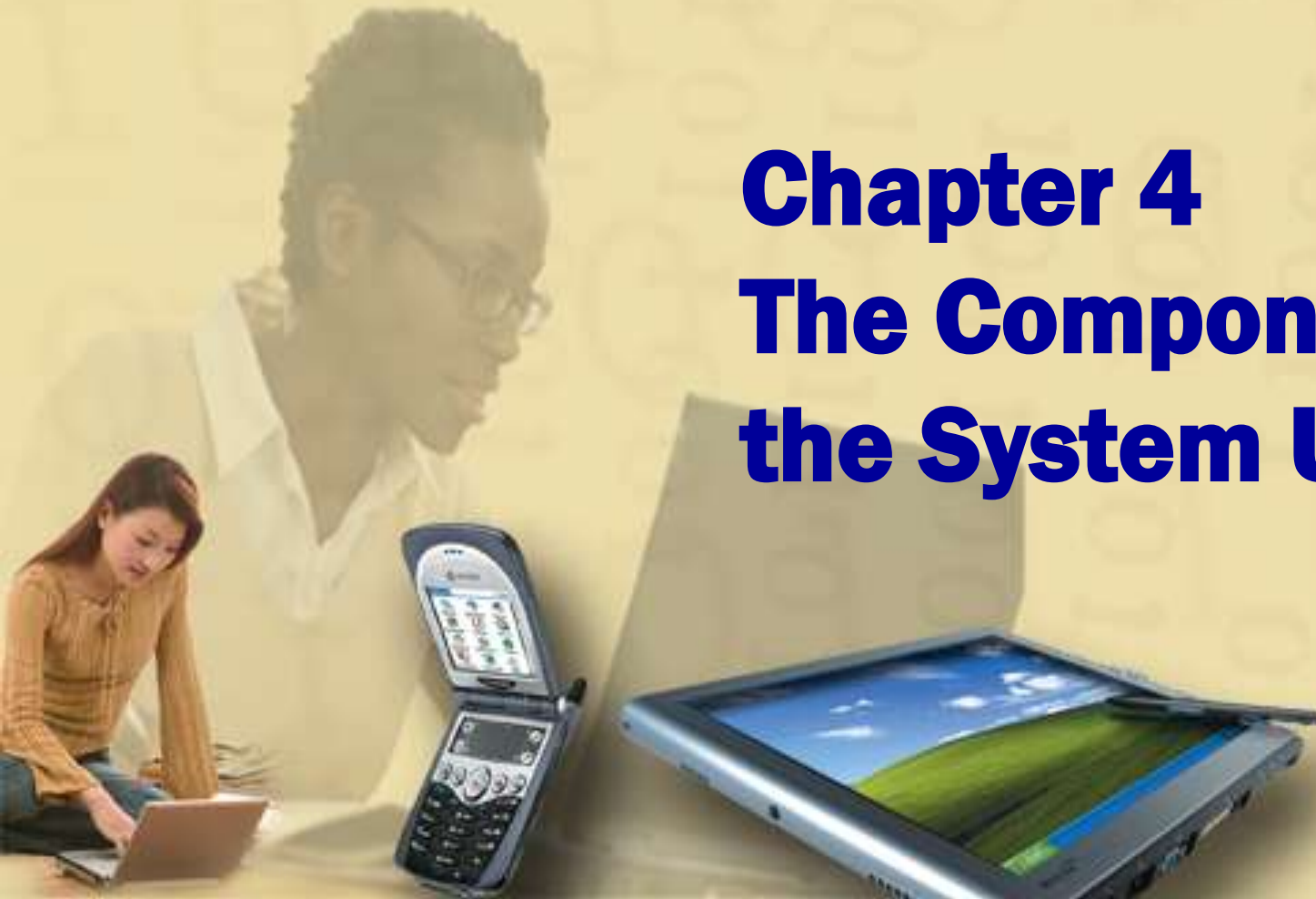# Discovering Computers

FUNDAMENTALS, Second Edition

Chapter 4
The Components of the System Unit

Today

- **The System Unit**
    - Motherboard
    - CPU
    - Control Unit
    - ALU
    - Machine Cycle
    - System Clock
- **Data Representation**
- **Memory**

