Unit I
Principles of Robotics

Chapter 1

Introduction to Industrial Robotics

Unit Objectives

Upon completion of this chapter, students will be able to:

- Cite important developments in the evolution of robots

- List and explain the classifications of industrial robots

- Define various types of automation

- Discuss the role of robots in our society

Key Technical Terms

Anthropomorphic	**Industrial Robot**	**Reprogrammable**
Automaton	**Robot**	**Robotics**
Unimate	**Fixed Sequence Robot**	**Flexible Automation**
Numerically Controlled (NC) Robot	**Variable Sequence Robot**	**Hard Automation**

By the end of this lesson the learner should be able to define and explain characteristics / actions related to these technical terms
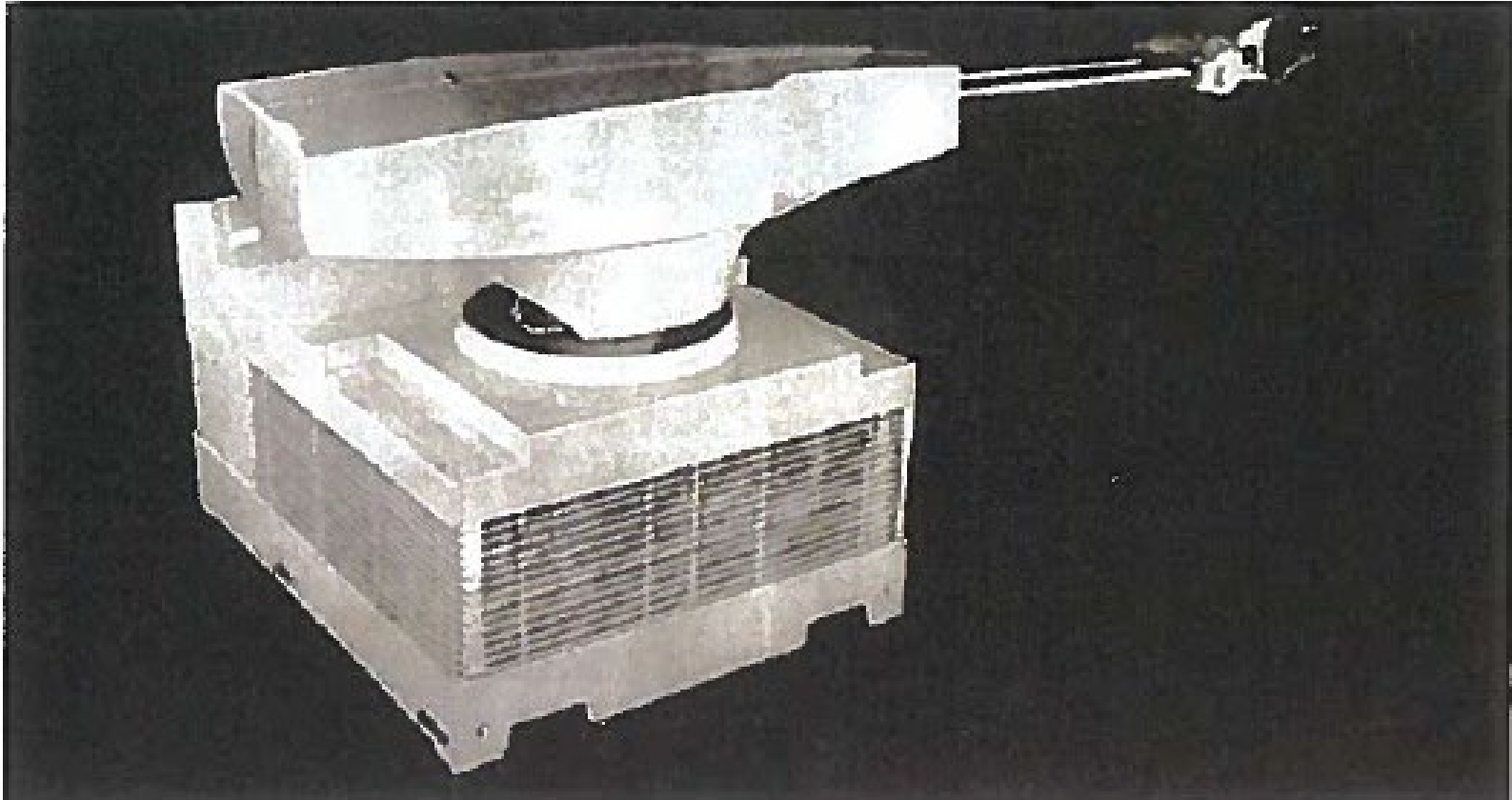
Early Robots – Automatons
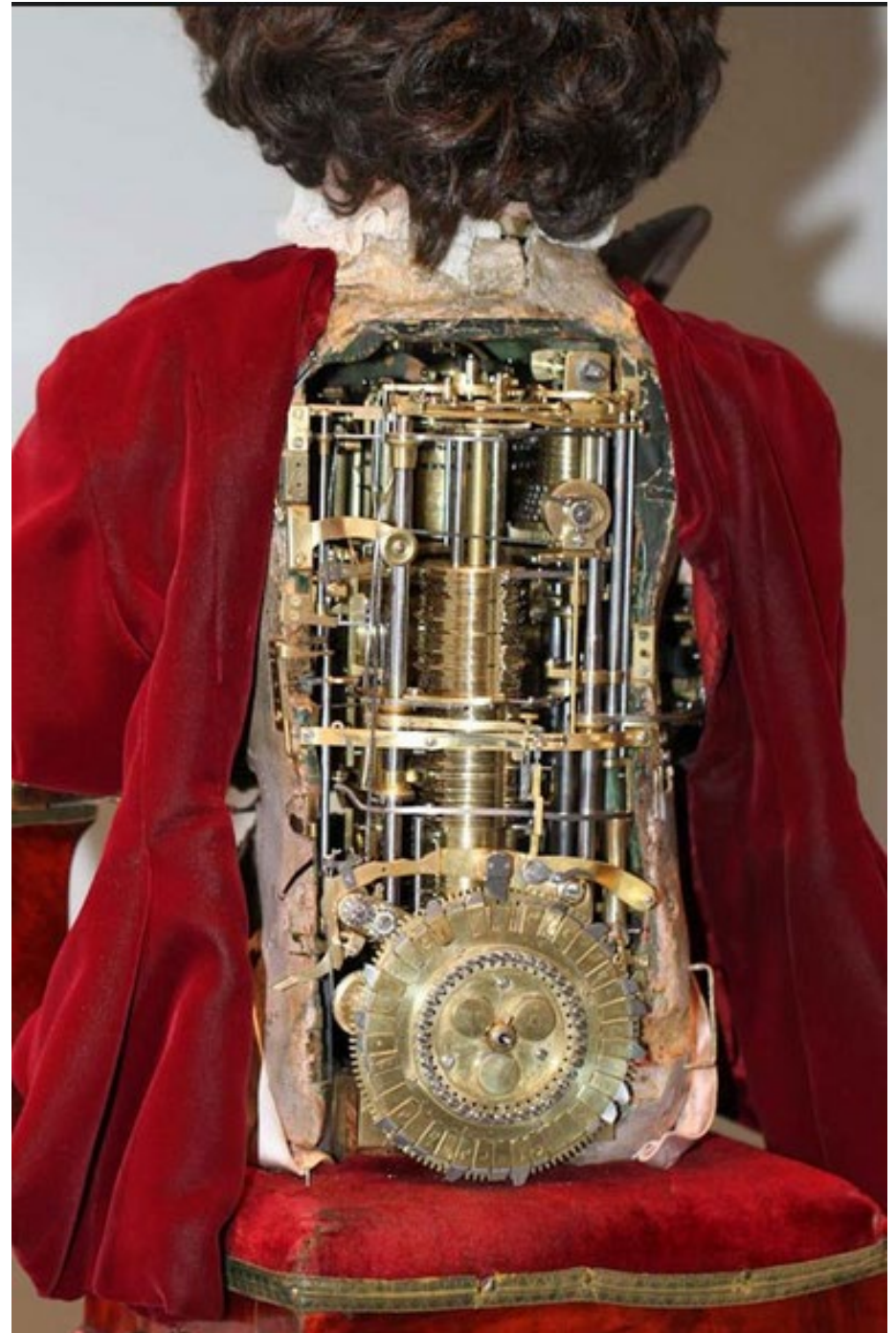
Robot Applications

