



Cyberworlds:

computers and connections

Computers are the defining technology of our time. Unlike other machines that are designed to carry out a specialised task, the computer is a general-purpose device. It is a universal machine.

This exhibition looks at the computer and seeks to understand what it is, what it can do, why it was developed, and how it works. It also explores the relationship between computers and people, and the impact of the computer on our lives.

Cyberworlds: computers and connections provides a rich and highly interactive resource for students of all ages. It has been conceived as an evolving exhibition that will showcase advances, applications and issues in information technology as they arise. The exhibition showcases significant objects, audiovisual material and interactive exhibits, enabling students to explore the issues surrounding each theme through a variety of experiences.

Major exhibition sponsor



Sponsor



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Curriculum links

Students of all ages can explore the issues of:

- the impact of information technology on the natural and built environment
- the social impact of computers and how people relate to them, including the computer's role in the home, workplace and social 'tribes'
- the interaction of design, technology, society and the environment
- the vast range of computer applications
- the historical context of the development of computers, including people and events
- the influence of computers on local and global communication processes
- potential developments in computer technology.

Primary links

Cyberworlds: computers and connections provides a strong resource for primary school students in the following areas:

Years K–6 Science and technology

Content strands:

- built environments
- information and communication
- products and services

Knowledge and understanding:

- the process of designing and making to satisfy human wants and needs
- the technologies people select and use; and how these technologies affect other people, the environment and the future
- the economic, social, moral and environmental consequences of new technologies.

Years K–6 Human society & its environment

- influences of cultural heritage on technology
- common human needs met through technology
- types of information available from various sources and the relative worth of sources; recency, credibility, applicability

- interpreting timelines, graphs, diagrams, tables, databases, texts etc.

Secondary links

Cyberworlds: computers and connections provides a strong resource for secondary school students in the areas of: computing studies, computing applications, and design and technology. The exhibition also contains links to visual arts 7–10, maths in society, science for life, industrial technology, applied studies, society and culture, business studies, science, and general studies.

Years 7–12 Design and technology

Knowledge:

- technologies and their uses in a variety of settings
- the interrelationships of design, technology, society and the environment
- design, production and marketing
- processes and systems used in design and technological activity
- resources used and managed in design and technological activity

Years 7–10 Computing studies

Theme content areas:

- intelligent systems
- information systems
- communication systems
- graphics systems
- modelling and simulation systems
- monitoring and control systems.

Perspectives (through which each theme area is approached):

- systems
- historical
- environmental
- personal/societal
- philosophical/ideological.

Years 11–12 Computing studies

Knowledge and understanding:

- how computers affect society
- the range of applications of computers
- the appropriateness of computer-applications in carrying out selected tasks
- computing terminology
- the fundamental principles and practices of computing
- the nature and function of computer-based systems
- how computer-based systems are developed
- the considerations relevant to a computer-user's physical environment

Years 7–10 Visual arts

Perspectives:

- new technologies

Forms of artmaking: electronic

- technical requirements and expressive possibilities

- applications of electronic media (animation, scanning/digitising, multiple imaging etc)

Extending your visit

Your visit to *Cyberworlds: computers and connections* can be extended and enhanced through visits to other Powerhouse exhibitions, or participation in one of our educational programs. Our booking staff are happy to discuss which sections of the museum will best link to your subject area.

Two specialised education areas, the Information Technology Centre and the SoundHouse offer programs which address the needs of various age-groups and curriculums.

