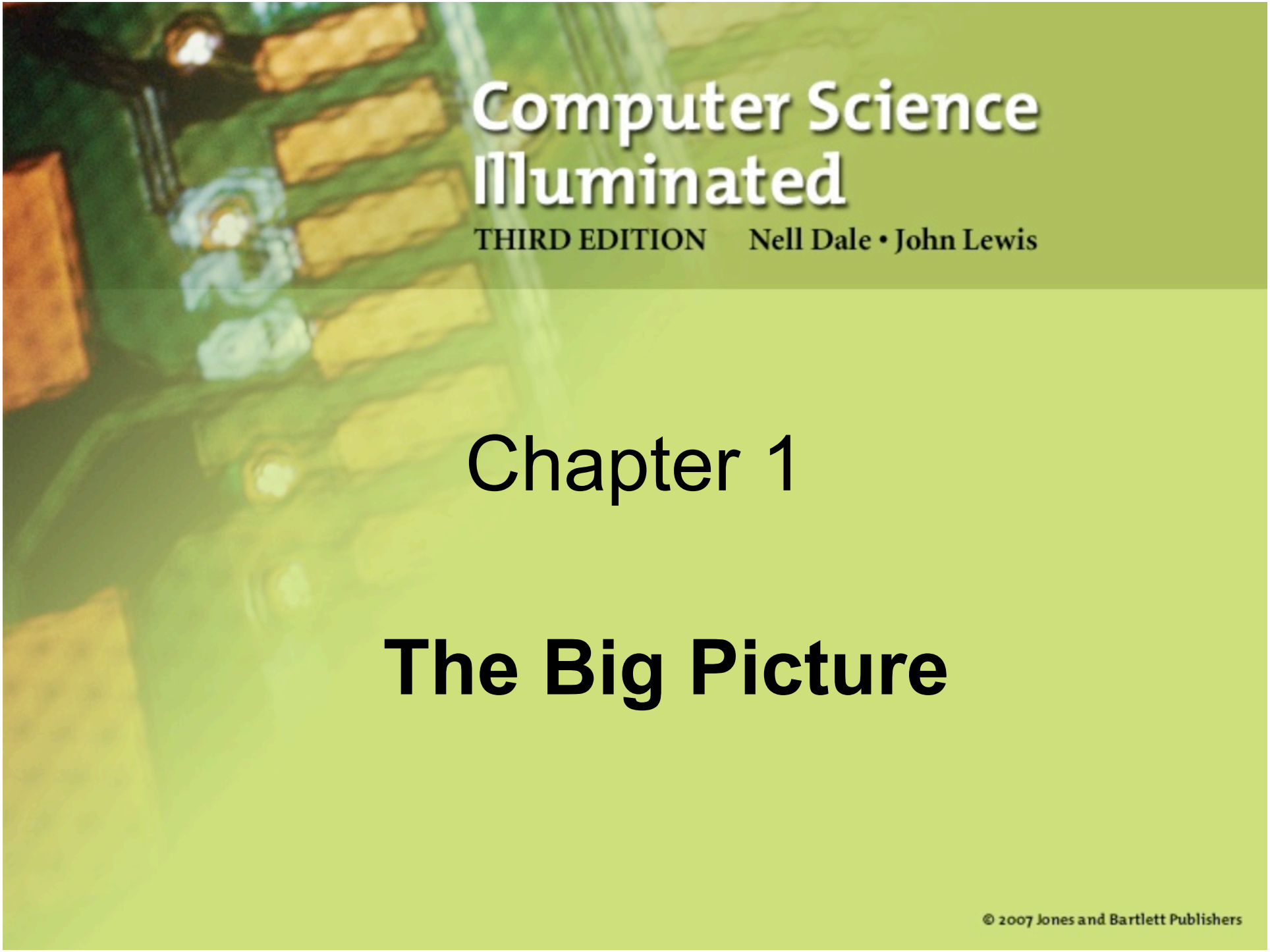
Computer Science
Illuminated
THIRD EDITION
Nell Dale • John Lewis
Chapter 1
The Big Picture
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Computing as a Discipline

What can be (efficiently) automated?

