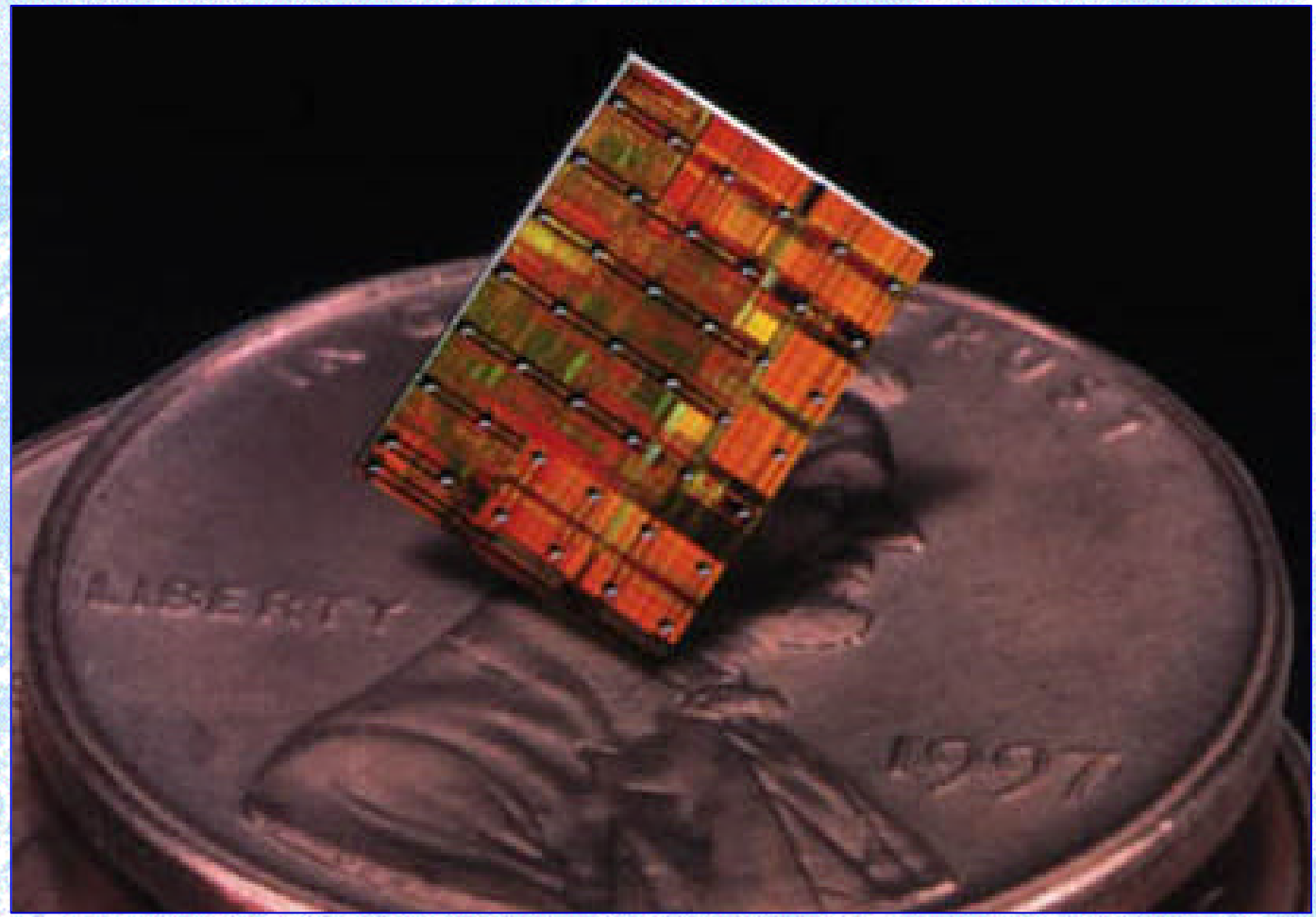
Chapter Sixteen



Inventing the Future

After reading this chapter, you should be able to:

- Describe several strategies for predicting the future
- List several trends in information technology that are likely to continue for a few more years
- Outline several research areas that may produce breakthroughs in computer technology in the next few decades