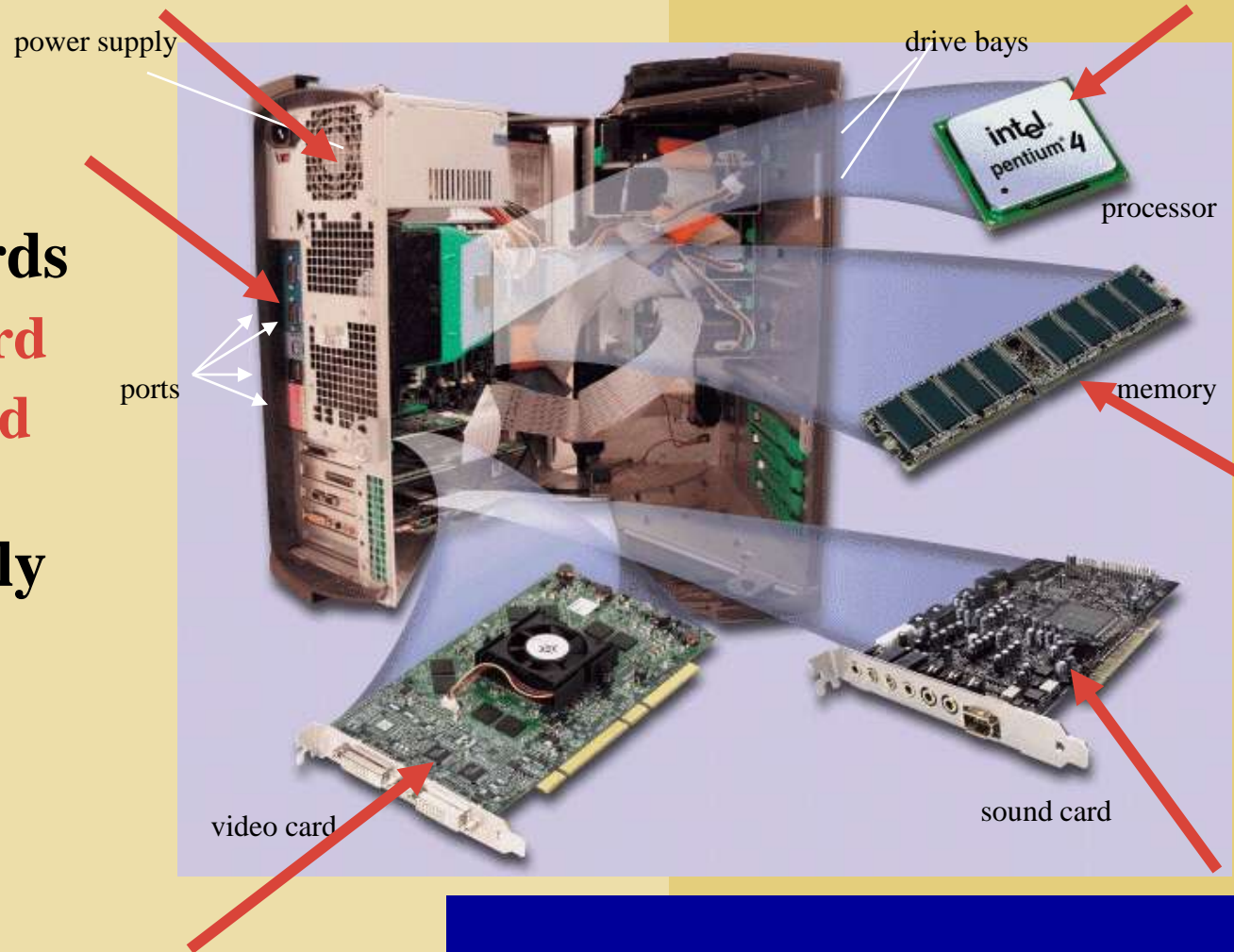# The System Unit

What is the system unit?

➢ **Case that contains electronic components of the computer used to process data**

The System Unit

## What are common components inside the system unit?

- **Processor**
- **Memory**
- **Adapter cards**
  - **Sound card**
  - **Video card**
- **Ports**
- **Power supply**

power supply

drive bays

processor

ports

memory

video card

sound card

The System Unit

What is the motherboard?