Four Necessary Skills

- Algorithmic Thinking
- Representation
- Programming
- Design

Is Computer Science a mathematical, scientific, or engineering discipline?

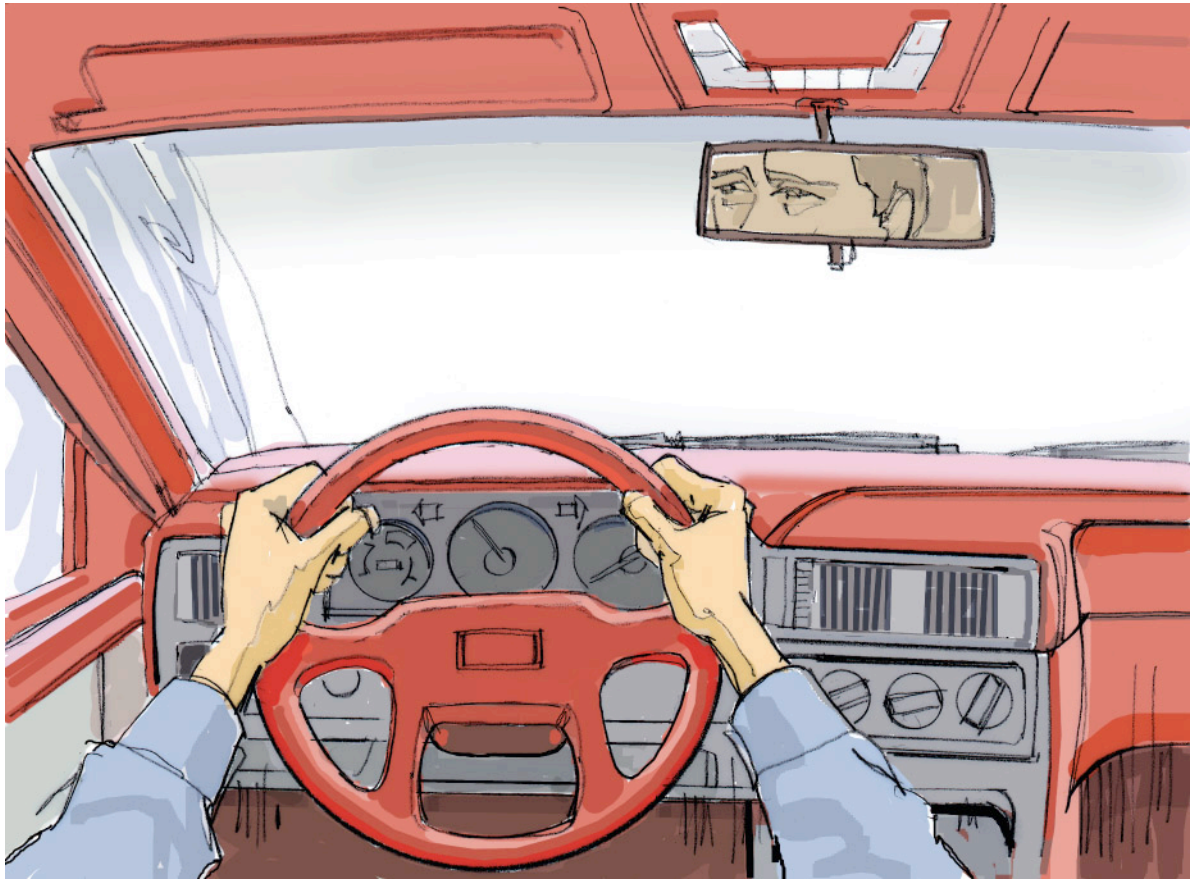