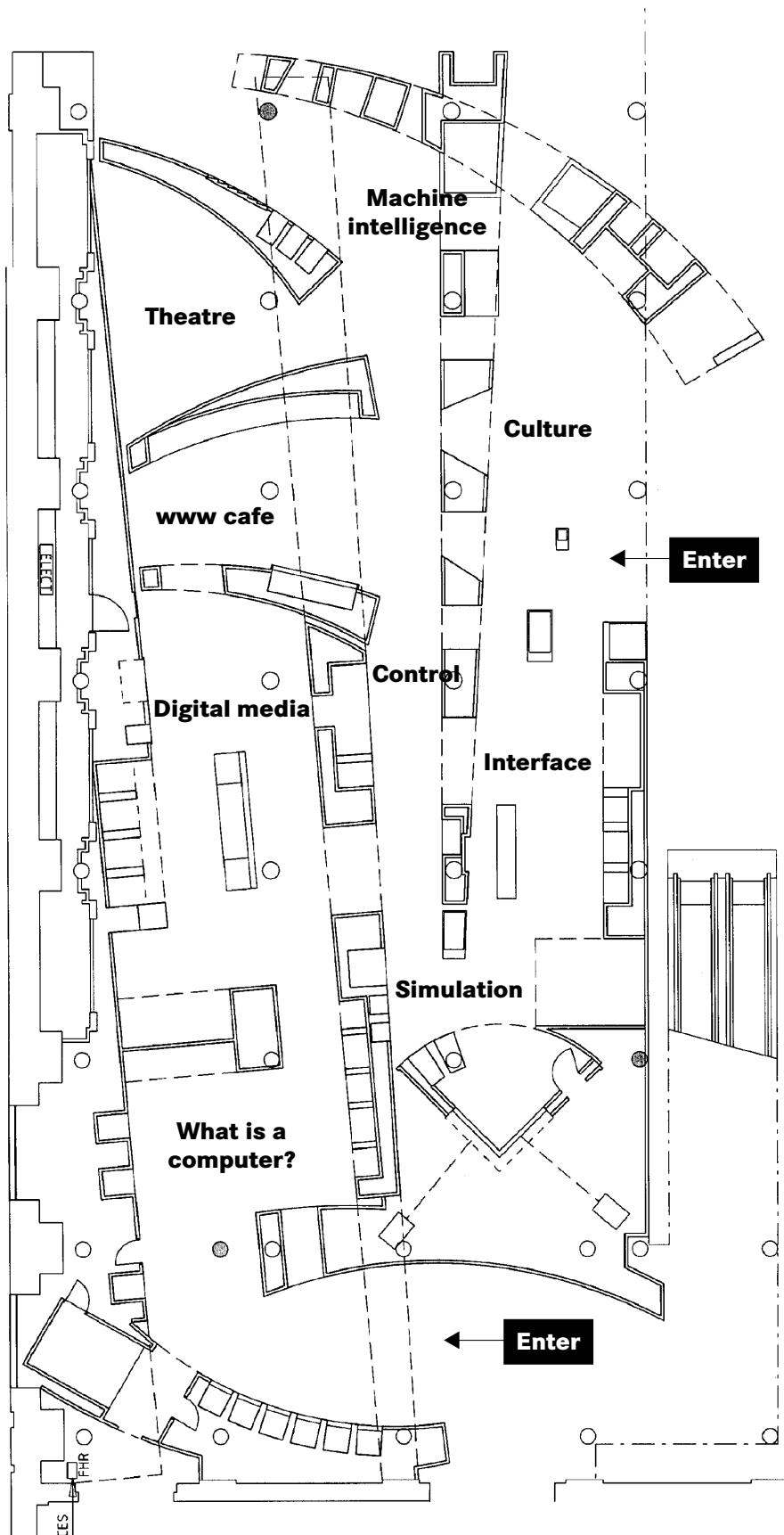
Information Technology Centre

The museum's Information Technology Centre (ITC) offers a range of exciting programs featuring hands-on experience of the latest technology developments in both software and hardware. Each program relates to themes from the exhibition.

SoundHouse

The SoundHouse is a fun learning environment featuring digital music technology. Through an educational program which incorporates hands-on activities, your students will extend their understanding of themes explored in the Digital media section of *Cyberworlds*.

Exhibition structure



Cyberworlds: computers and connections is divided into eight theme areas.

1. What is a computer?
2. Control
3. Simulation & visualisation
4. Digital media
5. Interface
6. Machine intelligence
7. Surfers Paradise
8. Culture

Exhibition themes

Section 1. What is a computer?

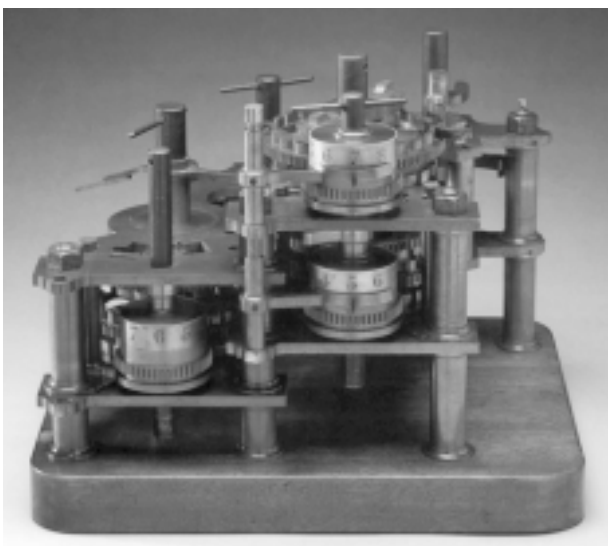


Questions and issues explored in this section:

- why is the computer like no other machine?
- how was the computer conceived?
- how does a computer work?
- how might computers change in the future?