➤ **Main circuit board in system unit**

➤ **Contains adapter cards, processor chips, and memory modules**

adapter cards

processor chip in a processor slot

memory module

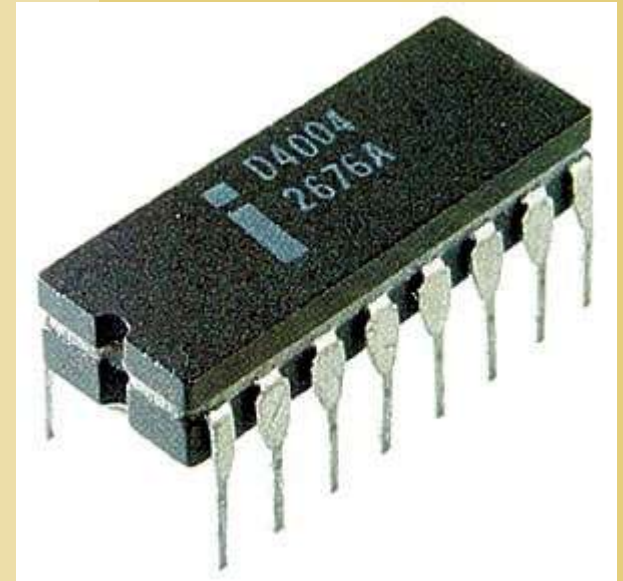expansion slots for adapter cards

motherboard

Next
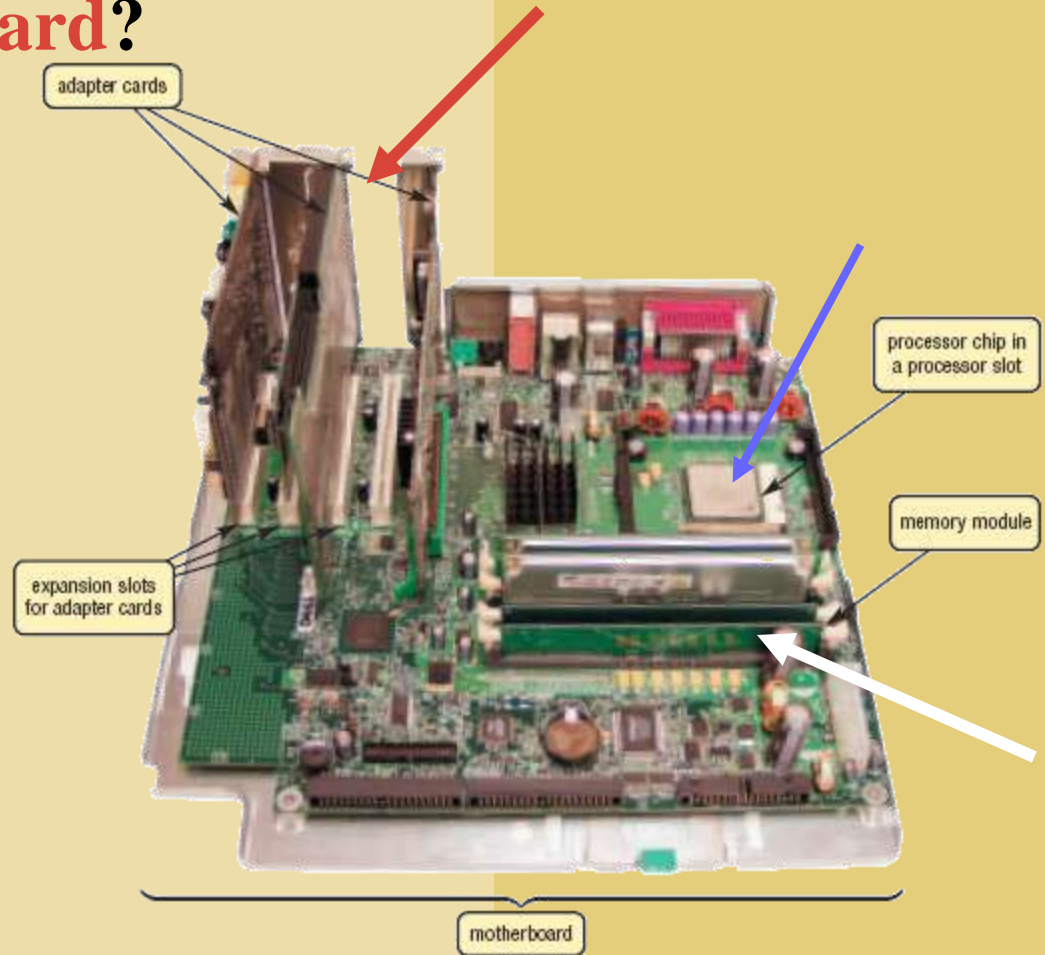
The System Unit

What is a chip?