Educational Activities

Video Surveillance and Security

(Courtesy of NEC Corporation.

Evolution of Industrial Robots

- 1954 – First Industrial Robot **Patented by George C. Devol, Jr.**
- 1958 – Unimation, Inc. formed with Joseph Engelberger as president
- 1961 – **First robot, called Unimate** sold to General Motors

Industrial Robots

Robotics Industries Association defines an industrial robot as:

*"A **reprogrammable**, **multifunctional manipulator** designed to move materials, parts, tools, or specialized devices through various programmed motions for the **performance of a variety of tasks**"*

The industrial robot:
- Is a machine
- Is reprogrammable
- Has a multifunction manipulator
- Is flexible – performs a variety of tasks

(ABB Graco, Motoman, Fanuc Robotics)

Hierarchy of Robotic Evolution
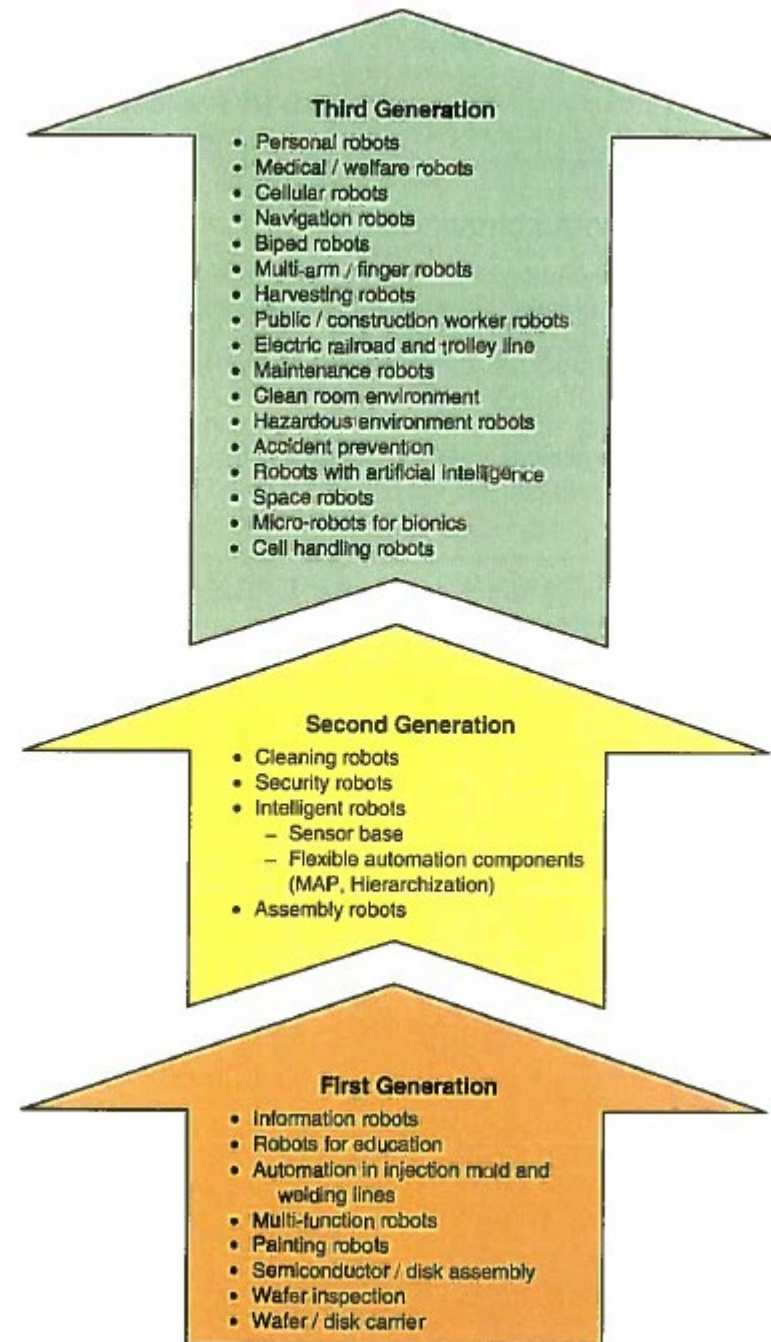
FIRST GENERATION ROBOTS
- Unimate
- Industry
- Educational
- ***Hard Automation***

SECOND GENERATION ROBOTS
- Anthropomorphic
- Cleaning
- Security
- Assembly
- ***Flexible Automation***

THIRD GENERATION ROBOTS
- Robots with Artificial Intelligence (AI)

Third Generation
- Personal robots
- Medical / welfare robots
- Cellular robots
- Navigation robots
- Biped robots
- Multi-arm / finger robots
- Harvesting robots
- Public / construction worker robots
- Electric railroad and trolley line
- Maintenance robots
- Clean room environment
- Hazardous environment robots
- Accident prevention
- Robots with artificial intelligence
- Space robots
- Micro-robots for bionics
- Cell handling robots

Second Generation
- Cleaning robots
- Security robots
- Intelligent robots
  - Sensor base
  - Flexible automation components (MAP, Hierarchization)
- Assembly robots

First Generation
- Information robots
- Robots for education
- Automation in injection mold and welding lines
- Multi-function robots
- Painting robots
- Semiconductor / disk assembly
- Wafer inspection
- Wafer / disk carrier

Flexible Manufacturing Work Cell

Future of Robotics