After reading this chapter, you should be able to:

- Describe some of the social and psychological risks of the information age
- Speculate about the long-term future of the information age

Chapter Outline

- Tomorrow Never Knows
- From Research to Reality: 21st-Century Information Technology
- Human Questions for a Computer Age

Tomorrow Never Knows

- The hazards of predicting the future are that technology is hard to foresee and the impact on society is even harder to predict

Tomorrow Never Knows

- To predict the future, you must recognize its four phases:
  - Hardware: must begin with new hardware
  - Software: software gives value to hardware products
  - Service: hardware/software must serve a human need
  - Way of Life: the service must become a way of life

From Research to Reality: 21st-Century Information Technology

- Engineers and scientists are shaping the future of computers and information technology:
  - Tomorrow's Hardware: Trends and Innovations
  - Tomorrow's Software: Evolving Applications and Interfaces

From Research to Reality: 21st-Century Information Technology

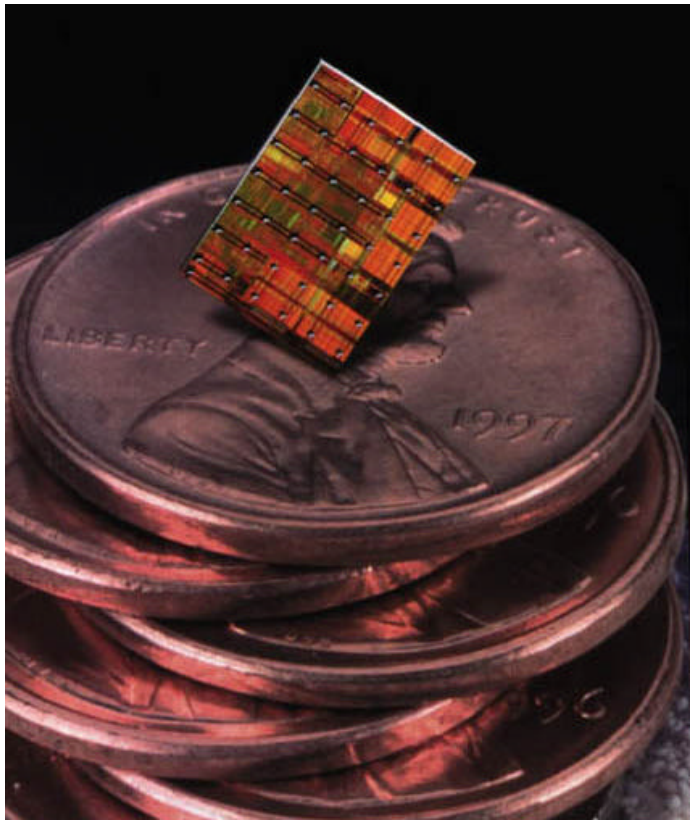
- Tomorrow's Service: Agents on the Network
- Tomorrow's Way of Life: Transparent Technology
- The Day After Tomorrow: Information Technology Meets Biology

Tomorrow's Hardware: Trends

- Trends in computer hardware include:
  - Speed: today's computers process millions of instructions per second (MIPS)
  - Size: no longer room-sized, today's computers can fit in your hand
  - Efficiency: today's computers consume less electricity than their precursors