What is a computer? more than a hammer; less than a brain

We understand or define a technology in a number of ways. We might consider the tasks it performs, the tools or machines it replaces or how it works. All technologies can be defined in terms of some human activity or capability that they enhance. This section looks at a number of these criteria to help us think about what a computer is.



Difference Engine specimen: after Charles Babbage's death, this portion of the Difference Engine was assembled from original parts by his son Henry. It was one of six specimens constructed to demonstrate the addition and carry mechanism. The Powerhouse Museum acquired it in 1995.

However, just as we are no longer in awe of the mechanics of the car, the radio or the television, eventually the question 'what is a computer?' will seem unnecessary.

This section was created by Tim Hunkin, who is best known for his BBC-TV series *The secret life of machines*, 1993.

Section 1 subthemes:

- what is a computer?
- Charles Babbage and Ada Lovelace
- Alan Turing

Key objects:

Babbage's Difference Engine – Charles Babbage spent 11 years, from 1823–1834, working on this fully automated machine that calculated and printed tables.

Babbage's Analytical Engine trial columns – the Analytical Engine was never completed, but it was designed to be the first general-purpose programmable machine. (On loan from the Science Museum, London.)

Videos/interactives:

Codebreaker! Crack the Enigma cipher – learn about codes by enciphering and deciphering a secret message.

How a computer works – learn more about how computers are different from other technologies, binary input, processing and output.

Difference engine 1 – fly through the mechanism of Babbage's first machine and see how it performed its calculations.

Section 2. Control



Questions and issues explored in this section:

- how do computers manipulate and control information and machines?
- how dependent is our society on computers?
- how much of this control is now beyond the understanding and control of any person?
- what is the Y2K (millennium) bug and how will it affect us?
- how much faith do you have in computer control systems?

Control a very human quality

All systems, whether they are social, technological or living, are controlled and regulated in some way. At the heart of 'control' is the processing and distribution of information. Because computers are essentially machines that translate information from one form to another, they are excellent control devices.



The Hollerith tabulator was developed by Herman Hollerith in 1887 after the 1880 US census, to sort and count census data. Photo: the Hollerith Tabulator, which used punched cards, was also adopted by business and science, Library of Congress.

Various apparatuses and strategies have been invented to help us to control machines and social organisations.

This section looks at some of the ways in which computers are used to control our environment, for example; traffic control, telephone exchanges, banks, stock markets and information databases.

Section 2 subthemes:

- principles of control
- hidden machines

Key objects:

PSF 1 traffic controller – the first microprocessor control traffic controller developed here in Sydney.

ID chip, reader and wrist band – chips are implanted into domestic animals so that they can be identified using the reader (scanner). The wrist band was designed to be attached to a person.

Section 3. Simulation and visualisation



Questions and issues explored in this section:

- what is simulation and visualisation?
- how do we use computers to enhance the human capacity to imagine and predict events in our world?
- how has visualisation and simulation changed through history?
- what are the pros and cons of computer simulated training?

Simulation and visualisation from the imaginary to the real

For centuries humans have used various tools and methods of simulation and visualisation for training, testing, modelling and making predictions. Simulation is the imitation or

representation of events and processes; visualisation uses graphic representation of data to enhance our understanding of and thinking about the world.

Computers are very powerful tools in these fields. So compelling are the experiences and images which they can provide that the distinction between the real and the virtual is sometimes lost.

Section 3 subthemes:

- simulation and visualisation
- the WEDGE: training, design and scientific visualisation
- the missing LINK: from trainer to simulation

Key objects:

D4 Mark2 (1955) Link trainer – used by the RAAF, the LINK's cockpit simulates the instruments and controls used in a Vampire jet.

Videos/ interactives:

The WEDGE – this 3-D virtual environment theatre allows you to see and interact with models that represent enormous amounts of information.



Computers can combine mechanical, functional and aerodynamic data to create a replica of the workings and operations of an aircraft, such as this Sea King simulator. Photo courtesy of Thomson-CSF Pacific Pty Ltd.

