



**UTM**  
UNIVERSITI TEKNOLOGI MALAYSIA

# INTRODUCTION TO HUMAN COMPUTER INTERACTION

Chapter 01 (Part 1)

SCSV2113 Human-Computer Interaction

School of Computing  
Universiti Teknologi Malaysia

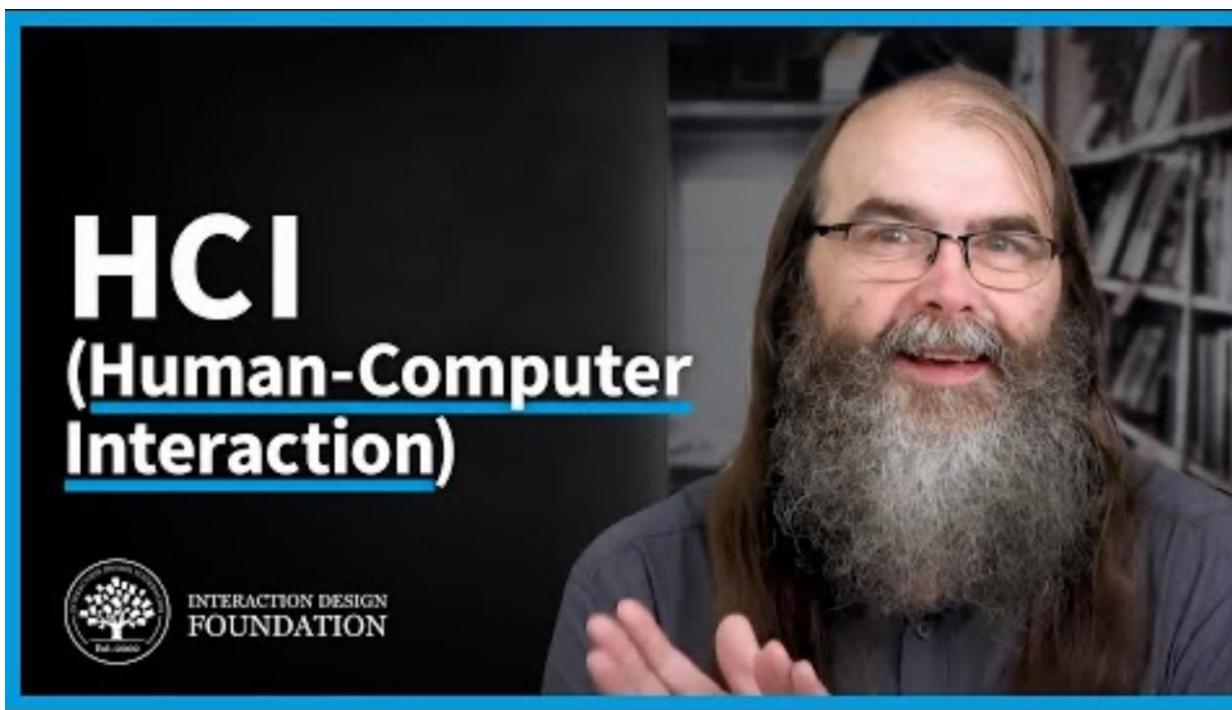
## 01 OVERVIEW OF HCI

## 02 EVOLUTION OF HCI

## 03 HISTORY & FUTURE OF HCI

# **Overview of Human Computer Interaction**

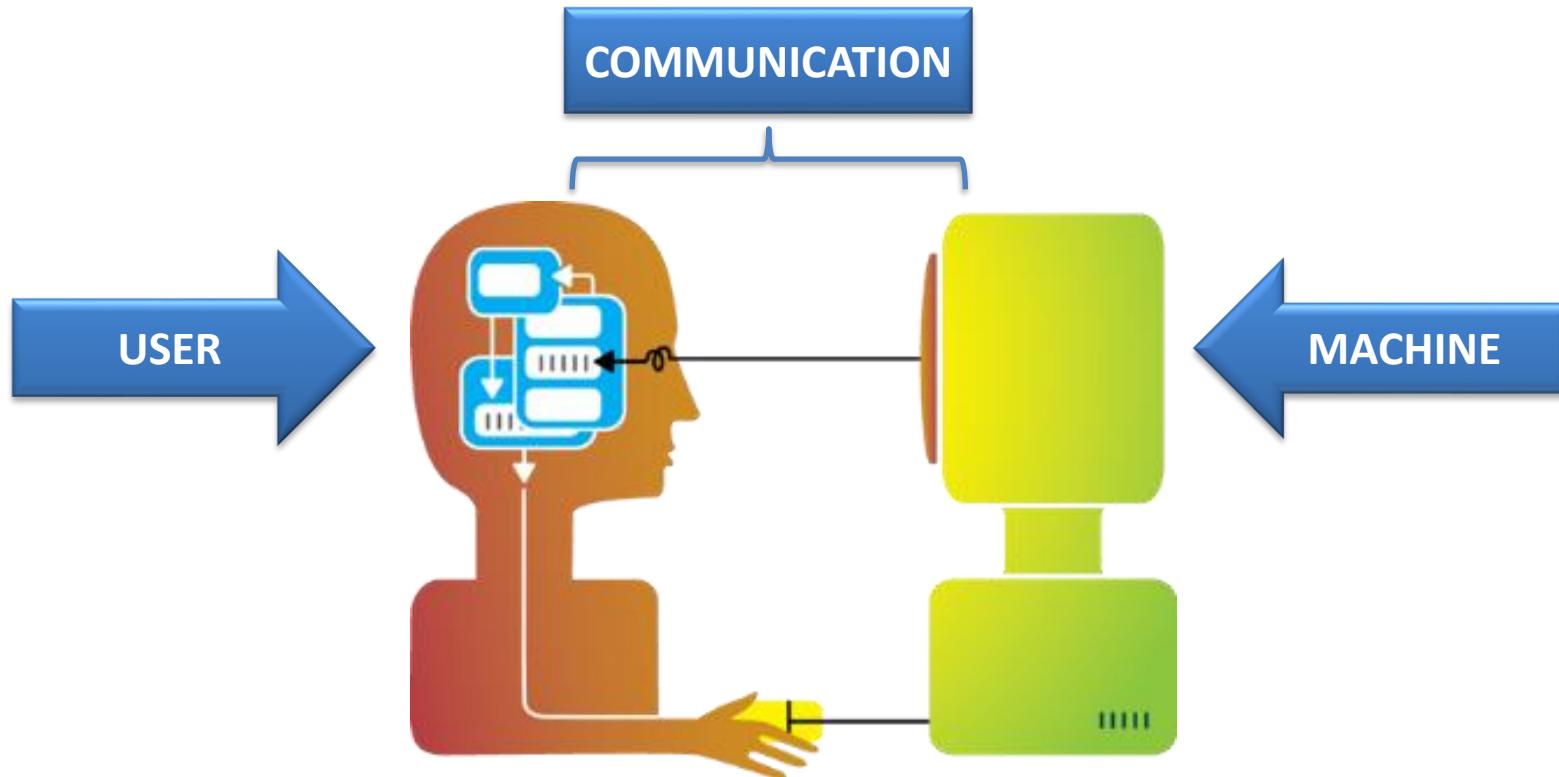
# What is HCI?

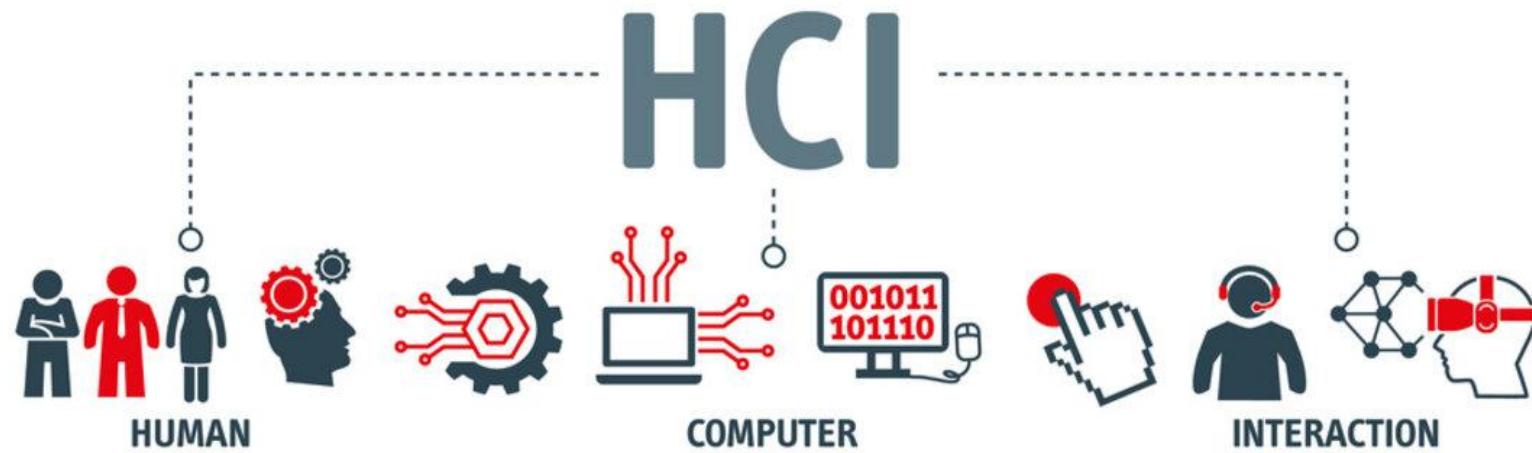


<https://youtu.be/yNzLBI0wsGU?si=0g16ZUp8SZPYvHRX>

# What is HCI?

- Stands for





# What is HCI?

## HUMAN

- Single user
- Groups
- I/O channels
- Memory
- Reasoning
- Problem solving
- Error
- Psychology