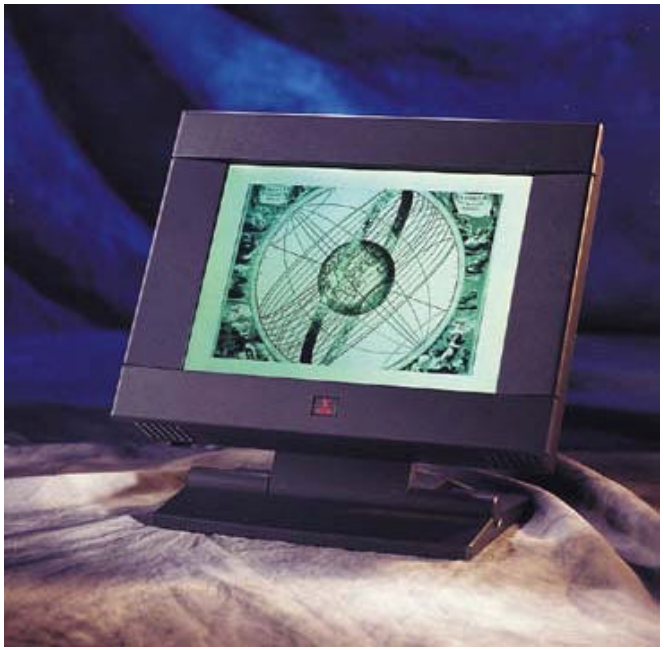
Tomorrow's Hardware: Trends

- Trends in computer hardware include:
  - Capacity: data storage is no longer a constraint
  - Cost: today's computers cost only a fraction of the earlier machines



Tomorrow's Hardware: Innovations

- New technological advancements have led to these hardware innovations:
  - Flat-panel displays
  - Solid-state storage devices
  - Parallel processing

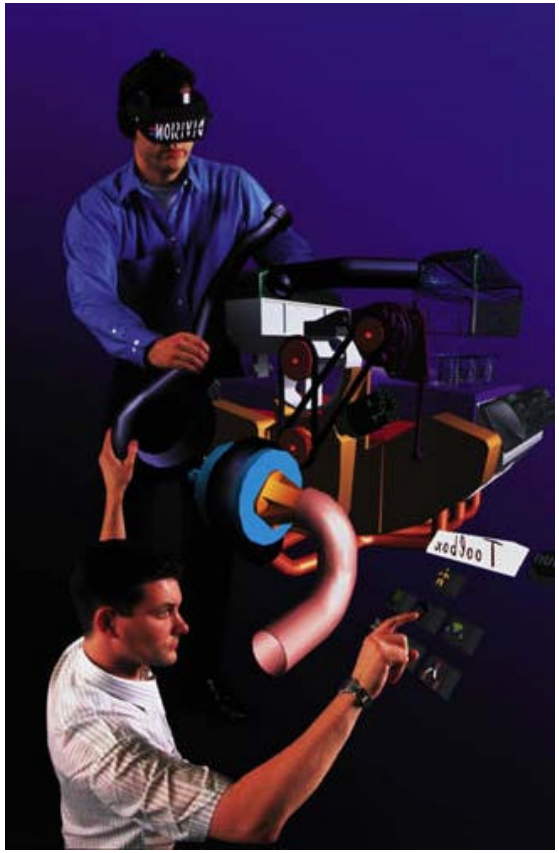


Tomorrow's Hardware: Innovations

- Alternative chip technologies
- Fiber optic networks and wireless networks

Tomorrow's Software: Evolving Applications

- Software technology continues to evolve
- Examples of advances in software include:
  - Object-oriented programming
  - CASE tools

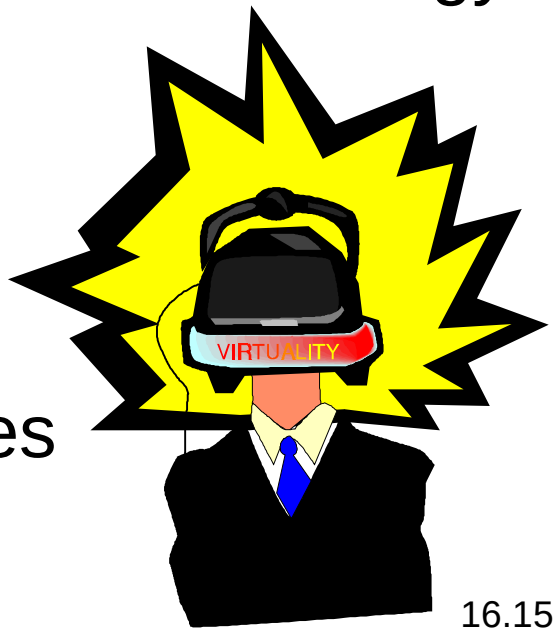


Tomorrow's Software: Evolving Applications

- Visual programming environments
- Seamless communication between computer platforms
- Customizable applications
- Better user interfaces