The transparent woman – built in Germany in 1954, the 'transparent woman' has plastic organs, an aluminium skeleton and a network of arteries, veins, nerves and a lymphatic system made from plastic coated wire that simulate these human systems.

Visualisation audiovisual – a compilation of short films showing various applications of visualisation.

Section 4. Digital media



Questions and issues explored in this section:

- how does the medium affect the meaning and context of a message?
- how has the computer facilitated convergence of traditional mediums into a new interactive multimedia form?
- what is the future potential of domestic appliances like 3-D TV?
- how is the 'truth value' of photography undermined by the new ability to seamlessly manipulate an image?
- how do new digital technologies extend the creative barriers of music, print, television and cinema production?

Digital media extending our creative horizons

For many years people have used painting, writing, printing, photography and electronic media to communicate across time and distance.

Now a new media revolution is under way. The computer allows us to combine words, sounds and pictures to form interactive multimedia. It also allows us to create sounds and images we sometimes find hard to distinguish from reality.

This section looks at how we use computers to create and communicate. It also explores developments that are transforming how we engage with photographs, music, television and cinema.

Section 4 subthemes:

- interactive multimedia
- from television to telecomputer
- digital tools
- synthetic music and video

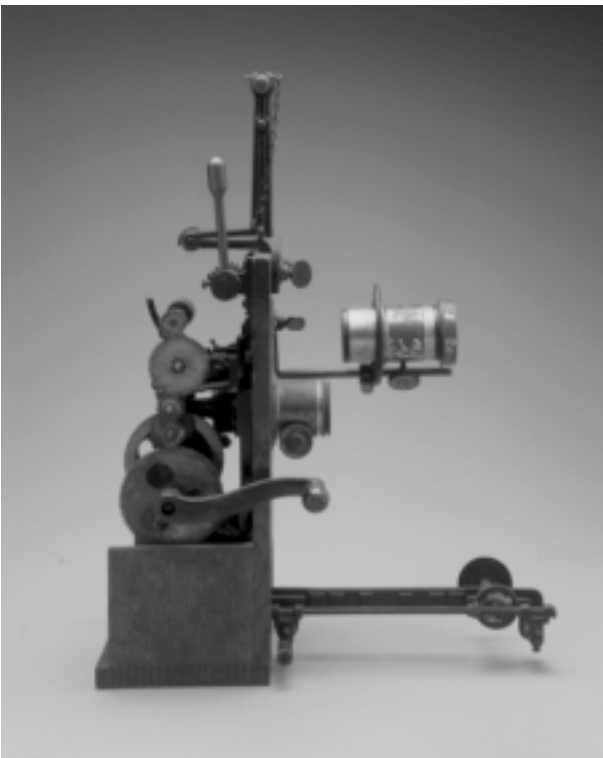
Key object:

Computer music instrument CMI I (1980) – built by Fairlight, the Computer Music Instrument transformed studio music production in the 1980s through digital sampling and sequencing.

Videos/interactives:

Convergence – learn how the computer manipulates and processes images and text.

You're in the movies – create and manipulate a photograph of yourself, text and sounds to create your own interactive multimedia movie clip.



Edison projector kinetoscope. In 1889, five years after George Eastman developed celluloid film, Thomas Edison cut pieces of film into long strips to use in a cinema camera (kinetograph). Edison's associate William Dickson then developed a sprocket system for the kinetograph, and later for the projector (kinetoscope), that could move the film past a lens when turned by a crank. Gift of F H Leydecker. 92/1895; B1887-1:2

3-D TV – don a specially designed headset and watch Australia's only three-dimensional television.

Digital imaginings audiovisual – four short stories look at the use of digital image manipulation in different contexts.

Section 5. Interface



Questions and issues explored in this section:

- what does it mean when one of two systems being interfaced is a human being?
- what are some alternative interfaces that put the user in direct contact with data?
- what makes a good or bad interface?
- how has the user/computer interface changed through history?
- what is an 'intelligent' interface?

Interface where people and computers meet

An interface is the boundary across which two systems communicate. The human-computer interface is the connecting point between a computer and the person using it.

In recent years the focus of computer interface design has shifted from the machine to the user. A well-designed interface helps people perform tasks. Most would agree that there is room for improvement.

This section looks at the progress that has been made in computer interface design and considers where it may lead.

