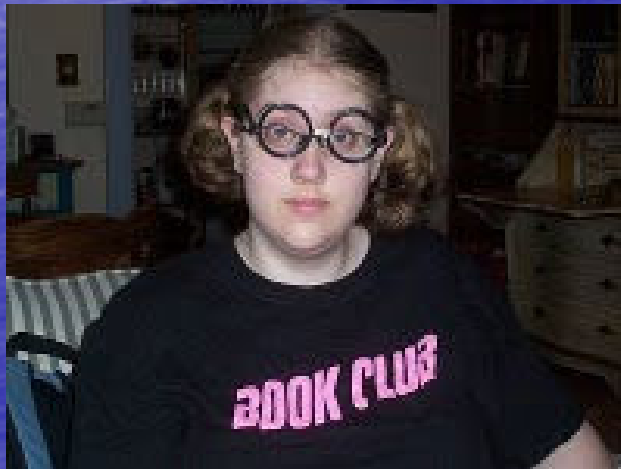
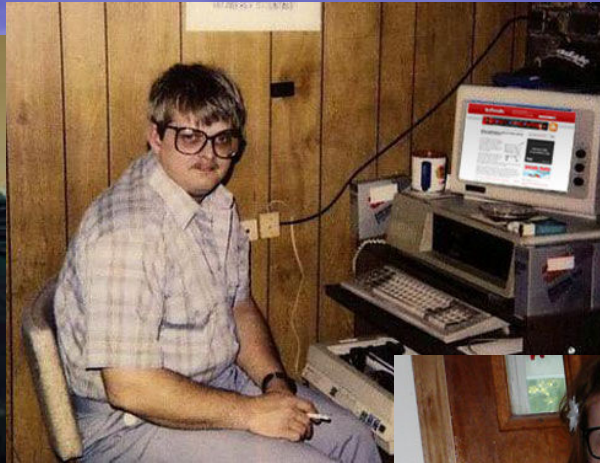
# What Companies Look For



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## The PC Weenies



"I don't mean to pry, but based on compromising your database, I understand that you're looking to hire a SQL security expert."

# What Companies Look For



# What Companies Look For

- Self-Motivated (examples on resume)
- Work effectively alone (independent)
  - Self-Starter/Desire to learn new skills
  - Quick learner/Wide range of skills
  - Potential!
- Work effectively in a group
  - Team player/Take and give direction

# What Companies Look For

- No Resume Padding!!!
- Effective Resumes
  - Making Your First Impression Count
  - TBP article:

<http://www.tbp.org/pages/Publications/Bent/Features/F08Fable.pdf>



# What Companies Look For

- Dependability (be at interview early)
- Enthusiasm / Personable
- Excellent Oral Communications
  - Make eye contact
- Excellent Written Communications
  - No misspellings, no slang, don't use contractions, careful with TLAs
- No Bad Breath/Smoker's/Coffee/BO

# What Companies Look For



# What Companies Look For

- Tutoring / SAGE
- Programming Contests
- Student Orgs (Officer)
- Volunteer
- Be Prepared for the Interview!
- Sleep and Eat beforehand / Do not drink tons of coffee or energy drinks

# What Companies Look For

- Think Out Loud during the interview
  - Brush up on CS basics like algorithms, data structures, and coding
  - Code, code, code. practice coding in a Google Doc (what they'll be asked to do in a phone interview) because it's different than in an editor
  - Talk a lot. interviewers want to hear thought process. even if you're not sure what the answer is, ask follow up questions or start brainstorming ideas.
  - Interviewers like questions that start simple and then they add complexity.
  - Know how to test your code!
- Beware your initial thoughts
  - "I totally blew the interview!" 😞
    - Got job offer 😊
  - "I nailed the interview!" 😊
    - No job offer 😞



# What Companies Look For

- Ten Tips for a (Slightly) Less Awful Resume

<http://steve-yegge.blogspot.com/2007/09/ten-tips-for-slightly-less-awful-resume.html>

- Get that job at Google (Read This!)