Abstraction

Abstraction A mental model that removes complex details

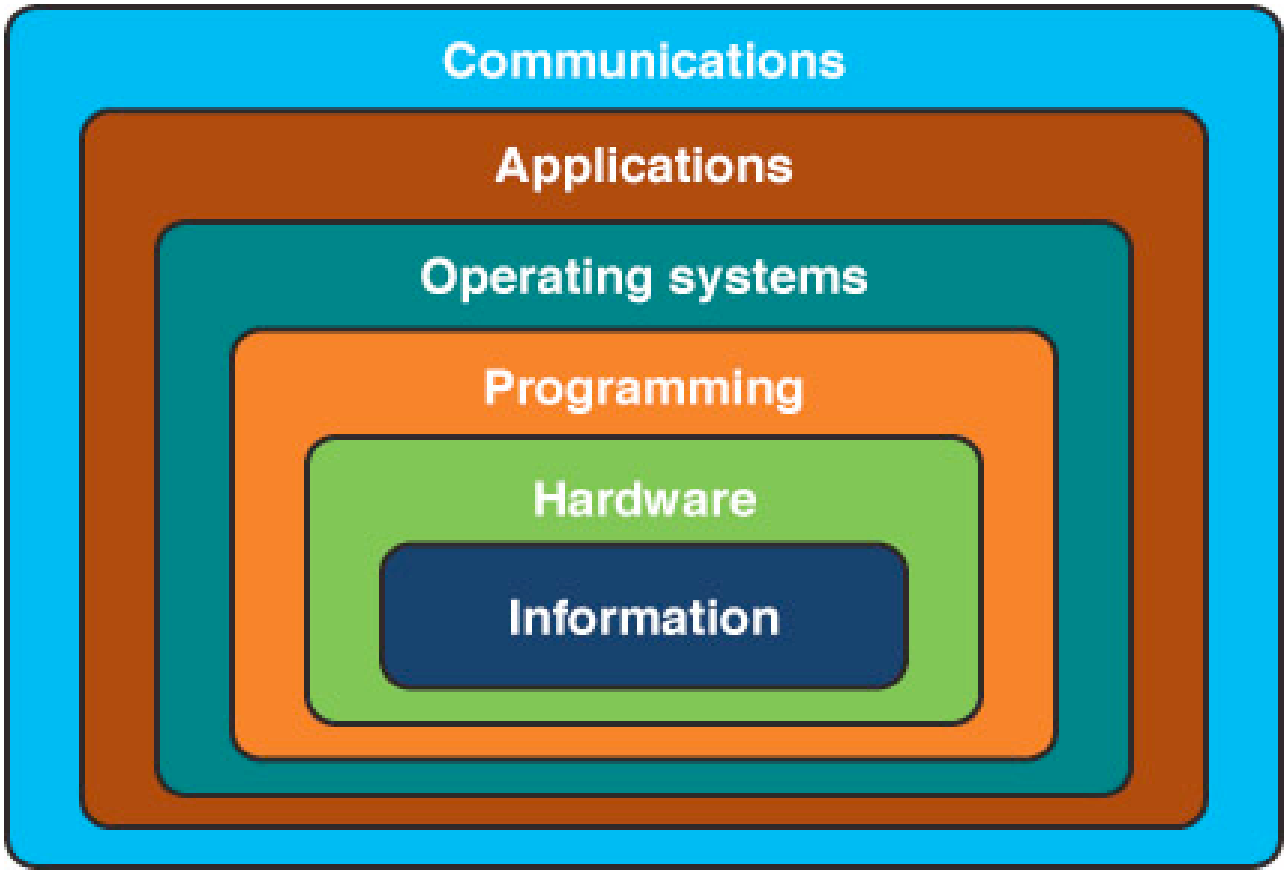
This is a key concept. Abstraction will reappear throughout the text – be sure you understand it!