Key object:

National Elliott 405 – this was the first commercial machine brought to Australia. It used electronic valves, and required a highly trained programmer.

Videos/interactives:

Sylvie – interact with the most advanced self-animated natural language enhanced intelligent agent in the world. Sylvie is expert in Artificial Intelligence, Alan Turing, Turing machines, control theory and some interface design.

Interface interactive – negotiate a number of interfaces and gain access to audiovisual material explaining more about each interface.



Made by Mattel in 1989 as an input device for Nintendo computer games, the PowerGlove is a sophisticated piece of hardware disguised as a toy. By combining the PowerGlove with visual information from a pair of Sega 3-D glasses (another extinct toy), computer hackers built homemade virtual reality systems. Powerhouse Museum collection.

Section 6. Machine intelligence



Questions and issues explored in this section:

- what is the nature of intelligence?
- is there more than one kind of intelligence?
- can a computer learn, converse, recognise objects, navigate through a space or have emotions?
- how has science fiction and popular culture shaped our perception of robots?
- what is the role of robots in industry, mining and agriculture, in the home, in the laboratory, in the hospital and in the military?
- what are the pros and cons of using robots in place of humans?

In our image artificial intelligence and robotics

Computers can process vast quantities of information far more rapidly than the human mind, but can they really think? Where does the definition of 'machine' end and that of 'intelligent being' begin?

This section explores the related fields of artificial intelligence (AI) and robotics. It looks at the nature of intelligence, the debates surrounding the quest to achieve AI and the research being undertaken to emulate aspects of human intelligence. It examines the impact of science fiction on our cultural perceptions of robotics and surveys the real-world robots of today.

Section 6 subthemes:

- what is intelligence?
- the search for artificial intelligence
- robots: artificial life
- robots in the real world

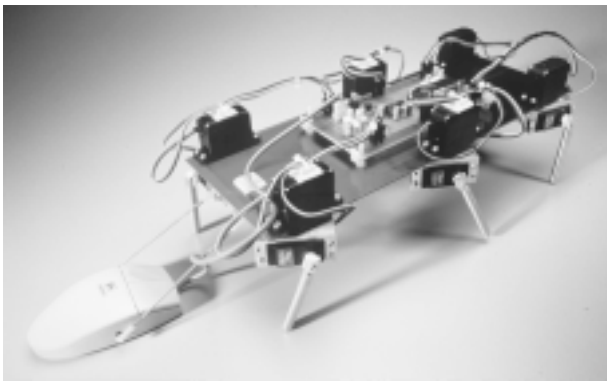
Key object:

Isaac the industrial robot arm – match yourself against Isaac in tests of skill and dexterity that demonstrate the flexibility and capabilities of industrial robots.

Videos/interactives:

Turing test – interact via a computer screen and keyboard with the MegaHal program. You could be conversing with a human or a computer – can you determine which?

Robot mobility video – investigate the various ways that have been used to make robots mobile – from walking robots with two or more legs, to wheels, caterpillar tracks and factory robots.



Stumpy, a robot developed by the University of NSW, learns to stand, walk and move towards a light.

Section 7. Surfers paradise



Questions and issues explored in this section:

- what is the internet?
- how does the internet work?
- would the internet have been possible without existing/older communication infrastructure?
- how can networks connect people and facilitate fun and easy communication?
- what are some of the issues and concerns surrounding the internet?

The internet exploring cyberspace

‘Cyberspace: a consensual hallucination experienced daily by billions of legitimate operators in every nation.’

– The ‘consensual hallucination’, imagined by William Gibson is rapidly becoming a reality. William Gibson, *Neuromancer*, 1984.

Today over 150 million people worldwide use the internet to publish, communicate, design and research. So quickly has the internet grown that it is beyond the control of any single government or organisation. But for how long?

In this area students can surf the net and explore developments in electronic communications.

Section 7 subthemes:

- communication networks
- WWW café
- theatrette

Key objects:

Muirhead-Jarvis phototelegraph receiver – during the 1950s, the GPO used this machine to send and receive over 6000 pictures a year, most of which were used by newspapers.

The needle telegraph – developed in England in 1837 by Charles Wheatstone and William Cooke, the needle telegraph was used by English railways. It used needles to point in pairs, spelling out both incoming and outgoing messages.

Videos/interactives:

Web surfing – surf the internet using the iMac computers, or build your own web-page using a simple interactive program.