<http://steve-yegge.blogspot.com/2008/03/get-that-job-at-google.html>

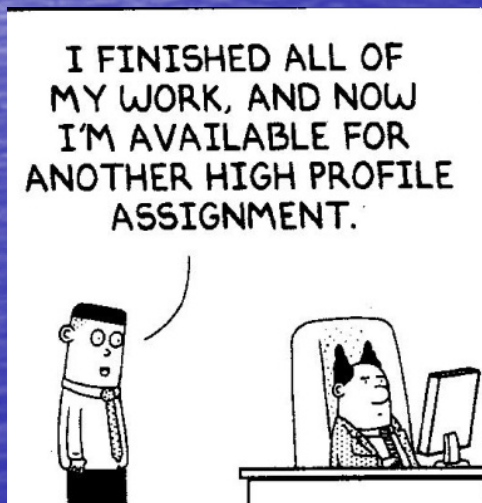
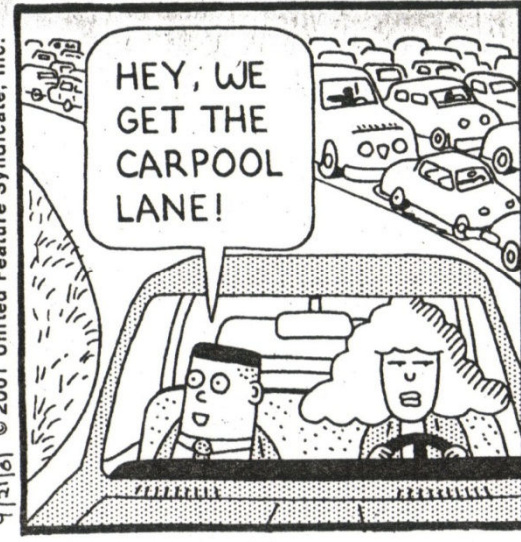
- Rich Programmer Food (Compilers!)

<http://steve-yegge.blogspot.com/2007/06/rich-programmer-food.html>

# Internships



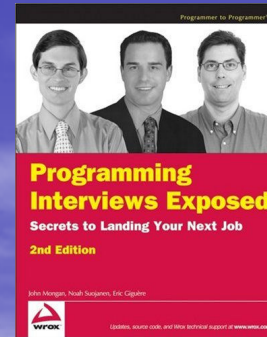
# Internships



# Campus Resources (Be Prepared)

- CompanyTech Talks and Info Sessions!
- DECaF
- Engineering Student Services (ESS)
  - Weekly emails, Internship Opportunities
- Corporate Affiliates Program (CAP)
  - Team Internship Program (TIP)
- Campus Career Services
  - Resumé & cover letters, Mock interviews
  - Library Walk Career Fairs
- CSE ugrad majors emails
- Networking

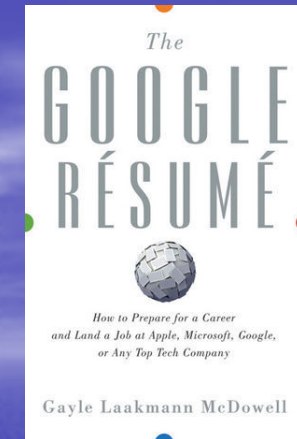
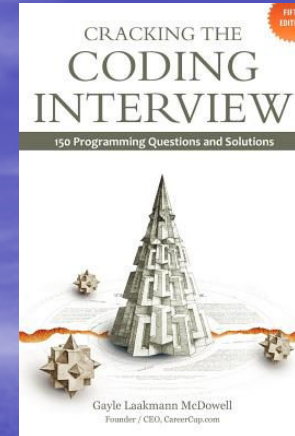
# Books



- **Programming Interviews Exposed**
  - By Morgan, Suojanen, Giguere
  - Wrox Publishing

Love this book. Great review of general data structures and discussion of how to approach programming questions. Also lots of generally useful programming questions and how to solve them (like reverse a linked list, reverse a string and advanced variations on them). [LDS]

# Books



- Gayle Laakmann McDowell
  - <http://www.technologywoman.com/>
- Cracking the Coding Interview
- The Google Resume

# How CS Resume Should Look

**One Page Only!**  
Unless > 10 years exp.

**A Real Resume Format**  
with organized columns

**Short (1 - 2 line bullets)**

**Focus on Accomplishments**  
not responsibilities

**GPA if at least 3.0**  
max (in-major, overall)

**3 - 4 Projects**  
Courses & independent  
Finished or unfinished

**List of Technical Skills**  
Short! Cut the "fluff."

123 Spruce St, Apt 35  
Philadelphia PA 19103

**GAYLE L. McDOWELL**

(555) 555-1212  
gayle@careercup.com

## EMPLOYMENT

### Software Engineer, Intern iChat AV

- Reduced time to render the user's browser
- Implemented iChat integration with
- Redesigned chat file format and imp

**Observe: No Objective!**  
Objectives / summaries  
are almost always useless.

### Lead Student Ambassador

Microsoft Corporation

Fall 2003 - Spring 2005

- Promoted to Lead Student Ambassador in Fall 2004; supervised 10 - 15 Student Ambassadors
- Created and taught Computer Science course, CSE 099: Software Design and Development