➢ **Small piece of semi-conducting material on which integrated circuits are etched**

▪ Integrated circuits contain many microscopic pathways capable of carrying electrical current

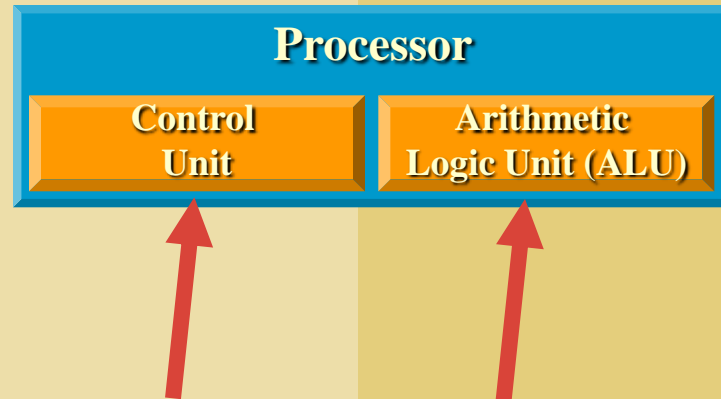➢ **Chips are packaged so they can be attached to a circuit board**

Intel's first processor

Next ▶

Processor

What is the central processing unit (CPU)?

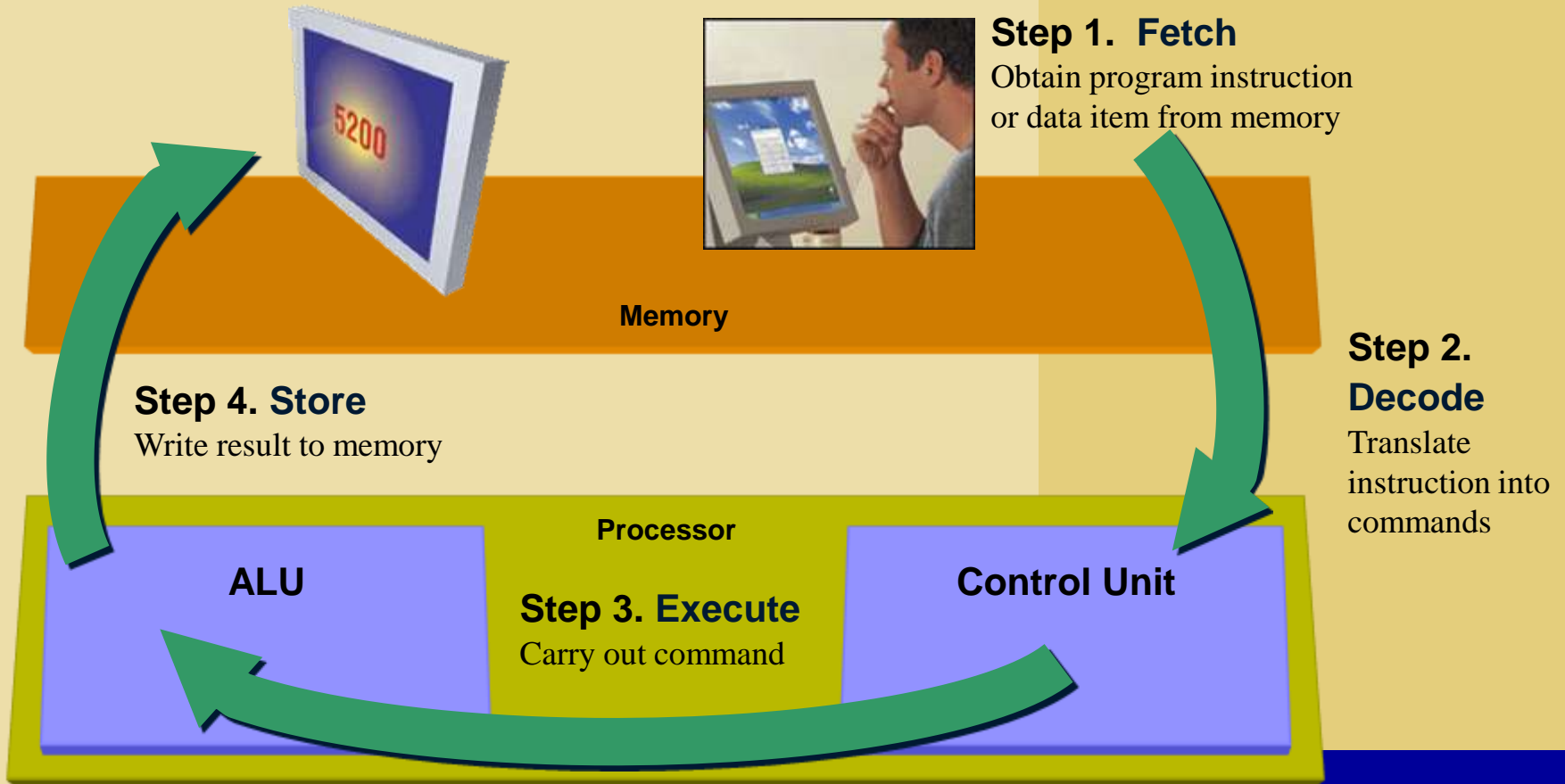> **Interprets and carries out basic instructions that operate a computer**
>
> - **Control unit** directs and coordinates operations in computer
>
> - **Arithmetic logic unit** (ALU) performs arithmetic, comparison, and logical operations
>
> **Also called the processor or the "brains of the computer"**