Section 8. Culture



Questions and issues explored in this section:

- who uses computers, & how has the computer user changed over time?
- what do computers mean to different people?
- how have issues of identity and human values been changed by computers?
- is our dependence on technology changing what we are?
- are we becoming cyborgs – part machine part organism?
- what are the implications of becoming a cyborg society?

Evolution of the computer user from military scientists to the whole family

Fifty years ago the typical computer user was either a researcher or an academic, employed by the military or in a university. Since then, computers have moved into offices and homes. This section looks at the changing profile of computer users – from highly trained experts to ordinary people. At the same time, subcultures of hackers, nerds, cyberpunks and geekgirls have built their identity around computers.

Today our increasing dependence on computers is transforming our culture.

Section 8 subthemes:

- military scientists
- Australia's first computer users: university researchers
- business culture
- homebrew to millionaire
- cyberpunks, geekgirls and other subcultures
- cyborg culture

Key object:

Apple I computer – the first Apple computer, built and marketed by Steve Jobs and Steve Wozniac in 1976. Like the Altair (*see image and caption below*), it came as a kit which you assembled yourself.

Videos/interactives:

The section includes six audiovisuals, each of which investigates a different computer culture or group of computer users: military culture, Australia's first computer users, the culture of business, the PC pioneers, computers and identity and cyborgs.



In January 1975, Popular electronics magazine announced the arrival of the world's first PC: the Altair 8800 Minicomputer, which came as a do-it-yourself computer kit. The Altair was strictly for electronics 'nerds'. Photo: Cover of Popular Electronics, courtesy Ziff-Davis Publications. 99/48/1

Glossary

Analogue • A method of representing information which is linked to the physical, eg sound being represented by waves.

Artificial intelligence (Machine Intelligence) • The concept that computers can be programmed to assume capabilities thought to be like human intelligence (such as learning, reasoning, adaptation and self-correction). Agreement has not been reached on whether computers can emulate human consciousness or the human mind, even if they can emulate aspects which we normally associate with human intelligence.

Automaton • A mechanical copy of a person or animal. Philosophically and mechanically, automata are the ancestors of robots.

Bandwidth • The information capacity of a connection, or how fast data travels from computer to computer through a phone line or other connection. It is usually measured in bits (of information) per second.

Binary • A system of numbers in which only 0s and 1s are used.

Browser • A software program that is used to look at or 'browse' the internet, eg Netscape Navigator, MS Explorer.

Chip • A piece of semiconductor material (usually silicon) which houses many integrated circuits.

Cipher • Secret or disguised writing.

Computer • An electronic device which processes data according to a given program of instructions.

Control • To direct or command actions.

Convergence • The integration of sound, pictures and text into a single stream of binary numbers.

Cyberspace • The term coined by author William Gibson, currently used to describe the world of information available through computer networks.

Cyborg • A being or system which is part machine, part organic, for example when a person rides a bike or drives a car, they and the machine together make a cyborg.

Data • Information operated on by a computer.

Database • A structured set of data held in a computer, which is accessible in a number of ways.

Digital • A form of information representation, where a code of usually binary digits is used. It allows manipulation and transferral of information between systems.

Email (Electronic mail) • Messages sent from one person to another via a computer network (such as the internet). These can include text, images, sound and video files.

FAQ (Frequently Asked Questions) • Online documents that list and answer the most common questions on a particular subject.

FTP (File Transfer Protocol) • A set of protocols by which data is transferred between computers. These protocols are in place so that different types of computers (eg PCs & Macintosh) can share information.

Hacker • A person who gains unauthorised access to computer networks to use or alter data.

HTTP/ TCP/ IP (HyperText Transferring Protocol, Transmission Control Protocol, Internet Protocol) • These are internet protocols which allow information to be shared between computers, ensuring that information passed from computer to computer is interpreted and displayed correctly.

HTML (HyperText Markup Language) • Many internet sites are written in this language. It allows text, pictures and sounds to be easily displayed.

Hyperlink • Any text, picture or icon within a web site that contains a link to another web page (text of this kind is usually known as hypertext).

Information technology • A branch of technology concerned with the movement and storage of information, especially using computers, telecommunications etc .

Integrated circuit (IC) • Also called a microprocessor, it is located on a chip, and provides the control function for whatever electronic device in which it is implanted. This can be anything from a domestic appliance to a traffic light. ICs are even implanted into pets for identification purposes.