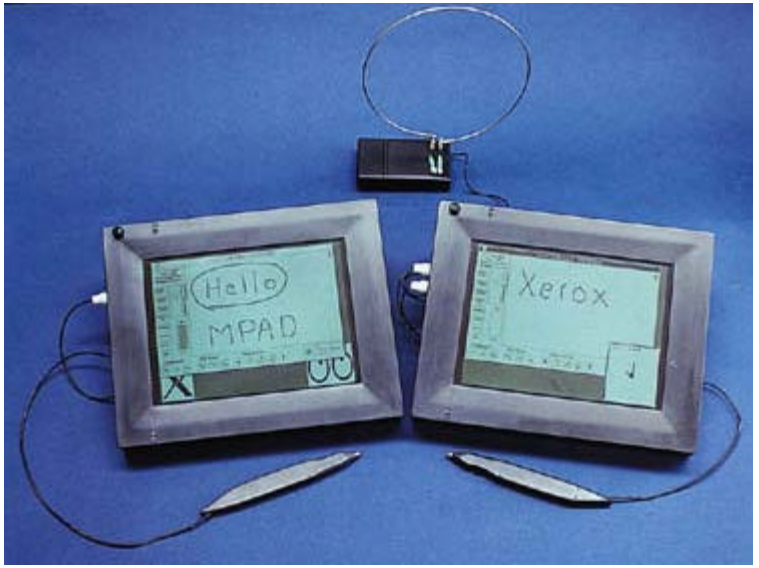
Tomorrow's Software: Evolving Interfaces

- Today's WIMP interface may be replaced by tomorrow's SILK interface:
  - Speech and language: speech technology will become part of the user interface
  - Image: two-dimensional interfaces will give rise to three-dimensional interfaces and include virtual reality



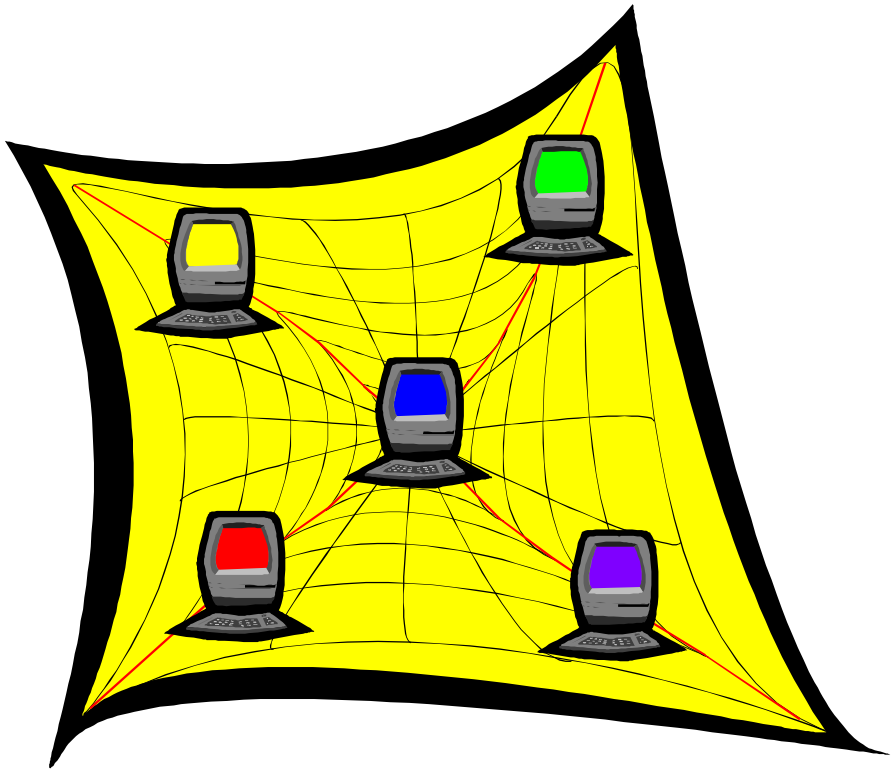
Tomorrow's Software: Evolving Interfaces