Processor

| Control Unit | Arithmetic Logic Unit (ALU) |

Processor

What is a machine cycle?

➤ **Four operations of the CPU comprise a machine cycle**

Step 1. Fetch
Obtain program instruction or data item from memory

Memory

Step 2. Decode
Translate instruction into commands

Step 4. Store
Write result to memory

Processor

ALU

Control Unit

Step 3. Execute
Carry out command

5200

Processor

What is the system clock?

➢ **Controls timing of all computer operations**

➢ **Generates regular electronic pulses, or ticks, that set operating pace of components of system unit**

Pace of system clock is clock speed
Most clock speeds are in the gigahertz (GHz) range (1 GHz = one billion ticks of system clock per second)

Processor

Which processor should you select?

➢ **It is a tough decision – there are many to choose from**

Intel	
Celeron D	Budget variety – single core
Pentium 4	Single core
Pentium D	Dual core
Pentium M	Mobile, single core
Core 2	
Core 2 Duo	Dual core
Core 2 Quad	4 core

AMD	
Sempron	Budget variety
Athlon 64	true 64-bit
Athlon 64 FX	better performance
Athlon 64 X2	Dual core
Turion	Mobile

Morse code

A .-	N -.	0 -----
B -...	O ---	1 .----
C -.-.	P .--.	2 ..---
D -..	Q --.-	3 ...--
E .	R .-.	4 ....-
F ..-.	S ...	5 .....
G --.	T -	6 -....
H	U ..-	7 --...
I ..	V ...-	8 ---..
J .---	W .--	9 ----.
K -.-	X -..-	
L .-..	Y -.--	Comma --..--
M --	Z --..	

Data Representation

How do computers represent data?

➤ **Computers are digital**

- Recognize only two discrete states: on or off

- Similar to dots and dashes used in Morse code

- Use Number system with two unique digits: 0 and 1. Use a **binary system** to recognize two states

- A **bit** is short for binary digits

Binary	Decimal
0	0
1	1
10	2
11	3
100	4
101	5
110	6
111	7
1000	8
1001	9
1010	10

Data Representation

What is a byte?

➢ **Eight bits**

➢ **Provides enough different combinations of 0s and 1s to represent 256 individual characters**

Data Representation

What are two popular coding systems to represent data?

