



Lecture 2

History of Computing

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Let's see if we can get our clickers working!

- First, I think we need to change the frequency
 - press and hold “on/off” for 2 seconds until power light flashes
 - enter “A” then “B”
 - you should get a green light indicating that it worked
 - if not, or if you make a mistake, just repeat
 - unfortunately, I think you'll need to do this every class
- You'll need to register your clicker on WebCT
 - if you haven't done it by now, you've missed out on the 5% participation marks we awarded for registering on time
 - you still need to do it to get credit for all your clicking
- Now let's do a sample poll

Today's lecture

- Discussion questions from last class
- Introduction
- Milestones in computing
- Milestones in networking

...then, if we make it this far:

- Milestones in information storage and retrieval
- Information technology issues

1.1 Discussion Questions

Networked Communications

“For the protection of children, computers in libraries should be configured to block objectionable content.”

A: You Agree

B: You Disagree

Intellectual Property

“The producers of software should have the right to prevent others from copying the software they produce.”

A: You Agree

B: You Disagree

Privacy

“The Vancouver Police should use Facebook posts to prosecute alleged participants in the 2011 Stanley Cup riot.”

A: You Agree

B: You Disagree

Computer and Network Security

“Canadians should have the right to vote online in federal, provincial and municipal elections.”

A: You Agree

B: You Disagree

Computer Reliability

“The manufacturer of a self-driving car should not be held responsible for crashes in bad weather, such as snow storms.”

A: You Agree

B: You Disagree

Professional Ethics

“A UBC CS sysadmin accidentally discovers pornography in a student’s private department file space, depicting a woman the sysadmin believes may be under 18. The sysadmin should inform the department head.”

A: You Agree

B: You Disagree

Work and Wealth

“It is immoral for a corporation to pay its CEO 400 times as much as a production worker.”

A: You Agree

B: You Disagree

1.1 Introduction

Information Age

- Era characterized by unprecedented access to information
- Catalysts
 - Low-cost computers
 - High-speed communication networks

Some Important Advances in Past Two Decades

What technologies do you think have been pivotal, and why?

Some key technologies:

- Cell phones
- MP3 players
- Digital photography
- Email
- World Wide Web
- Social networking

1.2 Milestones in Computing

Aids to Manual Calculating

- Tablet
 - Clay, wax tablets (ancient times)
 - Erasable slates (late Middle Ages)
 - Paper tablets (19th century)
- Abacus
 - Rods or wires in rectangular frame
 - Lines drawn on a counting board
- Mathematical tables
 - Tables of logarithms (17th century)
 - Income tax tables (today)



Please answer the following question

Did you own or hold foreign property at any time in 2005 with a total cost of more than CAN\$100,000? (read the "Foreign income" section in the guide for details) 266 Yes 1 No 2
 If yes, attach a completed Form T1135.

If you had dealings with a non-resident trust or corporation in 2005, see the "Foreign income" section in the guide.

As a Canadian resident, you have to report your income from all sources both inside and outside Canada.

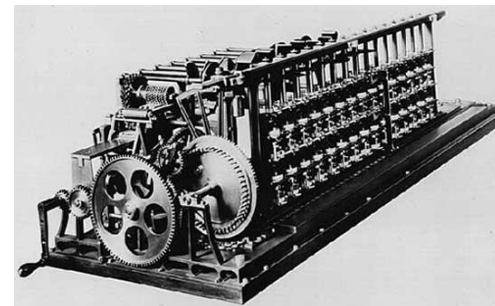
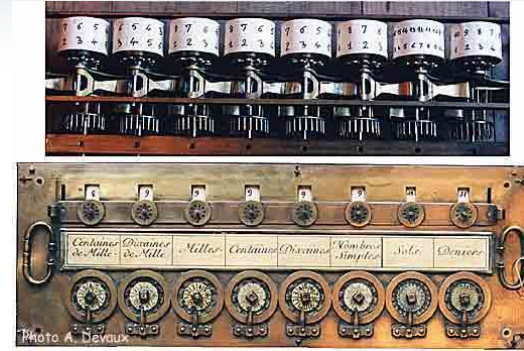
Total Income

Employment income (box 14 on all T4 Slips)	101	38,561.00
Commissions included on line 101 (box 42 on all T4 slips)	102	.00
Other employment income	104	.00
Old Age Security pension (box 18 on the T4A (OAS) slip)	113	.00
CPP or QPP benefits (box 20 on the T4A(P) slip)	114	.00
Disability benefits included on line 114 (box 18 on the T4A(P) slip)	152	.00
Other pensions or superannuation	115	.00
Employment Insurance benefits (box 14 on the T4E slip)	119	.00
Taxable amount of dividends from taxable Canadian corporations (see the guide)	120	.00
Interest and other investment income (attach Schedule 4)	121	.00
Net partnership income: limited on non-active partners only (attach Schedule 4)	122	.00
Rental Income	Gross 160	Net 126
Taxable capital gains (attach Schedule 3)		127
Support payments received	Total 156	Taxable amount 128
RRSP income (from all T4RSP slips)		129
Other income	Specify:	130
Self-employment income (see lines 135 to 143 in the guide)		
Business income	Gross 162	Net 135
Professional income	Gross 164	Net 137
Commission income	Gross 166	Net 139
Farming Income	Gross 168	Net 141
Fishing Income	Gross 170	Net 143