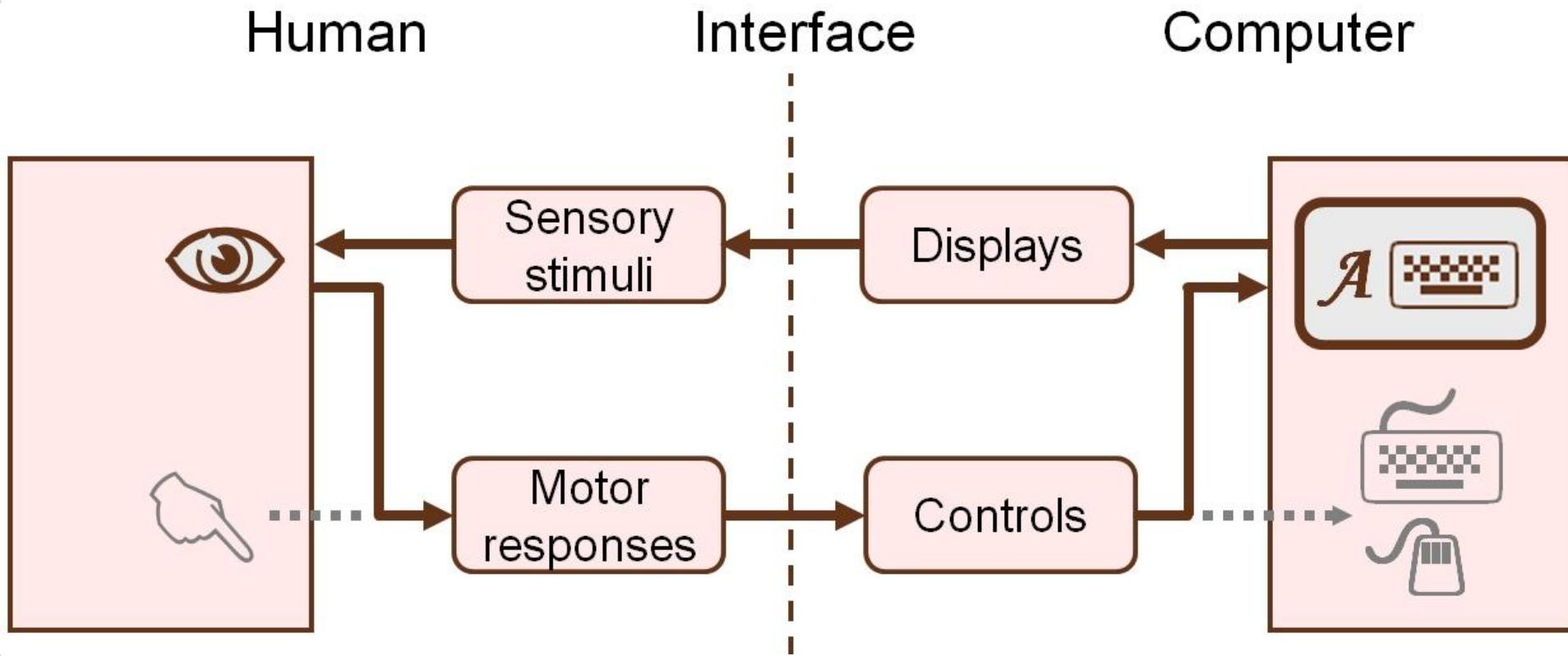
## COMPUTER

- Desktop
- Embedded system
- Data entry devices
- Output devices
- Memory
- Processing

## INTERACTION

- Direct/Indirect communication
- Models
- Frameworks
- Styles
- Ergonomics

# What is HCI?



# Why Study HCI?

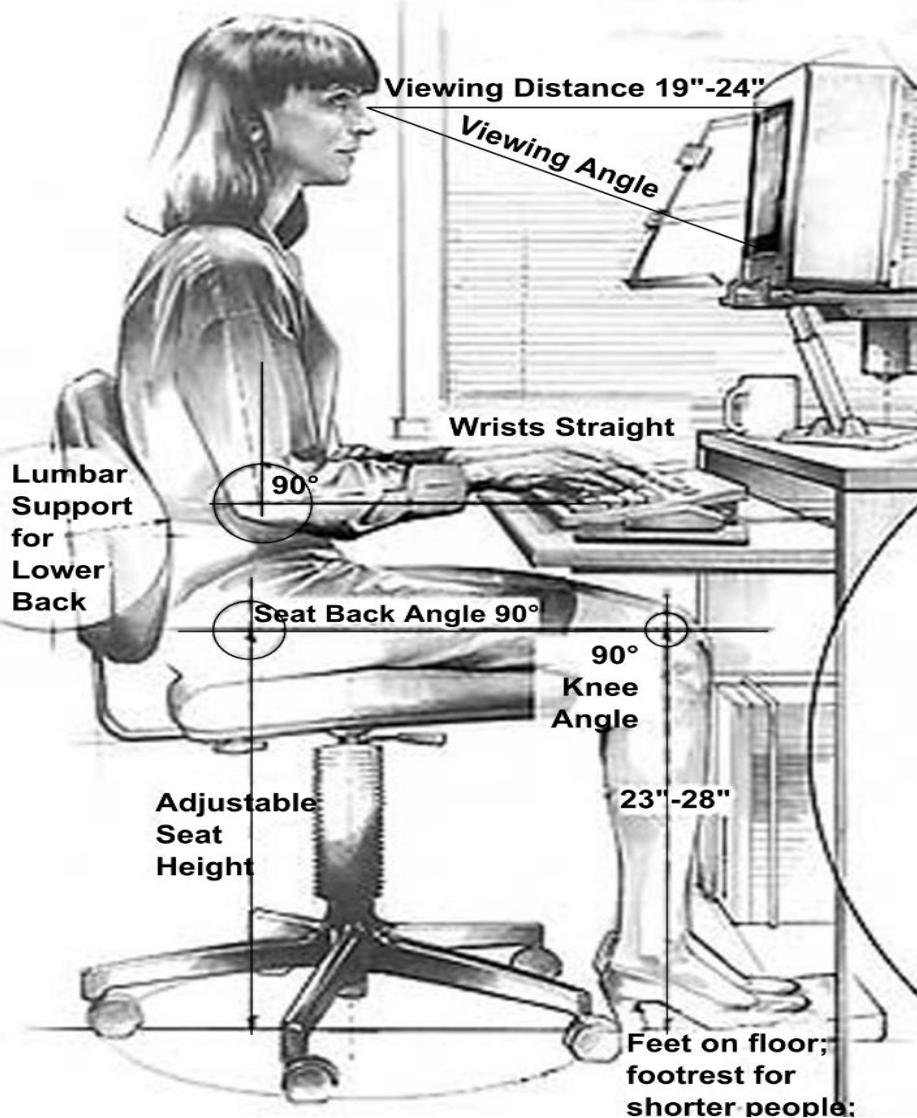
## BUSINESS VIEW



- To employ people more productively and effectively
  - **people costs** now far outweigh hardware and software costs
- People now expect “**easy to use**” systems
  - generally they are not tolerant of **poorly** designed systems
  - if a product is **hard to use**, they will **seek** other products

# Why Study HCI?

## HUMAN FACTORS VIEW



- Human have limitations
- Errors are costly in terms of
  - loss of time & money
  - loss of lives in critical systems
  - loss of morale

# How do you feel?...

**The 5th Wave**

**By Rich Tennant**



"...AND TO ACCESS THE PROGRAMS 'HOT KEY', YOU JUST DEPRESS THESE ELEVEN KEYS SIMULTANEOUSLY. HERB OVER THERE HAS A KNACK FOR DOING THIS THAT I THINK YOU'LL ENJOY — HERB! GOT A MINUTE?"

# Why HCI is Important

- Fail to design well, It can affect
  - Effectiveness
  - Productivity
  - Morale
  - Safety
- Example: a car with poor HCI

# Activity

- Take 5 minutes for everyone to write down one common device with substantial HCI design choices and discuss with the neighbor the pros and cons.
- How does it affect you or other users?



# Moore's Law

## 1 The accelerating pace of change ...



2045 Surpasses brainpower equivalent to that of all human brains combined

## 2 ... and exponential growth in computing power ...

Computer technology, shown here climbing dramatically by powers of 10, is now progressing more each hour than it did in its entire first 90 years



**Colossus**

The electronic computer, with 1,500 vacuum tubes, helped the British crack German codes during WW II



**UNIVAC I**

The first commercially marketed computer, used to tabulate the U.S. Census, occupied 943 cu. ft.



## 3 ... will lead to the Singularity

**Apple II**  
At a price of \$1,298, the compact machine was one of the first massively popular personal computers

Nvidia Tesla GPU & PC  
Mac Pro  
Dell Dimension 8400  
Pentium II PC



**Power Mac G4**  
The first personal computer to deliver more than 1 billion floating-point operations per second

Surpasses brainpower equivalent to that of all human brains combined

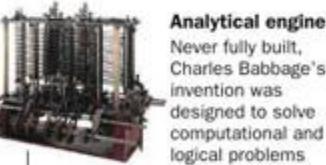
Surpasses brainpower of human in 2023



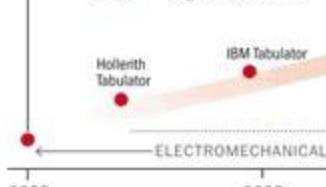
Surpasses brainpower of mouse in 2015

## COMPUTER RANKINGS

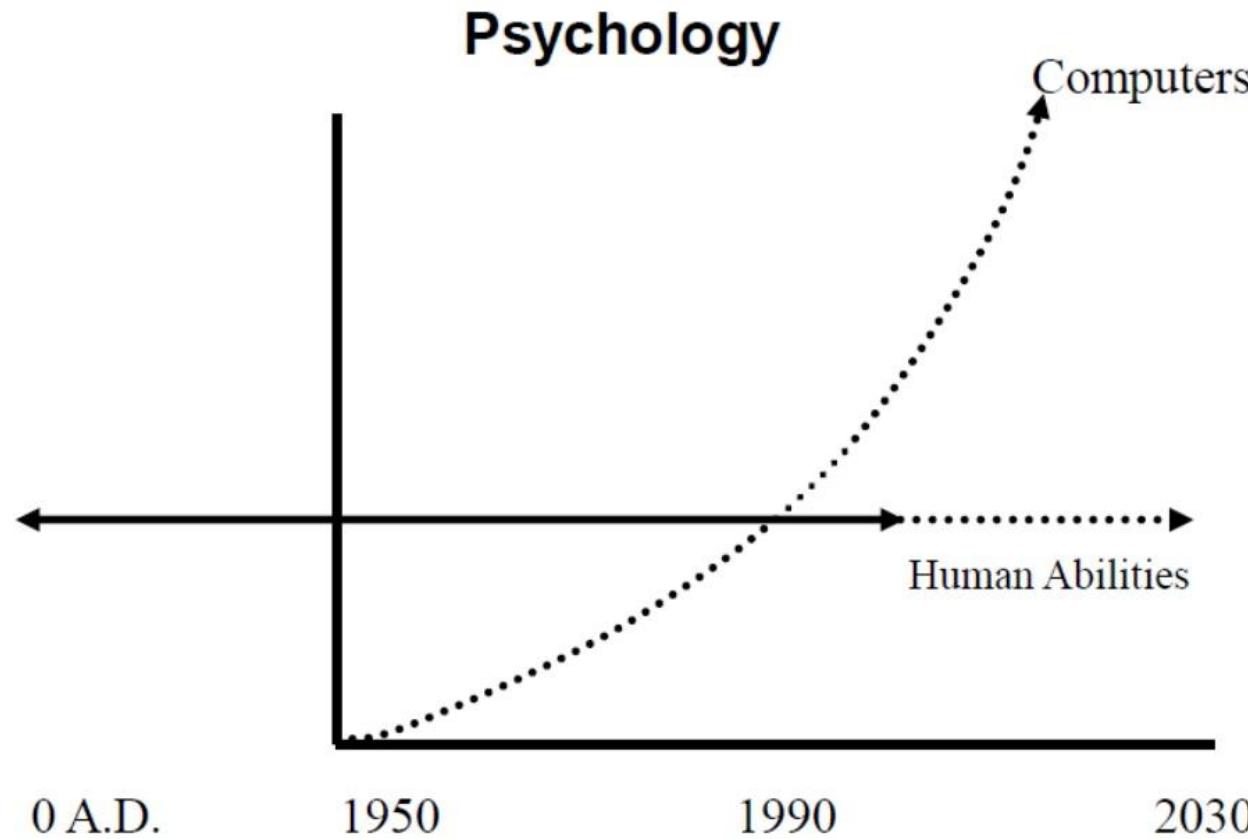
By calculations per second per \$1,000



**Analytical engine**  
Never fully built, Charles Babbage's invention was designed to solve computational and logical problems