Interface • The means or place of interaction between two systems. The usual interface between a person and a computer is the mouse, keyboard, printer and monitor.

Internet • The global network of computers that share information via telephone lines. The internet includes things like the world wide web and email.

IRC (Internet Relay Chat) • A system whereby people on computers can communicate on a wide range of subjects; similar to a conference line on a telephone, except the users communicate via their keyboards.

Media • Any medium through which information is imparted. This can be text, images, sound or video.

Modem (MOdulator – DEModulator) • A device which connects your computer to a phone line, enabling your computer to send and receive information.

Multimedia • A combination of two or more media.

Network • A chain of interconnected computers. This enables a more efficient exchange of information.

Newsgroups • On line discussion groups which are arranged by subject similar to IRC.

Online • To go 'online' means to connect to the internet to share information, access materials or use a service.

PPP/SLIP (Point to Point Protocol, Serial Line Internet Protocol) • Protocols (or sets of rules for computer behaviour) that allow a computer to use a modem and phone lines. PPP is replacing SLIP.

Robot • A versatile and programmable machine which can handle objects and devices, manipulate tools and move.

Search Engine • This is a specialised piece of software which searches through millions of web sites. You can access a search engine via the world wide web, and request it to find web pages on a particular subject.

Server • A computer which holds data (web pages, email etc) ready to be requested by other computers, and provides a gateway through which client computers can access the internet.

Simulation • The imitation or representation of events and processes.

Telnet • A function which allows you to access a computer remotely via the internet and control it using your own computer. This is particularly useful for searching library catalogues etc.

URL (Uniform Resource Locator) • This is the name for the 'address' of every site on the internet. An example is the Powerhouse's site: **http://www.phm.gov.au**.

Virtual environments • An environment simulated by a computer program.

Visualisation • To make visible, especially in one's mind, something that is not visible. Visualisation uses graphic representation of data to enhance our understanding of and thinking about the world.

www (world wide web) • Developed in the late 1980s, it is a massive collection of websites containing text, graphics, sound, animation and other files linked by hyperlinks and common protocols.

Teacher resources

Eames, Charles and Ray. *A computer perspective: background to the computer age*, Harvard University Press, Boston, 1990.

Greenburger, Martin. *Technologies for the 21st century: on multimedia*, The Voyager Company, Santa Monica, 1990.

Hardison, OB. *Disappearing through the skylight: culture and technology in the twentieth century*, Viking, Newyork, 1989.

Marks Greenfield, Patricia. *Mind and media: the effects of television, video games and computers*, Harvard University Press, Cambridge Mass., 1984.

Postman, Neil. *Technopoly: the surrender of culture to technology*, Alfred Knopf, New York, 1980.

Shedroff, Nathen. *Understanding computers*, Sterling Hutto and Ken Fromann, Alameda, California, 1992.

Zuboff, Shoshana. *In the age of the smart machine: the future of work and power*, Heinemann, London, 1988.

Websites

• What is a computer:

<http://www.rdrop.com/~jimw/jcgm.html>
Jim's computer museum

<http://www.comlab.ox.ac.uk/archive/other/museums/computing.html#museums>
Computer related museums

<http://www.ornl.gov/ORNL/SC/1st.html>
The history of supercomputing

<http://www.turing.org.uk/turing/> The Alan Turing home page

<http://www.cs.yale.edu/~tap/past-women-cs.html> Past notable women of computing

<http://www.syssrc.com/museum/index.html> System Source computer museum

• Visualisation and simulation:

<http://www.ht.com/> HT Medical Systems

<http://www.nist.gov/itl/div894/ovrt/OVRThome.html> Open virtual reality testbed home page

<http://www.ncsa.uiuc.edu/VR/cavernus/GALLERY/hardware.html> Cavernus image gallery

http://www.vislab.usyd.edu.au/vislab/vislab_home.html Sydney VisLab

<http://www.sgi.com/fun/movies/> SGI movie and animation gallery

http://felix.antiquity.arts.su.edu.au/research/time_map/proj_desc.html
TimeMap project

<http://www.avdigest.com/aahm/trmafspc.html> American Airpower Heritage Museum

<http://www.bleep.demon.co.uk/SimHist1.html> A Brief History of Aircraft Flight Simulation

Machine intelligence & robots:

<http://members.aol.com/DMD7371067/robot.htm> The magnetic lock

<http://www.ai.mit.edu/projects/infolab/ailab> The START Natural Language Question Answering System

http://gracco.irmkant.rm.cnr.it/luigi/lupa_algames.html Artificial Life 'Games'

<http://www.spc.uchicago.edu/users/sjack/classes/psc226/gould/gould.html>
A Brief History of Intelligence Testing

<http://www.roboticsandthings.com/robotix/rbxindex.html> Robotics and things

<http://www.srl.org/index.html> Survival Research Laboratories

http://wwwsyseng.anu.edu.au/rsl/rsl_frame.html

<http://telerobot.mech.uwa.edu.au/>
Australia's Telerobot on the Web

<http://www-robotics.cs.umass.edu/robotics.html> Robotics Internet Resources

<http://www.robotics.com/robomenu/>
The Robot Menu

<http://www.eshed.com/index.htm> Eshed Robotec

<http://robotics.jpl.nasa.gov/> NASA: robots

<http://www.ncea.org.au/> Robocow

• Interface:

<http://www.baddesigns.com/> Bad Human Factors Designs

<http://www.iarchitect.com/> Isys Information Architects

<http://www.virtex.com/> Virtual technologies, Inc.

<http://www2.dcs.hull.ac.uk/VEGA/> Virtual Environments Graphics & Applications

http://acsys.anu.edu.au/research/frameset_ve.htm Advanced Computational Systems

<http://www.hitl.washington.edu/index.html>
Human Interface Technology Laboratory

<http://www.sciam.com/1096issue/1096lusted.html> Controlling Computers With Neural Signals

<http://www.usernomics.com/hci.html>
Human-Computer Interface

<http://www.vrweb.com/WEB/COMPANY/Front.htm> Virtual presence

<http://www.sensable.com/default.htm>
SensAble Technologies

<http://www.genreality.com/> General Reality Company

<http://www.fakespace.com/index.html>
Fakespace Inc.

<http://www.vividgroup.com/> Vivid Group

• Control:

<http://www.iriscan.com/> IriScan, Inc.

• Culture:

<http://www.geekgirl.com.au/> Geekgirl

<http://sensemedia.net/sprawl> The Sprawl: a collaborative hypermedia environment

<http://members.aol.com/spoons1000/break/index.html> The Illustrated Guide To Breaking Your Computer

<http://www.nerdsrus.com/> 'Nerds r us'

<http://csirac.cs.latrobe.edu.au/csirac.htm>
CSIRAC: Australia's first computer in 1949

<http://www.knarf.demon.co.uk/alt-cp.htm>
Cyberpunk FAQ

<http://exo.com/~wts/wts10005.HTM> The Virtual Altair Museum

<http://wearables.gatech.edu/> Wearable computers

<http://www.mvis.com/html/technology.html> Microvision-Technology

<http://www.ubiq.com/hypertext/weiser/UbiHome.html> Ubiquitous Computing

<http://www.brat.org/index.html>
BRAT: a quarterly publication written by youth for youth

<http://www.geekgeer.com/index.html>
GeekGeer

- **Digital media:**

<http://www.synthzone.com/> Synth Zone:
midi and synthesizer resources

<http://www.lastplace.com/> Truly Virtual Web
Art Museum

<http://lonestar.texas.net/~val/> Web Art

http://www.obsolete.com/120_years/
Electronic Musical Instrument 1870 - 1990

http://gertrude.art.uiuc.edu/ludgate/the/place/soapbox/digital_age/paper1.html Art
and Design in the Digital Age

<http://brightbytes.com/cosite/what.html>
What is a camera obscura?

http://mdcm.arts.unsw.edu.au/1000-1998/Assignments/innovators_final.html Media
Innovators

<http://lab1.commslab.gov.au/lab/info/digtv/> Digital TV Broadcasting

<http://www.powershot.com/darkroom/compare.html> Darkroom to Desktop

<http://www.media.mit.edu/> The Media
Laboratory

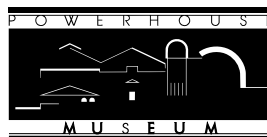
For further information

For more information on the *Cyberworlds* exhibition, visit the Powerhouse Museum's website <http://www.phm.gov.au>

For more information about the museum or to make a booking,
contact Education and Visitor Services at the Powerhouse Museum:

telephone (02) 9217 0222, fax (02) 9217 0441,

email: edserv@phm.gov.au



Ideas in Action

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<http://www.phm.gov.au>

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