


FOUNDP/T

PROGRAM


- Week 6 History of Computing
- Week 7 History of Computing
- Easter Holidays 2 weeks
- Week 8 Sociology of Computing
- Week 9 Sociology of Computing
- Week 10 Sociology of Computing
- Week 11 Bank Holiday
- Week 12 Sociology of Computing PLUS maths revision session



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Last semester we looked at:



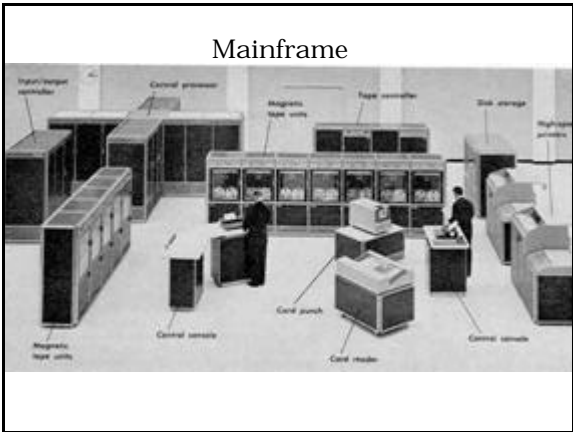
- Key ideas behind computing - automation etc.
- Mechanical devices to perform such automation
- Babbage's Analytical Engine with its universal scope and a layout similar to today's computers
- Turing machines
- Near and pre-computers
- The stored-program computer (EDSAC at Cambridge, EDVAC in the USA and the Manchester Baby)



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We will go on from this to look **briefly** at a number of key initiatives during the next two lectures:


- Week 6**
 - Software / The Compiler
 - Real-Time Computing
 - Minicomputer
 - The PC
 - Apple /Microsoft
- Week 7**
 - The Internet

Software

Software has always been problematic and unpredictable -writing for an **automaton**.

Cambridge Graduate David Wheeler worked on early programming on the EDSAC and wrote a programming manual in 1951, which covered subroutines. **De-bug first.**



John Backus

John Backus (IBM) developed **FORTRAN** (Formula Translation) between 1953-7 with little prestige or support from IBM. Soon in great demand. McCracken's text book used in universities.

Software

ALGOL – early international language late 1950s.

FORTRAN leader in scientific market

US heavy investment in computers with large memories (10 times bigger than first computers), backed up with magnetic tapes and drums. Needed larger, more sophisticated programs.

Automatic programming – high-level programming code, which looked like English or algebra.



Software / The Compiler

Grace Hopper developed the automatic programming system called the A-0 **COMPILER**, which automatically put together the pieces of code that made the whole program. She went around the country encouraging people to use automatic programming.

COBOL (Common Business-Oriented Language) dominated the business market.

In the 1950s there was no idea of software being a saleable commodity.

IBM users and UNIVAC users shared tips and programs (quite like UNIX / Linux users today)



Software

The RAND corporation was an early software contractor and developed programs for the **SAGE** air-defence project.

It was easy to start up a software company – you just needed a **pencil and a notepad**. By 1965 there were around 45 software contractors in the US.

The term **software** was introduced 1959-60.



RAND's original office in downtown Santa Monica

Software

Mariner 1 rocket disaster in 1962 was caused by a single mistaken character (hyphen) in a FORTRAN program, symbolized despair in the programming community. 1968 IBM's **unbundling strategy** – they decided to split software and hardware (software costs has risen from .05% to 33% of their budget).

1971 Pascal Developed

Structured programming – ADA

Formal methods



Real-Time Computing



A real-time system is one which responds to external messages in real time (within seconds or fractions thereof).

Real-time computing developed as part of a project to build an **aircraft trainer** during WW2. In 1944 there were 100 people working on a project "Whirlwind" at MIT under Jay Forrester.

Reaping the Whirlwind



The aircraft trainer was to be a simulator attached to an analogue computer system.

The computer needed to respond in real time and this was a major problem.

Perry Crawford (graduate student) realised that digital computers would give the speed required.



March 1946 Forrester decided to develop a full-scale digital computer. Despite escalating costs the government did not fund the project.

The SAGE Defence System

Semi Automatic Ground Environment

The Soviets exploded a nuclear bomb in 1949 and this led to the USA reviewing its air defences.

The review was led by George Valley Jr. who took over Project Whirlwind (which became part of project Lincoln at MIT) and 10 years on, SAGE.