> ASCII—American Standard Code
> for Information Interchange

> EBCDIC—Extended Binary Coded Decimal
> Interchange Code

ASCII code

Binary	Decimal	Hex	
0100 0001	65	41	A
0100 0010	66	42	B
0100 0011	67	43	C
0100 0100	68	44	D
0100 0101	69	45	E
0100 0110	70	46	F
0100 0111	71	47	G
0100 1000	72	48	H
0100 1001	73	49	I
0100 1010	74	4A	J
0100 1011	75	4B	K
0100 1100	76	4C	L
0100 1101	77	4D	M

Binary	Decimal	Hex	
0100 1110	78	4E	N
0100 1111	79	4F	O
0101 0000	80	50	P
0101 0001	81	51	Q
0101 0010	82	52	R
0101 0011	83	53	S
0101 0100	84	54	T
0101 0101	85	55	U
0101 0110	86	56	V
0101 0111	87	57	W
0101 1000	88	58	X
0101 1001	89	59	Y
0101 1010	90	5A	Z

Memory

What is memory?

➢ **Electronic components that store instructions, data, and results**

➢ **Each byte stored in unique location called an address, similar to seats in a concert hall**

Next ▶

Memory

How is memory measured?

➢ **By number of bytes available for storage**

Term	Abbreviation	Approximate Size
Kilobyte	KB or K	1 thousand bytes
Megabyte	MB	1 million bytes
Gigabyte	GB	1 billion bytes
Terabyte	TB	1 trillion bytes

Next

Buses

What is a bus?

➢ **Channel that allows devices inside and attached to the computer to communicate with each other**

- System bus connects processor and RAM

- Bus width determines number of bits transmitted at one time

- 32-bit or 64-bit
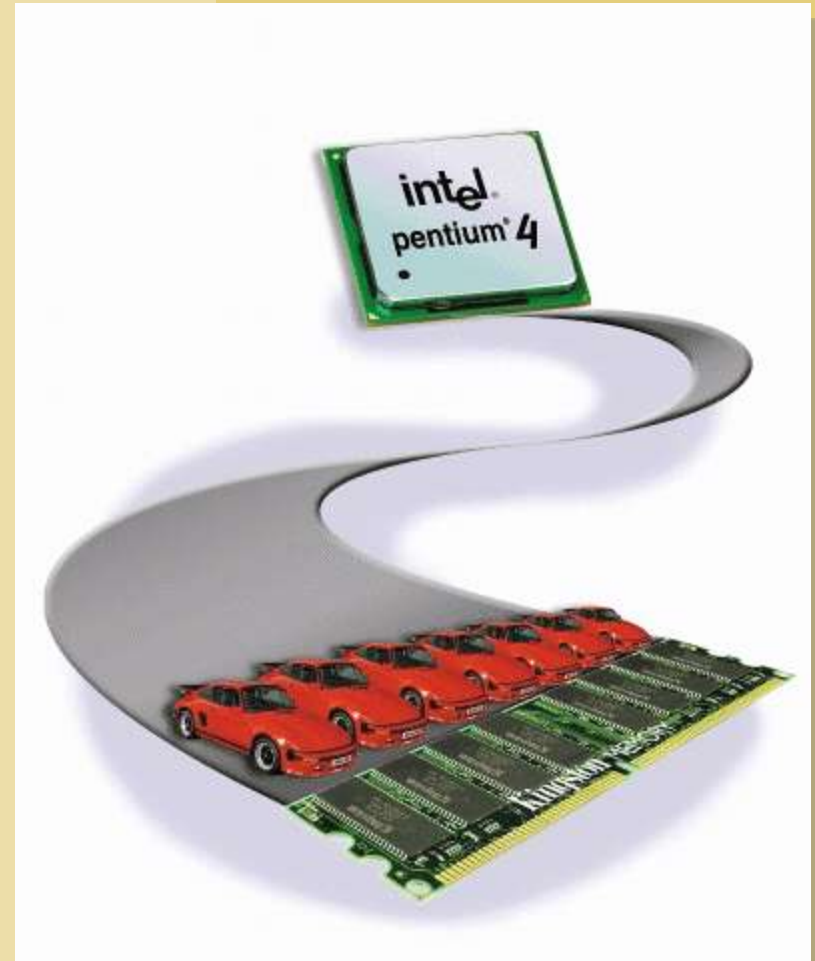
Processor comparison

	Computer 1	Computer 2	Computer 3
Company making computer			
Company making CPU			
CPU type			
Memory capacity			
32- or 64-bit?			
Single- or Dual-core?			

Processor comparison (con't)

	Computer 4	Computer 5	Computer 6
Company making **computer**			
Company making **CPU**			
CPU type			
Memory capacity			
32- or 64-bit?			
Single- or Dual-core?			