# Human vs. Computer



# Definition of HCI (1)

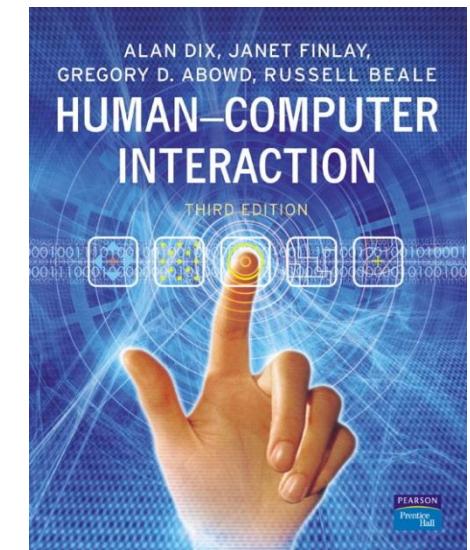
- “Human-computer interaction is a discipline concerned with the **design, evaluation and implementation** of **interactive computing system** for **human use** and with the study of major phenomena surrounding them.”

[ACM SIGCHI Curricula Human-Computer Interaction]



# Definition of HCI (2)

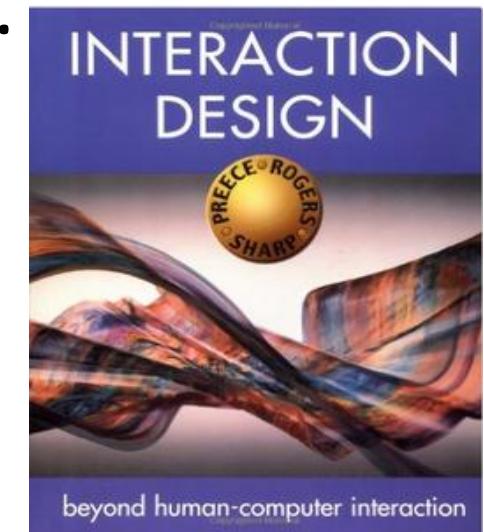
- “The study of **interaction** between **people** and **computer-based systems**; concern with the **physical, psychological and theoretical aspects** of this process.”



[Alan Dix et al. 2003]

# Definition of HCI (3)

- Human-computer interaction (HCI) is about **designing computer system** that support people so that they can carry out their activities **productively and safely**.



(Jenny Preece et al. 2002)

# Definition of HCI (3)

- HCI has a **role** in the design and development of all kinds of systems, ranging from those like:
  - air traffic control and nuclear processing where **safety** is extremely important,
  - to office systems, where **productivity** and job satisfaction are paramount,
  - to computer games, which must **excite and engage users**.

# Components of HCI



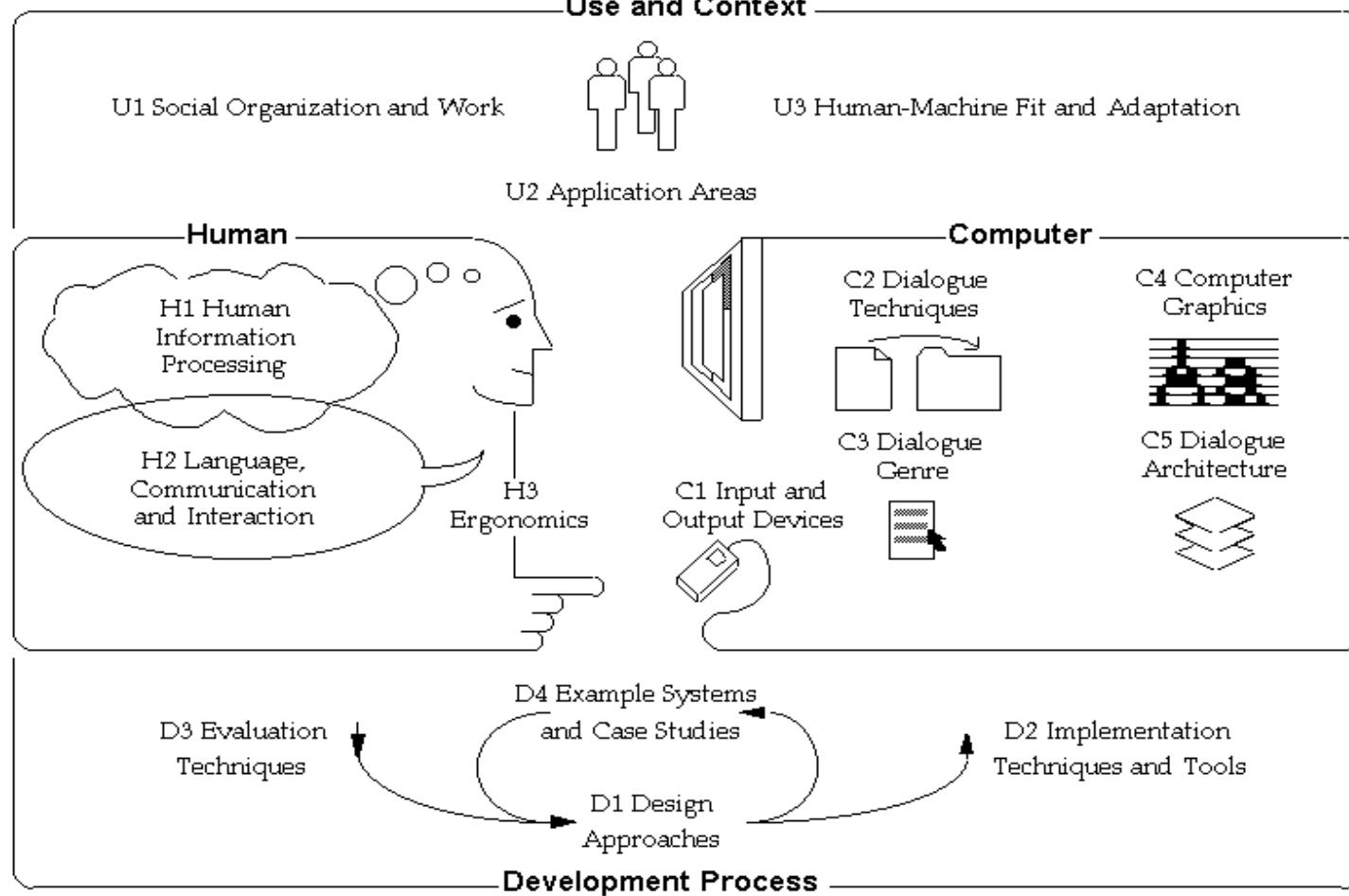
# Goal of HCI

To develop or improve the safety, utility and effectiveness of systems that include computers, often through improving usability

# Field of HCI

- Psychology
- Sociology
- Cognitive science
- Ergonomics / Human factors
- Computer science
- Visualization
- Design
- Interactive art
- Information science
- Information security
- Speech-language pathology
- Personal information management
- Phenomenology

# Meta Models of HCI



The Discipline of HCI [Source: Book “Human Computer Interaction” (1994,p.16)]

# Why HCI is important?

- “Human-computer interaction is the kind of discipline which is neither the study of humans, nor the study of technology, but rather the bridging between those two. So you always have to have one eye open to the question: what can the technology do? How can you build it? What are the possibilities? And one eye open to the question: what are people doing and how would this fit in? What would they do with it? **If you lose sight of either of those, you fail to design well.**”

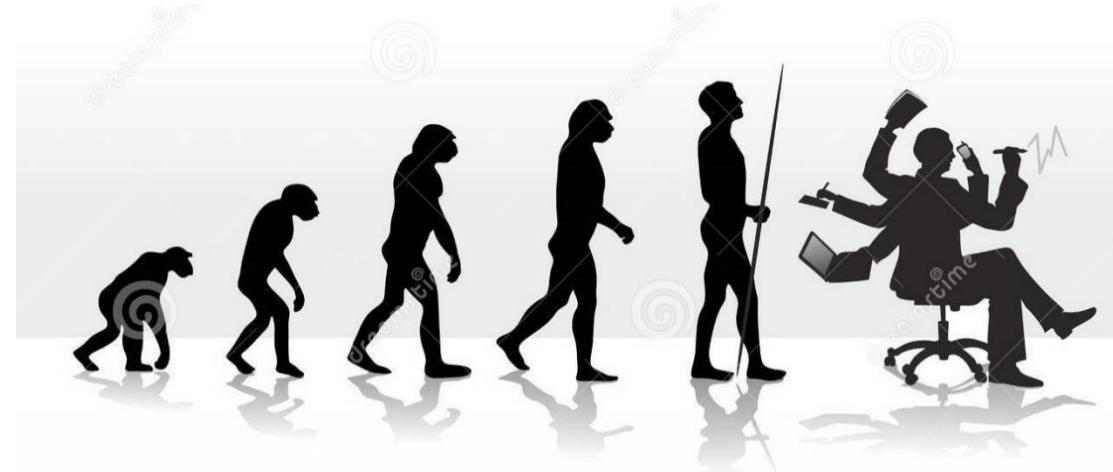
(Terry Winograd, Professor of computing, Stanford University)