Whirlwind Core Memory

1953 Whirlwind used core memory with an access time of 9 μ -secs making it the fastest computer in the world (and the most reliable).

Real-Time Computing

IBM took over project Whirlwind and built the IBM AN/FSQ-7 Computer

This was the largest computer ever built and received 100 sources of data e.g. Radar.

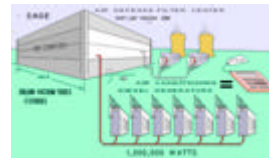
The SAGE system was designed to counteract bomber borne nuclear weapons but had no answer to Inter-Continental Ballistic Missiles (ICBMs).

Many technologies were developed as part of SAGE eg. Printed Circuit Board (PCB), core memory, mass storage devices

The IBM AN/FSQ-7



The Sage System



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Minicomputer

- 1950-1965 saw three stages in the electronics industry - vacuum tubes to transistors to chips.



- In 1970 a **minicomputer** cost \$20,000 with the same capability as a mainframe computer that cost ten times as much in 1965. The minicomputer was spawned by Project Whirlwind and MIT, not the mainframe.



The PC

- Behind this development are big names (Bill Gates, Steve Jobs), big companies (Microsoft, Apple, IBM) and social forces (people's hobbies).
- At the heart of the PC lies the microprocessor, developed 1969-1971 by the semiconductor firm Intel.
- **Silicon Valley, USA** was started off by Bill Shockley, co-inventor of the transistor in 1946. (Palo Alto was his home town.)

The PC

- The computer chip was designed almost by accident – chip made for Japanese advanced calculator was discovered to be general purpose.
- First microprocessors very expensive – chip \$1,000 in 1971.
- 1974, competition from Motorola etc. brings price down to \$100.



The PC



- Three years later, the first real PC arrived - the **Apple II**.
- Hence it had taken some years to appear, not just fallen from the sky overnight, as some have claimed.



Computer Hobbyists

- Hobbyist could be described as a young male technophile.
- Used electronic construction kits.
- Many hobbyists were radio amateurs.
- Hobby line had long history – radio, TV, hi-fi. Computers were next.
- Hobbyists may have used **minicomputer** at work.



Computer Hobbyists



Ted Nelson

- Amateur computer culture prevalent everywhere in US – particularly Silicon Valley.
- Late 1960s time of revolution. Computer Liberation, California – power to the people! Leading advocate - **Ted Nelson, hypertext** – everyone could get information from a computer which should not just belong to large companies.

Altair 8800

- In January 1975, the first microprocessor-based computer, the Altair 8800, sold in kit form, appeared on the front cover of *Popular Electronics*.
- This is often seen as **the first PC** – cheap enough for individual to buy.
- Small companies of two or three people sprang up to create extras for the limited Altair 8800. These were mostly hobbyists trying to make something of their pastime. **Bill Gates** was one of these early entrepreneurs.



Bill Gates

- Gates, typical nerd – programmed at night. Developed BASIC programming for the Altair 8800.
- Formed Micro-Soft in 1975 with Paul Allen.



Bill Gates

- "Homebrew Computer Club" in Silicon Valley. Swapped tips etc. - friendly scene. Melding of computer liberation and computer hobbyists.
- First Altair worldwide conference in 1975. Ted Nelson there.
- Gates **insisted** that software should not be shared amongst hobbyists, but should be sold. This started the **packaged-software industry** and was a complete culture shift, but did make software an economic reality and not just a pipe dream.



Homebrew Computer Club



Apple

- 1975-77 saw the microcomputer transform from a hobby machine to a consumer product.
- *Byte* magazine launched at this time.
- The mainframe took 10 years to go from a laboratory instrument to a business machine, the PC took only 2 years.
- Steve Jobs and Andrew Wozniak both attended the Homebrew Computer Club in 1975.



Apple

- They co-founded Apple in 1976.
- First Apple machine very simple - naked circuit board. Jobs realised that commercial packaging was necessary to make this a success.
- Apple II ready in 1977 when Apple was a tiny company in California with 12 employees.



IBM / MS-DOS

IBM entered the PC market late (1980), and were able to make use of advances in technology - they used second generation microprocessors which were faster, being 16 bit instead of 8 bit.



IBM needed an operating system for their new PC. The first company they tried let them down, and so they turned to Bill Gates and Paul Allen's tiny Microsoft company (32 staff in Seattle) in 1980. This story has now achieved legendary status. Thus the famous Disk Operating System, MS-DOS was born, to be sold with every IBM PC.