### Head Teaching Assistant

University of Pennsylvania

Fall 2001 - Spring 2005

- Courses: Advanced Java III, Software Engineering, Mathematical Foundations of Comp. Sci. I & II
- Promoted to Head TA in Fall 2004; led weekly meetings and supervised four other TAs

### Software Design Engineer, Intern

Microsoft Corporation

Summers 2001 - 2003

Visual Studio Core (Summer 2003)

- Implemented a user interface for the VS open file switcher (ctrl-tab) and extended it to tool windows.
- Created service to provide gradient across VS and VS add-ins. Optimized service via caching.
- Programmer Productivity Research Center (Summers 2001, 2002)
- Built app to compute similarity of all methods in a code base; reduced time from  $O(n^2)$  to  $O(n \log n)$ .
- Created test case generation tool which creates random XML docs from XML Schema

## EDUCATION

Philadelphia, PA

University of Pennsylvania

Fall 2000 - May 2005

- M.S.E. in Computer and Information Science, May 2005. GPA: 3.6
- B.S.E. in Computer Science Engineering with Minor in Mathematics, May 2005. Major GPA: 3.4
- Graduate Coursework: Software Foundations; Computer Architecture; Algorithms; Artificial Intelligence; Comparison of Learning Algorithms; Computational Theory
- Undergraduate Coursework: Operating Systems; Databases; Algorithms; Programming Languages; Comp. Architecture; Engineering Entrepreneurship; Calculus III

## TECHNICAL EXPERIENCE

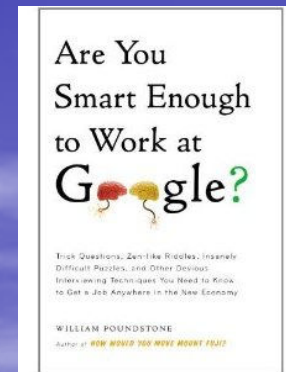
### Projects

- **Multi-User Drawing Tool** (2004). Electronic classroom where multiple users can view and simultaneously draw on a "chalkboard" with each person's edits synchronized. C++, MFC
- **Synchronized Calendar** (2003 - 2004). Desktop calendar with globally shared calendars, allowing users to schedule meetings with other users. Calendars automatically synchronized with centralized SQL server. C#.NET, SQL, XML. *Awarded Third Prize in Computer Science Senior Design Projects.*
- **Operating System** (2002). UNIX-style OS with scheduler, file system, text editor and calculator. C

### Languages and Technologies

- C++; C; Java; Objective-C; C#.NET; SQL; JavaScript; XSLT; XML (XSD) Schema
- Visual Studio; Microsoft SQL Server; Eclipse; XCode; Interface Builder

# Books

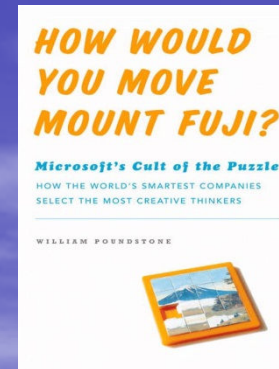


- **Are You Smart Enough to Work at Google?**
  - By William Poundstone
  - Little, Brown and Company Publishers

Trick Questions, Zen-like Riddles, Insanely Difficult Puzzles, and Other Devious Interviewing Techniques You Need to Know to Get a Job Anywhere in the New Economy



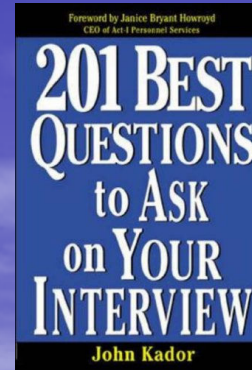
# Books



- **How Would You Move Mount Fuji?**  
(Microsoft's Cult of the Puzzle - How the World's Smartest Company Selects the Most Creative Thinkers)
  - By William Poundstone
  - Little, Brown and Company Publishers

More of a discussion of the Microsoft culture and why things are the way they are. Some fun puzzles to solve too. [LDS]

# Books



- 201 Best Questions To Ask On Your Interview
  - By John Kador
  - McGraw Hill Publisher

Great questions to ask, though not all of them are relevant to engineers. Just for the 10-20 questions I found that were good to ask, this one was worth buying. [LDS]