# **Evolution of Human Computer Interaction**

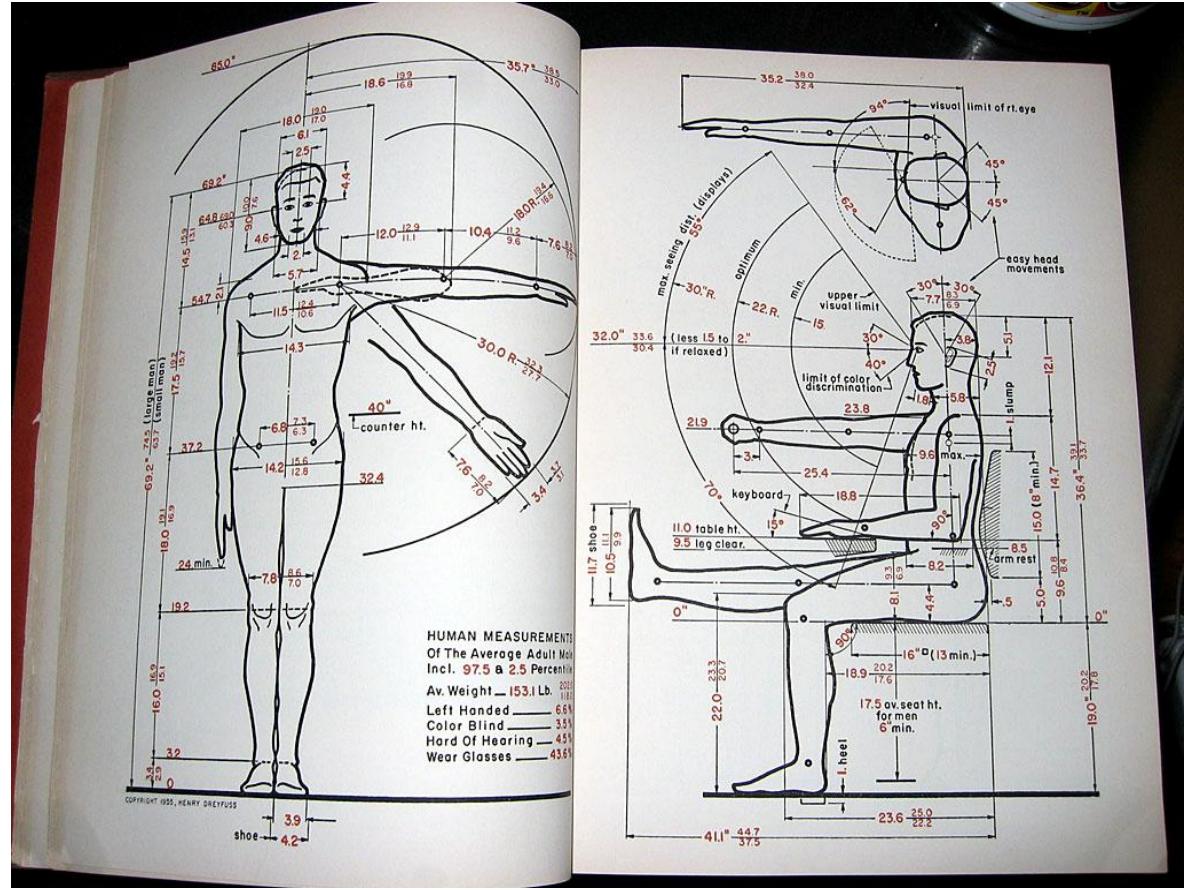
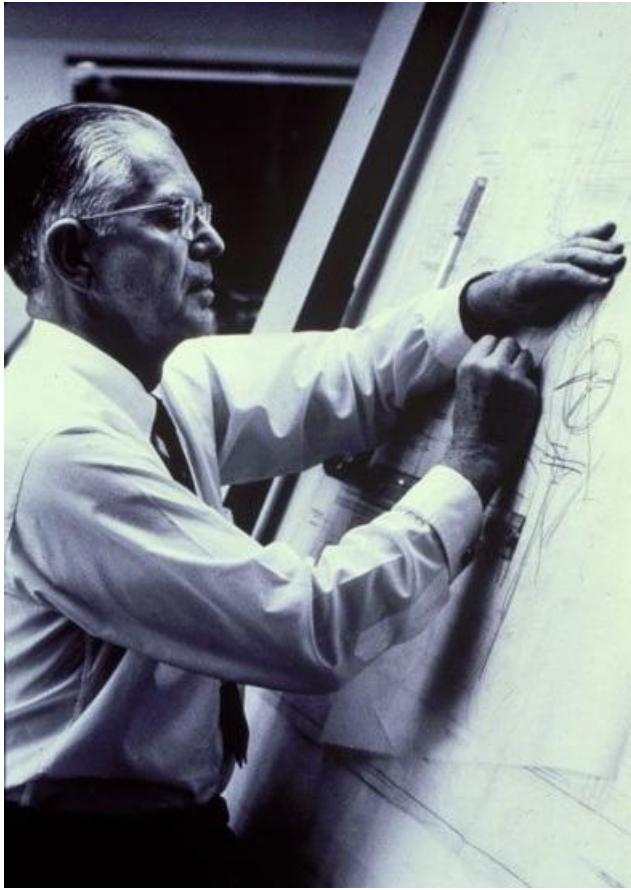
# Computer (Mac) Evolution



# Human Evolution



# History of HCI



**Henry Dreyfuss** designed specific measurements & proportions of the human body for specific work & environment. [Source: Book “**Designing for People**” (1955)]  
<http://www.youtube.com/watch?v=BLI4Oe7xenM>

# Raymond Loewy



## Raymond Loewy

Industrial designer

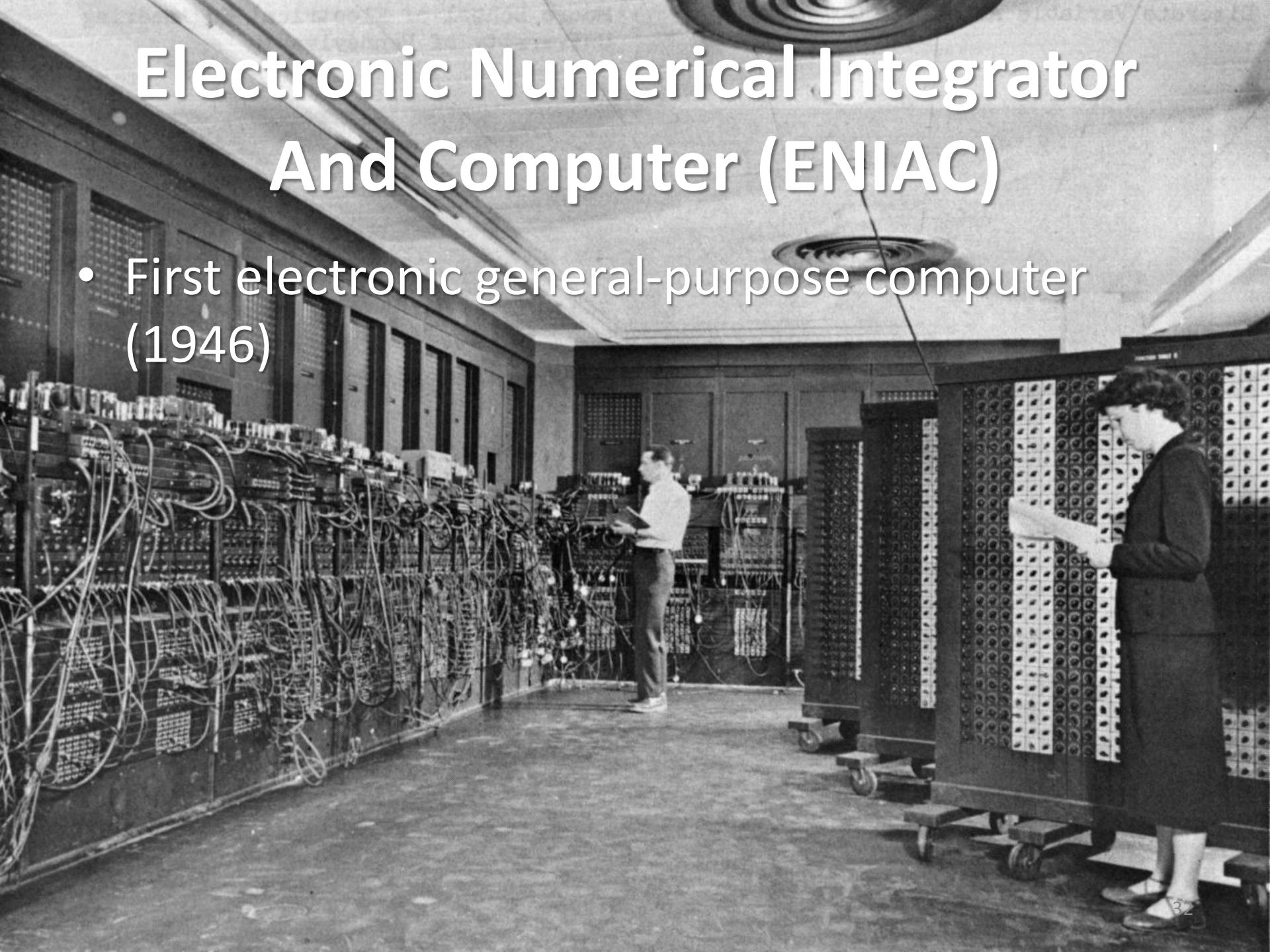
Raymond Loewy was a French-born American industrial designer who achieved fame for the magnitude of his design efforts across a variety of industries. He was recognized for this by Time magazine and featured on its cover on October 31, 1949. [Wikipedia](#)

<http://www.theverge.com/2013/11/5/5068132/raymond-loewy-the-man-who-designed-everything>

<http://www.raymondloewy.com/>

# Electronic Numerical Integrator And Computer (ENIAC)

- First electronic general-purpose computer (1946)