Internal View

Abstract View

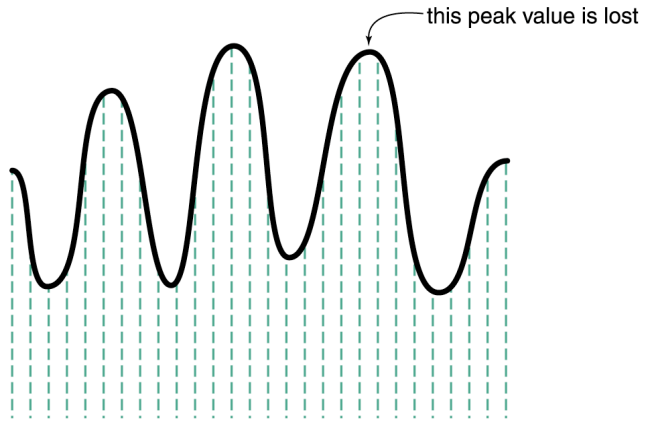


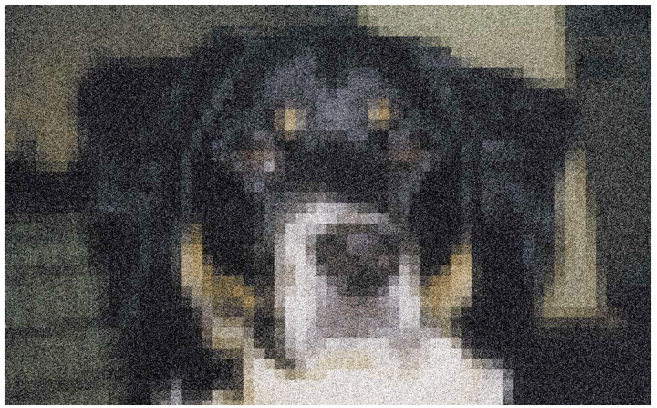
Layers of a Computing System



Information Layer

- Computers are **multimedia** devices, dealing with a vast array of information categories. Computers store, present, and help us modify:
  - Numbers
  - Text
  - Audio
  - Images and graphics
  - Video

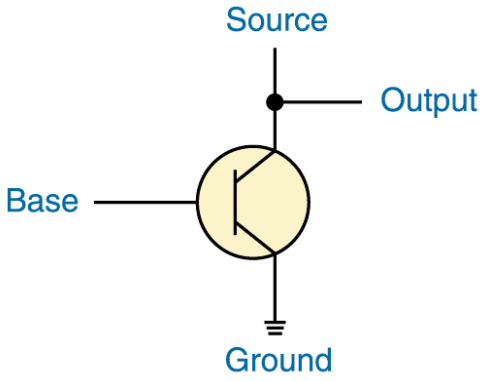


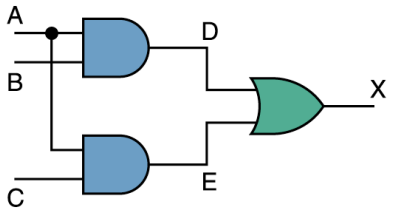


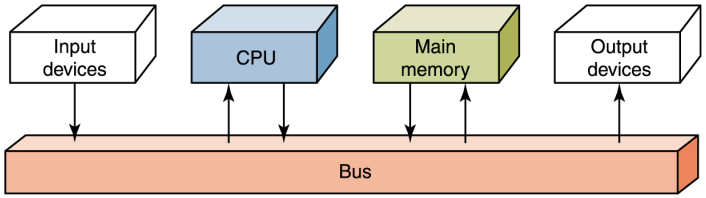
Hardware Layer

- Many Physical Components are brought together to form modern computer architectures
- e.g.,