From MISC:
 This amount may qualify for the pension income amount. See line 314 in the guide. See also FED VTRK

Early Mechanical Calculators

- Calculators of Pascal and Leibniz (17th century)
 - Worked with whole numbers
 - Unreliable
- Arithmometer of de Colmar (19th century)
 - Took advantage of advances in machine tools
 - Adopted by insurance companies
- Printing calculator of Scheutzes (19th century)
 - Used method of differences pioneered by Babbage
 - Adopted by Dudley Observatory in New York
 - Completed astronomical calculations



Social Change Created Market for Calculators

- Gilded Age (late 19th century America)
 - Rapid industrialization
 - Economic expansion
 - Concentration of corporate power
- New, larger corporations
 - Multiple layers of management
 - Multiple locations
 - Needed up-to-date, comprehensive, reliable, and affordable **information**



Mulberry Street, New York (1900)

Calculator Adoptions Created Social Change

- Fierce market
 - Continuous improvements in size, speed, ease of use
 - Sales increased rapidly
- “Deskilling” and feminization of bookkeeping
 - People of average ability quite productive
 - Calculators 6x faster than adding by hand
 - Women replaced men, wages dropped



Image from *Before the Computer* by James Cortada, Princeton University Press

Cash Register

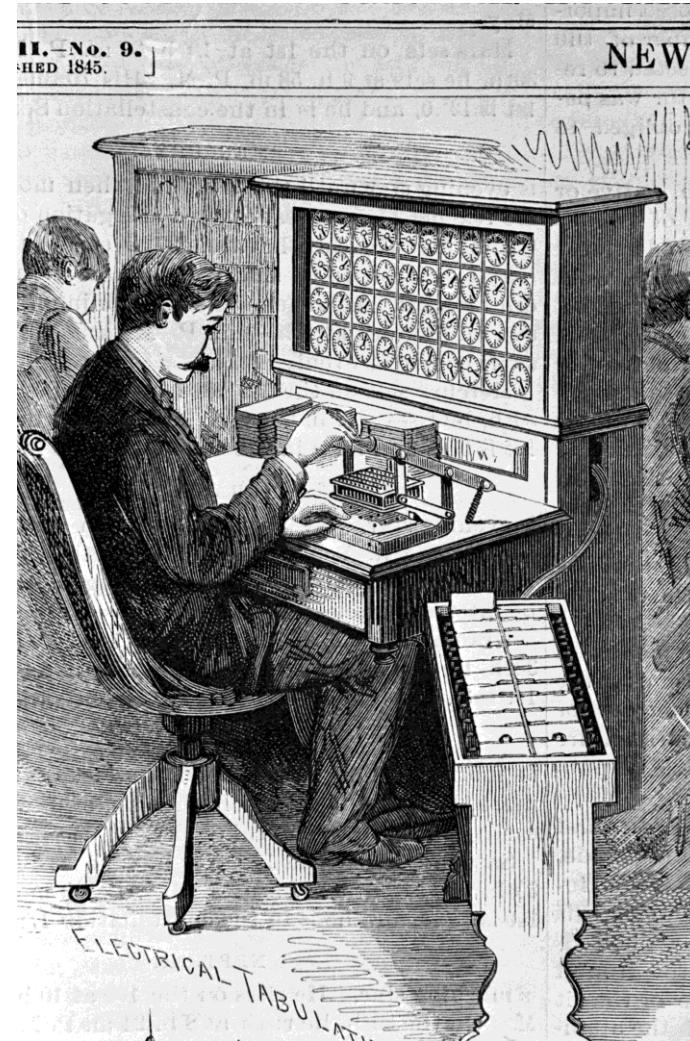
- Store owners of late 1800s faced problems
 - Keeping accurate sales records for department stores
 - Preventing embezzlement from clerks
- Response to problems: cash register
 - Created printed, itemized receipts
 - Maintained printed log of transactions
 - Rang bell every time drawer was opened



Image courtesy of the NCR Archive at Dayton History

Punched Card Tabulation

- Punched cards (late 19th century)
 - One record per card
 - Cards could be sorted into groups, allowing computation of subtotals by categories
- Early adopters
 - U.S. Bureau of the Census
(shown in image)
 - Railroads
 - Retail organizations
 - Heavy industries