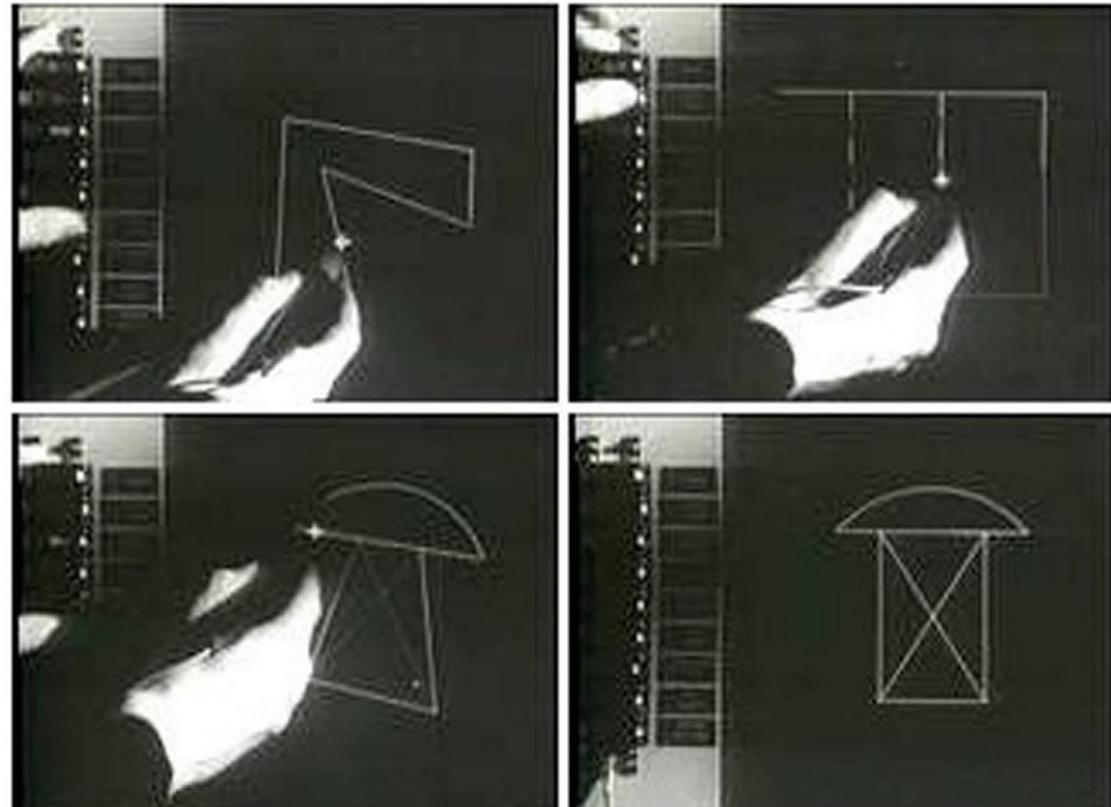


# Compilers

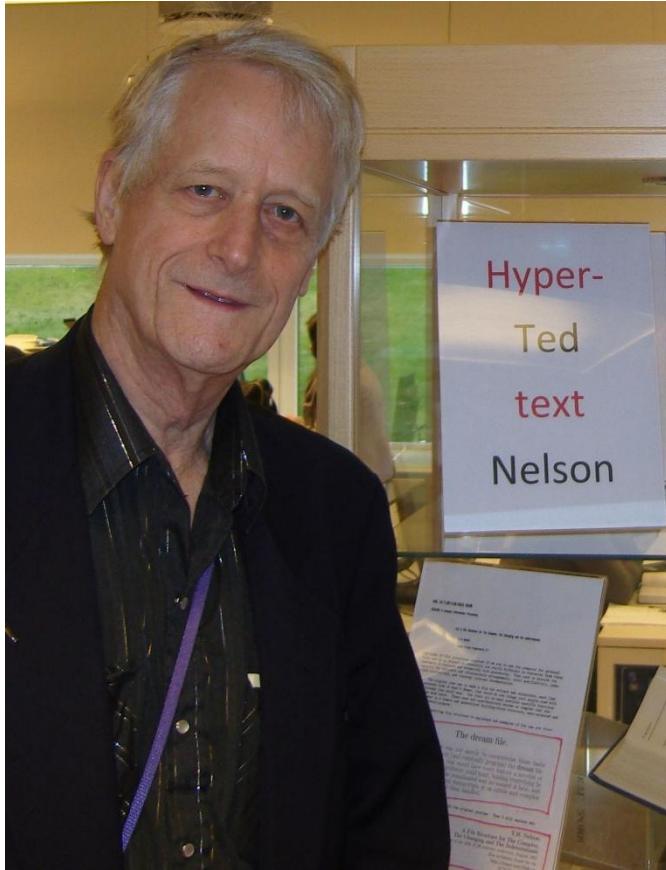


# Graphical User Interface (GUI)

- Ivan Sutherland's Sketchpad (1963)



# Hypertext



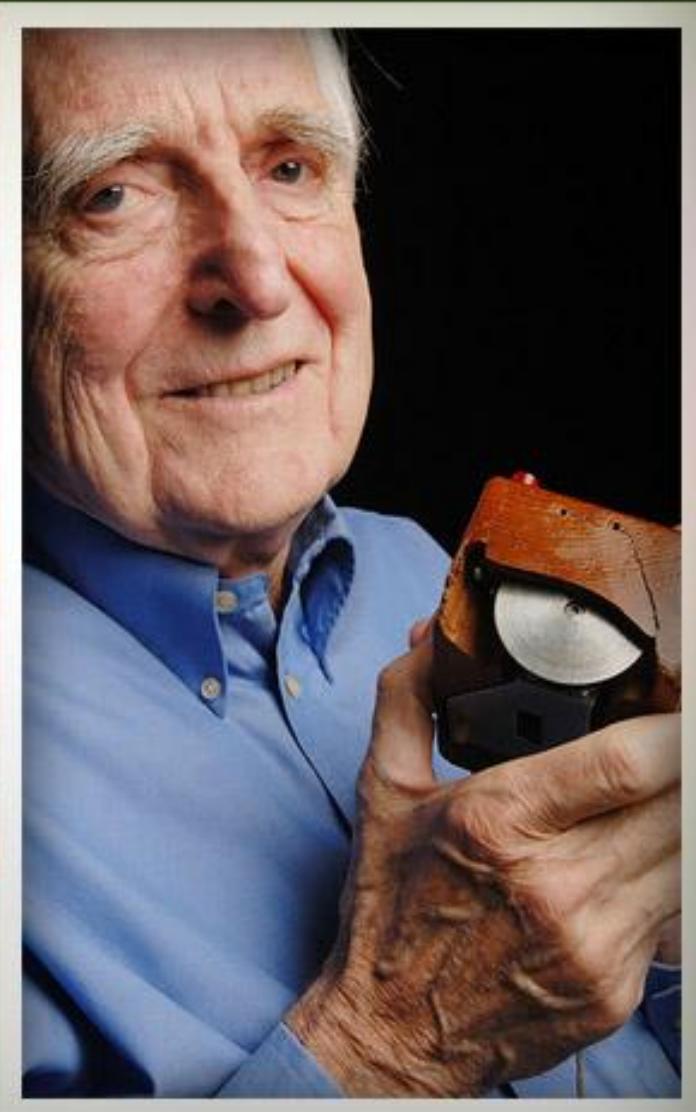
**Ted Nelson** introduced the terms “hypertext” & “hypermedia” in 1963.



**Hypertext Editing System (HES)** was an early hypertext research project conducted at Brown University in 1967

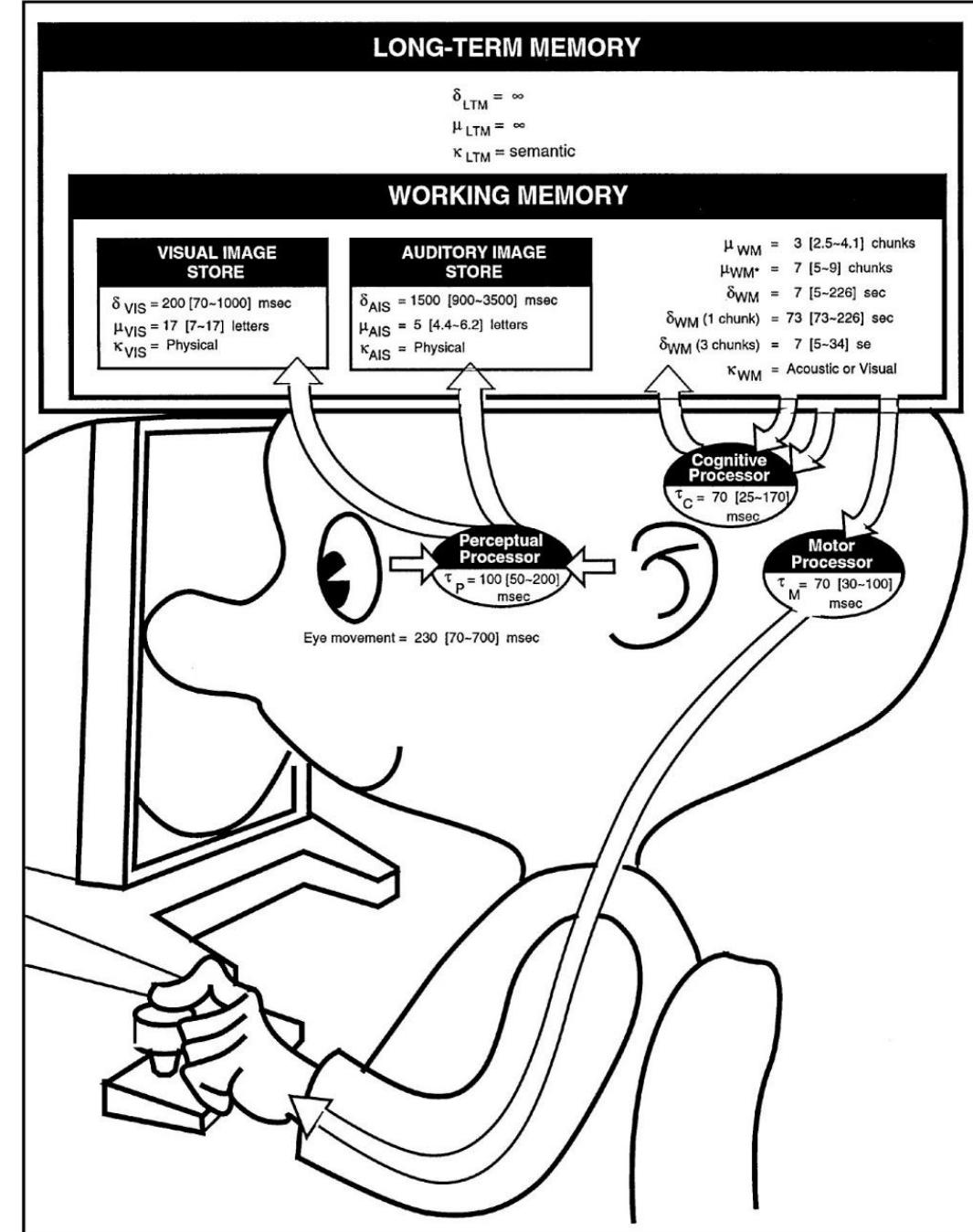
# Mouse

- Douglas Engelbart was an inventor of the computer mouse
- Invented in 1960s



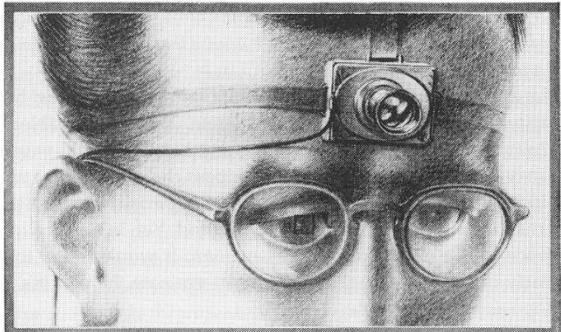
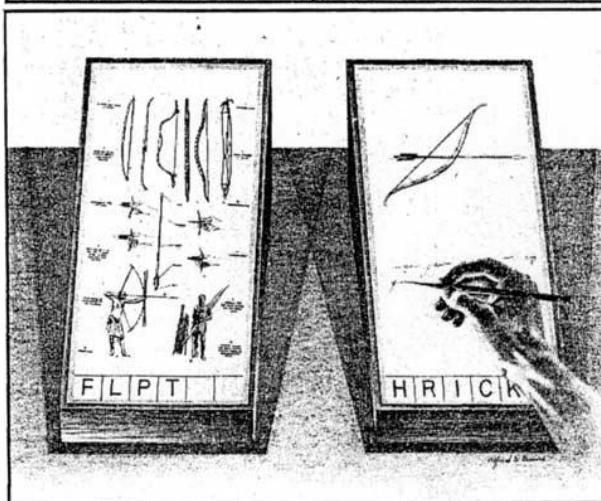
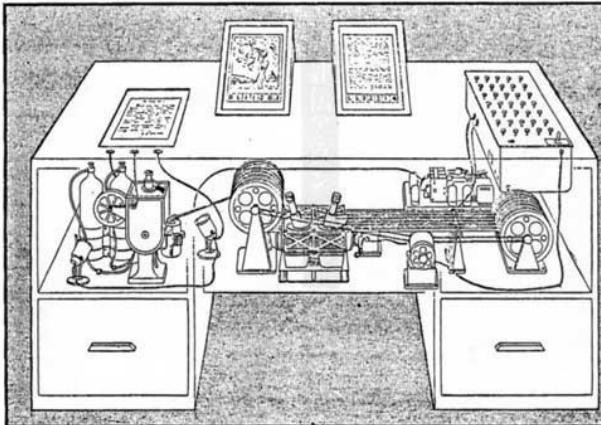
# Model Human Processor

- Introduced by Card, Moran & Newell in 1983
- To calculate how long it takes to perform a certain task using cognitive modeling method



# Memory Extender (Memex)

[“As We May Think”, Vannevar Bush, 1945]



A scientist of the future records experiments with a tiny camera fitted with universal-focus lens. The small square in the eyeglass at the left sights the object (LIFE 19(11), p. 112).