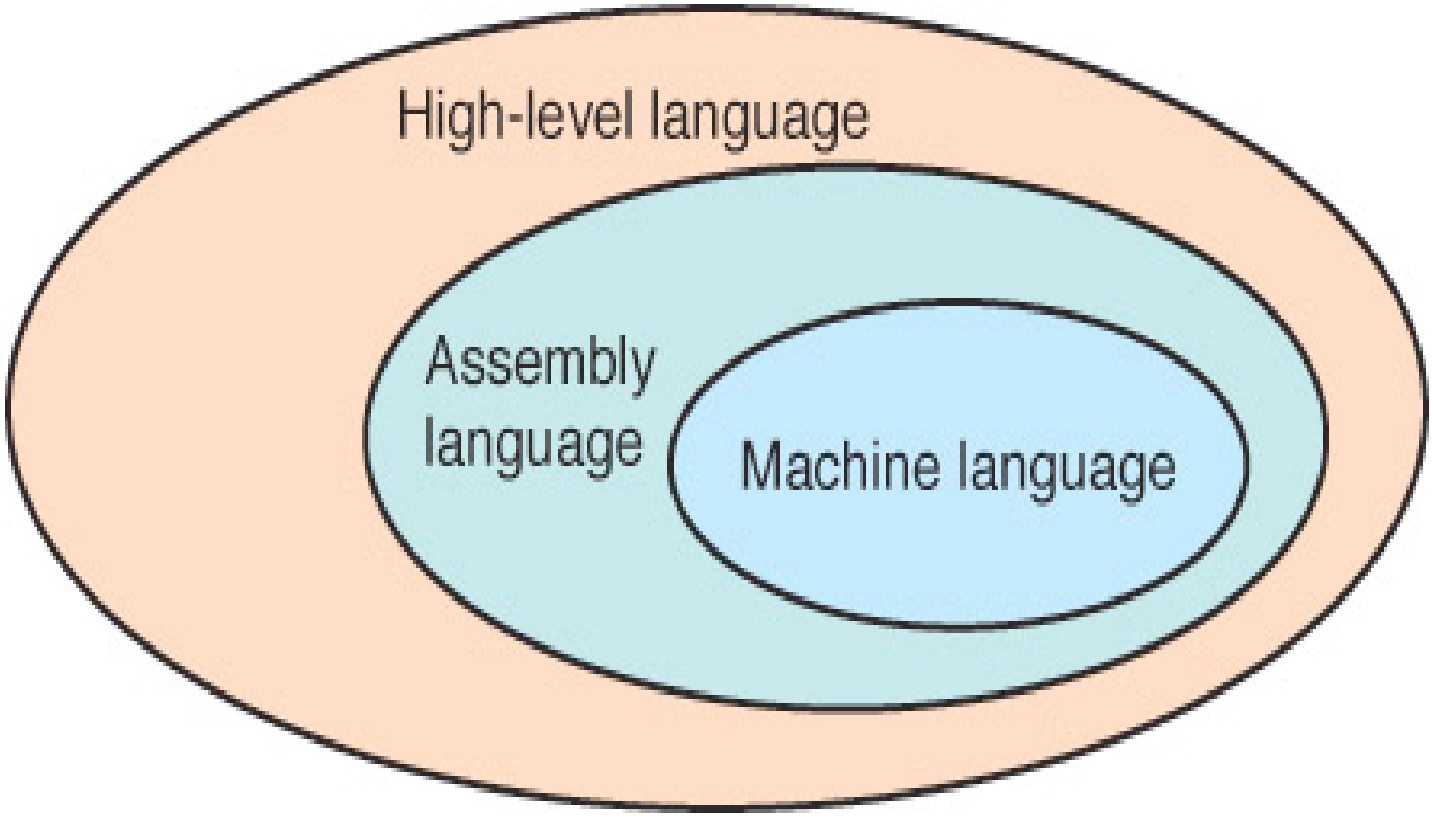
Gates
Circuits
Memory
CPU





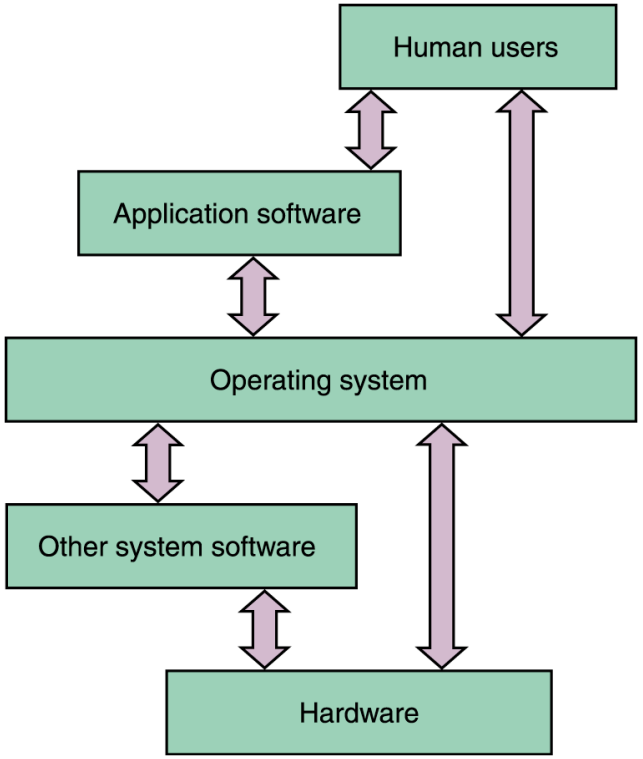


Programming Layer



Operating Systems Layer

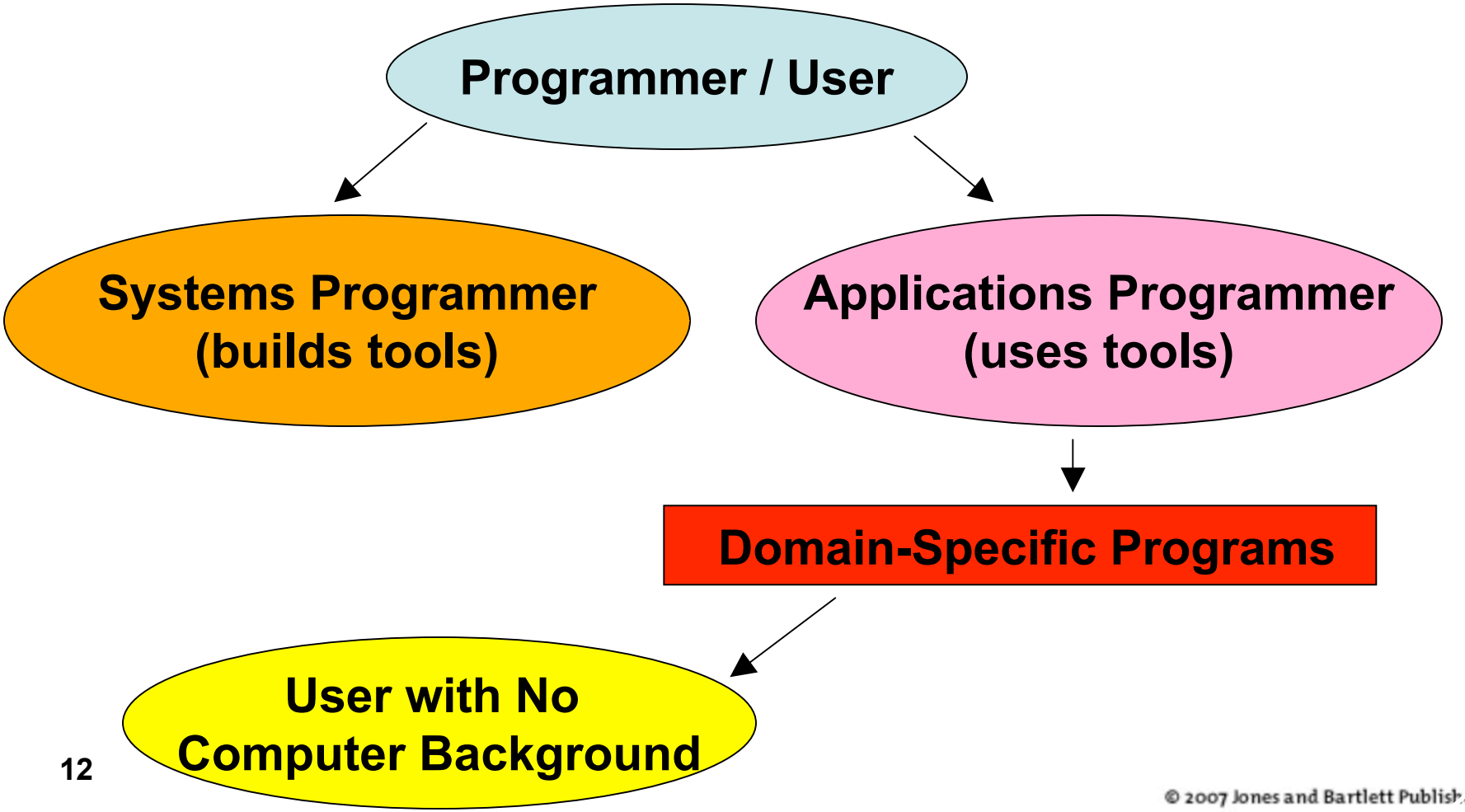
An **operating system** manages computer resources, such as memory and input/output devices, and provides an interface through which a human can interact with the computer