- Knowledge: intelligent applications will make interfaces more friendly, forgiving, and useful



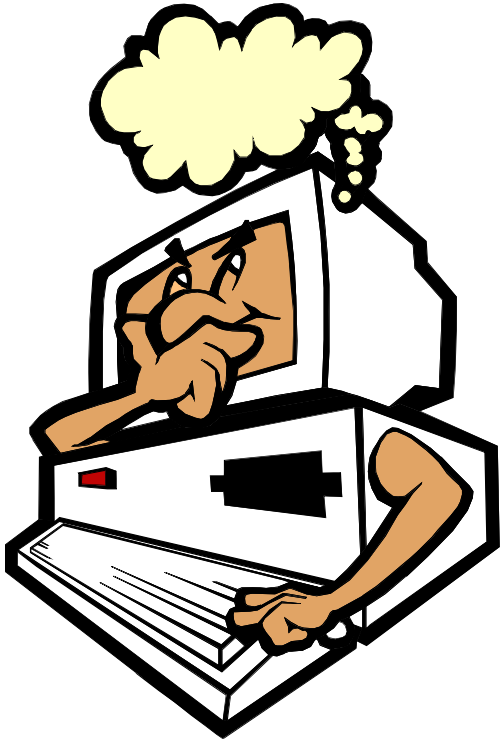
Tomorrow's Service: Agents on the Network

- Intelligent agents are software programs designed to be managed rather than manipulated



Tomorrow's Service: Agents on the Network

- An intelligent agent can:
  - Ask questions
  - Respond to commands
  - Pay attention to the user's work patterns
  - Serve as a guide and coach
  - Take on the user's goals
  - Use reasoning to fabricate its own goals

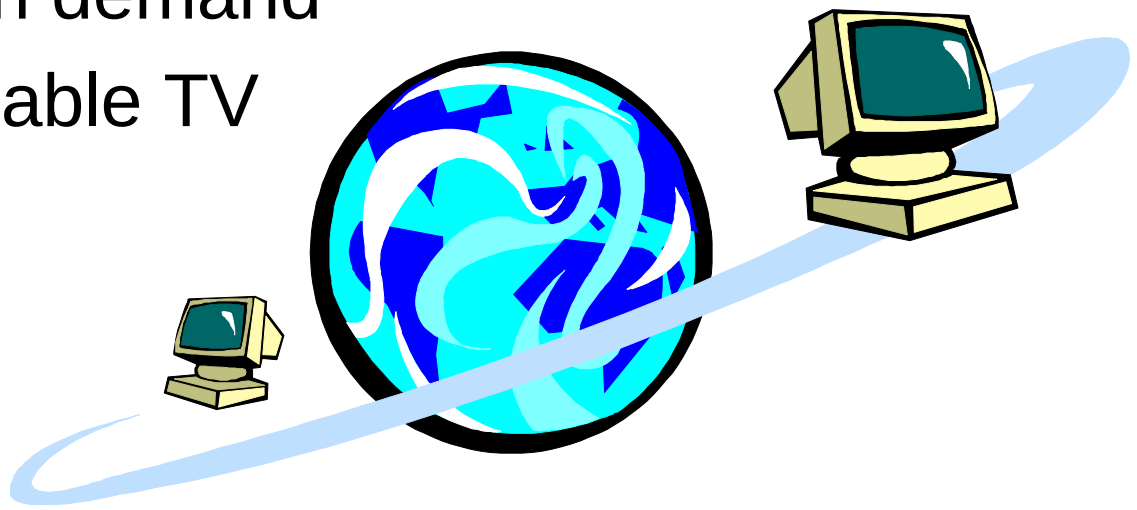


Tomorrow's Service: Cyberspace Services

- Tomorrow's information infrastructure will include these services:
  - Personal telephone numbers
  - Electronic yellow pages
  - Open electronic markets

Tomorrow's Service: Cyberspace Services

- On-demand automobiles
- Customized clothes
- Movies on demand
- Customizable TV