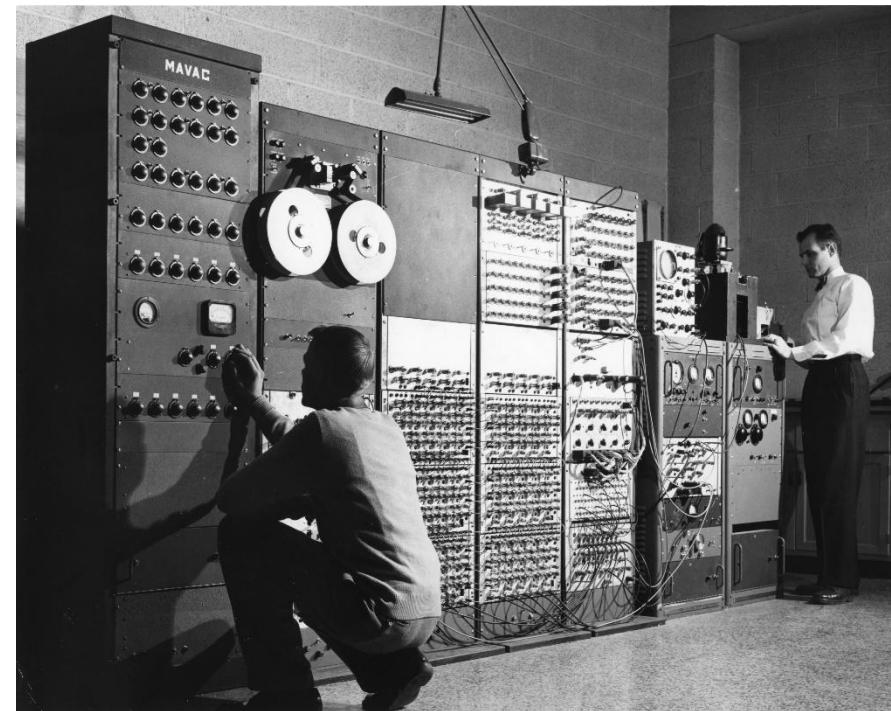
- A device to store all books, records and communication
- Mechanized to be consulted with exceeding speed and flexibility
- Support for full-text search, text & audio annotations and hyperlinks

# Man-Computer Symbiosis

[J.C.R. Licklider, 1960]



- Tightly coupled human brain & machine, speech recognition, time sharing and character recognition



# DynaBook

[Alan Kay, 1968]



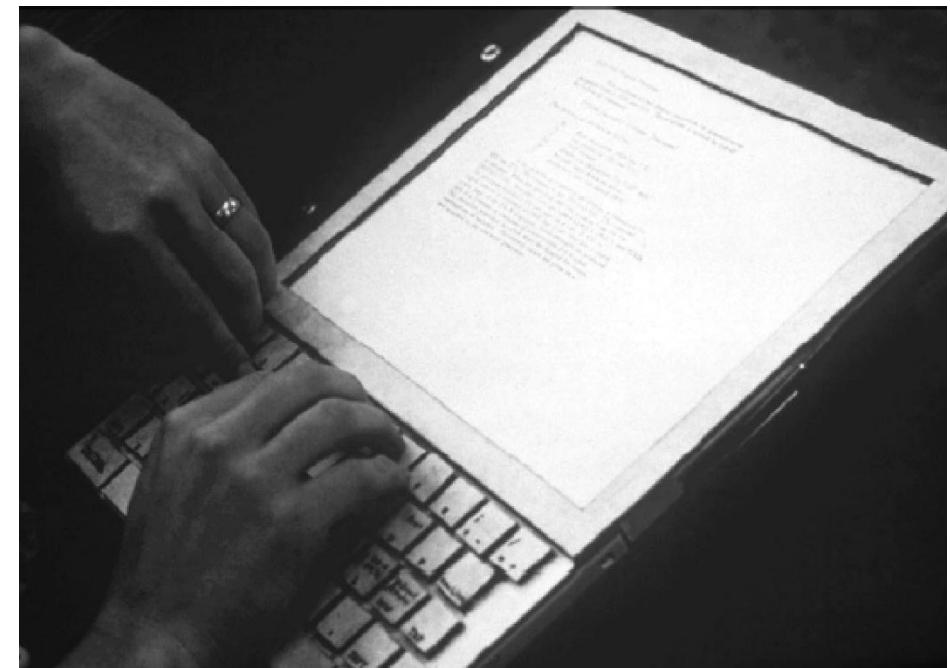
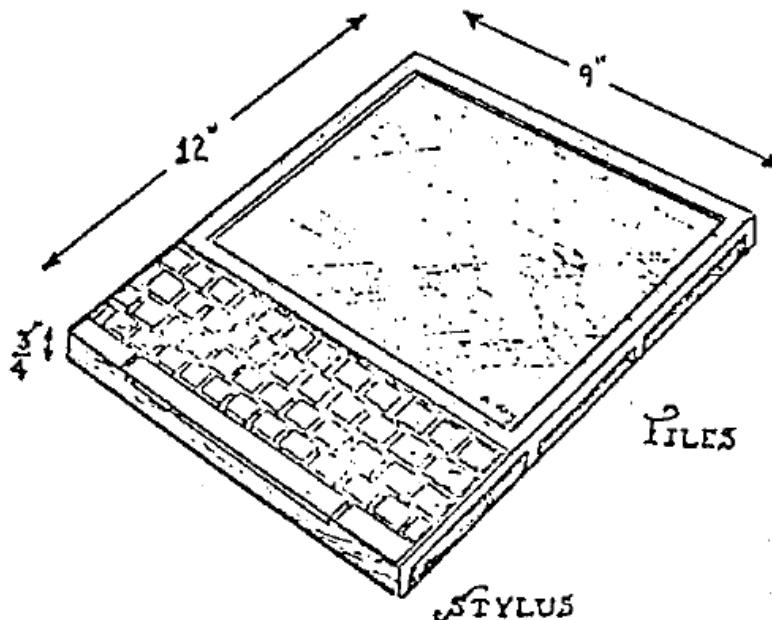
## The DynaBook

"I wish to God these calculations were executed by steam!"

Charles Babbage (age 19)  
ca. 1803

"The Analytical Engine weaves algebraic patterns, just as the Jacquard Loom weaves patterns in silk."

-Ada Augusta  
Countess of Lovelace



# XEROX Machines



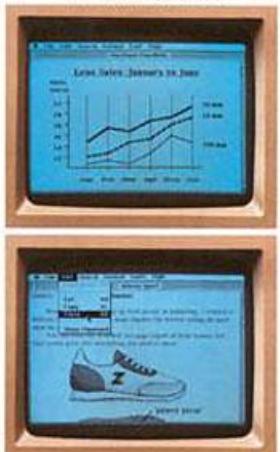
**XEROX Alto (1973)**



**XEROX Star (1981)**

[1984]

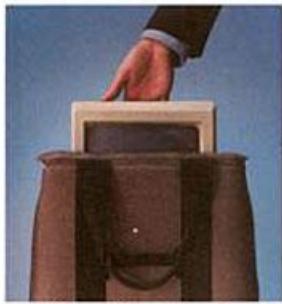
Macintosh's Personality.  
THE SERIOUS SIDE.



THE FUN SIDE



# Apple introduces Macintosh. The computer for the bemused, confused and intimidated.



The first Apple  
you can carry  
in a bag.

We understand how you feel.

It's Catch-22. If you're busy enough to really benefit from a computer, you don't have the time to decipher the buzz words, jargon, claims and counter-claims of "Computer-Speak."

So you're left bemused, confused or intimidated by an information overload



of space as an 8½ x 11 inch pad of paper. To understand how, forget computers. Imagine your desk. What do you see?

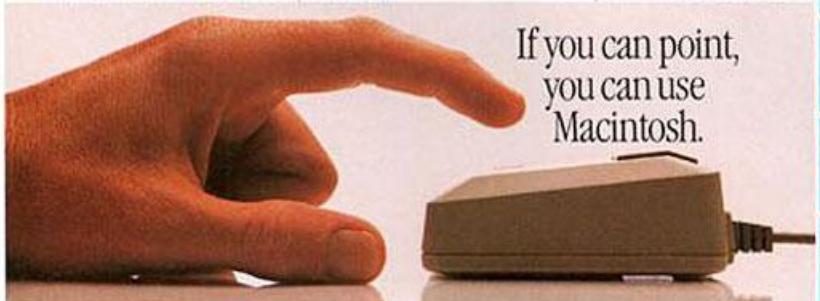
An In-and-Out tray. A calendar. Pens, paper, scissors, tape. Stacks of memos. Lists of things to do. A calculator. Drawers of files. And at the side, a trash can.

As you move the mouse, an arrow moves on the screen. Point the arrow to the file folder. Push the button on the mouse. And you're instantly working with that file.

Every other object on Macintosh's screen works the



If you can point,  
you can use  
Macintosh.



All of these objects are on Macintosh's screen. Just as they are on your desk.

Say, for example, you want a file. On other computers, you'd refer to a manual. Find a code. Type it on a keyboard. And wait. A slow, laborious process. Especially if you don't type.

With Macintosh there is no typing. To open a file, you move a hand-held device on your desk, called a mouse.

same way. Using the mouse, you can draw a chart. Cut it out. And paste it into the text of a memo. Just by pointing and clicking.

With software like MacWrite, MacDraw, MacPaint and MacTerminal, you work faster. More efficiently. And more creatively.

And there are hundreds more software programs on the way. Each on 3½ inch disks that let you carry file cabinets of information in your shirt pocket. Macintosh itself weighs only 20 pounds. Which means you can literally carry your whole office home with you.