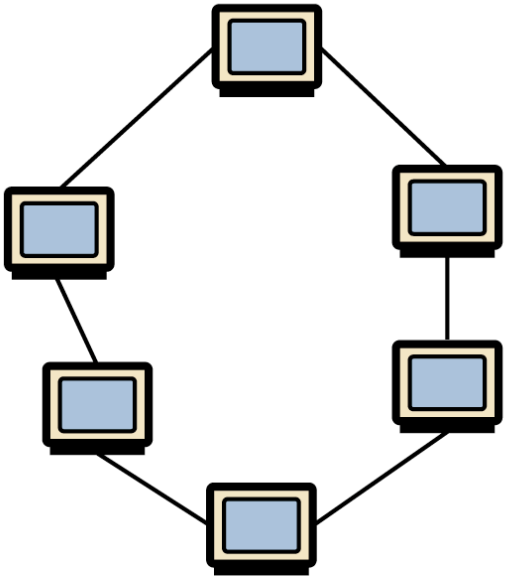
Applications Layer

- Numerical and Symbolic Computation
- Databases and Information Retrieval
- Artificial Intelligence and Robotics
- Graphics
- Organizational Informatics
- Bioinformatics

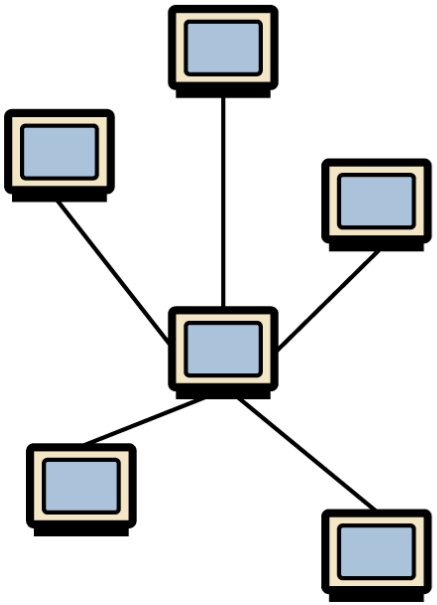
Computing as a Tool



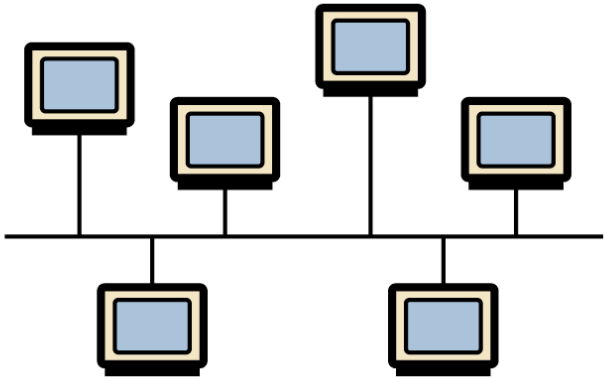
Communications Layer



Ring topology



Star topology



Bus topology

Ethical Issues

The Digital Divide

What is it?

How does it affect you?

What is computer literacy for

your sister, the musician?

your brother, the doctor?

your sister, the kindergarten teacher?

Is it important to try to bridge the digital divide?