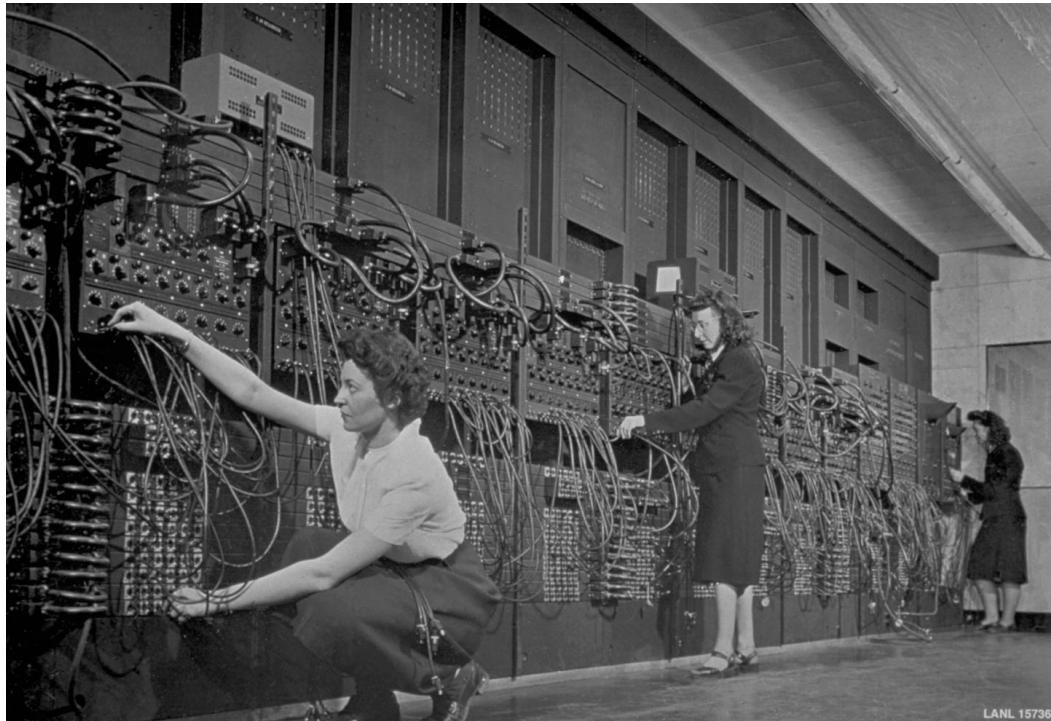
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Tabulators Led to Data-processing Systems

- Data-processing system
 - Receives input data
 - Performs one or more calculations
 - Produces output data
- Punched cards
 - Stored input data and intermediate results
 - Stored output
 - Stored programs on most complicated systems

Precursors of Commercial Computers

- Atanasoff-Berry Computer: vacuum tubes
- ENIAC: externally programmed with wires (shown below)
- EDVAC: program stored in memory
- Small-Scale Experimental Machine: CRT memory



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First Commercial Computers

- Remington-Rand
 - Completed UNIVAC in 1951
 - Delivered to U.S. Census Bureau
 - Predicted winner of 1952 election



Image courtesy of Unisys Corporation

- IBM
 - Larger base of customers
 - Far superior sales and marketing organization
 - Greater investment in research and development
 - Dominated mainframe market by mid-1960s

Programming Languages

- Assembly language
 - Symbolic representations of machine instructions
 - However, one assembly instruction for every machine language instruction: language not simpler
- FORTRAN
 - First higher-level language (shorter programs)
 - Designed for scientific applications
- COBOL
 - U.S. Department of Defense standard
 - Designed for business applications

Time-Sharing Systems and BASIC

Two changes that led to wider adoption of computers:

- Time-Sharing Systems
 - Divide computer time among multiple users
 - Users connect to computer via terminals
 - Cost of ownership spread among more people
 - Gave many more people access to computers
- BASIC
 - Developed at Dartmouth College
 - Simple, easy-to-learn programming language
 - Popular language for teaching programming

Transistor

- Replacement for vacuum tube
- Invented at Bell Labs (1947)
- Semiconductor
 - Faster
 - Cheaper
 - More reliable
 - More energy-efficient



Integrated Circuit

- Semiconductor containing transistors, capacitors, resistors
- Invented at **Fairchild Semiconductor**, Texas Instruments



Magnum Photos, Inc. © 1960 Wayne Miller

- Advantages over parts they replaced
 - Smaller, faster
 - More reliable, less expensive

IBM System/360

- Before System/360
 - IBM dominated mainframe market in 1960s
 - IBM computers were incompatible
 - Switch computers → rewrite programs
- System/360
 - Series of 19 computers, varying levels of power
 - All computers could run same programs
 - Upgrade without rewriting programs



Microprocessor

- Computer inside a single semiconductor chip
- Invented in 1970 at Intel



- Made personal computers practical