And to carry you through the largest workloads, is Macintosh's 32-bit microprocessor.

With twice the power of any 16-bit computer.

And because Macintosh is an Apple 32-bit SuperMicro, it can work as a part of an integrated system with other Macintoshes, Lisas and peripherals. It

can also communicate with DEC® and IBM® mainframes.

See Macintosh at your Apple dealer today.

While it may amaze you, Macintosh certainly won't bemuse, confuse or intimidate you.

And neither will the price.

Soon there'll be just two kinds of people. Those who use computers and those who use Apples.



For the authorized dealer nearest you or for more information, please call 1-800-268-7796. In Ontario and Quebec, call 1-800-268-7657. Apple, the Apple logo, MacWrite, MacDraw, MacPaint, MacTerminal, Lisa and Apple 32-bit SuperMicro are trademarks of Apple Computer, Inc. Macintosh is a trademark licensed to Apple Computer, Inc. DEC is a registered trademark of Digital Equipment Corporation. IBM is a registered trademark of International Business Machines Corporation.

# Apple LISA & Mac (1984)



Lisa Technology



43

# Challenges to HCI designers

- Two important challenges to HCI designers:
  - How to keep know what's going on within the development of technology (changes in technology)
  - How to ensure that their designs offer good HCI and take advantage of the potential functionality of the new technology

# **History and Future of Human Computer Interaction**

# History and Future of hci

- Large displays
- Small displays
- Peripheral displays
- Alternative I/O
- Ubiquitous computing
- Virtual environments
- Implants
- Speech recognition
- Multimedia
- Video conferencing
- Artificial intelligence
- Software agents
- Recommender systems
- Etc ...

# The Reactable



- An electronic musical instrument with a tabletop/mobile device
- A multi-touch interface for playing music
- Performers can simultaneously interact by moving and rotating physical objects on its surface.
- Use **Interfaces Gestures** to interact

<https://reactable.com/>

# The Reactable

**Video 2a**



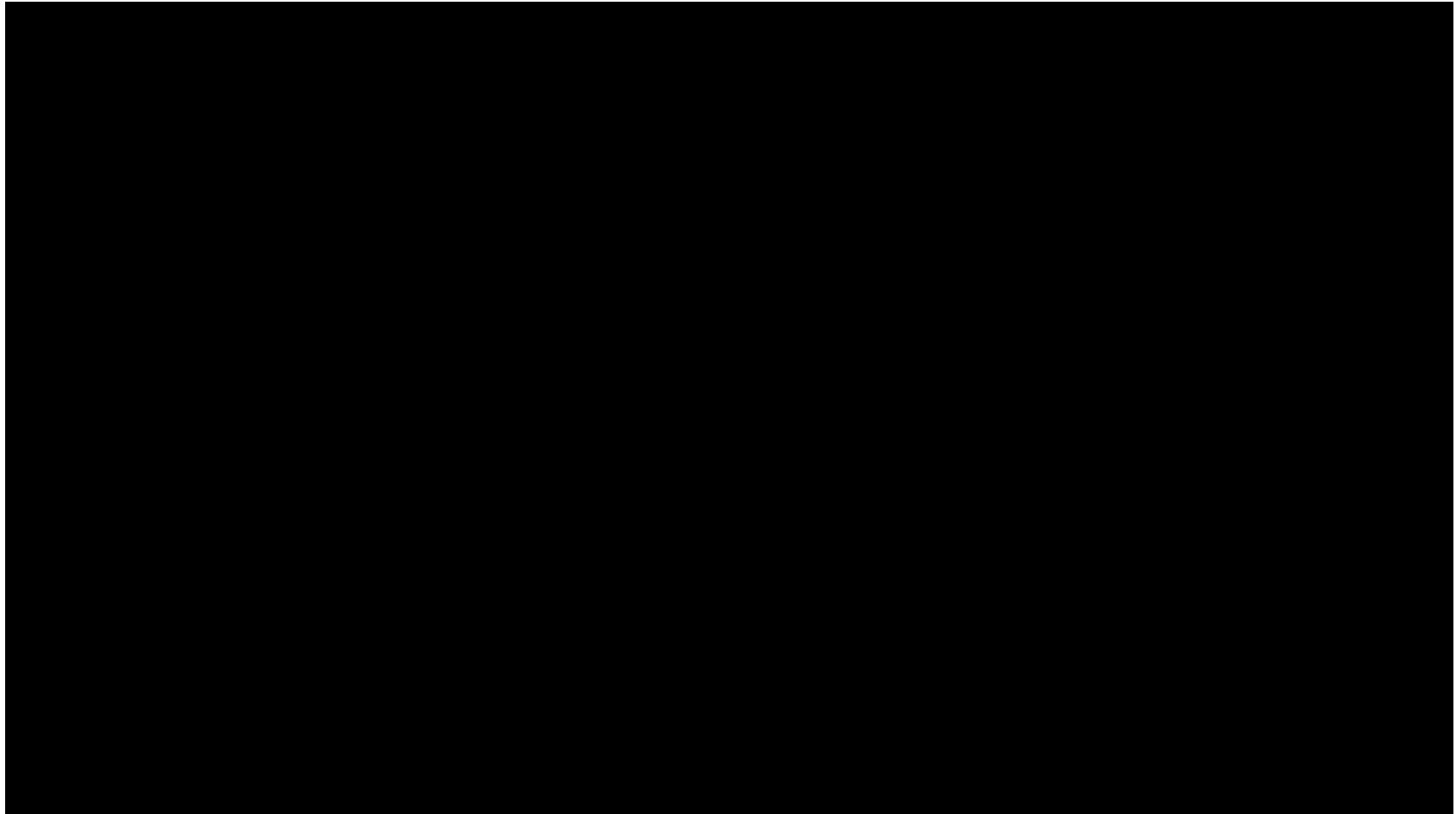
# HotHand Device

- A ring worn by music players that uses motion sensors and a wireless transmitter
- To create different kinds of sound effects by various hand gestures



# HotHand Device

Video 3a



# Rovio Robotic Webcam



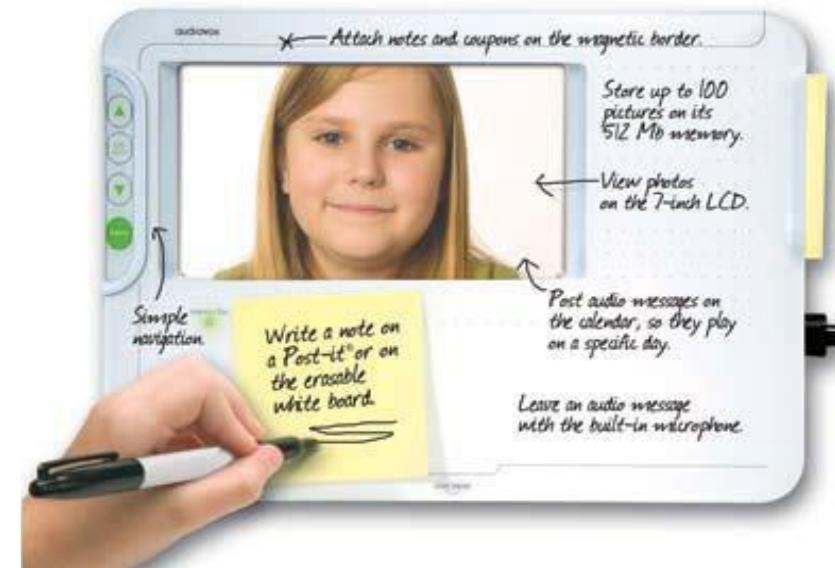
- Wirelessly connected to the internet
- It roams around the house providing an audio and video link to keep an eye on family/pets when you are out

# Rovio Robotic Webcam

**Video 4a**

# Audiovox's Digital Message Center

- New way of family living Digital Message Center is designed to be **attached to the refrigerator**.
- letting families scribble **digital notes** and leave audio and video messages for each other.



# Duality

- Duality ART+COM's artistic installation called Duality, located at the exit of a metro station in Tokyo.
- Passers-by provoke virtual ripple effects with their footsteps, as if walking across a pond.

Technology Reliant World



# Mobile Phone

**HAPPY BIRTHDAY  
MOBILE PHONE!**

LOVE FROM  
CARPHONE WAREHOUSE

1973

From the first mobile phone 'brick' to the latest Apple iPhone: as the size reduces, the potential expands.

2014



# iWatch(1)



# Apple iWatch

Video 5a



Bloomberg  
Business

# Ultra mobile PC (UMPC)

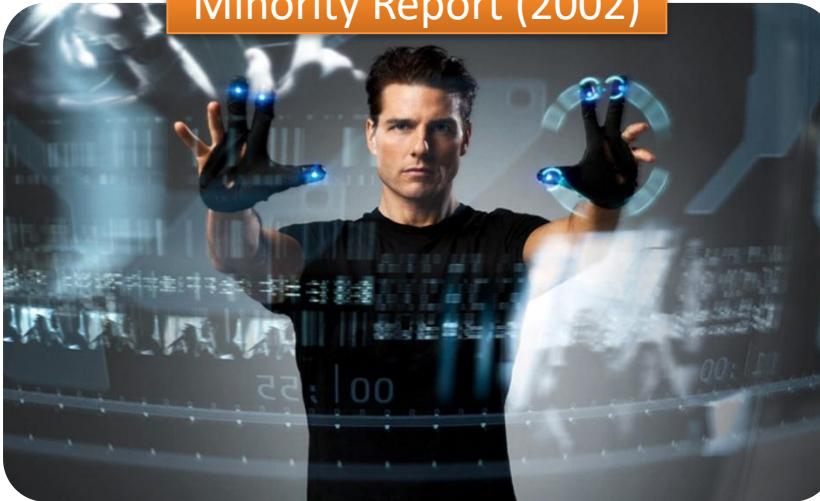
[http://www.youtube.com/watch?v=G\\_FS2TiK3AI](http://www.youtube.com/watch?v=G_FS2TiK3AI)