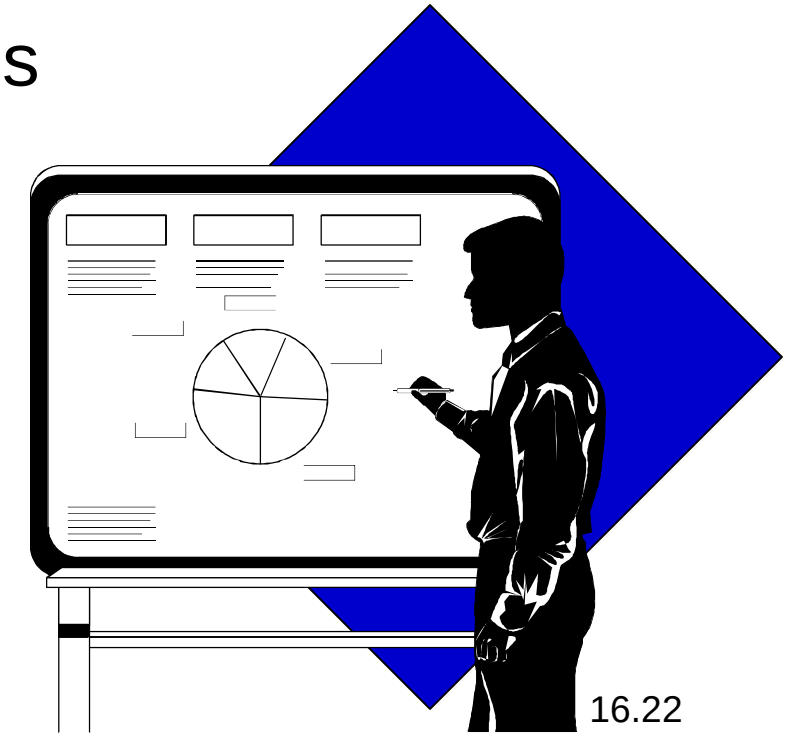


Tomorrow's Way of Life: Transparent Technology

- Some researchers are developing computers that don't make you think you're using a computer
- Embedded intelligence is already built in to many household appliances

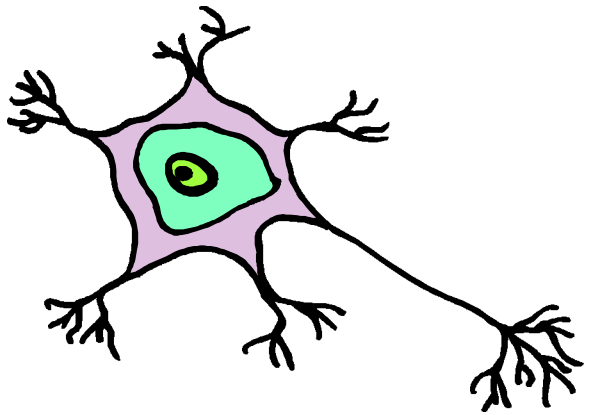
Tomorrow's Way of Life: Transparent Technology

- Three sizes of ubiquitous computers are being developed, in the form of:
  - Tabs: like smart badges
  - Pads: like smart notebooks and books
  - Boards: like smart bulletin boards and blackboards



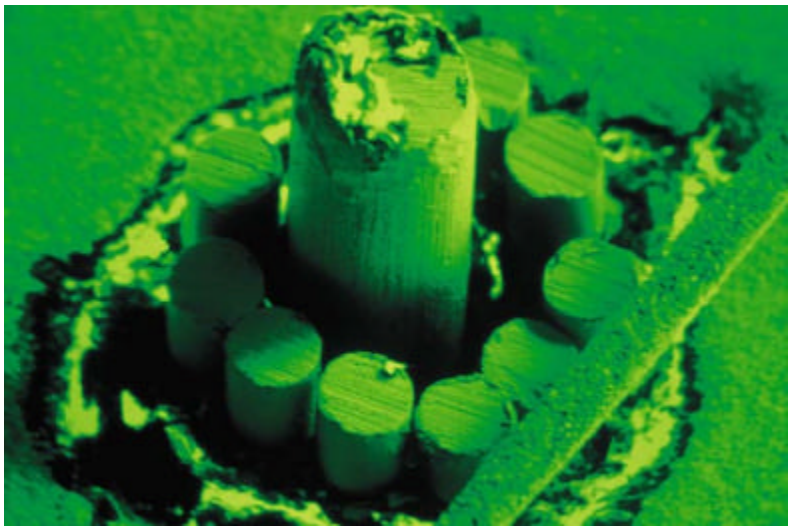
The Day After Tomorrow: Information Technology Meets Biology