# In General ... Think Out Loud

- Pointers, Pointers, ..., Pointers! `*ptr++`
- Memory Management
- C, C++ Java, C# Scripting Languages
- Assembly / Low-Level Architecture Details
- Compiling, Debugging, Debugging Tools
  - Read (correct & incorrect) code
- Algorithms & Data Structures
  - Time & Space costs (Big-Oh), Recursion!
- Evaluating your thinking process
- Brain teasers (maybe)

# In General ... Think Out Loud

- Be prepared for anything
  - Phone, on-campus Library Walk, on-campus private at career center/conf. room, elevator
  - Long day on-site interviewing (lunch/no lunch)
  - Surprisingly short interview or all Non-Technical
  - Interviewing for wrong position
  - Bring plenty of resumes/aux. materials
- Be prepared to ask questions
  - Company, specific job, work environment

# General Types of Questions

- Non-Technical
  - Things from your resume (Do Not Pad!)
    - Favorite class/project (hard class vs. UBW)
    - How did you get interested in CS?
  - Tell me about yourself
    - Greatest strengths / weaknesses / hobbies
  - Why do you want to work here?
    - Why should we hire you?
    - What salary do you want/willing to take?
  - What do you see yourself doing in 5 years?
  - Do you have any questions? (usu. at end)

# General Types of Questions

- Technical
  - Pointers, arrays, structs/unions, buffer overflows / run time stack, static vars, typedefs, macros, volatile, mem. mgmt, bit ops, binary/hex (C)
  - OOP (C++ and Java)
    - Polymorphism/virtual, Overloading (name mangling)
  - Simple data structures and algorithms
    - linked lists, trees, hash tables, sorting, searching - Big Oh
  - Threading, mutex, semaphore, monitor
  - Arch.: Endian, data type sizes/alignment, assembly
  - Unix commands, PERL, Regular Expressions

# General Types of Questions

- Technical
  - Pointers, bit ops, array overruns, memory leaks
  - Why/when to use queue, stack, linked list, array, vector, binary tree
  - OOP vs. Procedural programming / Java vs. C++
  - Call-by-reference vs. call-by-value
  - Number representations (SM, 1's, 2's comp)
  - Iterative and recursive factorial/Fibonacci/prime
  - Process mgmt, context switch, interrupt-driven IO
  - Compiler vs interpreter

# General Types of Questions

- Technical

- Program Palindrome, Anagram, Factorial, Fibonacci seq.
- String reversal (iterative and recursive)
- Given pre- and post-order traversal of a binary tree write the in-order traversal
- What does `((char *)&(x) + 1) - (char *)&(x)` do?
- Java: private/protected/package/public, final, abstract, static, this/this(), super/super(), import, compiler defaults (ctor, extends Object, this.), class vs. interface vs. abstract class, inheritance, polymorphism
- Testing, testing, testing!



# General Types of Questions

- Technical

- Software Engineering design concepts

- Waterfall, Agile, XP, TDD, Testing (white/black box, Unit, Regression), UML, design patterns, Layered and MVC architecture

- Group projects

- Resolve conflicts with previous coworkers and supervisors

- Other internships!

# Brain Teasers

- Given that the fountain at Balboa Park shoots water 10 feet in the air and the spout is 10 inches wide, what is the flow rate through the spout?
- If you are sitting in a boat in a lake with an anchor in it, when you drop the anchor in the water (assuming it sinks) what happens to the water level?

# Brain Teasers

- You have 9 jars, all filled with marbles that are 1 gram in weight. You have a tenth jar filled with marbles which are 1.1 grams in weight. You have a digital scale and you only get one measurement on it. You can measure anything but you can take only one measurement.

Which jar contains the 1.1 gram marbles?

# Brain Teasers

- U2 bridge crossing problem
- Given 9 bowling balls, determine the one heavier bowling ball in only 2 weighings.
- If an analog clock fell to the ground and broke into three pieces, and the numbers on each piece add up to the same sum, which three pieces did the clock break into?

# Brain Teasers

- You have two lengths of fuse. Each will burn for exactly one hour. But the fuses are not necessarily identical and do not burn at a constant rate. There are fast-burning sections and slow-burning sections.

How do you measure forty-five minutes using only the fuses and a lighter?

# Avoid Scam Companies

- Interview seems more like debugging their code for free
- Offer low salary compensated with stock options
- Promise you all sorts of things
  - If it sounds too good to be true, it usually is!

# Post Interview Etiquette

- Follow-up letter, phone call, e-mail
  - Gives you a chance to add something you forgot, re-emphasize a strong point, answer a question you could not answer on the spot, keep me in mind in the future if I am not right fit now, re-emphasize your interest in the job/company (or a Thanks, but No Thanks)

Above all else ...

- Relax