**Video 6a**

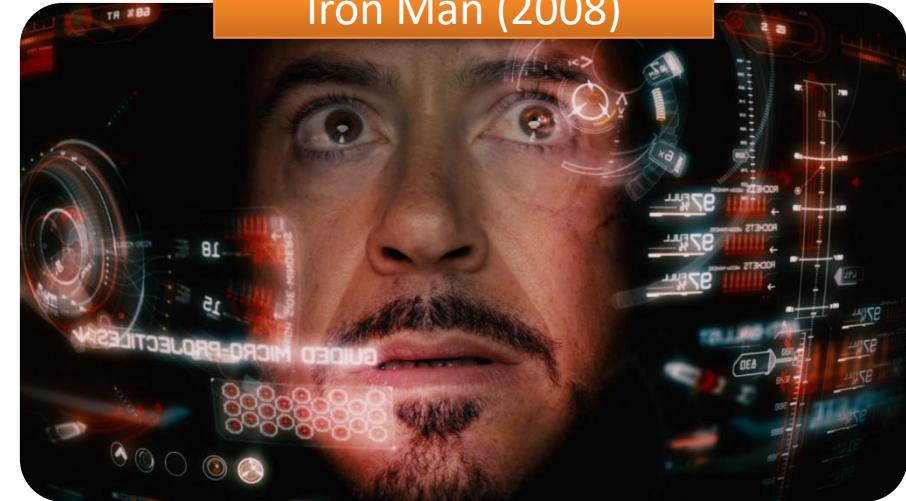


# Film Productions

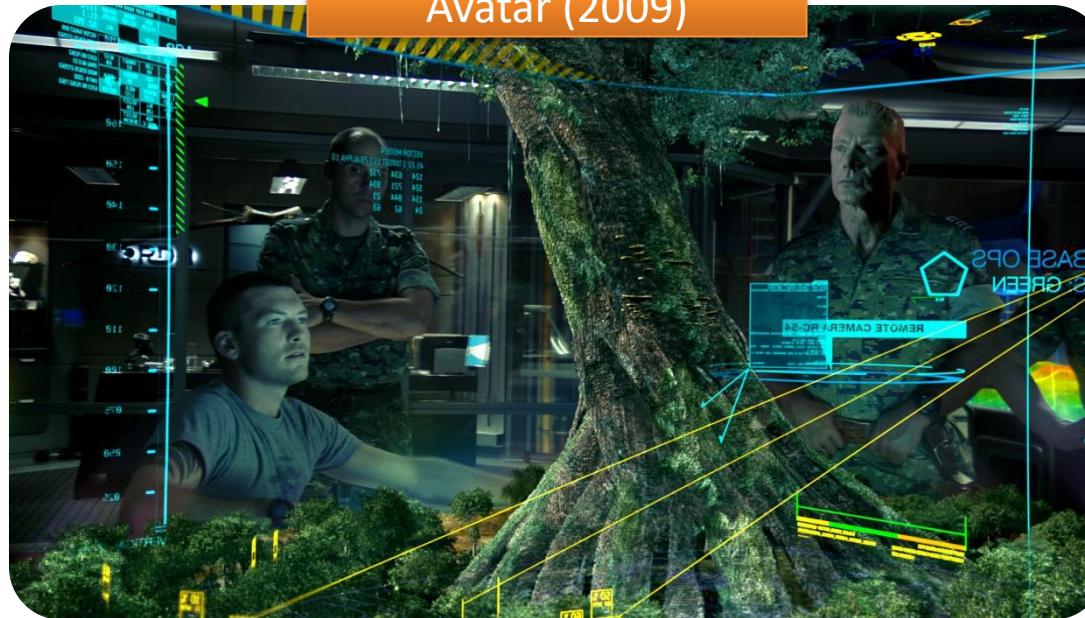
Minority Report (2002)



Iron Man (2008)

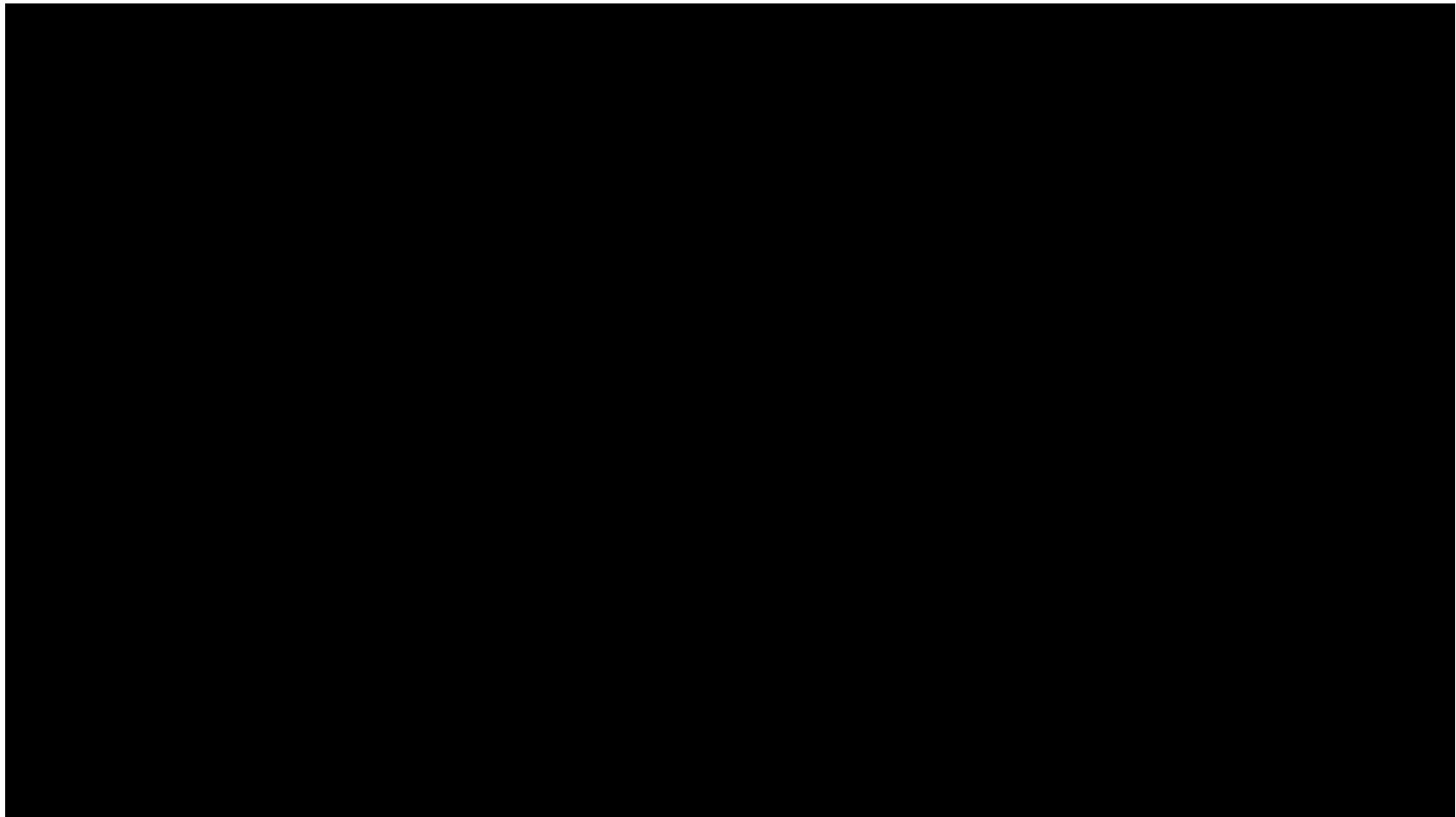


Avatar (2009)



# Other Technologies (Glass)

**Video 7a**



# Other Technologies

Video 7b



# MIT's TRANSFORM

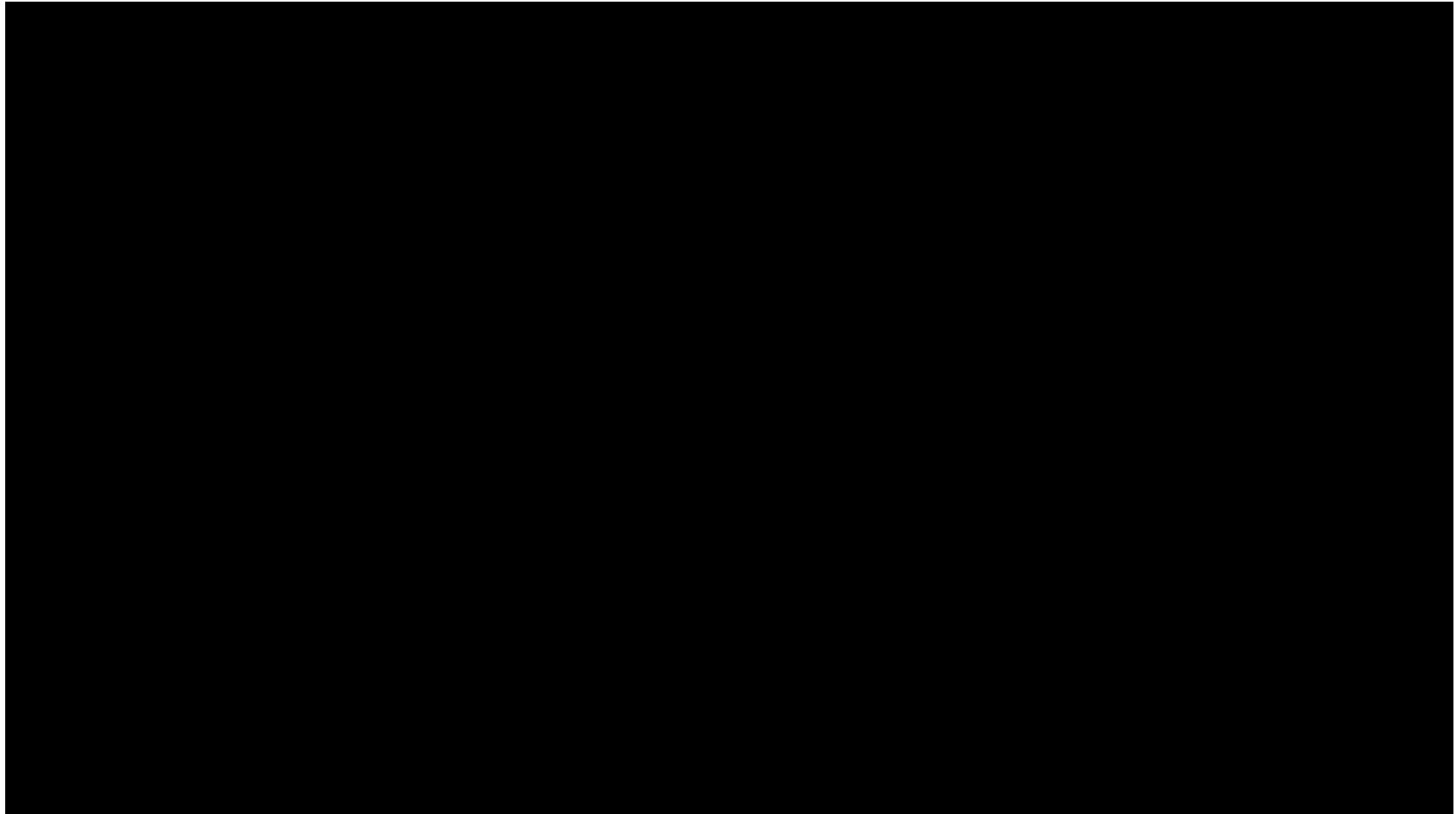
<https://tangible.media.mit.edu/project/transform/>

- Dynamic and Adaptive furniture
- It holds and moves objects like fruits, game tokens, office supplies and tablets; creates dividers on demand; and generates interactive sculptures to convey messages and audio.



# TRANSFORM

Video 10a



ANY  
questions?