HCI Notes

- The Memex (Vannevar Bush)
  - Microfilm containing books, pictures, etc.
  - Direct entry by placing handwritten notes on desk and pulling a lever
  - User can have mnemonics that reference a certain book
  - User can control the speed of scrolling through a book or jump to first page
  - Two items can be tied together through pointers
  - Memex Revisited
    - Engelbar and Nelson realized it would be digital
    - Doug Englebar: insights on computer-supported cooperative work and had ideas for mouse, GUI, word processors, window systems
    - Nelson: digital texts would allow interconnected materials (hypertext) which could not be presented on paper containing summaries, annotations, etc.
- Man-Computer Symbiosis
  - Licklider (1957) Most of thinking time was spent on setup and waiting for computation time
  - Interactive systems were critical
  - Timesharing
    - Increased access to computers, users could think at the terminal, text processing came about
  - Don Norman started the field of cognitive principles for computers as more nonprogrammers started using them
- Success stories in technology adoption - Mobile Revolution (~2007), Cloud computing (~2006), Social computing (~2000), World-wide-web (~1993), Personal computing (~1980)
- Ivan Sutherland - pioneered computer graphics and CAD, creator of sketchpad which was modern pen-based *interactive* system that supports CAD design and 3D modeling.
- Alan Kay (1940) developed smalltalk the first general OO programming language, also conceived the dynabook (laptop computer) and pushed Xerox Alto (1972) and star, first personal computers
- Principles - More fundamental, widely applicable, and enduring than guidelines
  - Determine user's skill level (user analysis), identify the tasks (task analysis), 5 primary interaction styles, prevent errors, eight golden rules, automation and human control
- "Know the user" Hansen (1971) - Age, gender, physical and cognitive abilities, education, cultural or ethnic background, training, motivation, goals and personality - novice, knowledgeable, or expert
- Task Analysis - done by observing and interviewing users, decomposition of high level tasks, relative task frequencies
- Interaction style - direct manipulation, menu selection, form fill-in, command language, natural language
- 8 golden rules of interface design - strive for consistency, cater to universal usability, offer informative feedback, design dialogs to yield closure, prevent errors, permit easy reversal of actions, support internal locus of control, reduce short term memory

- 5 Usability measures - time to learn, speed of performance, rate of errors by user, retention over time, subjective satisfaction
- HCI principles by Wilfred Hansen (1971) - know the user, minimize memorization, optimize operations, engineer for errors
- People are better at recognition than at recalling things (hence menus over commands)
- Affordance - A property in which the physical characteristics of an object or environment influence its function (ex. Doors with handles should be pushed and flat plates pulled)
- Designers have 2 types of mental models - models of how a system works (system model), and models of how people interact with systems (interaction models)
- Hierarchy of needs - functionality, reliability, usability, proficiency, creativity
- Between subjects - 1 group of users for each variable treatment, With-in subjects - all users perform all treatments
- T-test - compares 1 dependent variables on 2 treatments of 1 ind variables, ANOVA - compares 1 dependent variable on n treatments of m independent variables
- goals, objects, methods, selection rules (GOMS) analysis used to predict how long an expert user takes to perform a certain operation
- KLM (keystroke-level model)-K[eyeing]=.2s, P[ointing]=1.1s, H[oming]=0.4s, M[ental]=1.35s
- Efficiency = minimum input/input that has to be supplied by the user
- Information in bits conveyed by a choice with probability p(i) of being picked = $p(i)\log_2(1/p(i))$
- Fitts' Law: Time to move cursor to button = $a + b*\log_2(\text{Distance} / \text{Size} + 1)$
- Hick's Law: Time to choose among n choices = $\sum_i p(i)\log_2(1/p(i) + 1)$ or $a+b*\log_2(n+1)$
- Cognitive walkthrough - describe user, describe task from their perspective, make numbered list of steps, simulate the task, predict program behavior
- Heuristic evaluation - develop a set of design heuristics to guide evaluators (e.g. golden rules)
- 80/20 rule - 80% of effects generated by any large system are caused by 20% of the variables in that system
- Visual Variables - selective, associative, quantitative, order