- In the future, biotechnology and microtechnology will become more intertwined with computer technology
- These possibilities have led to development in:
  - Microtechnology
  - Nanotechnology
  - Artificial Life



Microtechnology

- Microtechnology is the development of microscopic machines on the scale of a millionth of a meter
- One of these machines has a motor that runs on static electricity

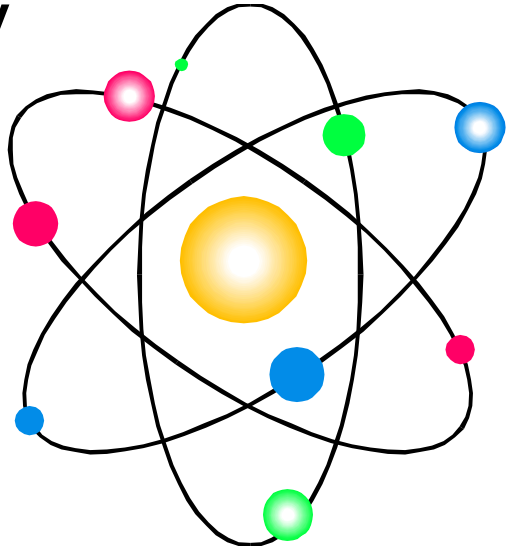


Microtechnology

- Others envision the use of microscopic machines with microsensors, like a smart pill to transmit body temperature
- In the future, such machine might be used to detect and destroy cancer cells

Nanotechnology

- Nanotechnology is the building of machines, atom by atom
- Nanomachines are only a few billionths of a meter in size



Nanotechnology

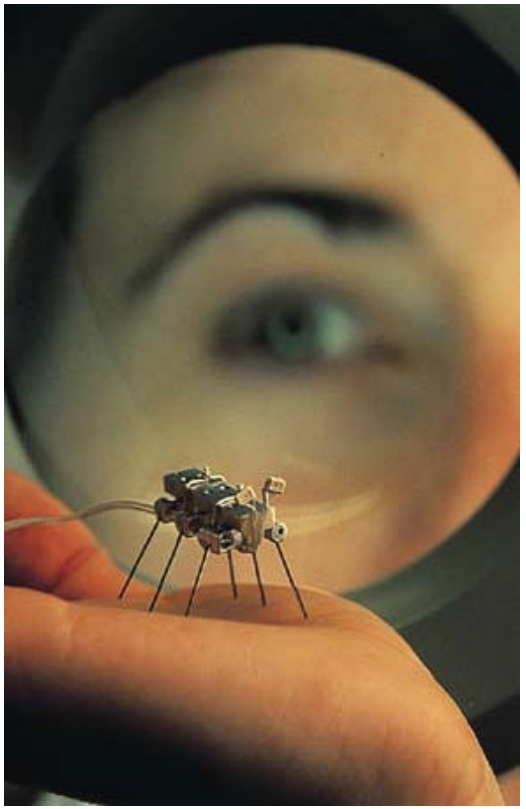
- Nanomachines have been built that use the motion of a single atom as a switch
- Nanomachines are being used to unlock the secrets of genetics
- Germ-sized robots might be built in the future

Artificial Life

- Artificial life includes synthetic organisms that act like natural living systems
- Some experts create simple software organisms that exist in computer memory

Artificial Life

- Other experts build colonies of insect robots that communicate with each other and respond to changes in the environment
- In the future, the line of distinction between artificial and real life may disappear



Human Questions for a Computer Age

- Will computers be democratic?
- Will the global village be a community?
- Will we become information slaves?